

CPC COOPERATIVE PATENT CLASSIFICATION

H ELECTRICITY

(NOTE omitted)

H02 GENERATION; CONVERSION OR DISTRIBUTION OF ELECTRIC POWER

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 "microstructural devices" and "microstructural systems".
4. {In this subclass, it is desirable to add the indexing codes of [H02K 2201/00](#)-[H02K 2213/12](#).}

WARNING

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

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)	1/223	. . . {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)}
1/02	. characterised by the magnetic material		
1/04	. characterised by the material used for insulating the magnetic circuit or parts thereof (insulation of windings H02K 3/30)	1/226	. . . . {of the claw-pole type}
		1/24	. . . Rotor cores with salient poles {; Variable reluctance rotors}
1/06	. characterised by the shape, form or construction	1/243	. . . . {of the claw-pole type}
1/08	. . Salient poles	1/246	. . . . {Variable reluctance rotors}
1/10	. . . Commutating poles	1/26	. . . Rotor cores with slots for windings
1/12	. . Stationary parts of the magnetic circuit	1/265	. . . . {Shape, form or location of the slots}
1/14	. . . Stator cores with salient poles	1/27	. . . Rotor cores with permanent magnets {(rotor cores for synchronous machines with means for mechanical adjustment of the excitation flux H02K 21/021)}
1/141	. . . . {consisting of C-shaped cores}		
1/143	. . . . . {of the horse-shoe type}	1/2706	. . . . {Inner rotor}
1/145	. . . . {having an annular coil, e.g. of the claw-pole type}	1/2713	. . . . . {where the magnetisation axis of the magnets is axial}
1/146	. . . . {consisting of a generally annular yoke with salient poles}	1/272	. . . . . {where the magnetisation axis of the magnets is radial or tangential}
1/148	. . . . . {Sectional cores (H02K 1/141 takes precedence)}	1/2726	. . . . . {consisting of a single magnet or of a plurality of axially juxtaposed single magnets}
1/16	. . . Stator cores with slots for windings	1/2733	. . . . . . {Annular magnets}
1/165	. . . . {Shape, form or location of the slots}	1/274	. . . . . . {consisting of a plurality of circumferentially positioned magnets}
1/17	. . . Stator cores with permanent magnets	1/2746	. . . . . . . {consisting of magnets arranged with the same polarity}
1/18	. . . Means for mounting or fastening magnetic stationary parts on to, or to, the stator structures	1/2753	. . . . . . . {consisting of magnets or groups of magnets arranged with alternating polarity}
1/182	. . . . {to stators axially facing the rotor, i.e. with axial or conical air gap}		
1/185	. . . . . {to outer stators}	1/276	. . . . . . . {Magnets embedded in the magnetic core}
1/187	. . . . . {to inner stators}	1/2766	. . . . . . . {having a flux concentration effect}
1/20	. . . with channels or ducts for flow of cooling medium		
1/22	. . Rotating parts of the magnetic circuit		

- 1/2773 {consisting of tangentially magnetized radial magnets}
- 1/278 {Surface mounted magnets; Inset magnets}
- 1/2786 {Outer rotor}
- 1/2793 {Rotor axially facing stator}
- 1/28 . . . Means for mounting or fastening rotating magnetic parts on to, or to, the rotor structures
- 1/30 using intermediate parts, e.g. spiders
- 1/32 . . . with channels or ducts for flow of cooling medium
- 1/325 {between salient poles}
- 1/34 . . Reciprocating, oscillating or vibrating parts of the magnetic circuit
- 3/00 Details of windings (coils in general H01F 5/00)**
- 3/02 . Windings characterised by the conductor material (conductors in general H01B 1/00, H01B 5/00)
- 3/04 . Windings characterised by the conductor shape, form or construction, e.g. with bar conductors
- 3/12 . . arranged in slots
- 3/14 . . . with transposed conductors, e.g. twisted conductors
- 3/16 . . . for auxiliary purposes, e.g. damping or commutating
- 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
- 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 generators with mechanical driving motors, 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 9/25](#))}
- 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 machines, 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
- 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 {, i.e. structural association with shields} (means for preventing or reducing eddy-current losses in the winding heads by shielding [H02K 3/42](#))
- WARNING**
Group [H02K 11/01](#) is incomplete pending reclassification of documents from group [H02K 11/022](#).
Group [H02K 11/01](#) is also impacted by reclassification into groups [H02K 11/012](#), [H02K 11/014](#), and [H02K 11/0141](#).
All groups listed in this Warning should be considered in order to perform a complete search.
- 11/012 . . {Shields associated with rotating parts, e.g. rotor cores or rotary shafts}
- WARNING**
Group [H02K 11/012](#) is incomplete pending reclassification of documents from groups [H02K 11/01](#) and [H02K 11/022](#).
Groups [H02K 11/01](#), [H02K 11/022](#) and [H02K 11/012](#) should be considered in order to perform a complete search.
- 11/014 . . {Shields associated with stationary parts, e.g. stator cores}
- WARNING**
Group [H02K 11/014](#) is incomplete pending reclassification of documents from groups [H02K 11/01](#) and [H02K 11/022](#).
Groups [H02K 11/01](#), [H02K 11/022](#) and [H02K 11/014](#) should be considered in order to perform a complete search.

- 11/0141 . . . {Shields associated with casings, enclosures or brackets}
- WARNING**
Group [H02K 11/0141](#) is incomplete pending reclassification of documents from groups [H02K 11/01](#) and [H02K 11/022](#).
Groups [H02K 11/01](#), [H02K 11/022](#) and [H02K 11/0141](#) should be considered in order to perform a complete search.
- 11/02 . for suppression of electromagnetic interference
- 11/022 . . {Shields}
- (Frozen) **WARNING**
Group [H02K 11/022](#) is no longer used for the classification of documents as of August 1, 2020).
The content of this group is being reclassified into groups [H02K 11/01](#)-[H02K 11/0141](#).
Groups [H02K 11/022](#) and [H02K 11/01](#) - [H02K 11/0141](#) should be considered in order to perform a complete search.
- 11/026 . . Suppressors associated with brushes, brush holders or their supports
- 11/028 . . Suppressors associated with the rotor
- 11/04 . for rectification
- 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
- 11/05 . . . Rectifiers associated with casings, enclosures or brackets
- 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}
- 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}
- 15/0081 . . . {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}
- 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](#))}
- 15/0435 . . {Wound windings}
- 15/0442 . . . {Loop windings (manufacturing of windings consisting of overlapped loops [H02K 15/0464](#))}
- 15/045 {Form wound coils}
- 15/0464 . . . {Lap windings (when on diagonally wound hollow coils [H02K 15/0492](#))}
- 15/0471 {manufactured by flattening a spiral winding}
- 15/0478 . . . {Wave windings, undulated windings (when on diagonally wound hollow coils [H02K 15/0492](#))}
- 15/0485 {manufactured by shaping an annular winding}
- 15/0492 . . . {Diagonally wound hollow coils}
- 15/06 . . Embedding prefabricated windings in machines
- 15/061 . . {Air-gap windings}
- 15/062 . . {Windings in slots; salient pole windings}
- 15/063 . . . {Windings for large electric machines, e.g. bar windings (windings consisting of cables [H02K 15/065](#))}
- 15/064 . . . {Windings consisting of separate segments, e.g. hairpin windings ([H02K 15/063](#) takes precedence)}
- 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](#))}
- 15/066 {inserted perpendicularly to the axis of the slots or inter-polar channels}
- 15/067 {inserted in parallel to the axis of the slots or inter-polar channels}
- 15/068 {Strippers}
- 15/08 . . Forming windings by laying conductors into or around core parts
- 15/085 . . by laying conductors into slotted stators
- 15/09 . . by laying conductors into slotted rotors
- 15/095 . . by laying conductors around salient poles
- 15/10 . . Applying solid insulation to windings, stators or rotors
- 15/105 . . {to the windings}
- 15/12 . . Impregnating, heating or drying of windings, stators, rotors or machines
- 15/125 . . {Heating or drying of machines in operational state, e.g. standstill heating}
- 15/14 . . Casings; Enclosures; Supports
- 15/16 . . Centering rotors within the stator; Balancing rotors
- 15/165 . . {Balancing the rotor}
- 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](#))}
- 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](#))}
- 16/02 . . Machines with one stator and two {or more} rotors
- 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](#))}
- 16/04 . . Machines with one rotor and stators
- NOTE**
Group [H02K 16/00](#) takes precedence over groups [H02K 17/00](#) - [H02K 53/00](#).
- 17/00 Asynchronous induction motors; Asynchronous induction generators**
- 17/02 . . Asynchronous induction motors
- 17/04 . . for single phase current
- 17/06 . . . having windings arranged for permitting pole-changing
- 17/08 . . . Motors with auxiliary phase obtained by externally fed auxiliary windings, e.g. capacitor motors
- 17/10 . . . Motors with auxiliary phase obtained by split-pole carrying short-circuited windings
- 17/12 . . for multi-phase current
- 17/14 . . . having windings arranged for permitting pole-changing
- 17/16 . . having rotors with internally short-circuited windings, e.g. cage rotors
- 17/165 . . . {characterised by the squirrel-cage or other short-circuited windings}
- 17/18 . . . having double-cage or multiple-cage rotors
- 17/185 {characterised by the double- or multiple cage windings}
- 17/20 . . . having deep-bar rotors
- 17/205 {characterised by the deep-bar windings}
- 17/22 . . having rotors with windings connected to slip-rings

17/24	. . . in which both stator and rotor are fed with AC	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
17/26	. . having rotors or stators designed to permit synchronous operation	19/365	. . . {with a voltage regulator}
17/28	. . having compensating winding for improving phase angle	19/38	. . Structural association of synchronous generators with exciting machines
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	21/00	Synchronous motors having permanent magnets; Synchronous generators having permanent magnets
17/32	. . Structural association of asynchronous induction motors with auxiliary mechanical devices, e.g. with clutches or brakes	21/02	. Details
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)	21/021	. . {Means for mechanical adjustment of the excitation flux}
17/36	. . . with another asynchronous induction motor	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)}
17/38	. . . with a commutator machine	21/023	. . . . {by varying the amount of superposition, i.e. the overlap, of field and armature}
17/40	. . . with a rotary AC/DC converter	21/024	. . . . . {Radial air gap machines}
17/42	. . Asynchronous induction generators (H02K 17/02 takes precedence)	21/025	. . . . . {by varying the thickness of the air gap between field and armature}
17/44	. . Structural association with exciting machines	21/026	. . . . . {Axial air gap machines}
19/00	Synchronous motors or generators (having permanent magnets H02K 21/00)	21/027	. . . . . {Conical air gap machines}
19/02	. Synchronous motors	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}
19/04	. . for single-phase current	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}
19/06	. . . Motors having windings on the stator and a variable-reluctance soft-iron rotor without windings, e.g. inductor motors	21/04	. . Windings on magnets for additional excitation {; Windings and magnets for additional excitation}
19/08	. . . Motors having windings on the stator and a smooth rotor without windings of material with large hysteresis, e.g. hysteresis motors	21/042	. . . {with permanent magnets and field winding both rotating}
19/10	. . for multi-phase current	21/044	. . . . {Rotor of the claw pole type}
19/103	. . . {Motors having windings on the stator and a variable reluctance soft-iron rotor without windings}	21/046	. . . {with rotating permanent magnets and stationary field winding}
19/106	. . . {Motors having windings in the stator and a smooth rotor of material with large hysteresis without windings}	21/048	. . . . {Rotor of the claw pole type}
19/12	. . . characterised by the arrangement of exciting windings, e.g. for self-excitation, compounding or pole-changing	21/10	. . Rotating armatures
19/14	. . having additional short-circuited windings for starting as asynchronous motors	21/12	. with stationary armatures and rotating magnets
19/16	. Synchronous generators	21/125	. . {having an annular armature coil (H02K 21/14 - H02K 21/24 take precedence)}
19/18	. . having windings each turn of which co-operates only with poles of one polarity, e.g. homopolar generators	21/14	. . with magnets rotating within the armatures
19/20	. . . with variable-reluctance soft-iron rotors without winding	21/145	. . . {having an annular armature coil (with homopolar co-operation H02K 21/20)}
19/22	. . having windings each turn of which co-operates alternately with poles of opposite polarity, e.g. heteropolar generators	21/16	. . . having annular armature cores with salient poles (with homopolar co-operation H02K 21/20)
19/24	. . . with variable-reluctance soft-iron rotors without winding	21/18	. . . having horse-shoe armature cores (with homopolar co-operation H02K 21/20)
19/26	. . characterised by the arrangement of exciting windings	21/185	. . . . {with the axis of the rotor perpendicular to the plane of the armature}
19/28	. . . for self-excitation	21/20	. . . having windings each turn of which co-operates only with poles of one polarity, e.g. homopolar machine
19/30	. . . for compounding	21/22	. . with magnets rotating around the armatures, e.g. flywheel magnetos
19/32	. . . for pole-changing	21/222	. . . {Flywheel magnetos}
19/34	. . Generators with two or more outputs	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	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
21/26	. with rotating armatures and stationary magnets	23/44	. . having movable, e.g. turnable, iron parts
21/28	. . with armatures rotating within the magnets	23/46	. . having stationary shunts, i.e. magnetic cross flux
21/30	. . . having annular armature cores with salient poles (with homopolar co-operation H02K 21/36)	23/48	. . having adjustable armatures
21/32	. . . having horse-shoe magnets (with homopolar co-operation H02K 21/36)	23/50	. Generators with two or more outputs
21/325	. . . . {with the axis of the rotating armature perpendicular to the plane of the magnet}	23/52	. Motors acting also as generators, e.g. starting motors used as generators for ignition or lighting
21/34	. . . having bell-shaped or bar-shaped magnets, e.g. for cycle lighting (with homopolar co-operation H02K 21/36)	23/54	. Disc armature motors or generators
21/36	. . . with homopolar co-operation	23/56	. Motors or generators having iron cores separated from armature winding
21/38	. with rotating flux distributors, and armatures and magnets both stationary	23/58	. Motors or generators without iron cores
21/40	. . with flux distributors rotating around the magnets and within the armatures	23/60	. Motors or generators having rotating armatures and rotating excitation field
21/42	. . with flux distributors rotating around the armatures and within the magnets	23/62	. Motors or generators with stationary armatures and rotating excitation field
21/44	. . with armature windings wound upon the magnets	23/64	. Motors specially adapted for running on DC or AC by choice
21/46	. Motors having additional short-circuited winding for starting as an asynchronous motor	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)
21/48	. Generators with two or more outputs	23/68	. Structural association with auxiliary mechanical devices, e.g. with clutch, with brake (control arrangements external to the machine H02P)
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	25/00	DC interrupter motors or generators
23/023	. . {having short-circuited brushes}	26/00	Machines adapted to function as torque motors, i.e. to exert a torque when stalled
23/026	. . {having an unregular distribution of the exciting winding or of the excitation over the poles}	27/00	AC commutator motors or generators having mechanical commutator
23/04	. . having permanent magnet excitation	27/02	. characterised by the armature winding
23/06	. . having shunt connection of excitation windings	27/04	. having single-phase operation in series or shunt connection
23/08	. . having series connection of excitation windings	27/06	. . with a single or multiple short-circuited commutator, e.g. repulsion motor
23/10	. . having compound connection of excitation windings	27/08	. . with multiple-fed armature
23/12	. . having excitation produced by current sources independent of the armature circuit	27/10	. . with switching devices for different modes of operation, e.g. repulsion-induction motor
23/14	. . having high-speed excitation or de-excitation, e.g. by neutralising the remanent excitation field	27/12	. having multi-phase operation
23/16	. . having angularly adjustable excitation field, e.g. by pole reversing or pole switching	27/14	. . in series connection
23/18	. . having displaceable main or auxiliary brushes	27/16	. . in shunt connection with stator feeding
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	27/18	. . in shunt connection with rotor feeding
23/22	. . having compensating or damping windings	27/20	. Structural association with a speed regulating device
23/24	. . having commutating-pole windings	27/22	. having means for improving commutation, e.g. auxiliary fields, double windings, double brushes
23/26	. characterised by the armature windings	27/24	. having two or more commutators
23/28	. . having open windings, i.e. not closed within the armatures	27/26	. having disc armature
23/30	. . having lap windings; having loop windings	27/28	. Structural association with auxiliary electric devices influencing the characteristic of the machine or controlling the machine
23/32	. . having wave winding; having undulating winding	27/30	. Structural association with auxiliary mechanical devices, e.g. clutch, brake (control arrangements external to the machine H02P)
23/34	. . having mixed windings	29/00	Motors or generators having non-mechanical commutating devices, e.g. discharge tubes or semiconductor devices
23/36	. . having two or more windings; having two or more commutators; having two or more stators		
23/38	. . having winding or connection for improving commutation, e.g. equipotential connection		
23/40	. characterised by the arrangement of the magnet circuits		
23/405	. . {Machines with a special form of the pole shoes}		

29/03	<ul style="list-style-type: none"> with a magnetic circuit specially adapted for avoiding torque ripples or self-starting problems 	37/14	<ul style="list-style-type: none"> with magnets rotating within the armatures
29/06	<ul style="list-style-type: none"> with position sensing devices 	37/16	<ul style="list-style-type: none"> having horseshoe armature cores
29/08	<ul style="list-style-type: none"> using magnetic effect devices, e.g. Hall-plates, magneto-resistors (H02K 29/12 takes precedence) 	37/18	<ul style="list-style-type: none"> of homopolar type
29/10	<ul style="list-style-type: none"> using light effect devices 	37/20	<ul style="list-style-type: none"> with rotating flux distributors, the armatures and magnets both being stationary
29/12	<ul style="list-style-type: none"> using detecting coils {using the machine windings as detecting coil} 	37/22	<ul style="list-style-type: none"> Damping units
29/14	<ul style="list-style-type: none"> with speed sensing devices {(structural association with other mechanical energy devices H02K 7/00)} 	37/24	<ul style="list-style-type: none"> Structural association with auxiliary mechanical devices
31/00	Acyclic motors or generators, i.e. DC machines having drum or disc armatures with continuous current collectors	39/00	Generators specially adapted for producing a desired non-sinusoidal waveform
31/02	<ul style="list-style-type: none"> with solid-contact collectors 	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)}
31/04	<ul style="list-style-type: none"> with at least one liquid-contact collector 	41/02	<ul style="list-style-type: none"> Linear motors; Sectional motors
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)	41/025	<ul style="list-style-type: none"> Asynchronous motors
33/02	<ul style="list-style-type: none"> with armatures moved one way by energisation of a single coil system and returned by mechanical force, e.g. by springs 	41/03	<ul style="list-style-type: none"> Synchronous motors; Motors moving step by step; Reluctance motors (H02K 41/035 takes precedence)
33/04	<ul style="list-style-type: none"> wherein the frequency of operation is determined by the frequency of uninterrupted AC energisation 	41/031	<ul style="list-style-type: none"> {of the permanent magnet type}
33/06	<ul style="list-style-type: none"> with polarised armatures 	41/033	<ul style="list-style-type: none"> {with armature and magnets on one member, the other member being a flux distributor}
33/08	<ul style="list-style-type: none"> with DC energisation superimposed on AC energisation 	41/035	<ul style="list-style-type: none"> DC motors; Unipolar motors
33/10	<ul style="list-style-type: none"> wherein the alternate energisation and de-energisation of the single coil system is effected or controlled by movement of the armatures 	41/0352	<ul style="list-style-type: none"> {Unipolar motors}
33/12	<ul style="list-style-type: none"> with armatures moving in alternate directions by alternate energisation of two coil systems 	41/0354	<ul style="list-style-type: none"> {Lorentz force motors, e.g. voice coil motors}
33/14	<ul style="list-style-type: none"> wherein the alternate energisation and de-energisation of the two coil systems are effected or controlled by movement of the armatures 	41/0356	<ul style="list-style-type: none"> {moving along a straight path}
33/16	<ul style="list-style-type: none"> with polarised armatures moving in alternate directions by reversal or energisation of a single coil system 	41/0358	<ul style="list-style-type: none"> {moving along a curvilinear path}
33/18	<ul style="list-style-type: none"> with coil systems moving upon intermittent or reversed energisation thereof by interaction with a fixed field system, e.g. permanent magnets 	41/06	<ul style="list-style-type: none"> 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}
35/00	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)	41/065	<ul style="list-style-type: none"> {Nutating motors}
35/02	<ul style="list-style-type: none"> with moving magnets and stationary coil systems 	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
35/04	<ul style="list-style-type: none"> with moving coil systems and stationary magnets 	44/02	<ul style="list-style-type: none"> Electrodynamic pumps
35/06	<ul style="list-style-type: none"> with moving flux distributors, and both coil systems and magnets stationary 	44/04	<ul style="list-style-type: none"> Conduction pumps
37/00	Motors with rotor rotating step by step and without interrupter or commutator driven by the rotor, e.g. stepping motors	44/06	<ul style="list-style-type: none"> Induction pumps
37/02	<ul style="list-style-type: none"> of variable reluctance type 	44/08	<ul style="list-style-type: none"> Magnetohydrodynamic [MHD] generators
37/04	<ul style="list-style-type: none"> with rotors situated within the stators 	44/085	<ul style="list-style-type: none"> {with conducting liquids}
37/06	<ul style="list-style-type: none"> with rotors situated around the stators 	44/10	<ul style="list-style-type: none"> Constructional details of electrodes
37/08	<ul style="list-style-type: none"> with rotors axially facing the stators 	44/12	<ul style="list-style-type: none"> Constructional details of fluid channels
37/10	<ul style="list-style-type: none"> of permanent magnet type (H02K 37/02 takes precedence) 	44/14	<ul style="list-style-type: none"> Circular or screw-shaped channels
37/12	<ul style="list-style-type: none"> with stationary armatures and rotating magnets 	44/16	<ul style="list-style-type: none"> Constructional details of the magnetic circuits
37/125	<ul style="list-style-type: none"> {Magnet axially facing armature} 	44/18	<ul style="list-style-type: none"> for generating AC power
		44/20	<ul style="list-style-type: none"> by changing the polarity of the magnetic field
		44/22	<ul style="list-style-type: none"> by changing the conductivity of the fluid
		44/24	<ul style="list-style-type: none"> by reversing the direction of fluid
		44/26	<ul style="list-style-type: none"> by creating a travelling magnetic field
		44/28	<ul style="list-style-type: none"> Association of MHD generators with conventional generators (nuclear power plants including a MHD generator G21D 7/02)
		47/00	Dynamo-electric converters
		47/02	<ul style="list-style-type: none"> AC/DC converters or <u>vice versa</u>
		47/04	<ul style="list-style-type: none"> Motor/generators

47/06	. . Cascade converters	2201/00	Specific aspects not provided for in the other groups of this subclass relating to the magnetic circuits
47/08	. . Single-armature converters	2201/03	. Machines characterised by aspects of the air-gap between rotor and stator
47/10	. . . with booster machines on the AC side	2201/06	. Magnetic cores, or permanent magnets characterised by their skew
47/12	. DC/DC converters	2201/09	. Magnetic cores comprising laminations characterised by being fastened by caulking
47/14	. . Motor/generators	2201/12	. Transversal flux machines
47/16	. . Single-armature converters, e.g. metadyne	2201/15	. Sectional machines
47/18	. AC/AC converters	2201/18	. Machines moving with multiple degrees of freedom
47/20	. . Motor/generators	2203/00	Specific aspects not provided for in the other groups of this subclass relating to the windings
47/22	. . Single-armature frequency converters with or without phase-number conversion	2203/03	. Machines characterised by the wiring boards, i.e. printed circuit boards or similar structures for connecting the winding terminations
47/24	. . . having windings for different numbers of poles	2203/06	. Machines characterised by the wiring leads, i.e. conducting wires for connecting the winding terminations
47/26	. . . operating as under- or over-synchronously running asynchronous induction machines, e.g. cascade arrangement of asynchronous and synchronous machines	2203/09	. Machines characterised by wiring elements other than wires, e.g. bus rings, for connecting the winding terminations
47/28	. . . operating as commutator machines with added slip-rings	2203/12	. Machines characterised by the bobbins for supporting the windings
47/30	. . Single-armature phase-number converters without frequency conversion	2203/15	. Machines characterised by cable windings, e.g. high-voltage cables, ribbon cables
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)	2205/00	Specific aspects not provided for in the other groups of this subclass relating to casings, enclosures, supports
49/02	. of the asynchronous induction type	2205/03	. Machines characterised by thrust bearings
49/04	. . of the eddy-current hysteresis type {(eddy current brakes cooperating with a rail B61H 7/083)}	2205/06	. Machines characterised by means for keeping the brushes in a retracted position during assembly
49/043	. . . {with a radial airgap}	2205/09	. Machines characterised by drain passages or by venting, breathing or pressure compensating means
49/046	. . . {with an axial airgap}	2205/12	. Machines characterised by means for reducing windage losses or windage noise
49/06	. of the synchronous type {(H02K 49/10 takes precedence)}	2207/00	Specific aspects not provided for in the other groups of this subclass relating to arrangements for handling mechanical energy
49/065	. . {hysteresis type}	2207/03	. Tubular motors, i.e. rotary motors mounted inside a tube, e.g. for blinds
49/08	. of the collector armature type	2209/00	Specific aspects not provided for in the other groups of this subclass relating to systems for cooling or ventilating
49/10	. of the permanent-magnet type	2211/00	Specific aspects not provided for in the other groups of this subclass relating to measuring or protective devices or electric components
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)}	2211/03	. Machines characterised by circuit boards, e.g. pcb
49/104	. . {Magnetic couplings consisting of only two coaxial rotary elements, i.e. the driving element and the driven element}	2213/00	Specific aspects, not otherwise provided for and not covered by codes H02K 2201/00 - H02K 2211/00
49/106	. . . {with a radial air gap}	2213/03	. Machines characterised by numerical values, ranges, mathematical expressions or similar information
49/108	. . . {with an axial air gap}	2213/06	. Machines characterised by the presence of fail safe, back up, redundant or other similar emergency arrangements
49/12	. of the acyclic type	2213/09	. Machines characterised by the presence of elements which are subject to variation, e.g. adjustable bearings, reconfigurable windings, variable pitch ventilators
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		
53/00	Alleged dynamo-electric perpetua mobilia		
55/00	Dynamo-electric machines having windings operating at cryogenic temperatures		
55/02	. of the synchronous type		
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}		

H02K

- 2213/12 . Machines characterised by the modularity of some components