CLASS 310, ELECTRICAL GENERATOR OR MOTOR STRUCTURE

SECTION I - CLASS DEFINITION

This is the residual class for all subject matter, not elsewhere classified, relating to electrical generator or motor structure.

(1) Note. This Class was produced in 1953 by making official the unofficial digests which have been established by the Examiners of Division 26 during the period from about 1900 onwards. A caveat is given: while it is believed that the titles and definitions are reasonably accurate, no assurance can be given that all the patents, issued prior to the date of reclassification, are in the proper subclass since only some of these individual patents were read during the reclassification project. Consequently, in making a thorough search in this class, it is advisable to investigate every subclass which may possibly be pertinent and not, in order to shorten the search, to rely upon the principle of superiority of subject matter because of position in the schedule, since that principle is applicable only in classes where each patent has been analyzed and placed in the schedule in accordance with that portion of the disclosed subject matter which is claimed.

(2) Note. Since Class 310 takes, under the class definition, only subject matter relating to electrical generator or motor structure not elsewhere classified, its scope can be determined only by determining the scope of other related classes, which classes are listed below under search class. Also consult the search notes in the definitions of these classes.

(3) Note. Many mechanical classes contain electrical disclosures, as where an electrical machine is disclosed in a mechanical environment, with which it cooperates. Consequently, in appropriate instances, the search must extend to the class or classes which relate to the environment in which the electrical disclosure may be found.

SECTION II - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

4, Baths, Closets, Sinks, and Spittoons, subclass 213 for the subject matter of that class having electrical ventilating means.

57, Textiles: Spinning, Twisting, and Twining, subclass 100 for the apparatus of that class having electric motor driving means.

73, Measuring and Testing, appropriate subclasses for mechanical measuring and testing devices having electric motors or generators as part thereof.

84, Music, subclasses 600 through 722 for electrical musical instruments having means to generate electric currents of particular wave form for use in musical instruments, such as electric organs. Note particularly indented subclasses 1.04+ for electric generators having means which are tuned to resonance.

105, Railway Rolling Stock, subclasses 49+ for electric locomotives.

123, Internal-Combustion Engines, subclass 149 for dynamos in combination with electric ignition systems for internal combustion engines.

124, Mechanical Guns and Projectors, subclass 3 for electromagnetic projectile propelling means.

160, Flexible or Portable Closure, Partition, or Panel, appropriate subclasses, particularly subclass 310 for this subject matter of that class having electric means to operate it.

173, Tool Driving or Impacting, appropriate subclass for an electric motor for driving a tool combined with features peculiar to tool driving. Generally, Class 310 includes motors having a named type of tool as a load. However Class 173 provides for a motor having specific impact delivering relationship to a tool, a passage to deliver cleansing or cooling fluid to a tool work surface, specific structure of a handle to manipulate a tool relative to work or plural motors, one of which is described as driving a tool and another as advancing a tool.

198, Conveyors: Power-Driven, subclass 381, 439 and 619 for electromagnetic conveyors in which the device or material being moved is moved by the action of a magnetic field.

258, Railway Mail Delivery, subclass 4 for magnetic apparatus utilized in railway mail delivery.

307, Electrical Transmission or Interconnections Systems, appropriate subclasses for miscellaneous electric systems having electric generators. Note particularly subclass 82, 84, 151, and 153.

315, Electric Lamp and Discharge Devices: Systems, subclass 55 for electric space discharge devices having combined therewith an integral electric generator or piezoelectric device, subclass 78 for vehicle space discharge device or lamp systems having a vehicle motor or vehicle motion driven generator.

318, Electricity: Motive Power Systems, appropriate subclasses for electric generator or motor structure having significant circuits connected thereto and for electric motor systems controlled by the control of the motor structure. Also note subclasses 538+ for electric motors, per se, having means to control or adjust them by control of the structure of the motor.

320, Electricity: Battery or Capacitor Charging or Discharging, appropriate subclass for a battery or capacitor charging system that utilizes an electric generator as a source of charge energy.

322, Electricity: Single Generator Systems, appropriate subclasses for electric generator having electric control systems.

323, Electricity: Power Supply or Regulation Systems, subclasses 201 through 204 for voltage magnitude and phase control systems utilizing motor generator or dynamo electric machine sets.

324, Electricity: Measuring and Testing, appropriate subclasses for electrical measuring or testing devices and systems having electric generators or motors as part thereof. Note particularly subclasses 160+ for speed measuring systems having tachometer generators and subclasses 76.11+ for electric meters having electric generators or motors as part thereof.

335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclasses 220+ for electromagnets with armatures (i.e., electric motor of the reciprocating type).

336, Inductor Devices, appropriate subclasses for structure of inductor devices, (e.g., transformers and inductive reactors), particularly for details of induction windings and coils, magnetic cores and cooling means for inductor.

363, Electric Power Conversion Systems, subclasses 102+, 150 and 174+ for electric power conversion systems utilizing dynamoelectric machine converters.

367, Communications, Electrical: Acoustic Wave Systems and Devices, appropriate subclass for compressional wave sensing systems having electro-vibrational transducers and for the corresponding transducers, per se.

416, Fluid Reaction Surfaces (i.e., Impellers), appropriate subclasses for electric motor driven impellers wherein the impeller is claimed as more than a named load.

417, Pumps, subclasses 410.1+ for pumps having electric drive motors.

505, Superconductor Technology: Apparatus, Material, Process, subclasses 150+ for high temperature (T_c 30 K) superconducting devices, and particularly subclasses 166+ for motors or generators.

SUBCLASSES

1 This subclass is indented under the class definition. Subject matter relating to assemblages of materials utilized in the fabrication of an electric generator or motor.

SEE OR SEARCH CLASS:

434, Education and Demonstration, subclass 380 for the teaching of the construction of electric motors or generators.

10 This subclass is indented under the class definition. Subject matter relating to means for converting electrical energy between the electrical and the mechanical state by means of an electromagnetic effect.

(1) Note. Consult the classes referred to in the search notes to this class for other classes having similar subject matter.

SEE OR SEARCH CLASS:

330, Amplifiers, subclass 58 for amplifiers including a rotating dynamoelectric machine as the active element thereof. See the Notes and Search Notes thereunder.

335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclasses 220+ for electromagnet with armature.

367, Communications, Electrical: Acoustic Wave Systems and Devices, subclasses 140+ for similar subject matter utilized in compressional wave sensing and detecting systems.

11 This subclass is indented under subclass 10. Subject matter having a fluid which is significantly related to the apparatus in a manner other than cooling or lubrication.

(1) Note. This subclass relates, for example, to dynamoelectric machinery in which the fluid may be conductive to electricity and to dynamoelectric machinery in which the fluid serves as a kinetic element to exert mechanical force.

SEE OR SEARCH CLASS:

324, Electricity: Measuring and Testing, subclasses 92+ for the structure of integrating electric meters which utilize a conductive or genetic fluid.

376, Induced Nuclear Reactions: Processes, Systems, and Elements, subclasses 100+ for thermonuclear reactions utilizing conducting gases as fuels.

12.01 Linear:

This subclass is indented under subclass 10. Subject matter in which a dynamoelectric device uses the electromagnetic effect to move or reposition a movable element in substantially straight-line motion with respect to a fixed element, i.e., stator, or to convert straight-line motion of the movable element into electrical energy.

(1) Note. The movable element is analogous to the rotor of a rotary machine, and is sometimes improperly referred to as a rotor.

(2) Note. Substantially straight-line motion may include travel in a path that deviates from a straight line, so long as the principle of operation is the same as for purely linear travel. For example, using a dynamoelectric effect to propel a toy train along a track arranged in an overall arcuate or circular path may be appropriate for this and indented subclasses if the type of motive force utilized at each location along the path is identical to that used for straight-line motion provided for in these subclasses.

SEE OR SEARCH THIS CLASS, SUBCLASS:

15 through 24, for a dynamoelectric device in which a movable element moves in a straight line and reciprocates back and forth.

300, for a non-dynamoelectric linear motor or generator.

SEE OR SEARCH CLASS:

104, Railways, subclass 282 for a railway vehicle and track having a linear motor which propels and suspends the vehicle, and subclasses 290-294 for a railway vehicle and track claimed in combination with a linear motor.

124, Mechanical Guns and Projectors, subclass 3 for an electromagnetic projectile propelling means.

318, Electricity: Motive Power Systems, subclass 38, 135, and 687 for a linear movement motor in combination with a system of electrical supply and/or control.

12.02 Having structure to facilitate assembly:

This subclass is indented under subclass 12.01. Subject matter wherein an element of a linear dynamoelectric device includes a particular feature that promotes ease, speed, or economy in the manufacture of the device.

(1) Note. Significant structural detail of a linear motor or generator must be recited for placement in this subclass. A nominal recitation of a motor part i.e., armature, stator, winding, shaft, etc., is not considered to be significant structure for placement in this subclass.

SEE OR SEARCH CLASS:

29, Metal Working, subclasses 596 through 598 for a method of dynamoelectric machine manufacture or assembly.

12.03 Micromachine (e.g., MEMS device, nanotechnology):
This subclass is indented under subclass 12.01. Subject matter including a linear dynamoelectric device having extremely small overall dimensions.

(1) Note. Although the term "extremely small" is a relative term, no specific size limitation is attached to this definition. Interpretation of this term should be understood by the use of terms such as micro-, nano-, MEMS, miniature, etc., used in the description of the machine. Similarly, construction of a machine by, for example, integrated circuit technology on a semiconductor wafer, should be evidence for proper placement in this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:
40, for rotary dynamoelectric device.

12.04 Specific use device:
This subclass is indented under subclass 12.01. Subject matter including a linear dynamoelectric device, per se, having structure specifically adapted to perform a particular function or for a particular application.

(1) Note. This subclass provides for a linear dynamoelectric device intended to be used with a specific power supply.

12.05 X-Y positioner:
This subclass is indented under subclass 12.04. Subject matter that including a linear dynamoelectric motor or motor combination, per se, that simultaneously or sequentially moves an object in mutually orthogonal directions.

12.06 Precision type (e.g., for integrated circuit manufacture):
This subclass is indented under subclass 12.05. Subject matter including an X-Y positioner having the ability to move an object with a high degree of accuracy or resolution, especially for minute movements.

(1) Note. This subject matter is commonly used where exacting movement is required, such as, for example, in integrated circuit manufacture or similar high precision tasks.

12.07 Projector (e.g., rail gun):
This subclass is indented under subclass 12.04. Subject matter that includes a linear dynamoelectric motor, per se, structurally arranged for launching a projectile.

SEE OR SEARCH CLASS:
124, Mechanical Guns and Projectors, subclass 54 for a projector.

12.08 Disk drive head motor:
This subclass is indented under subclass 12.04. Subject matter that includes a linear dynamoelectric motor, per se, having a structural detail particularly suited to reposition the head of a disk drive.

(1) Note. This subclass is limited to a linear motor subcombination, per se. See search note below for placement of a disk drive motor where a structural detail of a disk drive element other than a motor is recited.

SEE OR SEARCH CLASS:
360, Dynamic Magnetic Information Storage or Retrieval, for a magnetic disk drive, especially subclasses 266.2 through 267.8 for a magnetic disk drive with linear positioning of the head.

12.09 Rail vehicle (e.g., train, trolley):
This subclass is indented under subclass 12.04. Subject matter including a linear dynamoelectric motor, per se, having a structural detail particularly suited to propel a device or conveyance employed for carrying persons or objects while the device or conveyance is supported for rolling or sliding movement along a track formed of a horizontally extending bar or bars.

(1) Note. This subclass is limited to the linear motor subcombination, per se, of the vehicle. See search note for such a motor combined with other vehicle structure.

SEE OR SEARCH CLASS:
104, Railways, subclass 282 for a railway vehicle and track having a linear

motor which propels and suspends the vehicle, and subclasses 290-294 for a railway vehicle and track claimed in combination with a linear motor.

12.11 Conveyor or elevator motor:
This subclass is indented under subclass 12.04. Subject matter including a linear dynamoelectric motor, per se, having a structural detail particularly suited to linearly drive a hoisting machine or a apparatus for moving articles or bulk material from one place to another place.

12.12 Generator:
This subclass is indented under subclass 12.04. Subject matter including a linear dynamoelectric device that converts linear mechanical movement of the movable element into electrical energy.

12.13 Plural dynamoelectric machines (e.g., motors, generators):
This subclass is indented under subclass 12.01. Subject matter that including the combination of a linear motor or generator with another dynamoelectric machine.

(1) Note. The other dynamoelectric machine may be either another linear machine, or other type of dynamoelectric machine (e.g., reciprocating, oscillating, rotary, etc.).

SEE OR SEARCH THIS CLASS, SUBCLASS:
12.05, for a plural motor X-Y positioner.
300 through 371, for a non-dynamoelectric device.

12.14 Motor having both linear and rotary movement:
This subclass is indented under subclass 12.01. Subject matter including a linear motor having a movable element being driven in a linear path and also turned about its axis.

(1) Note. The linear and rotary movement may involve one or more movable elements.

12.15 Plural stators or movable elements:
This subclass is indented under subclass 12.01. Subject matter including a linear dynamoelectric motor having more than one stator or more than one movable element.

SEE OR SEARCH THIS CLASS, SUBCLASS:
12.09, for a linear motor for a train.

12.16 Voice coil type:
This subclass is indented under subclass 12.01. Subject matter in which the movable element comprises of a winding that is linearly movable by passing a current through the winding while the winding is within a magnetic field.

SEE OR SEARCH THIS CLASS, SUBCLASS:
12.08, for a flat linear motor specifically for use in a disk drive.

SEE OR SEARCH CLASS:
360, Dynamic Magnetic Information Storage or Retrieval, for magnetic disk drive structure, especially subclass 264.7 for a disk drive with a voice coil head positioner.
381, Electrical Audio Signal Processing Systems and Devices, for loudspeaker structure, especially subclass 400 for a loudspeaker having a movable voice coil drive.

12.17 Stepping or linear pulse type:
This subclass is indented under subclass 12.01. Subject matter including a linear dynamoelectric device structurally arranged to linearly move its movable element between two or more incremental positions of rest or equilibrium, and stop at a selected position of rest or equilibrium until an adjustment is made which causes movement to another incremental position of rest, i.e., stepping; or a linear dynamoelectric device that incrementally moves its movable element by applying a burst of magnetic energy at successive incremental positions along the linear path that forces the movable element into alignment with the magnetic field.

(1) Note. While a linear pulse motor may be constructed to stop or park at incremen-

tal positions, and thereby be a stepping motor, there is no such requirement that it do so. It may be moved steadily between successive incremental positions without parking until its ultimate destination is reached.

SEE OR SEARCH THIS CLASS, SUBCLASS:
12.05, for an X-Y positioner.
12.08, for a disk drive head motor.
49.01 through 49.55, for a rotary stepping motor.

12.18 Synchronous type (e.g., variable reluctance):
This subclass is indented under subclass 12.01. Subject matter wherein the speed of the movable element and either the frequency of the traveling magnet field used to drive the movable element in a motor, or the frequency of electricity generated from motion of the movable element in a generator, are directly related.

SEE OR SEARCH THIS CLASS, SUBCLASS:
309 through 311, for an electrostatically driven linear motor.

12.19 Having structure to facilitate control (e.g., position detector):
This subclass is indented under subclass 12.01. Subject matter including a linear dynamoelectric device with an included element provided as a subcombination of a system for regulating or monitoring the operation of the device.

(1) Note. This subclass provides especially for structure that may be a part of a control system, but as subcombination structure, is insufficient for placement in control systems. For example, a Hall effect sensor may be structurally included as a position detector, but in itself, does not have sufficient associated circuitry to be considered a control system or detection circuit.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclass 135 for electric control of a linear motor.
322, Electricity: Single Generator Systems, subclasses 49 through 98 for control of a single generator.
324, Electricity: Measuring and Testing, subclass 765.01 for the testing of an assembled motor or generator not elsewhere classifiable.

12.21 Coil structure:
This subclass is indented under subclass 12.01. Subject matter having significant physical detail of a wound conductor.

(1) Note. A coil connection, e.g., terminal, is provided for in this subclass.

(2) Note. This subclass provides for a superconductive coil.

SEE OR SEARCH THIS CLASS, SUBCLASS:
12.24, for a nominal coil used as an element of a magnet in a linear device.

12.22 Shape or spacing (e.g., multiple phase winding):
This subclass is indented under subclass 12.21. Subject matter including a coil having a significant spatial form or contour, or plural coils or coil sections having a significant geometric orientation with respect to one another.

(1) Note. The spacing of coils or coil sections may be defined by their positions as defined by pole structure. However, significant coil structure or spacing must be recited for proper placement in this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:
12.24, for magnet or pole structure having only nominally recited coil structure or spacing.

12.23 Coating:
This subclass is indented under subclass 12.21. Subject matter including a coil having an applied cover layer on a winding conductor or overall winding.

(1) Note. A coating is commonly used to, for example, insulate, encapsulate, protect, or adhere a coil to a core.

12.24 Magnet or pole structure:
This subclass is indented under subclass 12.01. Subject matter including significant detail of means for creating a magnetic field, or a low reluctance means to concentrate, direct or orient a magnetic field (i.e., pole).

SEE OR SEARCH THIS CLASS, SUBCLASS:
12.21, for detailed structure of a coil or winding for creating an electromagnetic field in a linear dynamoelectric machine.
40, for details of a magnet or pole structure in a rotary dynamoelectric machine.

12.25 Size, spacing or orientation (e.g., tilted):
This subclass is indented under subclass 12.24. Subject matter including a magnet or pole having a specific dimension, a specified distance between one another, or a specified angular position with respect to the axis of movement of the movable element.

SEE OR SEARCH THIS CLASS, SUBCLASS:
12.24, for a combination of a magnet and pole structure reciting a significant portion of a flux path circuit.

12.26 Shape:
This subclass is indented under subclass 12.24. Subject matter including a magnet or pole having a particular spatial form or contour.

12.27 Mechanical element:
This subclass is indented under subclass 12.01. Subject matter for a mechanical subcombination of a linear dynamoelectric device unprovided for elsewhere.

12.28 Commutation:
This subclass is indented under subclass 12.27. Subject matter including a slidable connection between a power supply and a winding.

12.29 Cooling:
This subclass is indented under subclass 12.27. Subject matter including means for transferring or removing heat from a linear dynamoelectric device or one of its components.

SEE OR SEARCH THIS CLASS, SUBCLASS:
16, for cooling of a reciprocating motor or generator.
52 through 65, for cooling of a rotary dynamoelectric machine.
216.014, for a cooling fin on a core having circumferentially offset laminations in a rotary dynamoelectric machine.
216.056, for a cooling fin on a laminated core of a rotary dynamoelectric machine.
216.119, for a cooling channel in the end ring of a core of a rotary dynamoelectric machine.
227, for current collector cooling in a rotary dynamoelectric machine.
417, for a rotary dynamoelectric machine end shield having ventilation holes.

12.31 Support for movable element (e.g., bearing):
This subclass is indented under subclass 12.27. Subject matter including means for facilitating proper operational positioning or spatial geometric relationship between a stator and movable element.

(1) Note. Included in this subclass are, for example, particular bearing arrangements, including mechanical bearings, fluid bearings and magnetic bearings.

12.32 Connection to load:
This subclass is indented under subclass 12.27. Subject matter including particular means for attaching a movable element of a linear dynamoelectric device to a device that is to be moved or repositioned by the device.

12.33 Enclosure:
This subclass is indented under subclass 12.27. Subject matter including a significant detail of a housing for a linear dynamoelectric device.

SEE OR SEARCH THIS CLASS, SUBCLASS:
89, for a housing for a rotary dynamoelectric machine.

13 Fixed and movable wound element type:
This subclass is indented under subclass 12.01. Subject matter in which both the fixed and the movable elements of the dynamoelectric

device are provided with current carrying conductors or inductor.

SEE OR SEARCH CLASS:
104, Railways, subclass 292 for a railway vehicle and track claimed in combination with a linear motor having fixed and movable wound elements on the track and vehicle, respectively.

14 **Solenoid and core type:**
This subclass is indented under subclass 12.01. Subject matter in which the fixed and the movable elements of the dynamoelectric device are concentric and consist of a hollow winding and a plunger type armature passing thereunto.

SEE OR SEARCH CLASS:
124, Mechanical Guns and Projectors, subclass 3 for electromagnetic guns and projectors.
335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclasses 255 through 264 for similar subject matter.

15 This subclass is indented under subclass 10. Subject matter in which the movable element of the dynamoelectric device moves to and fro along a straight line path or along an arcuate path which is so short as to be substantially a straight line.

(1) Note. The term reciprocating, as used in this subclass, is limited to straight line motion or nonstraight line motion which is of such short extent that the interrelationship between the moving elements of the dynamoelectric device is substantially the same as if the motion were only along a straight line path.

SEE OR SEARCH THIS CLASS, SUBCLASS:
12.01 through 12.33, for straight-line motion that is unidirectional and does not produce to-and-fro motion.
36+, for dynamoelectric devices which constrain the elements to oscillate to-and-fro motion and in which the extent of motion is such that some provision must be made for the nonlinear interaction between the relatively moving elements of the dynamoelectric device.

SEE OR SEARCH CLASS:
30, Cutlery, subclass 45 for this subject matter combined with a razor.
84, Music, subclasses 725+ for this subject matter utilized in an electrical musical instrument, such as an electric guitar.
209, Classifying, Separating, and Assorting Solids, subclass 360 for this subject matter combined with a vibratory separator.
236, Automatic Temperature and Humidity Regulation, subclass 75 for this subject matter in an automatic temperature or humidity regulation system.
246, Railway Switches and Signals, subclasses 225+ for this subject matter in a railway switching or signaling system.
318, Electricity: Motive Power Systems, subclass 37, 118, 119+, 556+, and 686 for this subject matter in an electric motor control system.
322, Electricity: Single Generator Systems, subclass 3 for this subject matter utilized in a single generator system.
335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclasses 87+ for this subject matter combined with a periodically actuated switch.
417, Pumps, subclasses 416+ for a reciprocating electric motor driving a reciprocating pump.

16 This subclass is indented under subclass 15. Subject matter having means for altering the temperature conditions of the machine.

(1) Note. This subclass relates, for example, to reciprocating motors having cooling means.

SEE OR SEARCH THIS CLASS, SUBCLASS:
52 through 65, for cooling of a rotary electric machine, and the search notes therein, for cooling provided in subcombination elements of an electric motor or generator.

SEE OR SEARCH CLASS:
336, Inductor Devices, subclasses 55+ for inductor devices with temperature modifying means (cooling means).

17 This subclass is indented under subclass 15. Subject matter having means for performing a function which is in addition to the function of the reciprocating dynamo device.

19 This subclass is indented under subclass 17. Subject matter having means for regulating the rate of motion or the duration of a period of inactivity of the reciprocating dynamoelectric device.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclasses 119+ for similar subject matter having a significant electrical circuit.

20 This subclass is indented under subclass 17. Subject matter having means for mechanically transforming the character or extent of motion delivered by or imparted to the dynamoelectric device.

SEE OR SEARCH CLASS:
74, Machine Element or Mechanism, appropriate subclasses for mechanical movements for converting one type of motion to another type of motion.

21 This subclass is indented under subclass 20. Subject matter in which the moving element of the dynamoelectric device is supported either by a leaf spring or by a pivot located at a distance from the line of relative motion of the dynamoelectric device which is large relative to the extent of movement.

22 This subclass is indented under subclass 21. Subject matter having a plurality of movable elements or armatures.

23 This subclass is indented under subclass 20. Subject matter in which the relatively movable parts of the dynamoelectric device are concentric and consist of a hollow winding and a plunger type armature passing thereunto.

24 This subclass is indented under subclass 23. Subject matter having a plurality of plunger type armatures.

25 This subclass is indented under subclass 15. Subject matter in which the movable parts of the dynamoelectric device reciprocate or vibrate at a frequency which is determined by the natural period of the mounting means for the movable parts.

(1) Note. This subclass relates, for example, to reciprocating motors having a tuned reed type of armature. Generally, but not invariably, a state of resonance exists between the natural period of the movable armature and the impulses of an electric field.

SEE OR SEARCH THIS CLASS, SUBCLASS:
26, for similar subject matter utilizing magnetostrictive means.

SEE OR SEARCH CLASS:
331, Oscillators, subclass 156 for electrical oscillators utilizing an electromechanical resonator of the vibrating reed or string type (e.g., tuning fork).

26 This subclass is indented under subclass 15. Subject matter having means to produce motion or electric energy by the action of magnetostriction.

(1) Note. Magnetostriction is a property exhibited by some materials which change their physical size or shape under the action of magnetic fields or which produce magnetic fields when physically stressed.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclass 118 for magnetostrictive motor systems.
331, Oscillators, subclass 157 for electrical oscillators utilizing an electromechanical resonator of the magnetostrictive type.

333, Wave Transmission Lines and Networks, subclass 148 and 201 for coupling networks having magnetostrictive elements as parts thereof.

335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclass 215 for this subject matter

367, Communications, Electrical: Acoustic Wave Systems and Devices, subclass 156 and 168 for magnetostrictive transducers used in underwater compressional wave production or sensing.

27 This subclass is indented under subclass 15. Subject matter in which both of the relatively movable parts of the dynamoelectric device include current carrying conductors or inductor.

28 This subclass is indented under subclass 15. Subject matter which is of the direct connected type.

(1) Note. This subclass relates, for example, to reciprocating electric motors where the reciprocating armature is directly connected to a source or absorber of motion.

29 This subclass is indented under subclass 28. Subject matter in which the relatively movable elements of the dynamoelectric device are supported by either of a leaf spring or a pivot located at a point remote from the line of motion of the dynamoelectric device when compared to the extent of motion of the latter.

SEE OR SEARCH THIS CLASS, SUBCLASS:

25, and 32, for this subject matter.

30 This subclass is indented under subclass 28. Subject matter in which the relatively movable parts of the dynamoelectric device are concentric and consist of a hollow winding and a plunger type armature passing thereunto.

SEE OR SEARCH THIS CLASS, SUBCLASS:

23, and 34+, for similar subject matter.

31 This subclass is indented under subclass 15. Subject matter in which the relative motion of the elements of the dynamoelectric device actuates an electrical switch which controls the flow of currents to windings associated with one of such elements.

SEE OR SEARCH CLASS:

335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclasses 87+ for periodic electromagnetic switches.

340, Communications: Electrical, subclasses 384.1+, especially subclasses 388.7 and 397.3 for interrupter in diaphragm and percussion type sound producer, respectively.

32 This subclass is indented under subclass 31. Subject matter in which the movable element of the dynamoelectric device is supported or carried by either a reed spring or a pivot located at a distance from the line of motion of a device which is large relative to the extent of motion of such element.

SEE OR SEARCH THIS CLASS, SUBCLASS:

21, and 29, for this subject matter.

33 This subclass is indented under subclass 32. Subject matter having plural armatures.

34 This subclass is indented under subclass 31. Subject matter in which the relatively movable elements of the dynamoelectric device include a hollow winding and an axial plunger or core embraced by such winding.

35 This subclass is indented under subclass 34. Subject matter having plural hollow windings and having means to energize the plural windings in sequence or at different times.

36 This subclass is indented under subclass 10. Subject matter in which the line of motion between the relatively movable elements of the dynamoelectric device lies along the arc of a portion of a circle and having means to accommodate such motion, over and above the means necessary for relative motion along a straight line.

SEE OR SEARCH THIS CLASS, SUBCLASS:

15+, for dynamoelectric devices having oscillate relative motion, but in which the extent of such motion does not require modification of the device because of the nonlinearity of the motion.

40+, for dynamoelectric devices having arcuate relative motion in which the motion exceeds 3605.

SEE OR SEARCH CLASS:

236, Automatic Temperature and Humidity Regulation, subclass 75 for the subject matter of that class having oscillating electric motors.

318, Electricity: Motive Power Systems, subclass 37, 119+, 556, and 686 for oscillating electric motor systems.

322, Electricity: Single Generator Systems, subclass 3 for oscillating generator systems.

37 This subclass is indented under subclass 36. Subject matter in which the relative motion between the elements of dynamoelectric device is communicated to a load by means of mechanical means which alter the character or amplitude of such motion.

SEE OR SEARCH THIS CLASS, SUBCLASS:

80+, for similar subject matter.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, appropriate subclasses for mechanical movements.

38 This subclass is indented under subclass 36. Subject matter in which the relative motion of the elements of the dynamoelectric device is transmitted to a load by an immediate attachment and without intervening transmitting parts or mechanisms.

39 This subclass is indented under subclass 36. Subject matter in which an electric switch or its equivalent controls the flow of currents through windings associated with one of the relative movable elements of the dynamoelectric device.

SEE OR SEARCH CLASS:

335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclasses 87+ for vibratory switches.

340, Communications: Electrical, subclasses 384.1+, especially subclasses 388.7 and 397.3 for interrupter in diaphragm and percussion type sound producer, respectively.

40 This subclass is indented under subclass 10. Subject matter in which the line of motion between the relatively movable elements of the dynamoelectric device lies along at least 360 degrees of the arc of a circle.

(1) Note. This subclass relates, for example, to dynamoelectric devices where the motion is continuous rotation in one direction, or where the rotation in one direction progresses for several turns before the rotation reverses in direction.

SEE OR SEARCH CLASS:

314, Electric Lamp and Discharge Devices: Consumable Electrodes, subclasses 69+ for arc lights having rotary electric motor means to feed the carbons.

362, Illumination, subclass 193 for bicycle lights having an electric generator driven by the motion of the vehicle.

417, Pumps, subclasses 410.1+ for pumps having rotary electric drive motors.

40.5 This subclass is indented under subclass 40. Subject matter including a linkage, usually between the motor and its support, to cause the complete motor to rotate or oscillate with respect to its support in response to the rotary motion of the motor rotor or armature.

SEE OR SEARCH CLASS:

416, Fluid Reaction Surfaces (i.e., Impellers), subclass 100 for oscillating electric fans where significant details of the impeller are recited.

41 This subclass is indented under subclass 40. Subject matter in which means are provided to impart initial rotation to the rotary element of

the dynamoelectric device other than by the dynamoelectric effect.

(1) Note. The initial rotation, for example, may be effected by a hand crank.

43 This subclass is indented under subclass 40. Subject matter in which one or more component parts of the dynamo or electric device are fabricated of a plastic nonmetal, as by a casting or pressure molding operation.

SEE OR SEARCH CLASS:
65, Glass Manufacturing, appropriate subclass for a process of working or treating glass.
264, Plastic and Nonmetallic Article Shaping or Treating: Processes, appropriate subclasses for methods for working or shaping plastic materials.
425, Plastic Article or Earthenware Shaping or Treating: Apparatus, appropriate subclasses for molding apparatus for shaping or reshaping plastic materials.

44 This subclass is indented under subclass 40. Subject matter in which one or more of the component parts of the dynamoelectric device are fabricated or powdered or sintered metal particles.

SEE OR SEARCH CLASS:
75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclasses 228+ for sintered metal powder compositions, such as those resulting from a process provided for in Class 419, Powder Metallurgy Processes and subclasses 255+ for metal containing powders.
419, Powder Metallurgy Processes, appropriate subclasses for processes of making articles by pressing and/or sintering metal particles.

45 This subclass is indented under subclass 40. Subject matter in which one or more parts of the dynamoelectric device have been treated with liquid material so as to retain within and/or on the surface of such parts residual amounts of such liquid material.

(1) Note. The coating or impregnation, for example, may be for the windings and may serve to exclude or displace moisture therefrom.

SEE OR SEARCH CLASS:
336, Inductor Devices, subclass 205 for inductor having coil turns cemented or embedded in plastic.
427, Coating Processes, subclasses 58+ for processes of coating, per se, of electrical products.

46 This subclass is indented under subclass 40. Subject matter in which one of the relatively movable elements of the dynamoelectric device consist merely of magnetizable material and is free of inductor or conductive windings.

(1) Note. Since the dynamoelectric effect is necessary one of the attraction of the magnetizable material by magnetic pole induced therein, the devices of this subclass are generally motors.

SEE OR SEARCH THIS CLASS, SUBCLASS:
168+, for inductor type generators.

47 This subclass is indented under subclass 46. Subject matter in which the dynamoelectric device is arranged to be transported or operated while held in the hand.

(1) Note. Many of the motors of this subclass are disclosed as operating hair clippers or moving cutter type of shavers.

SEE OR SEARCH THIS CLASS, SUBCLASS:
50, for portable or hand held dynamoelectric devices other than magnetic motors.

SEE OR SEARCH CLASS:
30, Cutlery, subclasses 43+ for dry shavers.
74, Machine Element or Mechanism, subclass 16 for power tables and stands.
318, Electricity: Motive Power Systems, subclass 17 for this subject matter having a significant electric circuit.

48 This subclass is indented under subclass 46. Subject matter in which the motor is combined with additional features over and above those required for its operation as a motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

17+, for similar combinations with reciprocating type dynamoelectric devices.

66+, for similar combinations with rotary type dynamoelectric devices, other than magnetic motors.

49.01 Stepping:

This subclass is indented under subclass 40. Subject matter in which the relatively movable elements are rotated in increments of less than 360 degrees with respect to one another between one position of rest to another position of rest, and stopping at each incremental position of rest until an adjustment is made which causes rotation to another position of rest.

(1) Note. For this and indented subclasses, where the relatively movable elements include a fixed or stationary element and a movable element that rotates with respect to the fixed element, the fixed element will be referred to as a "stator" and the rotating element as a "rotor", with the rotor having a rotary axis about which the rotor rotates.

(2) Note. This subclass includes, for example, a magnetic motor in the nature of servomotor or follow-up device.

SEE OR SEARCH THIS CLASS, SUBCLASS:

12.17, for a linear stepping motor.

49.02 Having a coil axially concentric to rotor axis (e.g., toroid coil):

This subclass is indented under subclass 49.01. Subject matter including an electrically conductive winding having a generally annular or ring shape periphery, wherein the geometric center of said periphery is located substantially on the rotary axis of a rotor.

(1) Note. The axially concentric coil is commonly mounted on a stator core of a motor surrounding the axis of the rotor. However, the coil does not have to actually surround the rotor structure, per se, for placement in this subclass. It need only surround the longitudinal axis of the rotor and be axially concentric therewith.

49.03 With bias magnet to position rotor (e.g., parking magnet, auxiliary flux):

This subclass is indented under subclass 49.02. Subject matter including a means for causing a magnet field to help restrain or pull one of the relatively movable elements into a position of rest.

(1) Note. A bias magnet is commonly used to "park" or secure a rotor at an incremental step until an adjustment is made to cause the rotor to move to another incremental position of rest. Such position of rest is commonly designed to enable the restart of a motor. A bias magnet is also commonly used as an additional means of providing magnetic flux along with the primary coil.

49.04 Bias magnet positioned between two axially concentric coils:

This subclass is indented under subclass 49.03. Subject matter having two axially concentric windings, and a bias magnet structurally arranged between the two windings.

SEE OR SEARCH THIS CLASS, SUBCLASS:

49.06, for a rotary stepper motor having plural axially concentric coils, each coil positioned axially adjacent to a rotor.

49.07, for a rotary stepper motor having an axially concentric coil adjacent to each axial end of a rotor.

49.19, for a rotary stepper motor having plural axially concentric coils.

49.05 Axially adjacent to rotor end:

This subclass is indented under subclass 49.02. Subject matter including an axially concentric coil structurally arranged to surround a rotor s axis next to an axial end of the rotor without surrounding the rotor structure, per se.

SEE OR SEARCH THIS CLASS, SUBCLASS:

154.05, and 154.06, for an axial air gap motor or generator with a permanent magnet on the stator.

156.32 through 156.37, for an axial air gap motor or generator with a permanent magnet on the rotor.

49.06 Plural coil and rotor combinations:

This subclass is indented under subclass 49.05. Subject matter including more than one axially concentric coil and more than one rotor, wherein each coil is positioned axially adjacent to an axial end of a respective rotor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

49.07, for a stepper motor with an axially concentric coil positioned adjacent to both axial ends of a rotor.

156.36 through 156.37, for an axial air gap motor or generator with multiple stators and a permanent magnet rotor.

49.07 Coil axially adjacent to each end of a rotor:

This subclass is indented under subclass 49.05. Subject matter including an axially concentric coil structurally arranged to surround a rotor s axis next to each axial end of the rotor without surrounding the rotor structure, per se.

SEE OR SEARCH THIS CLASS, SUBCLASS:

156.35, for an axial air gap motor or generator with two stators axially adjacent a permanent magnet rotor.

49.08 Having poles extending to opposite radial sides of rotor:

This subclass is indented under subclass 49.02. Subject matter including a pair of members of ferromagnetic material, each having a first end positioned adjacent to, respectively, opposite north and south magnetic field ends of an axially concentric coil, wherein each ferromagnetic member has a second end opposite its first end, each ferromagnetic member providing a low-reluctance magnetic flux path between its first and second ends, the second ends (i.e., poles) being respectively positioned on opposite sides of the rotor axis adjacent a radial face of the rotor, whereby magnetic flux is directed perpendicular to the rotary axis.

(1) Note. The north and south magnetic ends of the coil can be provided by a plurality of coils in a magnetic series circuit, so long as the poles are arranged to provide flux from opposite magnetic ends of the combined coils.

SEE OR SEARCH THIS CLASS, SUBCLASS:

49.09, for a rotary stepping motor where poles extend to opposite axial ends of the rotor.

49.09 Having poles extending to opposite axial ends of rotor:

This subclass is indented under subclass 49.02. Subject matter including a pair of members of ferromagnetic material, each having a first end positioned adjacent to, respectively, opposite north and south magnetic field ends of an axially concentric coil, wherein each ferromagnetic member has a second end opposite its first end, each ferromagnetic member providing a low-reluctance magnetic flux path between its first and second ends, the second ends (i.e., poles) being respectively positioned on opposite axial ends of the rotor axis adjacent an axial end face of the rotor, whereby magnetic flux is directed generally along or parallel to the rotary axis.

(1) Note. Commonly, the rotor is positioned radially inside the toroid coil, with poles of the coil extending radially inward and over the axial ends of the rotor.

(2) Note. The north and south magnetic ends of the coil can be provided by a plurality of coils in a magnetic series circuit, so long as the poles are arranged to provide flux from opposite magnetic ends of the combined coils.

SEE OR SEARCH THIS CLASS, SUBCLASS:

49.08, for a rotary stepping motor where poles extend to opposite radial sides of the rotor.

49.11 Having particular flux plate or yoke:
This subclass is indented under subclass 49.02. Subject matter including specific structural detail of a low-reluctance member positioned adjacent to a magnetic pole face at an axial end of the axially concentric coil, i.e., "flux plate"; or a low-reluctance member structurally arranged to provide a magnetic flux path from one magnetic pole of the coil to the other pole, i.e., "yoke".

(1) Note. A flux plate may serve as a magnetic pole, or merely provide a flux path from the coil to a separate pole attached to the flux plate. It is commonly a relatively thin, flat plate or disc. A yoke commonly extends circumferentially around a coil s periphery to function as a flux path between flux plates.

49.12 With alignment mechanism:
This subclass is indented under subclass 49.11. Subject matter including means for structurally orienting a flux plate or yoke in a particular position with respect to the axially concentric coil.

(1) Note. Alignment mechanisms commonly include structural features such as notches, protrusions, or markings, to align the flux plates or yoke into a preset position.

49.13 Having coil bobbin:
This subclass is indented under subclass 49.02. Subject matter including specific detail of a support or spool about which the axially concentric coil is wound.

SEE OR SEARCH THIS CLASS, SUBCLASS:
194, for a motor or generator spool or coil support, per se.

49.14 Integral with pole or flux plate:
This subclass is indented under subclass 49.13. Subject matter wherein the bobbin is structurally combined with a flux plate or pole piece in a unitary or monolithic structure.

49.15 Having interfitting poles:
This subclass is indented under subclass 49.02. Subject matter including a plurality of poles extending from the north magnetic pole of the coil and a plurality of poles extending from the south magnetic pole of the coil, wherein the plurality of poles are spatially arranged in such a way as to alternate between a pole of one magnetic polarity of the coil and a pole of the other magnetic polarity of the coil.

SEE OR SEARCH THIS CLASS, SUBCLASS:
257, for an interfitting or claw-tooth stator.
263, for an interfitting or claw-tooth rotor.

49.16 Having a particular dimension:
This subclass is indented under subclass 49.15. Subject matter wherein a specific size or spatial extent of one of the interfitting poles is recited.

49.17 Having a particular shape:
This subclass is indented under subclass 49.15. Subject matter wherein a specific spatial form or contour of one of the interfitting poles is recited.

49.18 With rotary to linear conversion:
This subclass is indented under subclass 49.02. Subject matter including means to change rotary stepping motion about an axis to motion along a line.

(1) Note. Such conversion may be performed by gearing, such as a threaded portion or worm gear inside the rotor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
12.17, for a linear stepping motor.

SEE OR SEARCH CLASS:
74, Machine Element or Mechanism, subclass 425 for worm gearing.

49.19 Having plural axially concentric coils:
This subclass is indented under subclass 49.02. Subject matter including more than one axially concentric coil.

SEE OR SEARCH THIS CLASS, SUBCLASS:

49.04, for a rotary stepping motor having two axially concentric coils with a bias magnet positioned between the coils.

49.06, for a rotary stepping motor having a plurality of axially concentric coil and rotor combinations.

49.07, for a rotary stepping motor having an axially concentric coil axially adjacent each end of a rotor.

49.21 Having a single axially concentric coil:
This subclass is indented under subclass 49.02. Subject matter including only one axially concentric coil.

49.22 Axially thin type (e.g., disk-shaped motor, planer):
This subclass is indented under subclass 49.01. Subject matter including a stepping motor wherein the length along its rotary axis is small in relation to its radial dimension.

(1) Note. An axially thin or disk-shaped stepper motor is commonly found in a timepiece such as a wristwatch, etc.

49.23 Having a particular stator feature:
This subclass is indented under subclass 49.22. Subject matter including an axially thin stepping motor having a specific structural detail of its stationary structure or stator.

49.24 Asymmetric stator pole spacing:
This subclass is indented under subclass 49.23. Subject matter including an axially thin motor including a plurality of stator poles, wherein the plurality of poles are spaced at various or non-uniform distances from the rotor, thus defining various length air gaps; or poles that are arcuately arranged at various or non-uniform distances with respect to one another around the rotor s axis of rotation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

49.36, for a rotary stepping motor having a permanent magnet rotor with axially directed flux path having asymmetric poles.

49.25 Inner and outer notches:
This subclass is indented under subclass 49.23. Subject matter including an axially thin stepper motor having a stator including an indentation or groove on both the side of the stator or stator pole facing the rotor air gap (i.e., inner side), and on a side of the stator opposite to the side facing the rotor air gap (i.e. outer side).

(1) Note. The inner notch has the effect of enlarging the air gap between the rotor and the stator at the notch position. It is commonly used to, for example, reduce cogging torque applied to the rotor.

(2) Note. The outer notch has the effect of creating a magnetic saturation point at the location of the outer notch due to the concentration of flux in a smaller stator cross section, and commonly defines a boundary location between stator poles.

49.26 Stator pole having inner notch:
This subclass is indented under subclass 49.23. Subject matter including an axially thin stepper motor having a pole with an indentation or groove on the side of the pole facing the rotor.

(1) Note. The inner notch has the effect of enlarging the air gap between the rotor and the stator at the notch position. It is commonly used to, for example, reduce cogging torque applied to the rotor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

49.25, for an axially thin stepper motor having both inner and outer notches.

49.27 Having integral poles:
This subclass is indented under subclass 49.26. Subject matter including a stator with an inner notch, and further having a plurality of poles that are structurally united or mechanically integrated without an air gap there between.

49.28 Permanent magnet on stator:
This subclass is indented under subclass 49.23. Subject matter including an axially thin stepping motor having a stator including a permanently magnetized portion.

49.29 Plural separate stator core sections facing rotor:

This subclass is indented under subclass 49.23. Subject matter including an axially thin stepper motor having a stator with a ferromagnetic flux concentration means (i.e., core) comprising more than one distinct segment, wherein each segment has a portion or surface (i.e. pole face) that is structurally arranged with respect to a rotor to provide an air gap between the respective pole faces and the rotor, across which magnetic flux is directed.

49.31 Two sections:

This subclass is indented under subclass 49.29. Subject matter wherein the number of plural sections comprises two sections.

49.32 Permanent magnet rotor with axially directed flux path:

This subclass is indented under subclass 49.01. Subject matter including a rotor having a permanent magnet for creating a magnetic flux field therein, wherein the magnet poles of the magnet are arranged to direct a flux path along the rotary axis of the rotor.

49.33 Having stepping function related to a particular stator winding arrangement:

This subclass is indented under subclass 49.32. Subject matter including a specifically recited structural or operational detail of an electrical conductor or plurality of electrical conductors wound on the stator for creating a magnetic field in the stator, wherein the structural or operational detail is one that defines or governs the angular extent of the steps of the motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

49.33, for a stator winding arrangement in a reluctance-type stepper motor.

49.34 Having particular stator pole feature:

This subclass is indented under subclass 49.32. Subject matter including a stepping motor having an axial flux path rotor that further includes a specifically recited structural detail of a stator pole.

49.35 Shifted or skewed stator pole:

This subclass is indented under subclass 49.34. Subject matter including a stator pole wherein a line between the center of one axial end of the pole and the center of the opposite axial end of the pole is not parallel with the axis of rotation of the rotor.

(1) Note. A skewed pole is commonly interpreted as a pole with an axis of symmetry that is twisted away from the rotor axis. A shifted pole may include a segmented pole, where one of the segments is angularly shifted around the rotor s axis with respect to the other segment, so that the line between an axial end of one segment and the opposite axial end of the other segment is not parallel with the rotor s axis of rotation.

49.36 Magnet in pole tooth:

This subclass is indented under subclass 49.34. Subject matter including a stator pole face having at least one projection (i.e., tooth) extending from the pole s face into an air gap between the pole face and a rotor, wherein the projection comprises a permanent magnet, or includes a permanent magnet therein.

49.37 Having particular stator-pole to rotor-pole relationship:

This subclass is indented under subclass 49.32. Subject matter including a stepping motor with an axial flux path rotor that further includes a specifically recited structural detail of an interrelationship between a pole or poles on the rotor and a pole or poles on the stator.

(1) Note. Recited structural detail may include the number of poles on each of the rotor and stator, the pole number ratio, the relative position of the poles, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

49.44, for a reluctance type stepper motor having a particular stator pole to rotor pole relationship.

49.38 Having plural rotor cores of different lengths:
This subclass is indented under subclass 49.32. Subject matter including a permanent-magnet axial flux path rotor including more than one ferromagnetic element (i.e., core) for concentrating the magnetic flux of the permanent magnet, wherein the cores have various or non-uniform axial dimensions.

49.39 Plural rotor sections (e.g., segmented rotor):
This subclass is indented under subclass 49.32. Subject matter including a stepping motor with an axial flux path rotor having two or more distinct rotor segments, wherein each segment includes a permanent magnet.

49.41 Separated by non-magnetic spacer or air gap:
This subclass is indented under subclass 49.39. Subject matter including a stepping motor with an axial flux path rotor having at least two physically separated rotor sections with a non-ferromagnetic material arranged between the sections.

(1) Note. The non-ferromagnetic material may include air in the space between the separated rotor sections.

49.42 Having dual axial air gaps:
This subclass is indented under subclass 49.01. Subject matter including a rotary stepping motor including two air gaps between the rotor and the stator, wherein each gap extends parallel to the rotary axis of the rotor.

49.43 Reluctance type:
This subclass is indented under subclass 49.01. Subject matter wherein torque to drive a rotor is produced in the rotor by the presence of an external magnetic field that causes the rotor to move until its ferromagnetic material lines up in a minimum magnetic flux resistance (i.e., minimum reluctance) position in the magnetic flux path circuit of the external magnetic field, without requiring a separately excited or induced field in the rotor.

49.44 Having a particular stator pole to rotor pole relationship:
This subclass is indented under subclass 49.43. Subject matter including a reluctance-type stepping motor with a specifically recited structural detail of the interrelationship between poles on the rotor and poles on the stator.

(1) Note. Recited structural detail may include the number of poles on each of the rotor and stator, the pole number ratio, the relative position of the poles, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
49.37, for a stepper motor with a rotor axial flux path having a particular stator pole to rotor pole relationship.

49.45 Having a stepping function related to a particular stator winding arrangement:
This subclass is indented under subclass 49.43. Subject matter including a specifically recited structural or operational detail of an electrical conductor or plurality of electrical conductors wound on the stator for creating a magnetic field in the stator, wherein the structural or operational detail is one that defines or governs the angular extent of the steps of the motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
49.33, for a winding arrangement in a stepper motor having a permanent magnet rotor with axial flux path.

49.46 Having stator with winding and permanent magnet:
This subclass is indented under subclass 49.43. Subject matter in which a reluctance-type of stepper motor has a stator that contains both a magnetic field coil and a permanent magnet.

49.47 Gearing defines stepping effect:
This subclass is indented under subclass 49.01. Subject matter including a stepper motor comprising a dynamoelectric machine and a mechanical mechanism having plural inter-engaging mechanical elements (i.e., gears), wherein the arcuate extent or distance of the motor s step or steps is a function of the struc-

tural inter-engaging relationship between the plural inter-engaging elements.

SEE OR SEARCH THIS CLASS, SUBCLASS:

82, for a motor or generator that utilizes a swash plate for motion conversion.

83, for a motor or generator that utilizes a gear for motion conversion.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, subclass 640 and its indented subclasses for gearing, per se.

318, Electricity: Motive Power Systems, subclasses 12 through 15 for this subject matter having a significant electric control circuit.

475, Planetary Gear Transmission Systems or Components, subclasses 331 through 349 for planetary gearing.

49.48 Positioned in magnetic air gap:

This subclass is indented under subclass 49.47. Subject matter wherein at least one of the interengaging mechanical elements is structurally arranged in an air gap between a rotor and a stator.

49.49 Pawl and ratchet type:

This subclass is indented under subclass 49.47. Subject matter wherein the plural interengaging elements include a pivoted or sliding element (i.e. pawl) that is adapted to fall into notches or spaces between teeth or projections on another element (i.e., ratchet) so as to permit motion in only one direction.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, subclasses 575 through 578 for ratchet and pawl gearing, per se.

49.51 Plural stators define stepping effect:

This subclass is indented under subclass 49.01. Subject matter including a stepper motor wherein the arcuate extent or distance of the motors step or steps is functionally related to the structure or structural relationship of more than one stator or stator section.

49.52 Commutator defines stepping effect:

This subclass is indented under subclass 49.01. Subject matter including a stepper motor wherein the arcuate extent or distance of the motor s step or steps is functionally related to the structure or structural relationship, either with respect to each other or other elements of the motor, of a series of electrically conductive bars on the moving element of the motor that connect with windings in the movable element, and slidably engage electrically conductive brushes on the stationary element of the motor, to permit current flow between the moving and stationary elements of the motor.

49.53 Permanent magnet defines stepping effect:

This subclass is indented under subclass 49.01. Subject matter including a stepper motor wherein the arcuate extent or distance of the motor s step or steps is functionally related to the structure, shape, placement or other arrangement of a permanent magnet positioned in the motor.

49.54 Windings define stepping effect:

This subclass is indented under subclass 49.01. Subject matter including a stepper motor wherein the arcuate extent or distance of the motor s step or steps is functionally related to the structure, shape, placement or other arrangement of a winding or windings in the motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

49.33, for a stator winding arrangement in a stepper motor having a permanent magnet rotor with axial flux path.

49.46, for a stator winding arrangement in a reluctance-type stepper motor.

49.55 Start or stop locating feature (e.g., parking magnet, detent):

This subclass is indented under subclass 49.01. Subject matter including structure that determines the position of a rotor at the beginning or end of a step.

(1) Note. Structure commonly used to perform this function includes, for example, a parking magnet, a notch in the magnetic circuit, or an asymmetric rotor/stator shape.

50 This subclass is indented under subclass 40. Subject matter in which the dynamoelectric device is arranged to be transported or operated while held in the hand.

SEE OR SEARCH THIS CLASS, SUBCLASS:

47, for portable or hand type rotary magnetic motors.

SEE OR SEARCH CLASS:

173, Tool Driving or Impacting, appropriate subclass for a tool driving or impacting device and including hand manipulated tool driving or impacting means. An electric motor described as for tool driving is classified in Class 173 if specific impact delivering relationship to a tool is claimed, a passage to deliver cleansing or cooling fluid to a tool work surface is claimed or specific structure of a handle to manipulate a tool relative to work is claimed.

315, Electric Lamp and Discharge Devices: Systems, subclass 33 for electric lamp or space discharge devices having combined therewith some circuit element structure such as the generator, where the combination is adapted to be portable.

318, Electricity: Motive Power Systems, subclass 17 for this subject matter in combination with a significant system.

322, Electricity: Single Generator Systems, subclass 1 for portably mounted single generator systems.

51 This subclass is indented under subclass 40. Subject matter having means to inhibit, dampout or insulate against the transmission of sound or mechanical oscillations or vibrations of the parts of the dynamoelectric device.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, subclass 573 for flywheel or rotor balancing means and subclass 574 for flywheel or rotor vibration damping means.

336, Inductor Devices, subclass 100 for inductor devices such as transformers, having means to suppress vibration.

52 This subclass is indented under subclass 40. Subject matter having means either to cool the dynamoelectric device or to contact a liquid or gas with the dynamoelectric device.

(1) Note. This and indented subclasses are generally directed to the cooling of the entire machine, and is also the residual area for cooling not otherwise provided for. For cooling subject matter specific to a particular subcombination element of a machine, the original classification should be placed into a subclass providing for the subcombination element, as set forth in the following search notes.

SEE OR SEARCH THIS CLASS, SUBCLASS:

16, for cooling of a reciprocating motor or generator.

12.29, for cooling of a linear motor or generator.

216.014, for a cooling fin on a core having cumferentially offset laminations in a rotary dynamoelectric machine.

216.056, for a cooling fin on a laminated core of a rotary dynamoelectric machine.

216.119, for a cooling channel in the end ring of a core of a rotary dynamoelectric machine.

227, for current collector cooling in a rotary dynamoelectric machine.

417, for a rotary dynamoelectric machine end shield having ventilation holes.

SEE OR SEARCH CLASS:

105, Railway Rolling Stock, subclass 59 for electric locomotives having motor coolers.

165, Heat Exchange, subclasses 47+ for a structurally installed heat exchange means.

336, Inductor Devices, subclasses 55+ for inductor devices with temperature modifying means (cooling means).

53 This subclass is indented under subclass 52. Subject matter having control means.

(1) Note. This subclass relates, for example, to electric motors having means to control the amount of cooling or to control the amount of fluid contact.

54 This subclass is indented under subclass 52. Subject matter in which the cooling fluid or contacting fluid is a liquid under normal atmospheric temperatures and pressures.

SEE OR SEARCH THIS CLASS, SUBCLASS:

11, for this subject matter where the fluid is a conducting or kinetic fluid and subclass 87 for this subject matter where the dynamoelectric device is submersible in a liquid.

55 This subclass is indented under subclass 52. Subject matter in which the cooling fluid or contacting fluid is a gas under normal atmospheric temperatures and pressures and is other than atmospheric air.

(1) Note. This subclass relates, for example, to dynamoelectric devices having hydrogen cooling means. Hydrogen has a thermal conductivity greater than other common gases.

56 This subclass is indented under subclass 52. Subject matter having means to remove impurities from or otherwise condition the gas used as a cooling or contacting fluid.

(1) Note. This subclass relates, for example, to dynamoelectric devices having cooling means in the form of an air blast means and having filter means in the air passage.

SEE OR SEARCH THIS CLASS, SUBCLASS:

55, for this subject matter where the gas is a nonatmospheric gas.

SEE OR SEARCH CLASS:

96, Gas Separation: Apparatus, for apparatus for gas separation, per se.

57 This subclass is indented under subclass 52. Subject matter in which a fluid is retained in the cooling system of a dynamoelectric device without loss or replacement, so as to serve merely as a heat transfer medium.

SEE OR SEARCH CLASS:

165, Heat Exchange, subclasses 104.11+ for a heat exchanging system having an intermediate fluent material receiving and discharging heat.

58 This subclass is indented under subclass 52. Subject matter relating to the circulation of cooling or other fluid through the dynamoelectric device.

(1) Note. The fluid may, for example, be forced through the dynamoelectric device.

59 This subclass is indented under subclass 58. Subject matter having plural dynamoelectric units, or having plural paths through which the fluid may flow.

60 This subclass is indented under subclass 58. Subject matter having means integral with the dynamoelectric device for forcing fluid through the dynamoelectric device.

(1) Note. The means, for example, may be vanes attached to the rotor of the dynamoelectric device.

SEE OR SEARCH CLASS:

417, Pumps, subclasses 366+ and 410.1+ for electric motor driven pumps where the pump is of general utility and not used merely to cool the electric motor.

61 This subclass is indented under subclass 60. Subject matter having means in the rotor of the dynamoelectric device to provide a duct or channel to accommodate a fluid flow along the duct or channel.

(1) Note. Frequently, for example, a radial or circumferential inclination of this duct or channel is sufficient to induce flow of fluid therethrough without other means for maintaining the flow.

62 This subclass is indented under subclass 60. Subject matter in which the pump or other propelling means for the cooling or contacting fluid is located downstream from the dynamoelectric device.

63 This subclass is indented under subclass 60. Subject matter in which the pump or other propelling means for the cooling or contacting fluid is located upstream from the dynamoelectric device.

64 This subclass is indented under subclass 58. Subject matter having means to facilitate, augment, or modify the transfer of heat from the dynamoelectric device from the cooling fluid or between different portions of the dynamoelectric device.

SEE OR SEARCH CLASS:
165, Heat Exchange, subclass 185 for a heat transmitter (e.g., fin), per se.

65 This subclass is indented under subclass 64. Subject matter in which the means for facilitating, augmenting, or modifying the transfer of heat includes devices for maintaining parts of the dynamoelectric device out of contact with each other, so that either the cooling fluid has access to enlarged areas of the device or face-to-face heat transmitting contact is avoided.

(1) Note. The means for spacing the parts, for example, may provide cooling passages between laminae or coils.

66 This subclass is indented under subclass 40. Subject matter combined with some other type of subject matter.

(1) Note. The search should in all appropriate cases be continued in the class which relates to the environment with which the dynamoelectric device is combined.

67 This subclass is indented under subclass 66. Subject matter in which the other subject matter is in built or incorporated into the dynamoelectric device.

SEE OR SEARCH CLASS:
105, Railway Rolling Stock, subclass 53 for electrical locomotives of the type in which the driving wheel is part of the electric motor.
180, Motor Vehicles, subclass 65.6 for a motor vehicle provided with an electric motor for driving it and wherein the motor may be affixed to a wheel of the vehicle.
362, Illumination, subclass 193 for bicycles light systems in which the bicycle light and an electric wheel driven generator are combined.

68 This subclass is indented under subclass 66. Subject matter in which the other subject matter is one or more electric circuit elements.

SEE OR SEARCH CLASS:
318, Electricity: Motor Power Systems, subclasses 830+ for induction motor systems having circuit control means built into the induction motor.

69 This subclass is indented under subclass 68. Subject matter having a shaft driven switch.

(1) Note. This subclass relates, for example, to blasting generators having a shaft driven switch.

70 This subclass is indented under subclass 69. Subject matter having a distributor or timer.

(1) Note. This subclass relates, for example, to ignition magnetos having a distributor switch or a timer switch as an integral part thereof.

71 This subclass is indented under subclass 68. Subject matter having connectors, terminals or lead-ins.

SEE OR SEARCH CLASS:
191, Electricity: Transmission to Vehicles, subclasses 2+ for electric motor traction systems having a system of distribution to energize the electric motor.
336, Inductor Devices, subclass 107 and 192 for inductive devices with connectors or having windings with terminals, taps or coil conductor end anchoring means, respectively.
439, Electrical Connectors, appropriate subclasses for a connector terminal, or lead-in, per se.

72 This subclass is indented under subclass 68. Subject matter having an impedance device.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, appropriate subclasses for electric motors having significant electric circuits.

73 This subclass is indented under subclass 68. Subject matter having illuminating devices.

SEE OR SEARCH CLASS:
362, Illumination, appropriate subclasses for illuminating devices, per se, and for combined structure of illuminating and nonilluminating device.

74 This subclass is indented under subclass 66. Subject matter in which the other element is an inertia or flywheel device.

SEE OR SEARCH CLASS:
74, Machine Element or Mechanism, subclasses 572+ for flywheels, per se, and for rotors, per se.

75 This subclass is indented under subclass 66. Subject matter in which the other element is a drive mechanism.

SEE OR SEARCH THIS CLASS, SUBCLASS:
118+, for similar subject matter.

SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, subclass 149 for internal combustion engines having generator igniting devices which are driven by the engine.
246, Railway Switches and Signals, subclass 245 for electric railway switching and signaling systems having a car actuated generator.
318, Electricity: Motive Power Systems, subclasses 9+ for this subject matter having a significant electric circuit.

76 This subclass is indented under subclass 75. Subject matter having a brake and a clutch.

SEE OR SEARCH THIS CLASS, SUBCLASS:
92+, for torque transmitting electrodynamic clutches or brakes, per se, and for the electric control systems for these devices.

SEE OR SEARCH CLASS:
192, Clutches and Power-Stop Control, appropriate subclass for miscellaneous clutch and brake systems.
318, Electricity: Motive Power Systems, subclasses 362+ and the other classes and subclasses referred to in the search notes of these subclasses for this subject matter having a significant electric circuit.

77 This subclass is indented under subclass 75. Subject matter having a brake.

(1) Note. Consult the search notes to subclass 76, above.

78 This subclass is indented under subclass 75. Subject matter having a clutch.

(1) Note. Consult the search notes to subclass 76, above.

79 This subclass is indented under subclass 75. Subject matter having a shaft and armature timing or phasing connection.

(1) Note. This subclass relates, for example, to dynamoelectric devices having means for adjusting the space-phase of the dynamoelectric device with respect to its source of mechanical energy or its mechanical load.

80 This subclass is indented under subclass 75. Subject matter having motion conversion means.

SEE OR SEARCH CLASS:
74, Machine Element or Mechanism, appropriate subclasses for mechanical movements.
318, Electricity: Motive Power Systems, subclass 14 for this subject matter having a significant circuit.

81 This subclass is indented under subclass 80. Subject matter having an unbalanced weight.

(1) Note. The subclass relates, for example, to dynamoelectric devices of the rotary

type which have an unbalanced rotor and act to produce vibratory motion.

SEE OR SEARCH CLASS:
601, Surgery: Kinesitherapy, subclasses 67+ for subject matter utilized for kinesitherapy.

82 This subclass is indented under subclass 80. Subject matter having a swash plate.

SEE OR SEARCH CLASS:
74, Machine Element or Mechanism, subclass 60 for swash plate mechanisms, per se.

83 This subclass is indented under subclass 80. Subject matter having gearing.

SEE OR SEARCH THIS CLASS, SUBCLASS:
49.47 through 49.49, for a rotary stepping motor in which gearing defines the stepping effect of the motor.

SEE OR SEARCH CLASS:
74, Machine Element or Mechanism, subclasses 640+ for gearing, per se.
318, Electricity: Motive Power Systems, subclasses 12+ and 15 for this subject matter having a significant electric circuit.
475, Planetary Gear Transmission Systems or Components, for planetary gearing.

84 This subclass is indented under subclass 80. Subject matter relating to impulse couplings.

85 This subclass is indented under subclass 66. Subject matter having mechanical shields or protectors.

SEE OR SEARCH CLASS:
361, Electricity: Electrical Systems and Devices, subclasses 600+ and the classes referred to in the search notes to Class 361, subclasses 600+ for housings for electrical apparatus.

86 This subclass is indented under subclass 85. Subject matter having a shield in the air gap.

87 This subclass is indented under subclass 85. Subject matter having means to render the device submersible.

88 This subclass is indented under subclass 85. Subject matter having means to render the device dirt, moisture or explosion proof.

(1) Note. A dynamoelectric device may be rendered explosion proof by filling all voids within the device in such manner that the passages are not sufficiently large to support a flame or explosion, because of the lose of energy from the flame or explosion by radiation to the surrounding mass of solid material.

SEE OR SEARCH THIS CLASS, SUBCLASS:
87, for this subject matter when submersible.

89 This subclass is indented under subclass 85. Subject matter relating to housings, windows or covers.

SEE OR SEARCH THIS CLASS, SUBCLASS:
12.33, for an enclosure for a linear electric motor.

SEE OR SEARCH CLASS:
174, Electricity: Conductors and Insulators, subclasses 50+ for miscellaneous boxes and housings for electrical apparatus having only a single type of electrical apparatus within the box or housing. Also consult the search notes to Class 174, subclasses 50+ for related art.

90 This subclass is indented under subclass 66. Subject matter having means to adjust a bearing or an air cap or to lubricate a bearing.

SEE OR SEARCH CLASS:
384, Bearings, appropriate subclasses for bearings or bearings and means to lubricate the bearing.

90.5 Magnetic bearing:
This subclass is indented under subclass 90. Subject matter wherein the bearing has an induction field.

SEE OR SEARCH CLASS:
219, Electric Heating, subclasses 647+, especially indented subclass 648 for electrically heating a body while magnetically suspending or supporting it.
250, Radiant Energy, subclasses 201+ for photoelectric cell systems adapted for use in magnetic suspensions.
310, Electrical Generator or Motor Structure, subclass 166 for means for suspending a body by means of an induction field.
324, Electricity: Measuring and Testing, subclass 151 for electric meters having magnetic suspensions.
361, Electricity: Electrical Systems and Devices, subclasses 139+ for control circuits for electromagnetic devices, especially subclasses 143+ or magnetic retention.

91 This subclass is indented under subclass 66. Subject matter having supports.

SEE OR SEARCH CLASS:
248, Supports, appropriate subclass for miscellaneous supports of general application.

92 This subclass is indented under subclass 40. Subject matter relating to torque transmitting clutches and brakes and the systems utilized with torque transmitting clutches.

(1) Note. The torque which is transmitted in the devices of this and indented subclasses is transmitted through the medium of an electromagnetic field. When the torque is transmitted by frictional contact, consult the classes referred to below under Search Class.

SEE OR SEARCH CLASS:
73, Measuring and Testing, subclasses 862+ for torque type dynamometers, utilized in testing, some of which utilize electromagnetic clutches and brakes.
188, Brakes, for mechanical brakes. Note subclasses 158+ for electric operators for such brakes.
192, Clutches and Power-Stop Control, appropriate subclasses for mechanical clutches and for systems utilizing a mechanical clutch as part thereof.
318, Electricity: Motive Power Systems, appropriate subclass for electric motor systems having an electromagnetic clutch or brake as part thereof. Also consult the extensive search notes to the Class Definition of Class 318 (note particularly the References To Other Classes) for related art.
322, Electricity: Single Generator Systems, subclass 12 for single generator system having an electromagnetic clutch for connecting and disconnecting the generator from the source of power, and subclass 40 for similar subject matter and which the electromagnetic clutch is utilized to control the speed of the generator.
361, Electricity: Electrical Systems and Devices, subclass 207 for electrostatic relay circuits, such as those which utilize piezoelectric devices or the Winslow effect.
417, Pumps, subclasses 223+ for pumps having dynamoelectric clutches for connecting and disconnecting the pump from a source of mechanical power.
464, Rotary Shafts, Gudgeons, Housings, and Flexible Couplings for Rotary Shafts, appropriate subclasses for a flexible coupling between a shaft and driven member.

93 This subclass is indented under subclass 92. Subject matter utilized for braking.

(1) Note. Consult the search notes to subclass 92, above.

SEE OR SEARCH CLASS:
188, Brakes, subclass 267 for a brake or shock absorber using magnetic flux to retard motion.

94 This subclass is indented under subclass 92. Subject matter having means to automatically control it.

(1) Note. Consult the search notes to subclass 92, above.

95 This subclass is indented under subclass 94. Subject matter automatically responsive to speed.

SEE OR SEARCH CLASS:
361, Electricity: Electrical Systems and Devices, subclasses 236+ for miscellaneous speed controlled systems.

96 This subclass is indented under subclass 92. Subject matter having drive mechanism, other than the torque transmitting clutch or brake.

SEE OR SEARCH THIS CLASS, SUBCLASS:
75+, for similar subject matter utilized in rotary electric motors and generators.

97 This subclass is indented under subclass 96. Subject matter having an output bias or resistance device.

98 This subclass is indented under subclass 96. Subject matter having a drive motor.

SEE OR SEARCH CLASS:
477, Interrelated Power Delivery Controls, Including Engine Control, for interrelated control between an engine and a transmission, clutch, or brake.

99 This subclass is indented under subclass 96. Subject matter having gearing means.

SEE OR SEARCH THIS CLASS, SUBCLASS:
83, for similar subject matter in rotary dynamoelectric machinery.

100 This subclass is indented under subclass 96. Subject matter having a mechanical clutch.

SEE OR SEARCH CLASS:
192, Clutches and Power-Stop Control, appropriate subclasses for mechanical clutches, per se.

101 This subclass is indented under subclass 92. Subject matter having plural units.

102 This subclass is indented under subclass 92. Subject matter which is adapted to be used with a generator motor.

103 This subclass is indented under subclass 92. Subject matter in which the torque is transmitted through a magnetic field.

SEE OR SEARCH THIS CLASS, SUBCLASS:
92, through 102, for torque transmitting clutches in which the torque is transmitted through an electrostatic field or by means of the Winslow effect.

104 This subclass is indented under subclass 103. Subject matter having a shield in the air gap.

(1) Note. The shield may, for example hermetically separate the rotor from the stator.

105 This subclass is indented under subclass 103. Subject matter in which the magnetic field induces eddy or other induced currents.

SEE OR SEARCH THIS CLASS, SUBCLASS:
166+, for alternating current induction motors.

106 This subclass is indented under subclass 105. Subject matter having a magnetic reluctance feature.

107 This subclass is indented under subclass 105. Subject matter having collection means for the induced currents.

SEE OR SEARCH THIS CLASS, SUBCLASS:
219+, for current collectors, per se.

108 This subclass is indented under subclass 107. Subject matter having means to deliver the current which is collected to an external device.

(1) Note. The external device, for example, may be a variable resistance.

109 This subclass is indented under subclass 108. Subject matter in which the external device is an electric motor.

110 This subclass is indented under subclass 108. Subject matter in which the external device is an impedance.

111 This subclass is indented under subclass 40. Subject matter relating to the modification of generated wave forms.

(1) Note. This subclass relates, for example, to wave generators and to generators having a special distribution of coil windings to obtain a specific wave form.

SEE OR SEARCH CLASS:
84, Music, subclasses 725+ for electrical and musical instruments having generator means to generate a particular way form, such as electric organs.

112 This subclass is indented under subclass 40. Subject matter relating to plural units which are structurally united.

(1) Note. This subclass relates, for example, to generators structurally united with exciters.

SEE OR SEARCH CLASS:
322, Electricity: Single Generator Systems, subclass 13 for generator systems having an electric motor to drive the generator.
323, Electricity: Power Supply or Regulation Systems, subclass 202 for balancer set systems.

113 This subclass is indented under subclass 112. Subject matter relating to motor generator sets.

SEE OR SEARCH CLASS:
363, Electric Power Conversion Systems, subclass 104 for dynamoelectric machine converter systems having plural structurally united units.

114 This subclass is indented under subclass 40. Subject matter having plural rotary elements.

SEE OR SEARCH THIS CLASS, SUBCLASS:
112, for subject matter having plural distinct units.

115 This subclass is indented under subclass 114. Subject matter in which both the field and the armature of a dynamoelectric device rotate.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclass 539 for this subject matter in combination with a significant electric circuit.
388, Electricity: Motor Control Systems, subclasses 835+ for running-speed control systems in which the field as well as the armature may be rotatable.

116 This subclass is indented under subclass 115. Subject matter in which the amount of motion is limited.

117 This subclass is indented under subclass 116. Subject matter having means to mechanically bias one or both of the rotatable elements.

118 This subclass is indented under subclass 115. Subject matter having drive mechanism to interconnect the field and armature.

SEE OR SEARCH THIS CLASS, SUBCLASS:
75+, for similar subject matter.

119 This subclass is indented under subclass 118. Subject matter in which the interconnecting mechanism is a fluid drive mechanism.

SEE OR SEARCH THIS CLASS, SUBCLASS:
11, for dynamoelectric devices having a kinetic fluid.

120 This subclass is indented under subclass 118. Subject matter in which the drive mechanism is friction drive mechanism.

121 This subclass is indented under subclass 118. Subject matter in which the interconnection drive mechanism includes a mechanical element whose motion is controlled by means other than the armature or the field.

(1) Note. The mechanical element, for example, may be an escapement.

122 This subclass is indented under subclass 121. Subject matter in which the mechanically controlled element is controlled by an additional dynamoelectric machine.

SEE OR SEARCH THIS CLASS, SUBCLASS:
112+, for plural units which are structurally united.

123 This subclass is indented under subclass 121. Subject matter in which the mechanically controlled element is controlled by means of a friction brake.

SEE OR SEARCH THIS CLASS, SUBCLASS:
77, for similar subject matter.

124 This subclass is indented under subclass 114. Subject matter having plural short circuited rotary elements.

125 This subclass is indented under subclass 124. Subject matter in which one of the short circuited elements is of the squirrel cage type.

SEE OR SEARCH THIS CLASS, SUBCLASS:
166+, for alternating current induction motors having squirrel cage type rotors.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclasses 318+ for plural induction motor rotor members with a significant electric circuit which may include plural squirrel cage members; and subclasses 830+ for plural short circuited induction motor rotor members in an electric motor system controlled by movable motor structure.

126 This subclass is indented under subclass 114. Subject matter having plural armatures in a common field.

127 This subclass is indented under subclass 40. Subject matter having plural collectors for transferring the current between the rotor and a stationary part of the dynamoelectric device.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclasses 495+ for miscellaneous electric motor systems having plural armature or rotor windings with means to control the current flowing therein.
323, Electricity: Power Supply or Regulation Systems, subclass 203 for dynamoelectric machine systems for controlling the voltage magnitude and plural sets of brushes.

128 This subclass is indented under subclass 127. Subject matter having both commutator and slip ring type collectors.

129 This subclass is indented under subclass 128. Subject matter adapted for use as a synchronous or rotary converter.

SEE OR SEARCH CLASS:
307, Electrical Transmission or Interconnection Systems, subclasses 45+, 82 and 151 for miscellaneous conversion systems having rotary converters.
318, Electricity: Motive Power Systems, subclass 719 for synchronous motor systems wherein the synchronous motors are self excited.
363, Electric Power Conversion Systems, subclasses 102+ and 174+ for rotary converter systems.

130 This subclass is indented under subclass 129. Subject matter adapted to be used for plural wire direct current systems.

(1) Note. This subclass relates, for example, to converters adapted to be used with the Edison three wire systems.

SEE OR SEARCH CLASS:
323, Electricity: Power Supply or Regulation Systems, subclass 202 for balancer set systems.

131 This subclass is indented under subclass 128. Subject matter having plural separate armature circuits.

132 This subclass is indented under subclass 131. Subject matter having a polyphase armature winding.

133 This subclass is indented under subclass 128. Subject matter having an armature winding which is common to both the commutator and the slip ring collector.

134 This subclass is indented under subclass 133. Subject matter having plural field windings.

SEE OR SEARCH CLASS:
363, Electric Power Conversion Systems, subclass 104 for this subject matter in combination with a significant electric conversion circuit.

135 This subclass is indented under subclass 128. Subject matter having means to connect the field of the dynamoelectric device to the commutator collector.

136 This subclass is indented under subclass 127. Subject matter having plural commutator type collectors.

137 This subclass is indented under subclass 136. Subject matter adapted to be used as double current direct current machines.

138 This subclass is indented under subclass 137. Subject matter in which one of the commutator type collectors is adapted to be used as an input and the other is adapted to be used as an output.

(1) Note. This subclass relates, for example, to the Dynamotor type machines.

139 This subclass is indented under subclass 137. Subject matter having hetro-axial excitation.

(1) Note. This subclass relates, for example, to double current direct current machines having cross field excitation.

140 This subclass is indented under subclass 136. Subject matter having plural armature windings.

141 This subclass is indented under subclass 140. Subject matter having plural field windings.

SEE OR SEARCH CLASS:
363, Electric Power Conversion Systems, subclass 104 for this subject matter in combination with a significant electric conversion circuit.

142 This subclass is indented under subclass 136. Subject matter having plural field windings.

SEE OR SEARCH CLASS:
363, Electric Power Conversion Systems, subclass 104 for this subject matter in combination with significant electric conversion circuit.

143 This subclass is indented under subclass 127. Subject matter having plural slip ring sets.

144 This subclass is indented under subclass 143. Subject matter having plural armature windings.

SEE OR SEARCH CLASS:
322, Electricity: Single Generator Systems, subclass 90 for this subject matter when utilized in a single generator system.

145 This subclass is indented under subclass 144. Subject matter having plural sets of poles.

146 This subclass is indented under subclass 144. Subject matter in which the armature windings are polyphase windings.

147 This subclass is indented under subclass 144. Subject matter in which the slip rings are connected in the field circuit.

148 This subclass is indented under subclass 127. Subject matter having plural sets of brushes.

SEE OR SEARCH THIS CLASS, SUBCLASS:
239+, and 248+, for brush holders or rigging and for brushes, per se.

SEE OR SEARCH CLASS:
322, Electricity: Single Generator Systems, subclass 53 for single generator systems wherein the generator has an odd number of brushes as, for example, third brush type generator.

323, Electricity: Power Supply or Regulation Systems, subclass 203 for dynamoelectric voltage magnitude machines having plural sets of brushes in combination with a significant electrical system.

149 This subclass is indented under subclass 148. Subject matter having plural field windings.

SEE OR SEARCH CLASS:
363, Electric Power Conversion Systems, subclass 104 for this subject matter in combination with a significant electric conversion circuit.

150 This subclass is indented under subclass 149. Subject matter having means for connecting the field windings in a polyphase manner.

151 This subclass is indented under subclass 148. Subject matter having means for connecting one brush to another brush by a direct connection having negligible impedance.

SEE OR SEARCH CLASS:
322, Electricity: Single Generator Systems, subclass 92 for this subject matter in a generating system.

152 This subclass is indented under subclass 40. Subject matter having a permanent magnet.

SEE OR SEARCH THIS CLASS, SUBCLASS:
49.28, for a rotary disk-type stepping motor having a permanent magnet in the stator.
49.32, for a rotary stepping motor having a permanent magnet motor with an axially directed flux path.
49.36, for a rotary stepping motor having a permanent magnet in a pole tooth.
49.46, for a rotary stepping motor of the reluctance type having a stator with a winding and a permanent magnet.
49.53, for a rotary stepping motor in which a permanent magnet defines the stepping effect.

SEE OR SEARCH CLASS:
335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclass 84, 92, 179, 205+, and 229+ for devices comprising at least one permanent magnet combined with an armature.

153 This subclass is indented under subclass 152. Subject matter in which the permanent magnet is combined with a flywheel.

(1) Note. This subclass relates, for example, to flywheel magneto machines.

SEE OR SEARCH CLASS:
74, Machine Element or Mechanism, subclasses 572+ for flywheels and rotors, per se.

154.01 Permanent magnet stator:
This subclass is indented under subclass 152. Subject matter having at least one permanent magnet on the stator of a dynamoelectric machine.

(1) Note. If the field permanent magnet is combined with a field electromagnet, then 310/181 takes precedence.

SEE OR SEARCH THIS CLASS, SUBCLASS:
181, For windings and core structures having a combined permanent and electromagnet.

154.02 Combined with generating coil:
This subclass is indented under subclass 154.01. Subject matter wherein at least one permanent magnet is combined with a generator coil on the stator.

154.03 Means for securing magnet:
This subclass is indented under subclass 154.01. Subject matter including a specific means for securing at least one permanent magnet to the stator.

154.04 Cantilevered:
This subclass is indented under subclass 154.03. Subject matter wherein at least one permanent magnet is supported from one of its ends on the stator, as in a cantilevered fashion.

154.05 Axial:
This subclass is indented under subclass 154.03. Subject matter wherein at least one permanent magnet is mounted perpendicular to the axis of rotation of the dynamoelectric machine and provides magnetic flux into an axial air gap which extends parallel to the axis of rotation.

154.06 Plural set of magnets:
This subclass is indented under subclass 154.05. Subject matter including plural sets of permanent magnets, which are mounted perpendicular to the axis of rotation and provide magnetic flux into an axial air gap with the rotor of a dynamoelectric machine.

154.07 Adhesive:
This subclass is indented under subclass 154.03. Subject matter wherein at least one permanent magnet is secured on the stator with an adhesive, such as epoxy or thermosetting resin.

154.08 Mounted to magnetic yoke:
This subclass is indented under subclass 154.03. Subject matter wherein at least one permanent magnet is mounted on a magnetic yoke.

154.09 Split housing/yoke:
This subclass is indented under subclass 154.03. Subject matter wherein at least one permanent magnet is secured so that it straddles two or more portions of the magnetic yoke or a magnetic housing of the dynamoelectric machine.

154.11 Embedded in core or pole:
This subclass is indented under subclass 154.03. Subject matter wherein at least one permanent magnet which is inserted in a hole in a magnetic core or pole of the stator, or has a magnetic core or pole formed around the permanent magnet.

154.12 Cylindrical sleeve holder:
This subclass is indented under subclass 154.03. Subject matter including a hollow tube type holder, i.e., cylindrical sleeve holder, other than a magnetic core or pole, presses at least one permanent magnet in a radial direction to secure the permanent magnet on the stator.

154.13 Holder with pocket for magnet:
This subclass is indented under subclass 154.03. Subject matter including a specific holding means, other than a magnetic core or pole, having a pocket for holding at least one permanent magnet on the dynamoelectric machine.

154.14 Spring clip:
This subclass is indented under subclass 154.03. Subject matter wherein at least one permanent magnet is secured on the stator with a spring clip positioned in a groove between circumferential side surfaces of at least one permanent magnet.

154.15 Clip secured to housing:
This subclass is indented under subclass 154.14. Subject matter where the spring clip is secured to the housing or magnetic yoke of the dynamoelectric machine.

154.16 Axially pressing on magnets:
This subclass is indented under subclass 154.03. Subject matter including a mounting means which secures at least one permanent magnet by axially pressing against a side of at least one permanent magnet.

154.17 Wedging between:
This subclass is indented under subclass 154.03. Subject matter including a wedge positioned between the circumferential side surfaces of at least one permanent magnet.

154.18 With a magnetic wedge:
This subclass is indented under subclass 154.17. Subject matter wherein the wedge is made of a magnetic material.

154.19 With an integral wedge:
This subclass is indented under subclass 154.18. Subject matter wherein the magnetic wedge is integrally formed with the housing or magnetic yoke of the dynamoelectric machine.

154.21 Permanent magnet characterized by the shape of the magnet:
This subclass is indented under subclass 154.01. Subject matter wherein at least one permanent magnet has a distinctive shape.

154.22 With specific dimension:
This subclass is indented under subclass 154.21. Subject matter wherein the shape of at least one permanent magnet has a specific dimension.

154.23 Horseshoe:
This subclass is indented under subclass 154.21. Subject matter wherein the shape of at least one permanent magnet is in the form of a horseshoe.

154.24 Bar, square, or rectangular:
This subclass is indented under subclass 154.21. Subject matter wherein at least one shape of the permanent magnet or magnets is a bar, square, or rectangle.

154.25 Disk, ring, or cylinder:
This subclass is indented under subclass 154.21. Subject matter wherein the shape of at least one permanent magnet is in the form of a disk, cylinder, or ring.

154.26 With means to prevent or reduce demagnetization (i.e. auxiliary magnetic poles):
This subclass is indented under subclass 154.01. Subject matter including a specific means, i.e., auxiliary pole, to prevent or reduce the demagnetization of at least one permanent magnet on the stator.

154.27 With an auxiliary pole extending between stator magnet and rotor:
This subclass is indented under subclass 154.26. Subject matter wherein the means to prevent and reduce demagnetization specifically includes an auxiliary magnetic pole with a portion extending between at least one permanent magnet and a rotor of the dynamoelectric machine.

154.28 Specific magnetization:
This subclass is indented under subclass 154.01. Subject matter including a specific magnetization pattern in at least one permanent magnet on the stator.

(1) Note. Asymmetrical magnet poles or a varying magnetic field intensity across a magnetic pole are specific magnetization patterns.

154.29 Specific position or shape:
This subclass is indented under subclass 154.28. Subject matter including a specific magnetization pattern created by the placement of multiple permanent magnets or a specific magnetization pattern created by a specific shape of at least one permanent magnet.

154.31 Single pole pair:
This subclass is indented under subclass 154.01. Subject matter wherein at least one permanent magnet on the stator produces only a single set of magnetic pole pair on the stator.

(1) Note. This subclass relates to a dynamoelectric machine having only a single horseshoe shaped permanent magnet on stator with the rotor positioned between the ends of the horseshoe.

154.32 Permanent magnet extends along an axis:
This subclass is indented under subclass 154.31. Subject matter wherein at least one permanent magnet occupies a plane parallel to a central axis of the stator.

(1) Note. This subclass relates to a dynamoelectric machine having a horseshoe magnet with both ends of the magnet forming poles for the dynamoelectric machine and the rest of the magnet extending in a plane parallel to the axis of rotation.

154.33 Plural rotors:
This subclass is indented under subclass 154.31. Subject matter including more than one rotor in the dynamoelectric machine, wherein at least one permanent magnet on the stator provides a single magnetic pole pair for each rotor simultaneously.

154.34 With adjustable magnet structure:
This subclass is indented under subclass 154.31. Subject matter wherein a magnetic portion of the stator is adjustable to effect the magnetic properties of the stator.

154.35 With specific pole pieces or pole shoes:
This subclass is indented under subclass 154.31. Subject matter wherein at least one permanent magnet is connected to magnetic

pole pieces or pole shoes having specific details.

154.36 Circumferentially spaced poles and magnets:
This subclass is indented under subclass 154.35. Subject matter wherein the pole pieces or pole shoes are aligned circumferentially with at least one permanent magnets.

154.37 Poles extending axially from magnets:
This subclass is indented under subclass 154.35. Subject matter wherein pole pieces or pole shoes extend from a surface of at least one permanent magnet in a direction of the axis of rotation.

154.38 Pole shoe shape:
This subclass is indented under subclass 154.35. Subject matter wherein the magnetic pole pieces or pole shoes have a specific shape.

154.39 Different size:
This subclass is indented under subclass 154.35. Subject matter wherein the magnetic pole pieces or pole shoes are of unequal size.

154.41 Laminated:
This subclass is indented under subclass 154.35. Subject matter wherein the magnetic pole pieces or pole shoes are formed from laminated magnetic material.

154.42 Induced flux return pole:
This subclass is indented under subclass 154.35. Subject matter including induced magnetic pole on the stator which act as flux returns paths to at least one permanent magnets.

154.43 Additional permanent magnets:
This subclass is indented under subclass 154.01. Subject matter wherein the stator of the dynamoelectric machine includes additional permanent magnets which provide the main magnetic flux for the dynamoelectric machine.

154.44 Additional shield or coating (non-magnetic):
This subclass is indented under subclass 154.01. Subject matter including a non-magnetic shield or coating formed from non-magnetic material directly on at least one permanent magnet.

154.45 Multiple pole pairs:
This subclass is indented under subclass 154.01. Subject matter wherein at least one permanent magnet on the stator forms multiple magnetic pole pairs on the stator.

154.46 With specific pole shoe pieces:
This subclass is indented under subclass 154.45. Subject matter wherein at least one permanent magnet is connected to magnetic poles or pole shoes having specific details.

154.47 Magnet extending between two poles:
This subclass is indented under subclass 154.45. Subject matter wherein at least one permanent magnet contacts and extends between two magnetic pole shoes.

154.48 Induce flux return pole:
This subclass is indented under subclass 154.45. Subject matter including induced magnetic pole in the stator acting as flux return paths for at least one permanent magnet.

154.49 Adjustable:
This subclass is indented under subclass 154.45. Subject matter wherein a magnetic portion of the stator structure is adjustable to effect the magnetic properties of the stator.

155 This subclass is indented under subclass 154.01. Subject matter having means, in relation with the permanent magnet stator, to produce a variable reluctance so that the amount of magnetic flux traversing a certain part of the magnetic path varies.

SEE OR SEARCH THIS CLASS, SUBCLASS:
168+, for this subject matter in nonpermanent magnet alternating current generators.

156.01 Permanent magnet rotor:
This subclass is indented under subclass 152. Subject matter having at least one permanent magnet on the rotor of a dynamoelectric machine.

SEE OR SEARCH CLASS:
324, Electricity: Measuring and Testing, subclass 146 for similar subject matter utilized in electric meters.

156.02 Transverse flux:
This subclass is indented under subclass 156.01. Subject matter wherein the permanent magnet rotor of the dynamoelectric machine is used in a transverse flux machine(i.e. a machine having a stator with a single-phase toroidal coil within a "U" -Shaped magnetic core).

SEE OR SEARCH THIS CLASS, SUBCLASS:
164, for details of the toroidal coil,
266, for a double air gap rotor,
268, for a disk shaped rotor.

156.03 With a hysteresis ring:
This subclass is indented under subclass 156.01. Subject matter wherein the rotor of rotor of the dynamoelectric machine has at least one ring of a material which is subject to a hysteresis effect.

156.04 Separate portion of the rotor magnet used as a thrust bearing:
This subclass is indented under subclass 156.01. Subject matter wherein at least one permanent magnet of the rotor has a distinctive portion of the magnet which produces magnetic flux acting solely as a thrust bearing to support the rotor in the machine.

SEE OR SEARCH THIS CLASS, SUBCLASS:
90.5, for details of a rotor with separate dynamo rotor magnet and thrust bearing magnet.

156.05 Separate portion of the rotor magnet used as a magnet for sensing(i.e. for position or frequency):
This subclass is indented under subclass 156.01. Subject matter wherein at least one permanent magnet of the rotor has a distinctive portion of the magnet which produces magnetic flux acting solely as a source of magnetic flux for a rotor position sensor or rotor frequency sensor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
156.06, for details of a rotor with separate dynamoelectric machine rotor magnet and position sensing magnets with a combined flux; 68B for details of a combined motor and rotor position sensor;

SEE OR SEARCH CLASS:
324, Electricity: Measuring and Testing, subclass 160 for details of speed sensor.
324, Electricity: Measuring and Testing, subclass 207.11 for details of magnetic position sensors.

156.06 Combined with flux for sensing:
This subclass is indented under subclass 156.01. Subject matter wherein the flux from at least one permanent magnet of the rotor is combined with the flux from an additional permanent magnet for a rotor position or rotor frequency sensor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
156.05, for details of a rotor with the dynamoelectric machine rotor magnetacts or includes a portion to act as a rotor position sensor or rotor frequency sensor.
68, B, for details of a combined motor and position sensor.

SEE OR SEARCH CLASS:
324, Electricity: Measuring and Testing, subclass 160 for details of speed sensors

156.07 Additional flux directing magnets:
This subclass is indented under subclass 156.01. Subject matter wherein the rotor includes both at least one main permanent magnet to provide the majority of the magnetic flux for the machine and an additional permanent magnet mounted on the rotor which guides the magnetic flux flow from the main permanent magnet in a particular direction.

156.08 Mounting (such as on a surface of a shaft):
This subclass is indented under subclass 156.01. Subject matter wherein at least one permanent magnet on the rotor is mounted directly on a shaft for rotation therewith.

156.09 Keyed to shaft:
This subclass is indented under subclass 156.08. Subject matter wherein the mounting includes a key and keyway between at least one permanent magnet and the shaft.

156.11 Magnets in shaft:
This subclass is indented under subclass 156.08. Subject matter wherein at least one permanent magnet is mounted physically within the shaft or coaxial with the shaft structure and sharing the same rotational axis as the shaft.

156.12 Mounted on a sleeve/hub:
This subclass is indented under subclass 156.08. Subject matter wherein at least one permanent magnet of the rotor is mounted on the outer surface of a sleeve/hub which is between the permanent magnet and the shaft of the rotor.

156.13 Keyed to a sleeve/hub:
This subclass is indented under subclass 156.12. Subject matter including a key and keyway between the magnet and the sleeve/hub to secure the magnet to the sleeve/hub.

156.14 Knurl between the sleeve/hub and a shaft:
This subclass is indented under subclass 156.12. Subject matter including a knurl surface between the sleeve/hub and the shaft of the rotor.

156.15 Induced flux pole on sleeve/hub:
This subclass is indented under subclass 156.12. Subject matter wherein at least one permanent magnet is mounted on the sleeve/hub in which additional magnetic poles are induced by the magnetic flux of the permanent magnet mounted on the sleeve/hub.

156.16 Spring mounted:
This subclass is indented under subclass 156.12. Subject matter including at least one resilient element such as a coil spring or a leaf spring to secure the permanent magnet to the sleeve/hub.

156.17 Spring mounted flux shunt:
This subclass is indented under subclass 156.16. Subject matter including means for mounting at least one magnetically soft element on a resilient support which allow the magnetically soft element to be moved in proximity to at least one permanent magnet.

156.18 With a threaded fastener:
This subclass is indented under subclass 156.08. Subject matter wherein the assembly for mounting at least one permanent magnet of the dynamoelectric machine to the rotor includes at least one threaded fastener such as a bolt or screw.

156.19 With a wedge:
This subclass is indented under subclass 156.08. Subject matter wherein the mounting includes at least one wedge applying pressure to at least one permanent magnet to secure it in place on the rotor.

156.21 With an adhesive:
This subclass is indented under subclass 156.08. Subject matter wherein the mounting includes an adhesive such as epoxy or thermosetting resin for securing at least one permanent magnet to the rotor.

156.22 With an axial end clamp:
This subclass is indented under subclass 156.08. Subject matter wherein the mounting includes at least one element applying axial pressure to the end of at least one permanent magnet to secure it on the rotor.

156.23 With casting material around the magnet:
This subclass is indented under subclass 156.08. Subject matter wherein the mounting includes a casting material or potting material enveloping at least a portion of at least one permanent magnet to secure it to the rotor.

156.24 Including a spring mount to modify a flux:
This subclass is indented under subclass 156.08. Subject matter wherein a portion of the rotor is spring mounted to be movable to adjust the position of the permanent magnet so as to modify a flux in the air gap between the rotor and a stator of the dynamoelectric machine.

156.25 Having radially magnetized and axially offset magnets:
This subclass is indented under subclass 156.08. Subject matter wherein the rotor includes a plurality of permanent magnets

which are radially magnetized and axially offset relative to one another.

156.26 Mounted on a bell shape hub:
This subclass is indented under subclass 156.08. Subject matter wherein at least one permanent magnet is secured to an inner or outer surface of bell shaped hub to form the rotor.

156.27 With thermal compensation:
This subclass is indented under subclass 156.08. Subject matter including an element to compensate structural changes caused by temperature variations experienced by at least one permanent magnet and rest of the rotor.

156.28 Sleeve covering magnet face:
This subclass is indented under subclass 156.08. Subject matter wherein the mounting includes a sleeve, extending over the magnetic face of at least one permanent magnet and holding at least one permanent magnet on the rotor.

156.29 Sleeve parallel to magnetic face:
This subclass is indented under subclass 156.08. Subject matter wherein the mounting includes a sleeve, extending around the sides of at least one permanent magnet to hold at least one permanent magnet on the rotor.

156.31 Banding around magnet:
This subclass is indented under subclass 156.08. Subject matter wherein the mounting includes multiple wrappings of a band to secure the magnet on the rotor.

156.32 Including an axial air gap:
This subclass is indented under subclass 156.01. Subject matter wherein at least one permanent magnet of the rotor is oriented to provide an axial magnetic air gap between the rotor and a stator the dynamoelectric machine.

156.33 With pole shoes:
This subclass is indented under subclass 156.32. Subject matter including pole pieces or pole shoes in physical contact and magnetic contact with at least one permanent magnet.

156.34 With a stator between a rotating flux return plate and rotor magnet:
This subclass is indented under subclass 156.32. Subject matter wherein the stator is sandwiched between the permanent magnet rotor and a flux return plate.

156.35 With single rotor magnet and plural stators:
This subclass is indented under subclass 156.32. Subject matter wherein the permanent magnet rotor is sandwiched between a pair of stators.

156.36 With plural sets of rotating magnets:
This subclass is indented under subclass 156.32. Subject matter wherein the permanent magnet rotor includes plural axially spaced sets of rotating permanent magnets.

156.37 With single stator and plural sets of rotating magnets:
This subclass is indented under subclass 156.36. Subject matter wherein the stator is sandwiched between two sets of rotating permanent magnets of the rotor.

156.38 Specific shape:
This subclass is indented under subclass 156.01. Subject matter wherein at least one permanent magnet has a distinctive shape.

156.39 Horseshoe:
This subclass is indented under subclass 156.38. Subject matter wherein at least one permanent magnet has a horseshoe shape.

156.41 Triangular:
This subclass is indented under subclass 156.38. Subject matter wherein at least one permanent magnet has a triangular shape.

156.42 Star:
This subclass is indented under subclass 156.38. Subject matter wherein at least one permanent magnet has a star shape.

156.43 Specific magnetization:
This subclass is indented under subclass 156.38. Subject matter wherein at least one permanent magnet has a specific magnetization pattern.

156.44 Different pole width:
This subclass is indented under subclass 156.43. Subject matter wherein the physical dimensions of at least one permanent magnet create form the magnetic poles of unequal size on the rotor.

156.45 Specific dimensions:
This subclass is indented under subclass 156.43. Subject matter wherein at least one permanent magnet has specific dimensions such as arc length, thickness, width or axial length which effects the pattern of the magnetic flux emanating from at least one permanent magnet.

156.46 Shaped to vary air:
This subclass is indented under subclass 156.43. Subject matter wherein at least one permanent magnet of the dynamoelectric machine includes a specific shape to vary the physical dimensions of the working air gap between the rotor and a stator of the dynamoelectric machine.

156.47 Skewed:
This subclass is indented under subclass 156.43. Subject matter wherein at least one permanent magnets of the dynamoelectric machine is arranged such that the magnetic poles of the rotor are displaced in a circumferential direction over the axial length of the rotor.

156.48 Pole shoes or pole pieces:
This subclass is indented under subclass 156.01. Subject matter wherein at least one permanent magnet of the dynamoelectric machine includes pole pieces or pole shoes in physical contact and magnetic contact with the permanent magnets.

SEE OR SEARCH THIS CLASS, SUBCLASS:
156.33, for permanent magnet dynamos with pole shoes and an axial air gap with the stator field coils.

156.49 Radial flux path and radially positioned pole shoes:
This subclass is indented under subclass 156.48. Subject matter wherein at least one permanent magnet is radially magnetized with pole pieces or pole shoes disposed radially with respect to at least one permanent magnet.

156.51 Laminated pole shoes and multiple pole pairs:
This subclass is indented under subclass 156.49. Subject matter wherein multiple magnetic pole pairs are formed on the rotor by at least one permanent magnets, having laminated pole pieces or pole shoes in physical contact and magnetic contact with at least one permanent magnet.

156.52 Laminated pole shoes with single pole pair:
This subclass is indented under subclass 156.49. Subject matter wherein a single magnetic pole pair is formed on the rotor by at least one permanent magnet, having laminated pole shoes in physical contact and magnetic contact with at least one permanent magnet.

156.53 Embedded in a core:
This subclass is indented under subclass 156.49. Subject matter wherein at least one permanent magnet of the dynamoelectric machine is embedded in a magnetic core which forms the rotor of the machine.

156.54 Induced flux return poles:
This subclass is indented under subclass 156.53. Subject matter including induced flux return poles formed on the core.

156.55 Circumferential flux path and circumferential pole shoes:
This subclass is indented under subclass 156.48. Subject matter wherein at least one permanent magnet of the dynamoelectric machine are circumferentially magnetized with pole pieces or poles shoes disposed circumferentially with respect to at least one permanent magnet.

156.56 Embedded:
This subclass is indented under subclass 156.55. Subject matter wherein the pole pieces or pole shoes are formed by embedding at least one permanent magnet in a core.

156.57 With slots or holes to guide flux:
This subclass is indented under subclass 156.55. Subject matter wherein the polepieces or pole shoes include slots or holes to guide the flux.

156.58 Different size pole shoes:
This subclass is indented under subclass 156.55. Subject matter wherein the pole pieces or pole shoes are of different sizes.

156.59 Pole shoes fixed to hub or shaft:
This subclass is indented under subclass 156.55. Subject matter wherein the circumferentially positioned pole pieces or pole shoes are fixed to a hub or shaft of the rotor.

156.61 Pole shoes fixed with end plates:
This subclass is indented under subclass 156.55. Subject matter wherein the circumferentially positioned pole pieces or pole shoes are fixed to axial end plates of the permanent magnet of the rotor.

156.62 Axially magnetized with poles shoes at one end:
This subclass is indented under subclass 156.48. Subject matter wherein at least one permanent magnet is axially magnetized with poles pieces or pole shoes positioned at only one axial end of the permanent magnet.

156.63 Laminated pole shoes:
This subclass is indented under subclass 156.62. Subject matter wherein the pole pieces or pole shoes are laminated.

156.64 Axially magnetized with poles shoes at both ends:
This subclass is indented under subclass 156.48. Subject matter wherein at least one permanent magnet is axially magnetized with pole pieces or pole shoes positioned at both axial ends of the permanent magnet.

156.65 Laminated pole shoes:
This subclass is indented under subclass 156.64. Subject matter wherein the pole pieces or pole shoes are laminated.

156.66 Claw poles/interfitting poles/lundel:
This subclass is indented under subclass 156.01. Subject matter wherein at least one permanent magnet of the dynamoelectric machine includes interfitting/claw-pole/lundel type pole pieces or pole shoes.

156.67 Laminated pole shoes:
This subclass is indented under subclass 156.66. Subject matter wherein the pole pieces or pole shoes are laminated.

156.68 Poles formed by magnets:
This subclass is indented under subclass 156.66. Subject matter wherein at least one permanent magnet forms the interfitting/claw-pole/lundel poles.

156.69 Plural sets of claw poles:
This subclass is indented under subclass 156.66. Subject matter wherein the rotor includes multiple sets of interfitting/claw-pole/lundel poles arranged in the axial direction.

156.71 Claw poles extend in the same axial direction:
This subclass is indented under subclass 156.66. Subject matter wherein the interfitting/claw-pole/lundel poles extend in the same axial direction with respect to the rotor.

156.72 Additional support for magnet:
This subclass is indented under subclass 156.66. Subject matter wherein the rotor includes additional support for at least one permanent magnet, such as a support ring radially positioned between at least one permanent magnet and the interfitting/claw-pole/lundel poles.

156.73 Additional support for claw pole tips:
This subclass is indented under subclass 156.66. Subject matter wherein the rotor includes additional support for the tips of the claw-poles/interfitting/lundel poles.

(1) Note. The term “claw pole” refers to magnetic poles formed on the rotor with interfitting poles which extend axially from a central structure.

156.74 Damping features:
This subclass is indented under subclass 156.01. Subject matter including an electrical conductor to protect against demagnetization of at least one permanent magnet of the rotor.

156.75 Damper plate on magnetic face:
This subclass is indented under subclass 156.74. Subject matter wherein the electrical conductor to protect against demagnetization of the permanent magnets of the rotor is a plate means provided on the face of the permanent magnet.

156.76 Damper in pole pieces:
This subclass is indented under subclass 156.74. Subject matter wherein the electrical conductor is a damper winding positioned in pole shoes/pole pieces on the face of at least one permanent magnet.

156.77 Damper cage around magnet:
This subclass is indented under subclass 156.74. Subject matter wherein the electrical conductor is a damper cage around the periphery of at least one permanent magnet.

156.78 Squirrel cage:
This subclass is indented under subclass 156.01. Subject matter including a squirrel cage type winding on the rotor in addition to at least one permanent magnet.

156.79 Including laminated ring:
This subclass is indented under subclass 156.78. Subject matter wherein the squirrel cage winding is formed in a laminated ring of magnetic material.

156.81 Magnet positioned between squirrel cage and stator:
This subclass is indented under subclass 156.78. Subject matter wherein at least one permanent magnet of the rotor is positioned between the squirrel cage winding and a stator of the dynamoelectric machine.

156.82 Axially positioned magnets:
This subclass is indented under subclass 156.78. Subject matter wherein at least one permanent magnet of the rotor of the dynamoelectric machine are axially positioned with respect to a magnetic core of the rotor.

156.83 Including a flux barrier:
This subclass is indented under subclass 156.78. Subject matter wherein the squirrel cage type winding includes a feature to block or guide the magnetic flux in the rotor.

156.84 Flux barrier is a magnet:
This subclass is indented under subclass 156.83. Subject matter wherein the flux barrier is an additional permanent magnet which is different from at least one permanent magnet of the rotor.

157 This subclass is indented under subclass 40. Subject matter which is vertically disposed.

158 This subclass is indented under subclass 40. Subject matter relating to universal motors which will operate with either alternating current or direct current sources.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclass 245 and 246+ for universal motor systems.

159 This subclass is indented under subclass 40. Subject matter relating to alternating current rotary dynamoelectric devices.

160 This subclass is indented under subclass 159. Subject matter relating to frequency converters.

SEE OR SEARCH THIS CLASS, SUBCLASS:
127+, for this subject matter having plural collectors.

SEE OR SEARCH CLASS:
84, Music, subclasses 725+ for this subject matter in an electrical musical instrument, such as an electric organ.
191, Electricity: Transmission to Vehicles, subclass 7 for this subject matter in a distribution system utilized for transmitting electricity to a moving vehicle from a stationary point.
363, Electric Power Conversion Systems, subclasses 157+, especially subclasses 174+ for this subject matter in a conversion system.

161 This subclass is indented under subclass 159. Subject matter relating to dynamoelectric machinery for shifting the phase of the alternating current.

SEE OR SEARCH CLASS:
323, Electricity: Power Supply or Regulation Systems, subclasses 201 through 204 for this subclass matter in a phase control system.

162 This subclass is indented under subclass 159. Subject matter relating to synchronous dynamoelectric machinery.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclasses 700+ for this subject matter in a synchronous motor system.

163 This subclass is indented under subclass 162. Subject matter of the reaction type.

164 This subclass is indented under subclass 163. Subject matter having a toroidal coil.

165 This subclass is indented under subclass 162. Subject matter having an electromagnetic coil which is adapted to be energized by direct current.

166 This subclass is indented under subclass 159. Subject matter of the induction motor or induction generator type.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclasses 727+ for induction motor systems.
322, Electricity: Single Generator Systems, subclass 47 for induction generator systems.

167 This subclass is indented under subclass 166. Subject matter having means to start a dynamoelectric machine, which is utilized as a motor, by the use of repulsion starting.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclasses 725+ for repulsion motor systems; and subclass 728 for repulsion start induction motor systems.

168 This subclass is indented under subclass 166. Subject matter relating to inductor type generators wherein the magnetic circuit is varied by varying the reluctance of said magnetic circuit.

SEE OR SEARCH THIS CLASS, SUBCLASS:
155, for this subject matter having a permanent magnet in the magnetic circuit.

SEE OR SEARCH CLASS:
322, Electricity: Single Generator Systems, subclass 47 for induction type generator systems.

169 This subclass is indented under subclass 168. Subject matter relating to high frequency generators.

(1) Note. The high frequency is obtained, for example, by the use of saw tooth reluctance type rotor, which is rotated at a high rate of speed.

170 This subclass is indented under subclass 169. Subject matter relating to multi-frequency generators.

171 This subclass is indented under subclass 166. Subject matter relating to induction generators.

(1) Note. An induction generator is a synchronous motor which is either self excited by connecting a large condenser in its output circuit or by driving it above synchronous speed while connected to an energized circuit.

172 This subclass is indented under subclass 166. Subject matter relating to shifting field type induction motors.

(1) Note. This subclass relates, for example, to the shaded pole type of induction motor in which, although only a single phase of current is connected to the motor, a true rotating field is obtained by the use of pole faces which are partly free and partly surrounded by a short circuited coil.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclass 750 for reversing shaded pole induction motor systems; and subclasses 781+ for shaded pole induction motor systems.

173 This subclass is indented under subclass 159. Subject matter having a commutator.

SEE OR SEARCH THIS CLASS, SUBCLASS:
127+, for this subject matter having plural commutators.
167, for this subject matter in an induction motor.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclasses 725+ for repulsion motor systems and subclasses 244+ for other alternating current motor systems in which the motor has a commutator.

174 This subclass is indented under subclass 173. Subject matter for use with a single phase of alternating current.

175 This subclass is indented under subclass 174. Subject matter in which the armature windings are conductively connected to the source of energy.

176 This subclass is indented under subclass 174. Subject matter in which the armature winding is connected to the source of energy by means of transformer action.

177 This subclass is indented under subclass 40. Subject matter relating to direct current dynamoelectric machines.

178 This subclass is indented under subclass 177. Subject matter relating to homopolar dynamoelectric machines.

(1) Note. A homopolar dynamoelectric machine is one in which the moving armature conductor is not in the form of a coil, but is rather in the form of one half of a single turn. Generally, this is achieved by utilizing a disk or a cylinder as the coil with pairs of brushes to conduct the current from and to the conductor at spaced points.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclass 253 for homopolar motor systems.
322, Electricity: Single Generator Systems, subclass 48 for this subject matter utilized in a generator system.

179 This subclass is indented under subclass 40. Subject matter relating to windings and core structure.

SEE OR SEARCH CLASS:
324, Electricity: Measuring and Testing, subclasses 76.11+ for the structure of integrating electric meters having a rotary portion which operates in the manner of an electric motor.
335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclasses 220+ for the structure of electromagnets.
336, Inductor Devices, appropriate subclasses for the structure of inductor and inductive reactors.

180 This subclass is indented under subclass 179. Subject matter relating to field or excitation windings or core structure.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclasses 521+ for electric motor systems having means to control the field.

181 This subclass is indented under subclass 180. Subject matter having a combined permanent and electromagnet.

SEE OR SEARCH THIS CLASS, SUBCLASS:
152+, for permanent magnet machines.

SEE OR SEARCH CLASS:
322, Electricity: Single Generator Systems, subclass 46 for generator control systems in which the generator has a combined permanent and wound field structure.
335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclasses 229+ for devices with electromagnets combined with permanent magnets having an armature.

182 This subclass is indented under subclass 180. Subject matter having a short circuited winding or conductor.

SEE OR SEARCH CLASS:
336, Inductor Devices, subclasses 73+ for inductive devices having closed coils or single conductor members (e.g., rings, bands, discs, etc., of conductive material).

183 This subclass is indented under subclass 182. Subject matter having a damper type winding.

(1) Note. A damper winding is a winding which acts to absorb higher frequencies of magnetic flux by ohmic dissipation or by the generation of induced currents which oppose the higher frequencies of flux.

184 This subclass is indented under subclass 180. Subject matter having plural field windings.

SEE OR SEARCH CLASS:
322, Electricity: Single Generator Systems, subclasses 63+ for this subject matter in a single generator system.
363, Electric Power Conversion Systems, subclass 104 for this subject matter in combination with a significant electric conversion circuit.

185 This subclass is indented under subclass 184. Subject matter having plural sets of poles.

186 This subclass is indented under subclass 184. Subject matter in which one of the plural field windings is an interpole, compensating or neutralizing pole.

SEE OR SEARCH THIS CLASS, SUBCLASS:
185, for this subject matter when associated with plural independent sets of poles.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclasses 521+ for this subject matter in an electric motor system.
322, Electricity: Single Generator Systems, subclasses 64 through 66 for this subject matter in a single generator system.

187 This subclass is indented under subclass 184. Subject matter having a slotted or divided pole.

SEE OR SEARCH THIS CLASS, SUBCLASS:
172, for split phase induction motors having a divided pole, one half of which is surrounded by a short circuiting conductor.
182+, for field structure having short circuited windings or conductors, some of which are set into slots in the pole faces.

188 This subclass is indented under subclass 184. Subject matter relating to differentially related field windings.

189 This subclass is indented under subclass 180. Subject matter in which the field coil has a variable length or a tapped winding.

SEE OR SEARCH CLASS:
322, Electricity: Single Generator Systems, subclass 71 for this subject matter in a single generator system.
336, Inductor Devices, subclass 150 for inductor tap changing means.
388, Electricity: Motor Control Systems, subclasses 835+ for running-speed control systems in which the length of the field winding may be varied.

190 This subclass is indented under subclass 180. Subject matter having a magnetic shunt for shifting the field flux.

SEE OR SEARCH CLASS:
335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclasses 220+ for miscellaneous magneto-mechanical devices which may utilize flux shunting means, see especially subclasses 236+.
336, Inductor Devices, subclass 133 and 160+ for inductive devices with adjustable magnetic shunts and induc-

tive regulators with magnetic shunts, respectively.

191 This subclass is indented under subclass 180. Subject matter having adjustable magnetic structure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

190, for the subject matter where the adjustable structure is a magnetic shunt.

SEE OR SEARCH CLASS:

318, Electricity: Motive Power Systems, subclasses 538+ for electric motor systems in which the motor structure is controlled or adjusted. Consult the search notes to these classes for related art.

322, Electricity: Single Generator Systems, subclasses 49+ for a single generator system in which the magnetic structure of a generator is controlled or adjusted.

336, Inductor Devices, subclasses 132+ for inductive devices having plural core parts which are relatively adjustable.

192 This subclass is indented under subclass 180. Subject matter having nonmagnetic inserts or air gaps in the field or winding structure.

SEE OR SEARCH CLASS:

336, Inductor Devices, subclasses 135+, 165 and 178 for core structure with adjustable air gap, an air gap in the magnetic shunt of an inductive regulator and inductive devices having closed cores with air gaps, respectively.

193 This subclass is indented under subclass 180. Subject matter having a nonuniform core cross section.

SEE OR SEARCH CLASS:

336, Inductor Devices, subclasses 155+ for inductive regulators of the saturable type having nonuniform core cross sections, where a part of the core, having a small cross section, saturates before other parts of the core, having larger cross sections, saturate.

194 This subclass is indented under subclass 180. Subject matter relating to coil supports and spools.

SEE OR SEARCH CLASS:

336, Inductor Devices, subclass 185 and 208 for coil supports for plural coil windings and coils on preformed supports or mounts (for single coil windings), respectively.

195 This subclass is indented under subclass 179. Subject matter relating to armature or primary windings or core structure.

SEE OR SEARCH CLASS:

324, Electricity: Measuring and Testing, subclasses 134+ for the structure of armatures utilized in integrating type electric meters.

196 This subclass is indented under subclass 195. Subject matter relating to the prevention of corona discharges.

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, subclasses 140+ for insulators having means to distribute a voltage stress along the insulator.

336, Inductor Devices, subclass 70 for coil capacitance modifying surge potential gradient modifying means.

361, Electricity: Electrical Systems and Devices, subclasses 212+ for the discharging of static electricity.

197 This subclass is indented under subclass 195. Subject matter having a short circuited winding or conductor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

166+, for complete induction motors.

SEE OR SEARCH CLASS:

336, Inductor Devices, subclasses 73+ for inductive devices having closed coils or single conductor members (e.g., rings, bands, discs, etc., of conductive material).

198 This subclass is indented under subclass 195. Subject matter having plural windings.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclasses 495+ for this subject matter in an electric motor system.
322, Electricity: Single Generator Systems, subclass 90 for this subject matter in a single generator system.

199 This subclass is indented under subclass 198. Subject matter relating to combined stationary and rotary windings.

200 This subclass is indented under subclass 195. Subject matter having a variable length or a tapped winding.

SEE OR SEARCH CLASS:
322, Electricity: Single Generator Systems, subclass 93 for this subject matter in a single generator system.
336, Inductor Devices, subclasses 137+ for adjustable inductor having means to change the coil length or connections. Note especially indented subclass 150 for that subject matter having tap changing means. Also see subclass 15 for inductive devices with variable length coils, whose length varies through winding and/or unwinding of the coil.

201 This subclass is indented under subclass 195. Subject matter in which the winding conductors are in the form of bars.

202 This subclass is indented under subclass 195. Subject matter in which the winding conductors are in the form of open windings.

(1) Note. An open winding is a winding of the type in which, starting from a given point, it is not possible to reach that given point again by continuously going along the winding in only one direction.

203 This subclass is indented under subclass 195. Subject matter relating to closed windings.

(1) Note. A closed winding is a winding of such type that it is possible to arrive at any point by leaving that point and traversing the winding continuously in only one direction.

204 This subclass is indented under subclass 203. Subject matter relating to equalizers or equalizer windings.

205 This subclass is indented under subclass 203. Subject matter relating to multiplex windings.

206 This subclass is indented under subclass 203. Subject matter relating to lap windings.

207 This subclass is indented under subclass 203. Subject matter relating wave windings.

208 This subclass is indented under subclass 195. Subject matter relating to coils.

SEE OR SEARCH THIS CLASS, SUBCLASS:
194, for similar subject matter.

209 This subclass is indented under subclass 195. Subject matter relating to adjustable magnetic structure.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclasses 538+ for the subject matter in electric motor systems.
322, Electricity: Single Generator Systems, subclasses 49+ for this subject matter in a single generator system.
336, Inductor Devices, subclasses 132+ for inductive devices having plural core parts which are relatively adjustable.

210 This subclass is indented under subclass 179. Subject matter relating to secondary windings or conductors.

(1) Note. A secondary winding or conductor is one in which current is induced by transformer action.

211 This subclass is indented under subclass 210. Subject matter relating to squirrel cage type secondary windings.

212 This subclass is indented under subclass 211. Subject matter having inherently variable impedance at variable frequencies.

(1) Note. This subclass relates, for example, to squirrel cage rotors in which the rotor bars are in the form of ribbons, set in deep slots so that the inductive reactance of the different portions of a ribbon are different. This subclass also relates, for example, to double squirrel cage type rotors.

213 This subclass is indented under subclass 179. Subject matter relating to antiparasitic conductors.

(1) Note. This subclass relates, for example, to the elimination of skin current effects in dynamoelectric machine windings; in which, due to the action of different inherent reactances in different parts of a common conductor the current is caused to concentrate in one part of the conductor with resulting excess heating. Such current concentration and excess heating can be avoided, for example, by dividing these conductors into a plurality of parallel members which are twisted about each other and insulated from each other everywhere except by their ends, where they are conductively joined.

SEE OR SEARCH CLASS:
174, Electricity: Conductors and Insulators, subclass 114 for split or imbricated conductors, per se.

214 This subclass is indented under subclass 179. Subject matter relating to coil retainers or slot closers.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.099 through 216.103, for a magnetic element for bridging adjacent pole ends.

SEE OR SEARCH CLASS:
428, Stock Material or Miscellaneous Articles, subclasses 544+ for stock materials, e.g., of indefinite length, which are all metal or have adjacent metal components.

215 This subclass is indented under subclass 179. Subject matter relating to slot liners.

SEE OR SEARCH CLASS:
336, Inductor Devices, subclasses 196+ for inductor devices (e.g., transformers and inductive reactors) having supporting or spacing means between coil and core.

216.001 Core:
This subclass is indented under subclass 179. Subject matter including specific structural detail of an element comprising a ferromagnetic material for concentrating magnetic flux along a low-reluctance flux path.

(1) Note. The core is commonly inductively coupled with a source of magnetic energy, and directs the flux from the source along a predetermined path in a motor or generator where the energy interacts with other elements of the machine to produce motion or electrical energy.

SEE OR SEARCH CLASS:
336, Inductor Devices, subclasses 210 through 213 , 216-219, 233, and 234 for magnetic core structure for use in an inductor, of which subclasses 233 and 234 is the general subclass for a core not elsewhere classified.

216.002 Pole-less core (i.e., slotless, toothless):
This subclass is indented under subclass 216.001. Subject matter including a magnetic core accommodating a winding thereon, the core lacking any pole extending therefrom.

(1) Note. The winding is commonly placed against a smooth-surfaced core instead of wound around a core extension or tooth.

216.003 Wire core:
This subclass is indented under subclass 216.001. Subject matter including a core comprised of an elongated slender rod or filament of magnetic material that is wound or coiled in plural turns, or bunched together in a manner sufficient to build the desired core cross-section.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.004 through 216.066, for laminated core structure.

216.004 Laminated core:
This subclass is indented under subclass 216.001. Subject matter including a core constructed of a plurality of superposed, thin layers (i.e., sheets) of magnetic material joined together into a unitary structure.

(1) Note. The plurality of layers may be formed from plural sheets of material superposed on one another, or a single sheet of material folded or wound on itself to form plural superposed layers.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.03, for a wire core.
216.057 through 216.063, for a laminated pole.
216.064, for a laminated pole tip.

SEE OR SEARCH CLASS:
336, Inductor Devices, subclass 210 for an inductor core structure with means for fastening plural parts of the core or the core laminations into a single integral core; and subclass 213, for an inductor core structure formed of a continuous, wound strip or filament of magnetic material.

216.005 Having winding lead accommodation structure:
This subclass is indented under subclass 216.004. Subject matter including a laminated core with a means in the form of a recess, slot, channel or other passage on or through a portion of the core, for the specific purpose of containing an electrical conductor (i.e., lead) extending from a winding associated with the core.

216.006 Having particular grain orientation:
This subclass is indented under subclass 216.004. Subject matter including a laminated core having a lamination comprised of a sheet of ferromagnetic material having magnetic crystals (i.e., grains) aligned in generally the same direction or in a predetermined directional pattern, or a specified relationship of a crystal orientation of one lamination with respect to that of another lamination.

216.007 Plural laminated segments radially united:
This subclass is indented under subclass 216.004. Subject matter including at least two distinct sets of laminated core sections combined to form the core, wherein one section is positioned at a greater distance from the rotor axis than the other core section.

(1) Note. The core sections are commonly comprised of, for example, annular shaped sections of increasing diameter, wherein the sections are joined together generally along a circumferential border of each section having a common radius with the other section.

216.008 Plural axially laminated segments circumferentially united:
This subclass is indented under subclass 216.004. Subject matter including at least two distinct sets of laminated core sections combined to form the core, each section having laminations stacked in a direction parallel to the rotor axis, wherein one section is generally positioned at a similar distance from the rotor axis as the other core section, and joined to the other core section along a boundary in common with a radial line directed away from the rotor axis.

(1) Note. This subclass includes, for example, two axially-laminated C-core sections united face-to-face at their respective open ends; but it is not so limited to only two such arcuate sections joined together to form the core.

216.009 Having particular mating joint structure:
This subclass is indented under subclass 216.008. Subject matter including a core having a plurality of axially laminated sections circumferentially united, wherein there is a recited structural detail of the connection between the two sections.

216.011 Circumferentially offset laminations:
This subclass is indented under subclass 216.004. Subject matter including a laminated core having a plurality of laminations having a common structural feature, wherein the lami-

nations are stacked in such a way that the feature in one of the laminations is not axially aligned with the like feature in the other lamination.

(1) Note. A laminated structure in this subclass commonly has similar laminations, where each lamination is rotated in the plane of the lamination with respect to the like feature of a mating lamination. However, it is not required that the laminations be identical.

216.012 Offset pole teeth:

This subclass is indented under subclass 216.011. Subject matter including a laminated core including a lamination having a radially extending pole tooth as the common structural feature that is circumferentially offset from a corresponding pole tooth in a mating lamination.

216.013 Having axially extended spirally-laminated core:

This subclass is indented under subclass 216.011. Subject matter including a laminated core wherein a lamina is helically wound both around and along an axis along a path similar to a screw thread, so that laminations formed by each turn are stacked in the axial direction of the axis.

(1) Note. The common structural feature is commonly formed at a plurality of positions on the lamina, wherein the distance between common features is such that the common features of adjacent turns do not axially align with one another after the lamina is wound into a core.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.041, through 216.044, for an axially extending spiral lamination.

216.046, and 216.047, for having radially stacked laminations by spiral winding.

216.014 Offset cooling fins:

This subclass is indented under subclass 216.011. Subject matter including a laminated core including a lamination including a portion with a ventilation passage there through as the common structural feature that is circumferentially offset from a corresponding ventilation passage in a mating lamination.

SEE OR SEARCH THIS CLASS, SUBCLASS:

12.29, for cooling of a linear motor or generator.

16, for cooling of a reciprocating motor or generator.

52 through 65, for of a rotary dynamoelectric machine, especially subclass 64, for a heat exchange structure in a dynamoelectric machine.

58+, for general cooling in a dynamoelectric machine by circulation of a cooling fluid, especially subclass 64, for a heat exchange structure in a dynamoelectric machine.

216.056, for a cooling fin defining an outer peripheral shape of a laminated core.

216.119, for a cooling channel in the end ring of a core of a rotary dynamoelectric machine.

227, for current collector cooling in a rotary dynamoelectric machine.

417, for a rotary dynamoelectric machine end shield having ventilation holes.

SEE OR SEARCH CLASS:

165, Heat Exchange, subclass 185 for a heat exchanger fin, per se.

216.015 Plural diverse elements:

This subclass is indented under subclass 216.004. Subject matter including a laminated core constructed of more than one element or section of distinct or unlike form or qualities.

(1) Note. The unlike form or qualities may be among differences in shape, size, or material, etc., but is not so limited; and/or may include a core section that is not laminated, for example.

216.016 Diverse laminations:

This subclass is indented under subclass 216.015. Subject matter including a laminated core in which the diverse elements are dissimilar laminations.

(1) Note. The plural different laminations may be diverse in their shapes, size or material.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.017, for a laminated core having both magnetic and nonmagnetic laminations.

216.017 Magnetic and nonmagnetic laminations:

This subclass is indented under subclass 216.016. Subject matter including a laminated core in which the diverse elements are a lamination of magnetic material and a lamination of non-magnetic material.

(1) Note. The magnetic and nonmagnetic laminated sheets may be stacked in an alternating sequence, or a portion of the laminated core may be formed by a group of laminated sheets of material that differs from the material in a different portion of the core.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.016, for a laminated core having diverse laminations other than magnetic/nonmagnetic differences.

216.018 Different thicknesses:

This subclass is indented under subclass 216.016. Subject matter including a laminated core having a plurality of laminations that include a lamination of a first thickness and a lamination of a second thickness different from the first thickness.

216.019 Having diverse shapes to accommodate coil contour:

This subclass is indented under subclass 216.016. Subject matter including a laminated core formed with a plurality of laminations, wherein at least one of the laminations is shaped differently than at least one of the other laminations in an area where a winding is positioned, to provide a winding engaging surface that is variously shaped to mirror that of a varying surface shape of, or any bends in, the winding.

216.021 E-shaped:

This subclass is indented under subclass 216.004. Subject matter including a core formed of stacked laminations, wherein the peripheral shape of the lamination sheets, and that of the resulting core formed therefrom, resembles the letter "E" of the alphabet.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.023 through 216.039 , for a C- or U-shaped laminated core.

216.055, and 216.056, for a laminated core having a particular outer peripheral shape.

216.022 Having winding on center leg and magnetically coupled poles:

This subclass is indented under subclass 216.021. Subject matter including a laminated E-shaped core having a winding wound around the center extension, wherein the two outer extensions are magnetically connected.

(1) Note. The core may be comprised, for example, of two E-type cores arranged face-to-face in a mirror image arrangement where the two outer extensions are mechanically or magnetically connected to one another, with a winding around each respective center extension.

216.023 C- or U-shaped core:

This subclass is indented under subclass 216.004. Subject matter including a core formed of stacked laminations, wherein the peripheral shape of the laminations, and that of the resulting core formed therefrom, resembles the letter "C" or "U" of the alphabet, or having two side legs extending from each end of an arcuate section or "middle bend."

(1) Note. Each lamination may include plural sections, so long as the sections combined in each lamination layer resembles the letter "C" or "U", such as found in a split core that, when unified, resembles said letters.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.021, and 216.022, for an E-shaped laminated core.

216.055, and 216.056, for a laminated core having a particular outer peripheral shape.

216.024 Plural cores unified by magnetic coupling between poles, with a winding around the middle bend of each core:

This subclass is indented under subclass 216.023. Subject matter including more than one C- or U-shaped core, where the poles of each core are magnetically coupled to the poles of the other core to connect the cores together into a unitary core, and a winding is located around the middle bend portion of each core.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.026, for two unified C- or U-shaped cores magnetically coupled together.

216.027, for similar structure in which structural coupling between poles is performed by a non-magnetic material.

216.032, for two unified C- or U-shaped cores coupled at the poles via a spring.

216.025 Two cores:

This subclass is indented under subclass 216.024. Subject matter wherein the number of plural cores is two.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.026, for two unified C- or U-shaped cores magnetically coupled together.

216.027, for similar structure in which structural coupling between poles is performed by a non-magnetic material.

216.032, for two unified C- or U-shaped cores coupled at the poles via a spring.

216.026 Two cores unified by magnetic coupling between poles, with a winding on each side leg of each core:

This subclass is indented under subclass 216.23. Subject matter including two C- or U-shaped cores, where the poles of each core are magnetically coupled to the poles of the other core to connect the cores together into a unitary core, and a winding is located around on each side leg of each core.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.025, for two unified C- or U-shaped cores magnetically coupled together.

216.027, for similar structure in which structural coupling between poles is performed by a non-magnetic material.

216.032, for two unified C- or U-shaped cores coupled at the poles via a spring.

216.027 Two cores unified by structurally coupled poles, with a winding around the middle bend of each core:

This subclass is indented under subclass 216.023. Subject matter including two C- or U-shaped cores, where the poles of each core are structurally coupled to the poles of the other core to connect the cores together into a unitary core, and a winding is located around the middle bend portion of each core.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.025, for two unified C- or U-shaped cores magnetically coupled together.

216.026, for two unified C- or U-shaped cores magnetically coupled together.

216.032, for two unified C- or U-shaped cores coupled at the poles via a spring.

216.028 Having centrally-supported arcuate pole and a winding around each end of pole:

This subclass is indented under subclass 216.023. Subject matter including a C- or U-shaped core having a pole having a curved shape, and is supported from the core at a point between the two ends of the curve such that the pole has two portions extending from said point, and a winding is placed on each extension.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.029, for a core having plural unified C- or U-shaped cores and a pole winding.

216.029 Plural unified cores having a pole winding:

This subclass is indented under subclass 216.023. Subject matter including more than one C- or U-shaped core combined into a single core structure, having at least one pole with a winding located thereon.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.028, for a C- or U-shaped core having a centrally supported arcuate pole, and a winding around each end of pole.

216.031 Two cores:

This subclass is indented under subclass 216.029. Subject matter wherein the number of plural cores is two.

216.032 Two cores unified by a joint spring coupling between poles:

This subclass is indented under subclass 216.023. Subject matter including two C- or U-shaped cores, where the poles of each core are structurally coupled to the poles of the other core to connect the cores together into a unitary core, wherein the means for structurally coupling is a resilient or elastic member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.025, for two unified C- or U-shaped cores magnetically coupled together.

216.026, for two unified C- or U-shaped cores magnetically coupled together.

216.027, for similar structure in which structural coupling between poles is performed by a non-magnetic material.

216.033 Having winding around middle bend of core:

This subclass is indented under subclass 216.023. Subject matter including a single C- or U-shaped core having a winding placed around the middle bend of the core.

216.034 Having magnetically coupled poles:

This subclass is indented under subclass 216.033. Subject matter including a single C- or U-shaped laminated magnetic core having a winding wound around the center portion thereof, and magnetic material connected between the “open” ends of the C or U shape.

(1) Note. The “open” end of the C or U shape commonly defines two poles facing one another. The magnetic material connected between the “open” ends may be fastened to the “open” ends, or integrally formed with the C- or U-shaped core.

216.035 Double-section core:

This subclass is indented under subclass 216.033. Subject matter including a single C- or U-shaped core having a winding placed around the middle bend of the core, where the core comprises two sections joined together into a unitary core.

216.036 Having winding around core side leg:

This subclass is indented under subclass 216.023. Subject matter including a single C- or U-shaped core having a winding placed around a side leg of the core.

216.037 Winding around each side leg:

This subclass is indented under subclass 216.036. Subject matter including a single C- or U-shaped core having a winding placed around each side leg of the core.

216.038 Core side legs extend along rotor axis:

This subclass is indented under subclass 216.023. Subject matter including a C- or U-shaped core positioned in relation to a rotor such that the legs are arranged to extend in the same general direction as the rotary axis of the rotor.

216.039 Core middle bend extends along rotor axis:

This subclass is indented under subclass 216.023. Subject matter including a C- or U-shaped core positioned in relation to a rotor such that the middle bend of the core is arranged to extend in the same general direction as the rotary axis of the rotor.

(1) Note. The middle bend of the core may be “stretched” or elongated to extend the distance of the rotor s length, with the core side legs positioned at respective axial ends of the rotor.

216.041 Having axially extended spiral lamination:

This subclass is indented under subclass 216.004. Subject matter including a laminated core wherein a lamina is helically wound both around and along an axis along a path similar to a screw thread, so that laminations formed by each turn are stacked in the axial direction of the axis.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.013, for an axially extending spirally-wound core with offset laminations.

216.047, for a radially-stacked, spirally-wound core having an axially-extended spiral-wound pole.

216.042 Having machined poles:

This subclass is indented under subclass 216.041. Subject matter including an axially extending spiral wound core, wherein poles are cut, ground, or otherwise machined into the laminated core.

216.043 Having bending notch:

This subclass is indented under subclass 216.041. Subject matter including a cut or nick in the edge of the lamina arranged to relieve stress in the lamina and allow it to more easily adapt to its desired axially extending spiral shape.

216.044 Having inter-layer mating projection and recess:

This subclass is indented under subclass 216.041. Subject matter including an axially extended spiral lamination that includes at least one depression, groove or other form of recessed area (i.e., recess) constructed and arranged to matingly receive a protruding element (i.e., projection) located on another area of the lamination, the recess and projection being further located with respect to one another along the lamination such that, when the lamination is wound, the adjacent laminations are secured in their wound position.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.048, for a radially laminated core with mating interfitting structure on the face of a lamination.

216.065, for a core having laminations secured by a bonding agent.

216.045 Radially stacked:

This subclass is indented under subclass 216.004. Subject matter including a laminated core in which the laminations are built up in a radial direction with respect to the axial direction of the core.

(1) Note. When stacked in this manner, the edges of the laminations are substantially parallel to one another, with each edge generally extending along parallel paths of different radiuses from one another.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.062, for a radially laminated pole.

216.046 Spirally wound:

This subclass is indented under subclass 216.045. Subject matter including a radially stacked laminated core in which the stacking in the radial direction comprises a thin magnetic sheet coiled about an axis in continuous layers of increasing distance away from the axis.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.054, for a non-planer core lamination.

216.047 Having axially-extended spiral-wound pole:

This subclass is indented under subclass 216.046. Subject matter including a spiral-wound core having at least one spiral-wound pole projecting away from the core in a direction parallel to the rotor axis.

(1) Note. The spiral-wound pole may be separately spirally wound from and attached to the core, or it may be formed by slots cut into an axial end face of a spirally wound core.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.013, for a laminated core having circumferentially offset laminations using an axially-extended spirally-wound lamination.

216.041, for a laminated core having an axially-extended spiral lamination.

216.048 Having interlamina mating structure on lamina face:

This subclass is indented under subclass 216.004. Subject matter including a projection or recess on a broad surface of a lamination (i.e., face) constructed and arranged to engage with a corresponding recess or projection, respectively, on an adjacent lamination to secure the laminations together into a unitary core.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.044, for a mating projection and recess for securing laminations in an axially-extending spirally wound core.

216.049 through 216.052, for a laminated core having a lamination with a mounting ear.

216.065, for a core having structure for binding the core together into a unified core.

216.049 Having a lamination including a radially extending mounting projection (e.g., mounting ear):

This subclass is indented under subclass 216.004. Subject matter including a laminated core having at least one lamination having an integral structural extension that extends perpendicularly away from the rotor axis, for securing the laminated core to a core-supporting structure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.113, for a core having a supporting means.

433, for a frame having an axial tie-bar dovetailed to a core for supporting the core.

216.051 Dovetail projection:

This subclass is indented under subclass 216.049. Subject matter including a laminated core having at least one lamination having a radially extending projection having a flared shape (e.g., dovetail) serving as a tenon that mates and interlocks with a corresponding mortise in the core-supporting structure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

433, for a frame having an axial tie-bar dovetailed to a core for supporting the core.

216.052 Provided only on partial number of laminations:

This subclass is indented under subclass 216.049. Subject matter including a laminated core having a plurality of laminations with less than the full set of the laminations having a radially extending mounting projection; i.e., at least one lamination of the plurality lacks a radial projection.

216.053 Having integral spider (e.g., spokes):

This subclass is indented under subclass 216.004. Subject matter including a laminated core having a lamination including a main body portion having structurally unified radially-directed spokes extending therefrom for supporting the main body portion from a shaft.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.121, for a structure for supporting a core from a shaft.

420, for a frame having a spider mounted to a shaft.

216.054 Non-planar lamination (e.g., wavy):

This subclass is indented under subclass 216.004. Subject matter including lamination sheets stacked into a unitary core, wherein the surface of each sheet is a shape other than significantly flat.

(1) Note. Significantly flat refers to the general overall shape of the surface, which may include, for example, projections or recesses on the surface for interlocking with adjacent laminations, etc., and still be considered significantly flat.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.013, for a spirally wound laminated core with circumferentially offset laminations.

216.046, and 216.047, for a radially-stacked spirally wound laminated core.

216.055 Having a particular outer peripheral shape:

This subclass is indented under subclass 216.004. Subject matter including a laminated core having a specifically recited geometrical form or contour associated with its external perimeter.

SEE OR SEARCH THIS CLASS, SUBCLASS:

12.26, for a linear motor having a magnet or pole structure have a particular shape.

49.16, for a stepping motor with interfitting poles of a particular shape.

216.021, and 216.022, for an E-shaped laminated core.
216.023 through 216.039, for a C-or U-shaped laminated core.
216.069 through 216.073, for a core having a slot of a particular shape or with plural diverse pole shapes.
216.097, for a pole tip having a particular dimension.
216.111, and 216.112, for a core having a particular dimension.

216.056 Cooling fin:

This subclass is indented under subclass 216.055. Subject matter including wherein the outer peripheral shape includes a shape having a high surface-area to volume ratio for the purpose of efficiently dissipating heat from the core to a surrounding medium.

SEE OR SEARCH THIS CLASS, SUBCLASS:
16, for cooling of a reciprocating motor or generator.
12.29, for cooling of a linear dynamoelectric machine.
52 through 65, for cooling of a rotary dynamoelectric machine, especially subclass 64 for a heat exchange structure in a dynamoelectric machine.
216.014, for a cooling fin on a laminated core having cumferentially offset laminations.
216.119, for a cooling channel in the end ring of a core of a rotary dynamoelectric machine.
227, for current collector cooling in a rotary dynamoelectric machine.
417, for a rotary dynamoelectric machine end shield having ventilation holes.

SEE OR SEARCH CLASS:
165, Heat Exchange, subclass 185 for a heat exchanger fin, per se.

216.057 Laminated pole:

This subclass is indented under subclass 216.004. Subject matter including a pole, per se, constructed of a plurality of superposed, thin layers of magnetic material joined together into a unitary structure.

(1) Note. The plurality of layers may be formed from plural sheets of material superposed on one another, or a single sheet of material folded or wound on itself to form plural superposed layers.

(2) Note. The laminated pole may be attached or attachable to a core body that is either laminated or non-laminated.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.064, for a laminated pole tip.
216.074 through 216.105, for non-laminated pole structure.

216.058 Securing means:

This subclass is indented under subclass 216.057. Subject matter including a specific recitation of an element or structure for holding the superposed sheets together into a unified or integral structure.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.065, for a laminated core having a bonding agent between laminations.
216.113 through 216.137, for core securing means for supporting a core, or holding it together into an integral unit.

216.059 Alternating laminations:

This subclass is indented under subclass 216.057. Subject matter including a laminated pole constructed of a plurality of groups of laminations that are superposed on each other in alternating layers.

216.061 Circumferentially stacked:

This subclass is indented under subclass 216.057. Subject matter including a laminated pole in which the laminations are built up (i.e., stacked) along a generally radial arc or portion of a circle having the axis of rotor rotation at the center.

(1) Note. When stacked in this manner, the edges of the laminations are substantially parallel to one another, with each edge generally extending along a radial line extending from the axis of rotation.

216.062 Radially stacked:

This subclass is indented under subclass 216.057. Subject matter including a laminated pole in which the laminations are built up in a

radial direction with respect to the intended axis of rotation of the motor or generator containing the core.

(1) Note. When stacked in this manner, the edges of the laminations are substantially parallel to one another, with each edge extending along generally parallel paths of different radiuses from the axis of rotation.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.045, for a radially stacked core.

216.063 Wound lamination:
This subclass is indented under subclass 216.057. Subject matter including a laminated pole wherein the plurality of superposed layers are formed by a thin sheet of material turned or coiled about itself so that each turn is superposed on a previous turn.

216.064 Laminated pole tip (e.g., shoe):
This subclass is indented under subclass 216.057. Subject matter including a laminated core having a particularly recited detail of a pole end face structure, or having a member (e.g. shoe) added to an end of a pole, wherein the added member is constructed of a plurality of superposed, thin layers of magnetic material joined together into a unitary structure.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.091, for non-laminated pole tip structure.

216.065 Adhesively bonded laminations:
This subclass is indented under subclass 216.004. Subject matter wherein the core laminations are secured together as an integral body via a sticking or adhering material placed between the laminations.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.044, for an axially-extended spirally wound core having an inter-layer mating projection and recess.
216.048, for a radially stacked laminated core having inter-layer mating structure on the face of a lamination.
216.137, for a bonding agent used to fix a core to a support structure or for fixing a core together as an integral body.

216.066 Homogeneous core or yoke (e.g., solid core):
This subclass is indented under subclass 216.001. Subject matter including a core or yoke formed from a ferromagnetic material having a substantially uniform structure or composition throughout the core.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.004 through 216.013, for a laminated core.

216.067 Molded magnetic powder resin:
This subclass is indented under subclass 216.066. Subject matter including a homogenous core or yoke constructed of a mass of magnetic particles dispersed in a resin binder, and formed into a single, solid mass of desired shape.

216.068 Reshaped magnetic element (e.g., bent sheet):
This subclass is indented under subclass 216.066. Subjected matter including a homogenous core or yoke constructed from a volume of ferromagnetic material that is bent, twisted, or otherwise forcibly rearranged from an initial shape into a final core shape.

216.069 Having slot of particular shape:
This subclass is indented under subclass 216.001. Subject matter including a core have a groove or channel (i.e., slot) for accommodating a winding therein, wherein there is recited a specific detail of the slot s geometrical or spatial form or contour.

(1) Note. The slot commonly houses or provides a location to accommodate a winding.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.111, for a core having a particular dimension.
216.096, for a pole tip having an asymmetric shape.
216.097, for a pole tip having a particular dimension.

216.071 Plural diverse slot shapes:

This subclass is indented under subclass 216.069. Subject matter including a core having more than one slot, wherein at least one slot has a different shape than at least one other slot.

216.072 With plural diverse pole widths:

This subclass is indented under subclass 216.071. Subject matter including a core having plural diverse slot shapes, and further includes more than one pole, wherein at least one pole has a different width than at least one other pole.

216.073 With plural diverse pole shapes:

This subclass is indented under subclass 216.069. Subject matter including a core having a slot with a particular shape, and further includes more than one pole, wherein at least one pole has a different geometrical or spatial form or contour than at least one other pole.

216.074 Pole structure:

This subclass is indented under subclass 216.001. Subject matter including a specifically recited detail of a core's pole structure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.057 through 216.064 , for laminated pole structure.

216.112, for a core having a particular pole pitch.

216.075 Particular to switch reluctant machine:

This subclass is indented under subclass 216.074. Subject matter including a pole having a particular structural feature specifically adapted for use in a stator or rotor core of a switch reluctant type dynamoelectric machine.

216.076 Having integral flux shunt:

This subclass is indented under subclass 216.074. Subject matter including a core pole having a means included therein for diverting flux from a direct path between the opposite ends of the pole.

(1) Note. The shunt is commonly a means of establishing a higher reluctance area than the surrounding pole material.

216.077 Via hole:

This subclass is indented under subclass 216.076. Subject matter including a pole with an integral flux shunt comprised of an opening in the pole material that defines a higher reluctance flux path than the core material.

216.078 Pivotally mounted (e.g., hinged):

This subclass is indented under subclass 216.074. Subject matter including a core with a pole that is mounted on the core in such a manner that is can be turned or swiveled from one position to another, as by a hinge, or the pole is mounted on a core section adapted for similar movement with respect to another core section.

216.079 Removable pole:

This subclass is indented under subclass 216.074. Subject matter including a pole constructed and arranged to be separable from the remainder of the core.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.098, for a pole tip that is removable from the remainder of the pole.

216.081 Having intermediate spacer:

This subclass is indented under subclass 216.079. Subject matter including an element mounted between the removable pole and core that positions the pole out of direct abutment with the core when fixed to the core.

216.082 Having wedge between pole and core:

This subclass is indented under subclass 216.079. Subject matter including a core having at least one removable pole that includes a tapered element forcibly inserted between the removable pole and the core.

216.083 Having threaded fastener (e.g., screw):

This subclass is indented under subclass 216.079. Subject matter including a means for removably fixing the pole to the core that comprises an elongated element including a spiral groove around the circumference of the element, wherein the elongated element bridges a portion of the pole and a portion of the core.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.127, for a core secured by a threaded fastener.

216.084 With mating female threaded fastener element (e.g., bolt):

This subclass is indented under subclass 216.083. Subject matter including a threaded fastener for attaching a removable pole, wherein the threaded fastener includes a male-threaded fastener that is threadable into a female-threaded fastener separate and distinct from the pole or core.

216.085 Fastened through pole flange:

This subclass is indented under subclass 216.083. Subject matter including a removable pole having a projecting rim or extension (i.e., flange) through which a threaded fastener is positioned and utilized to removably fix the pole to the core.

216.086 Dovetail connection:

This subclass is indented under subclass 216.079. Subject matter including a removable pole having a flared tenon extending therefrom that is mateable with a mortise or other means on the core for removably holding the pole via engagement between the mortise and the tenon.

216.087 Having auxiliary bias force element:

This subclass is indented under subclass 216.086. Subject matter including a dovetailed removable pole, wherein the means for removably fastening the pole to the core includes means for applying pressure against the dovetail to aid in holding or maintaining the dovetail connection to the core.

216.088 Split pole:

This subclass is indented under subclass 216.086. Subject matter including a dovetailed removable pole, wherein the pole is comprised of plural sections.

216.089 Crimped connection:

This subclass is indented under subclass 216.079. Subject matter including a core with a removable pole that includes a portion that is deformably pressed, twisted or pinched together into fixed engagement with a portion of the core.

216.091 Pole tip (e.g., shoe):

This subclass is indented under subclass 216.074. Subject matter including a recitation of a structural detail of a pole end or face.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.064, for a laminated pole tip, or structural details of the end face of a laminated pole.

216.092 Defining non-uniform air gap:

This subclass is indented under subclass 216.091. Subject matter including a pole having an end or face constructed and arranged to define one boundary end of a space (i.e., air gap) between the pole tip and another element defining an opposite air gap boundary face, wherein the distance between all points on the pole end or face and the opposite boundary face of the air gap are not the same distance.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.096, for an asymmetrically shaped pole tip.

216.093 Tapered tip:

This subclass is indented under subclass 216.092. Subject matter including a pole tip that has a cross-sectional area perpendicular to the direction between the boundary faces of the gap, wherein the cross-sectional area varies with distance away from the air-gap boundary end of the pole.

216.094 Via tip slot:

This subclass is indented under subclass 216.092. Subject matter including a pole tip that includes a grooved channel (i.e., slot) that defines the non-uniform air gap.

216.095 With electrical conductor in slot (i.e., winding):

This subclass is indented under subclass 216.094. Subject matter including an electrical conductor positioned in the slot in the pole tip.

216.096 Asymmetrically shaped:

This subclass is indented under subclass 216.091. Subject matter including a pole tip having a shape that is dissimilar on opposite sides of the center of the pole tip.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.092, for a pole tip that defines a non-uniform air gap.

216.097 Having a particular dimension:

This subclass is indented under subclass 216.091. Subject matter including a pole tip having a specifically recited spatial extent, e.g., length, width, height, etc.

(1) Note. The dimension may be expressed as a ratio of, for example, length to width, etc., for placement in this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.111, for a core having a particular dimension.

216.098 Removable tip:

This subclass is indented under subclass 216.091. Subject matter including a pole tip that is capable of being separated from the remainder of the pole.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.079 through 216.089, for a removable pole.

216.099 Magnetic inter-pole bridging structure:

This subclass is indented under subclass 216.091. Subject matter including a core having a plurality of poles, wherein at least two adjacent poles have ends that have a structural member formed of ferromagnetic material connected between the adjacent pole ends.

(1) Note. The bridging element may itself define a pole tip, or it can be an element separate from, or integral with, distinct pole tips or shoes on adjacent pole ends. The bridging element should be distinguished from magnetic material forming a core body from which the poles extend.

SEE OR SEARCH THIS CLASS, SUBCLASS:

214, for a coil retainer that bridges poles to hold a coil in a slot between poles.

216.104, for a nonmagnetic element positioned between two adjacent poles for holding a pole tip on a pole body.

216.101 Cylindrical bridging structure:

This subclass is indented under subclass 216.099. Subject matter including a core having a plurality of radially-inward extending poles having a bridging element or elements magnetically bridging the poles together at their inner radial ends, wherein the bridging element or elements together form a cylindrically shaped structure.

(1) Note. The cylindrically shaped structure can be a single cylindrical element connected to or integral with the pole ends, or a series of individual arcuate bridging members connected between adjacent poles that collectively form a cylindrically shaped structure in combination with the pole inner ends.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.103, for an arcuate shaped magnetic bridging member connecting two adjacent pole inner ends, where the member defines a pole tip common to two pole members.

216.102 Integral with radially extending poles:

This subclass is indented under subclass 216.101. Subject matter wherein the cylindrical inter-pole bridging structure and the radially extending poles are constructed together as a unified structural unit.

216.103 Bridge defines distinct pole tip common to two adjacent poles:

This subclass is indented under subclass 216.099. Subject matter including a bridging structure that includes a bridge element that bridges only two adjacent poles, and functions as a single pole tip shared by the two adjacent poles.

216.104 With nonmagnetic inter-pole tip support:

This subclass is indented under subclass 216.091. Subject matter including a non-ferromagnetic element positioned between two adjacent poles for holding or fixing a pole tip against, or in a positional relationship to, a pole body.

SEE OR SEARCH THIS CLASS, SUBCLASS:

214, for a coil retainer that bridges poles to hold a coil in a slot between poles.

216.099 through 216.0103 for a magnetic element for bridging adjacent poles ends.

216.113, for subject matter to attach a core to a support.

216.105 Insulated:

This subclass is indented under subclass 216.104. Subject matter including an interpole tip support that is electrically non-conductive or highly resistant to the passage of electric current.

216.106 Having flux guide:

This subclass is indented under subclass 216.001. Subject matter wherein the core includes a means for directing the flux within the core in a particular path.

(1) Note. The flux guiding means may include, for example, a slit or slot in the core that creates a localized higher reluctance path within the core.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.076, for a pole structure having an integral flux shunt.

216.108, for a flux shield that reduces flux penetration in a particular portion of the core.

216.107 For reluctant rotor core:

This subclass is indented under subclass 216.106. Subject matter wherein the core is specifically designed for use in the moving element (i.e., rotor) of a machine of the reluctance type.

216.108 Having flux shield:

This subclass is indented under subclass 216.001. Subject matter including a means for reducing penetration of flux into a particular portion of the core.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.076, for a pole structure having an integral flux shunt.

216.106, for a flux guide that directs flux in a particular path.

216.109 Spaced-segment core:

This subclass is indented under subclass 216.001. Subject matter including a core comprising a plurality of individual core sections, wherein two adjacent core sections are mounted with respect to one another such that an air space is provided between the two adjacent sections.

216.111 Core having a particular dimension:

This subclass is indented under subclass 216.001. Subject matter including a core in which a specified measure of spatial extent of at least a portion of the core is recited.

(1) Note. Dimensions may include, for example, various radii at various portions of the core, the depth of a slot, the distance between poles, etc., but are not so limited to these examples.

SEE OR SEARCH THIS CLASS, SUBCLASS:

12.26, for a linear motor having a magnet or pole structure have a particular shape.

49.16, for a stepping motor with interfitting poles of a particular shape.

216.021, and 216.022, for an E-shaped laminated core.

216.023 through 216.039, for a C-or U-shaped laminated core.

216.069 through 216.073, for a core having a slot of a particular shape.

216.097, for a pole tip having a particular dimension.

216.112 Specific pole pitch:

This subclass is indented under subclass 216.111. Subject matter wherein the particularly recited dimension is pole pitch.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.074 through 216.105, for pole structure, per se.

216.113 Having a particular binding or supporting means:

This subclass is indented under subclass 216.001. Subject matter including a specifically recited means for either securing the core

together as an integral body, or securing the core to a support structure.

(1) Note. Subject matter including significant core structure adapted for supporting the core via the core structure itself, a detailed structural relationship between a separate fixing means and the core, or a particular structure of the fixing means, per se, are classified in this and indented subclasses; whereas a core support (e.g., frame) having a means for supporting a nominal core is classified elsewhere. See Search Notes, below.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.004 through 216.014 , for laminated core structure, particularly subclass 216. 044, for a projection /recess for securing laminations in an axially spirally wound core; subclass 216.048, for a radially laminated core with mating interfitting structure on the face of a lamination; subclasses 216.049-216.052, for a laminated core having a lamination with a mounting ear.

216.058, for a laminated pole having means for securing the laminations into a unitary body.

216.079, for a means for supporting a removable pole to a core.

216.104, for a nonmagnetic pole tip support positioned between adjacent poles.

422, for a frame having a means for securing a core to the frame.

SEE OR SEARCH CLASS:

336, Inductor Devices, subclasses 65 through 68 for mounting or support structure for an inductor.

216.114 End ring or plate:

This subclass is indented under subclass 216.113. Subject matter wherein the securing means comprises a band generally mounted along the periphery of an axial end face of a core, or a generally flat or planar member attached to an axial end face of a core, for securing core elements together as an integral body.

(1) Note. A ring or plate for this subclass is for the purpose of securing, for example, by bridging across core laminations or core sections to bind them together as a unit, as opposed to a mere enclosure, support or stator end shield, classified elsewhere.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.135, for a core secured by a circumferential clip.

400 through 417, for an end shield.

216.115 Insulated:

This subclass is indented under subclass 216.114. Subject matter including an end ring or end plate comprised of a material that is highly resistant or non-conductive to electrical current.

(1) Note. The insulation is commonly used to provide electrical insulation between the core and a coil or winding supported on the coil. The ring or plate may be comprised of insulating material, or include a layer of insulating material placed on the surface of the ring or plate.

216.116 Secured to shaft:

This subclass is indented under subclass 216.114. Subject matter wherein the end ring or end plate is fixedly attached to an elongated element (i.e., shaft) having an axis about which the core and elongated element rotate.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.119, for a core secured to a shaft by means other than an end ring or end plate.

420 through 424, for a frame secured to a shaft via a spider.

216.117 With balancing weight:

This subclass is indented under subclass 216.116. Subject matter including an element having a particular mass positioned on the end ring or end plate and shaft combination such that the center of mass of the combination is located on the axis of the shaft.

216.118 Secured to frame:

This subclass is indented under subclass 216.114. Subject matter wherein the end ring or end plate is fixedly attached to the machines frame or enclosure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

418 through 433, for frame structure having means for supporting a core.

216.119 Having a cooling channel:

This subclass is indented under subclass 216.114. Subject matter including an end ring or end plate having a ventilation passage therein to permit heat to be dissipated from the core.

SEE OR SEARCH THIS CLASS, SUBCLASS:

16, for cooling of a reciprocating motor or generator.

12.29, for cooling of a linear dynamoelectric machine.

52 through 65, for cooling of a rotary dynamoelectric machine, especially subclass 60, for circulation via hollow passages.

216.014, for a cooling fin on a core having cumferentially offset laminations in a rotary dynamoelectric machine.

216.056, for a cooling fin on a laminated core of a rotary dynamoelectric machine.

227, for current collector cooling in a rotary dynamoelectric machine.

417, for a rotary dynamoelectric machine end shield having ventilation holes.

216.121 Secured to shaft:

This subclass is indented under subclass 216.113. Subject matter wherein the support structure from which the core is supported is an elongated element (i.e., shaft) having an axis about which the core and elongated element rotate.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.053, for a laminated core having a lamination with an integral spider to support the core on a shaft.

216.116, for a core secured to a shaft via an end ring or end plate.

216.129, for a core is secured by an axially extending bar to hold the core together.

216.122 Two axial end shafts:

This subclass is indented under subclass 216.121. Subject matter wherein the shaft comprises two shafts, wherein each shaft is fixed to respective opposite axial ends of the core, without passing through the core.

216.123 Keyed to shaft:

This subclass is indented under subclass 216.121. Subject matter including a core secured to a shaft that further includes an element (i.e., key) for locking the core and shaft together to prevent relative movement between the core and shaft.

(1) Note. The key can be an element separate and distinct from the core and shaft, or an integral extension of one of the core and shaft.

216.124 Resilient securing means:

This subclass is indented under subclass 216.113. Subject matter wherein the means to secure the core to a support includes a material or structure that is capable of withstanding shock without permanent deformation or rupture (e.g., by a spring or elastic material, etc.).

SEE OR SEARCH THIS CLASS, SUBCLASS:

423, for a frame supported from a shaft-mounted spider with a resilient core supporting means.

431, for a frame having a resilient core supporting means.

216.125 Secured by wedge:

This subclass is indented under subclass 216.113. Subject matter wherein the means for fixing the core to a support includes a tapered element press fit in a narrow space between the core and the support.

216.126 Fastened wedge:

This subclass is indented under subclass 216.125. Subject matter including a wedge having means to fixedly attach the wedge in its wedging position to prevent it from slipping out of the wedging position.

216.127 Secured by threaded fastener (e.g., screw):
This subclass is indented under subclass 216.113. Subject matter wherein the means for fixing the core to a support includes an elongated element having an exterior helical projection (i.e., screw thread), wherein the elongated element passes through a bore in either one of the support or the core, and is engagable with mating threads on the other one of the support or core for holding the support and core in a fixed relationship.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.083, for a pole removably secured to a core by a threaded fastener.

216.128 Insulated fastener:
This subclass is indented under subclass 216.127. Subject matter wherein the threaded fastener is constructed of an electrically resistive or non-conductive material.

216.129 Secured by axially extending bar:
This subclass is indented under subclass 216.113. Subject matter including a core fixing means comprising a rigid elongated element that extends generally parallel to the axis of rotation of a machine in which the core is associated, and is attached to the core at one or more points to secure the core.

(1) Note. The axially extending bar may also serve as a means to secure the core to a supporting element.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.116, for a core supported on a shaft via an end ring or end plate.
216.121, for a core supported on a shaft.
432, and 433, for a frame having an axial tie bar for supporting a core.

216.131 Secured by axially directed clamping means (e.g., spring clip):
This subclass is indented under subclass 216.113. Subject matter including means for providing axially directed pressure at both axial ends of a core to bind elements or laminations of a core together into a unitary body.

(1) Note. The means for clamping commonly consists of a clip that spans the length of the core, with, for example, spring tensioned arms at the axial ends of the clip to provide axially directed pressure to squeeze core laminations together into a binding relationship.

(2) Note. The means for clamping the core into a unitary body may also serve to secure the core to a supporting element.

216.132 Positioned in core slot:
This subclass is indented under subclass 216.131. Subject matter wherein the core includes an axially extending depression or slot in its surface, and the clamping means is positioned in the depression or slot.

216.133 Positioned in axial through hole:
This subclass is indented under subclass 216.131. Subject matter wherein the core includes an axially extending bore from one axial end of the core to the other and the clamping means is located in the bore.

216.134 Integral with supporting element:
This subclass is indented under subclass 216.131. Subject matter wherein the clamping means comprises an element structurally united with a supporting means for the core.

216.135 Secured by circumferential clip:
This subclass is indented under subclass 216.113. Subject matter including core securing means comprising an element that extends at least partially around the outer periphery of the core and grips the core.

216.136 Secured by weld:
This subclass is indented under subclass 216.113. Subject matter wherein the particular means for fixing the core to a support structure or fixing the core as an integral body includes a fusion bond created by heating.

216.137 Secured by bonding agent:
This subclass is indented under subclass 216.113. Subject matter wherein the particular means for fixing the core to a support structure or fixing the core as an integral body includes an attachment established via an adhesive material.

SEE OR SEARCH THIS CLASS, SUBCLASS:

216.065, for a bonding agent uses to secure laminations of a laminated core together.

219 This subclass is indented under subclass 40. Subject matter relating to current collectors.

SEE OR SEARCH CLASS:

191, Electricity: Transmission to Vehicles, subclasses 45+ for similar subject matter where current is collected from an extended conductor by a traveling brush.

318, Electricity: Motive Power Systems, subclasses 541+ for electric motor systems having current collector control means, such as brush shifting means.

322, Electricity: Single Generator Systems, subclass 53 and 54+ for single generator systems having brush control means for shifting the generator brush.

388, Electricity: Motor Control Systems, subclass 836 for running-speed control systems in which the position or number of brushes may be varied.

439, Electrical Connectors, subclasses 1+ for a pair of relatively movable electrical connectors.

220 This subclass is indented under subclass 219. Subject matter relating to the reduction of sparking at the current collector.

SEE OR SEARCH CLASS:

318, Electricity: Motive Power Systems, subclasses 400.1 through 400.42 for electric motor systems having means to control the commutation.

221 This subclass is indented under subclass 220. Subject matter having arc extinguishing means.

(1) Note. This subclass relates, for example, to dynamoelectric devices having means to extinguish arcs that result when the commutator flashes over.

SEE OR SEARCH CLASS:

361, Electricity: Electrical Systems and Devices, subclasses 1+ for safety and protection of systems and devices, indented subclasses 2+ for arc control, subclasses 20+ for generator protective circuits, and subclasses 23+ for motor protective circuits.

222 This subclass is indented under subclass 220. Subject matter for providing a spark neutralizing current.

223 This subclass is indented under subclass 220. Subject matter having flux compensating means.

224 This subclass is indented under subclass 223. Subject matter in which the flux compensating means is a compensating pole or winding.

225 This subclass is indented under subclass 223. Subject matter in which the flux compensating means is a short circuited coil circuit.

226 This subclass is indented under subclass 223. Subject matter in which the flux compensating means is a means to introduce a distortion of the magnetic field.

227 This subclass is indented under subclass 219. Subject matter having cooling means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

16, for cooling of a reciprocating motor or generator.

12.29, for cooling of a linear dynamoelectric machine.

52 through 65, for cooling of a rotary dynamoelectric machine.

216.014, for a cooling fin on a core having cumferentially offset laminations in a rotary dynamoelectric machine.

216.056, for a cooling fin on a laminated core of a rotary dynamoelectric machine.

216.119, for a cooling channel in the end ring of a core of a rotary dynamoelectric machine.

417, for a rotary dynamoelectric machine end shield having ventilation holes.

228 This subclass is indented under subclass 219. Subject matter having cleaning, lubricating, resurfacing or repairing means as part thereof.

SEE OR SEARCH CLASS:
29, Metal Working, subclass 597 for miscellaneous methods of manufacturing and repairing commutators.

229 This subclass is indented under subclass 219. Subject matter having means to cause a brush to traverse along a path which is parallel to the axis of rotation of the dynamoelectric device.

(1) Note. The brush traverse may, for example, be an adjustment to regulate the position of the brush or it may be, for example, a means to cause the brush to traverse back and forth continuously so as to distribute wear.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclasses 541+ for this subject matter in an electric motor system.

230 This subclass is indented under subclass 219. Subject matter having means for circumferentially shifting the position of the brush in order to effect reversal of the direction of rotation.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclass 292 for this subject matter in an electric motor system.
322, Electricity: Single Generator Systems, subclass 53 and 54+ for this subject matter in a single generator system.
323, Electricity: Power Supply or Regulation Systems, subclass 203 for this subject matter in a voltage magnitude control system.

231 This subclass is indented under subclass 219. Subject matter relating to rotary structure.

SEE OR SEARCH CLASS:
428, Stock Material or Miscellaneous Articles, subclass 569 for stock materials or intermediate articles which comprise continuous interengaged phases of plural metals, at least one of which contains molybdenum or tungsten.

232 This subclass is indented under subclass 231. Subject matter relating to slip rings.

233 This subclass is indented under subclass 231. Subject matter relating to commutators.

SEE OR SEARCH CLASS:
29, Metal Working, subclass 507 for miscellaneous methods of manufacturing commutators.
174, Electricity: Conductors and Insulators, subclass 138 for commutator segment insulators, per se.
361, Electricity: Electrical Systems and Devices, subclasses 245+ for polarity reversing systems some of which have commutated type reversing switches.

234 This subclass is indented under subclass 233. Subject matter relating to winding connectors for connecting the winding to the commutator segments.

235 This subclass is indented under subclass 233. Subject matter relating to molded supports for supporting the commutator segments.

236 This subclass is indented under subclass 233. Subject matter relating to cylindrical or drum type commutators.

237 This subclass is indented under subclass 233. Subject matter relating to disk type commutators.

SEE OR SEARCH CLASS:
370, Multiplex Communications, subclasses 303+ for a multiplexing system having a rotary distributor.

238 This subclass is indented under subclass 219. Subject matter relating to fixed collector structure.

SEE OR SEARCH CLASS:
314, Electric Lamp and Discharge Devices: Consumable Electrodes, subclasses 130+ for electrode holders for arc lamps and similar devices.

239 This subclass is indented under subclass 238. Subject matter relating to brush holders or rigging.

240 This subclass is indented under subclass 239. Subject matter relating to means for lifting the brushes.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclass 728 for induction motor systems in which the induction motor starts as a repulsion motor.
322, Electricity: Single Generator Systems, subclasses 54+ for this subject matter in a single generator system.

241 This subclass is indented under subclass 239. Subject matter having means for circumferentially adjusting the position of the brushes.

242 This subclass is indented under subclass 239. Subject matter relating to means for holding or guiding the brushes.

243 This subclass is indented under subclass 239. Subject matter having means for operating the brush rigging or holders by means of fluid pressure.

(1) Note. This subclass relates, for example, to brush rigging in which the pressure of the brush against the commutator is determined by fluid pressure.

244 This subclass is indented under subclass 239. Subject matter in which the brush is affixed to a pivoted arm.

245 This subclass is indented under subclass 239. Subject matter in which the brush is slidably positioned in its holder.

246 This subclass is indented under subclass 245. Subject matter having an arm which presses against the brush to exert pressure between the brush and the commutator or slip ring.

247 This subclass is indented under subclass 245. Subject matter having an axial spring to press upon the brush so as to exert pressure between the brush and the commutator or slip ring.

248 This subclass is indented under subclass 238. Subject matter relating to brushes, per se.

SEE OR SEARCH CLASS:
373, Industrial Electric Heating Furnaces, appropriate subclasses for electric arc furnaces some of which utilize electrodes which are analogous to the brushes of this and indented subclasses.
313, Electric Lamp and Discharge Devices, subclasses 326+ (note particularly indented subclass 357) for electrodes for electric lamp and discharge devices, some of which are analogous to the brushes of this and the indented subclasses.
314, Electric Lamp and Discharge Devices: Consumable Electrodes, subclass 60 for arc lamp electrodes, some of which are analogous to this and indented subclasses.

249 This subclass is indented under subclass 248. Subject matter having an electrical connector.

(1) Note. The electrical connector, for example, may be a copper pigtail which is integral with a carbon brush.

SEE OR SEARCH CLASS:
439, Electrical Connectors, appropriate subclasses for an electrical connector, generally.

251 This subclass is indented under subclass 250. Subject matter in which the structure is made of composite materials.

SEE OR SEARCH CLASS:
428, Stock Material or Miscellaneous Articles, subclasses 615+ for composite stock materials, such as, for example, plural metallic layers with interleaved nonmetallic layers.

252 This subclass is indented under subclass 248. Subject matter relating to the composition of the brush.

(1) Note. The search should, in all instances, continue in the class which relates to the composition, per se.

SEE OR SEARCH CLASS:
106, Compositions: Coating or Plastic, appropriate subclasses for coating or plastic compositions in general.
252, Compositions, subclasses 500+ for electrically conductive compositions and for brushes defined solely in terms of the composition of which they are composed.

253 This subclass is indented under subclass 252. Subject matter relating to carbonaceous compositions.

254.1 Miscellaneous stator structure:
This subclass is indented under subclass 40. Subject matter related to stator structure, per se, not otherwise provided for.

(1) Note. This is the residual locus for miscellaneous stator structure for an electrical generator or motor that is not provided for elsewhere. Mere intended use as a stator is insufficient for original placement in this subclass if particular recited structure is provided for in earlier subclasses. Similarly, discretion should be exercised in placement in this subclass as a cross reference merely due to disclosed use as a stator.

SEE OR SEARCH CLASS:
336, Inductor Devices, subclasses 210 through 213, 216-219, 233, and 234 for various features of magnetic core structure of inductive devices, of which subclass 233 is the general subclass for inductor device cores not elsewhere classified.

255 This subclass is indented under subclass 254.1. Subject matter relating to railway type machines.

SEE OR SEARCH CLASS:
105, Railway Rolling Stock, subclasses 49+ for electric locomotives.

256 This subclass is indented under subclass 254.1. Subject matter relating to the prevention of flux loss due to stray fields.

SEE OR SEARCH CLASS:
336, Inductor Devices, subclasses 84+ for inductor devices with electric and magnetic shielding means.

257 This subclass is indented under subclass 254.1. Subject matter relating to interfitting or claw tooth stators.

SEE OR SEARCH THIS CLASS, SUBCLASS:
263, for interfitting or claw tooth rotors.

260 This subclass is indented under subclass 254.1. Subject matter relating to end turn supports.

SEE OR SEARCH THIS CLASS, SUBCLASS:
270, for end turn supports for rotors.

SEE OR SEARCH CLASS:
336, Inductor Devices, subclass 197 for inductor devices having coil clamps or wedges to secure or space coil and core.

261.1 Miscellaneous rotor structure:
This subclass is indented under subclass 40. Subject matter relating to rotor structure, per se, not otherwise provided for.

(1) Note. This is the residual locus for miscellaneous rotor structure for an electrical generator or motor that is not provided for elsewhere. Mere intended use as a rotor is insufficient for original placement in this subclass if particular recited structure is provided for in earlier subclasses. Similarly, discretion should be exercised in placement in this subclass as a cross reference merely due to disclosed use as a rotor.

SEE OR SEARCH CLASS:
336, Inductor Devices, subclasses 210 through 213, 216-219, 233, and 234 for various features of magnetic core structure of inductive devices, of which subclass 233 in the general subclass for inductor device cores not elsewhere classified.

262 This subclass is indented under subclass 261.1. Subject matter relating to high speed rotors.

SEE OR SEARCH THIS CLASS, SUBCLASS:
168+, especially 169+, for induction type generators utilizing high speed rotors.

263 This subclass is indented under subclass 261.1. Subject matter relating to interfitting or claw tooth rotors.

SEE OR SEARCH THIS CLASS, SUBCLASS:
257, for interfitting or claw tooth stators.

264 This subclass is indented under subclass 261.1. Subject matter relating to armatures, per se.

265 This subclass is indented under subclass 264. Subject matter relating to drum type armatures.

266 This subclass is indented under subclass 264. Subject matter relating to hollow armatures.

(1) Note. This subclass relates, for example, to armatures having a double air gap.

267 This subclass is indented under subclass 264. Subject matter relating to ring type armatures.

268 This subclass is indented under subclass 264. Subject matter relating to disc type armatures.

269 This subclass is indented under subclass 264. Subject matter relating to salient pole armatures.

270 This subclass is indented under subclass 261.1. Subject matter relating to end turn supports.

SEE OR SEARCH THIS CLASS, SUBCLASS:
260, for end turn supports for stator windings.

SEE OR SEARCH CLASS:
336, Inductor Devices, subclass 197 for inductor devices having coil clamps or wedges to secure or space core and coil.

271 This subclass is indented under subclass 261.1. Subject matter relating to banding.

SEE OR SEARCH THIS CLASS, SUBCLASS:
262, for high speed type rotors.

272 This subclass is indented under subclass 40. Subject matter relating to elements.

SEE OR SEARCH CLASS:
74, Machine Element or Mechanism, subclasses 567 through 617 for mechanical elements, per se.

273 This subclass is indented under subclass 40. Subject matter relating to miscellaneous features not set forth in the indented subclasses under subclass 40.

300 NONDYNAMOELECTRIC:
This subclass is indented under the class definition. Subject matter which is not related to the conversion of energy between the electrical and mechanical state by electromagnetic action.

(1) Note. Consult the classes referred to in the search notes to the class definition of this class for other classes having similar subject matter.

SEE OR SEARCH THIS CLASS, SUBCLASS:
10+, for subject matter under the class definition related to the conversion of energy between the electrical and the mechanical state by means of electromagnetic action.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclasses 116+ for the subject matter of this subclass in combination with an electrical system.
322, Electricity: Single Generator Systems, subclass 2 for subject matter of this subclass in an electric generator system.

301 Nuclear reaction:
This subclass is indented under subclass 300. Subject matter relating to the obtaining of energy in the electrical state from the internal energy of the atom.

(1) Note. This subclass relates, for example, to electric generators consisting of radioactive sources which acquire a charge due to the emission of electrons or other ionized particles at such a high speed as to go through a considerable adverse electric gradient before being collected.

SEE OR SEARCH CLASS:
331, Oscillators, subclass 94 for electrical oscillators of the molecular or particle resonant type (e.g., Maser).
376, Induced Nuclear Reactions: Processes, Systems, and Elements, subclasses 100+ for fusion reactors; and subclasses 347+ for fission reactors.

302 Contact potential difference:
This subclass is indented under subclass 301. Subject matter comprising at least a pair of metal electrodes having dissimilar work functions and a material (e.g., gas) ionized by a radioactive source, the electrodes and the material so arranged relative to each other that the ions of the material, under the influence of the field established between the electrodes are collected by the electrodes to provide a source of current for an external load.

303 P-N semiconductor:
This subclass is indented under subclass 301. Subject matter comprising two intimately united semiconductor materials, one of the N type and one of the P type, and a radioactive source which irradiates the semiconductor materials to liberate charge carriers (electrons and holes) therein which flow under the influence of the field across the junction of the semiconductor materials to be collected on opposite sides of the junction and thus, provide a source of current for an external load.

304 Secondary electron emission:
This subclass is indented under subclass 301. Subject matter wherein energy from a radioactive source is directed toward a material which emits electrons in response thereto, the emitted electrons being collected by an electrode and providing a source of current and potential for an external load between the electrode and the radioactive source and/or the electron emissive material.

305 Direct charged particle emission:
This subclass is indented under subclass 301. Subject matter comprising a radioactive source of charged particles and electrode means (cathode and/or anode) to collect the charged particles to provide a source of current and potential for an external load between the electrodes or electrode and source.

306 Thermal or pyromagnetic:
This subclass is indented under subclass 300. Subject matter in which the energy is changed between the electrical and the thermal state.

(1) Note. This subclass relates, for example, to means for generating electricity due to a change in the temperature of material, or to means for generating mechanical energy due to the change of magnetic flux which results from change of temperature.

(2) Note. The combination of an electrical generator system and a nuclear reactor is provided for in Class 376, Induced Nuclear Reactions: Processes, Systems, and Elements, subclasses 317+.

SEE OR SEARCH CLASS:
136, Batteries: Thermoelectric and Photoelectric, subclasses 200+ for thermocouple batteries, per se.
318, Electricity: Motive Power Systems, subclass 117 for thermoelectric motor systems, per se.
322, Electricity: Single Generator Systems, subclass 2 for electrical generator systems in which electricity is converted to heat which in turn is converted into electricity.
374, Thermal Measuring and Testing, subclass 176 for a thermometer having a ferromagnetic sensor.
376, Induced Nuclear Reactions: Processes, Systems, and Elements, subclasses 317+ for electrical generator systems in which the products of an

induced nuclear reaction are converted to electricity.

307 With heat actuated bimetal element:
This subclass is indented under subclass 306. Subject matter having structure comprised of at least two materials having different coefficients of expansion which structure is deformed by the energy in its thermal state, and during its deformation, does mechanical work.

308 Charge accumulating:
This subclass is indented under subclass 300. Subject matter in which the electrical energy results from the incremental buildup of the potential charge over a period of operation of the device.

309 Electrostatic:
This subclass is indented under subclass 308. Subject matter in which the electrical charge or potential is of static electricity.

(1) Note. This subclass relates, for example, to static electric generators, commonly known as Whinhurst machines.

310 Friction:
This subclass is indented under subclass 309. Subject matter in which the static electricity is generated by frictional moving contact of two parts of the apparatus.

SEE OR SEARCH CLASS:
361, Electricity: Electrical Systems and Devices, subclass 207 for electrostatic electric relay systems such as those which utilize the Winslow effect, which is defined in the definition of that subclass.

311 Piezoelectric elements and devices:
This subclass is indented under subclass 300. Subject matter which includes a shaped body of a material which exhibits an electrostatic polarization when subjected to mechanical stress or which exhibits a mechanical stress tending to produce deflection, expansion, or contraction when subjected to electrical stress, the body being so shaped relative to the electromechanical properties of the material as to render the body useful for the conversion of energy between the electrical and mechanical states, and combinations of such bodies with means which utilize or which contribute to the utilization of such bodies for the conversion of energy between the electrical and mechanical states.

(1) Note. In the titles and definitions of the subclasses indented hereunder, the term "piezoelectric element" is used to denote the shaped body, per se, and the term "piezoelectric device" is used to denote the combination of such a shaped body and means which utilizes or which contributes to the utilization of such bodies for the conversion of energy between the electrical and mechanical states.

(2) Note. This and the indented subclasses include piezoelectric materials in combination with electrodes for the piezoelectric materials, such devices in combination with ancillary devices (such as holders or ovens) and piezoelectric motors or generators. Piezoelectric crystals in combination with an art device are classified with the art device.

(3) Note. This and the indented subclasses include patents relating to methods for using piezoelectric devices where such methods are not otherwise classified. Such methods are classified in the subclass providing for the apparatus required to perform the method.

(4) Note. Neither this nor the indented subclasses include mere piezoelectric materials, nor the method of or apparatus for making piezoelectric materials or piezoelectric devices. For the excluded subject matter, see the search notes below. Piezoelectric materials per se, when shaped to claimed configurations, where the configuration is disclosed as being significant to the piezoelectric property of the crystal (e.g., plate, AT cut) are classified in indented subclasses 357+.

SEE OR SEARCH THIS CLASS, SUBCLASS:
26, for magnetostrictive transducers which may have similar circuitry or structure as that used with piezoelectric devices.

SEE OR SEARCH CLASS:

29, Metal Working, subclass 25.35 for methods of making piezoelectric devices.

73, Measuring and Testing, subclass 170.08 and 170.09 for fluid flow direction measuring utilizing a piezoelectric sensor and subclass 170.33 for a piezoelectric probe for oceanographic measuring.

178, Telegraphy, subclass 70 and 71.11 for repeaters which use piezoelectric elements.

235, Registers, subclass 924 for registers which use a ferroelectric element.

250, Radiant Energy, subclass 370 and 492 for a radiant energy source which may be combined with a piezoelectric element.

252, Compositions, subclass 62.9 and the classes specified in the notes thereto, for piezoelectric compositions.

307, Electrical Transmission or Interconnection Systems, subclass 400.

313, Electric Lamp and Discharge Devices, subclass 508 for the combination of a piezoelectric element and a luminescent solid or liquid.

318, Electricity: Motive Power Systems, subclass 118 for magnetostrictive motor systems which may be similar to piezoelectric motor systems.

322, Electricity: Single Generator Systems, subclass 2 for the miscellaneous generator systems having a nonmagnetic generator (other than a piezoelectric generator).

324, Electricity: Measuring and Testing, subclass 727 for processes and means for subjecting a piezoelectric element to an electric test, as for the purpose of predicting its frequency drift, or determining the polarity of charge produced by mechanical stress, or of determining its activity. Search subclasses 76.39+ for frequency meters, per se. Search subclass 109 for electricity sensing, measuring, or testing using a piezoelectric element.

330, Amplifiers, subclass 5.5 for parametric amplifiers which may use piezoelectric material.

359, Optics: Systems (Including Communication) and Elements, subclasses 230+ for light control by a piezoelectric opaque element.

361, Electricity: Electrical Systems and Devices, subclasses 271+ for capacitors, per se, which may be similar in material or structure to a piezoelectric element.

363, Electric Power Conversion Systems, appropriate subclasses for such systems which utilize piezoelectric devices.

365, Static Information Storage and Retrieval, subclass 145 for ferroelectric storage systems. Note the polarization of the ferroelectric element is usually changed as a function of the stored information.

374, Thermal Measuring and Testing, subclasses 117+ for temperature measuring using a vibratory effect.

427, Coating Processes, subclass 100 for piezoelectric materials produced by coating methods.

312 Adding or subtracting mass:

This subclass is indented under subclass 311. Subject matter combined with a means for changing the mass of the piezoelectric element, e.g., depositing mass onto or evaporating mass from the surface of a piezoelectric element to change its resonant frequency.

(1) Note. Other methods of changing the mass include grinding, cutting, or chemical etching.

SEE OR SEARCH CLASS:

29, Metal Working, subclass 25.35 where the changing of the mass may be a step in the manufacture of a piezoelectric device.

313 Surface acoustic wave devices:

This subclass is indented under subclass 311. Subject matter wherein a piezoelectric element is combined with, or comprises, a material or body having an elastic surface on which varying mechanical stresses produced by the piezoelectric element travel.

SEE OR SEARCH THIS CLASS, SUBCLASS:

334, for piezoelectric generators of acoustic waves which travel through a body or material rather than on the surface of the body or material, e.g., "bulk mode".

SEE OR SEARCH CLASS:

235, Registers, subclass 181 and 197 for devices wherein the surface wave device functions as a correlator or convolver.

333, Wave Transmission Lines and Networks, subclasses 157+ for devices wherein the waveguide serves as a delay line, and subclasses 187+ where the surface wave device performs as an electric filter.

314 Electrical systems:

This subclass is indented under subclass 311. Subject matter for supplying electric energy via an electric circuit element to piezoelectric devices and/or electric circuit elements which are supplied with electric energy by piezoelectric devices.

(1) Note. The circuit element is other than just an electrode of the piezoelectric device.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 67+ for piezoelectric transducers which couple an alternating current, electric circuit, and a device having mechanical vibrations for testing purposes and for the testing system which utilizes such transducers.

181, Acoustics, subclasses 101+ for acoustic wave (especially seismic) which may utilize a piezoelectric element.

307, Electrical Transmission or Interconnection Systems, subclass 400 for electrical systems utilizing electrets.

318, Electricity: Motive Power Systems, subclass 116 for electric motor control systems where the electric motor is of the piezoelectric type. Note that subclass 314 of this class (310) also contains some systems where electric potential is applied to a piezoelectric device.

322, Electricity: Single Generator Systems, subclass 2 for the miscellaneous generator systems having a nonmagnetic generator (other than a piezoelectric generator).

324, Electricity: Measuring and Testing, subclass 727 for processes of and means for subjecting a piezoelectric crystal to an electric test, as for the purpose of predicting its frequency drift, or of determining the polarity of charge produced by mechanical stress, or of determining its activity. Search subclasses 76.39+ for frequency meters, per se.

330, Amplifiers, subclass 5.5 for solid element wave propagating amplifiers wherein the solid element may be of the piezoelectric phonon type, and subclass 174 for amplifiers having electromechanical transducers, which may be piezoelectric crystals, in a signal coupling circuit.

333, Wave Transmission Lines and Networks, subclass 149 for delay networks utilizing piezoelectric devices, and subclasses 187+ for filters utilizing piezoelectric devices.

361, Electricity: Electrical Systems and Devices, subclass 211 for electric circuits for relays which may be piezoelectric.

363, Electric Power Conversion Systems, appropriate subclasses for such systems utilizing piezoelectric devices.

367, Communications, Electrical: Acoustic Wave Systems and Devices, subclasses 140+ for piezoelectric transducers used in electrical acoustic wave communication.

369, Dynamic Information Storage or Retrieval, subclass 144 for a piezoelectric phonograph pickup.

600, Surgery, subclasses 437+ for ultrasonic systems which may include a piezoelectric element.

601, Surgery: Kinesitherapy, subclasses 15+ and 46+ for ultrasonic systems which may include a piezoelectric element.

315 Temperature compensation circuits:

This subclass is indented under subclass 314. Subject matter having circuit elements associated with the piezoelectric element which compensate for changes in its piezoelectric properties upon changes in temperature, e.g., turnover point, impedance, frequency, resistance, etc.

SEE OR SEARCH CLASS:

331, Oscillators, subclass 116 for electromechanical resonator controlled oscillators which may compensate via electric circuit elements for changes in the resonator frequency due to the temperature change.

316.01 Input circuit for simultaneous electrical and mechanical output from piezoelectric element:

This subclass is indented under subclass 314. Subject matter wherein (a) electrical energy is supplied to the piezoelectric element and (b) the piezoelectric element has an electrical output and a mechanical output both of which are utilized.

(1) Note. Subject matter of this subclass type may include feedback circuits.

(2) Note. A device such as a nondestructive testing unit which is electrically excited to produce an acoustic wave output and then receives the returning acoustic wave and converts that into an electric output is viewed as having sequential rather than simultaneous outputs for classification purposes under subclass 314. Thus, such a device which includes electric-circuit elements for both input and output would usually be classified in subclasses 317 or 319 rather than in this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

318, for the combination of an electric circuit element and an electrical resonator comprised of a piezoelectric device which converts an alternating electrical input voltage to mechanical motion which is entirely converted by the piezoelectric device itself back to an alternating electrical output voltage having the same frequency as, and in phase with the input voltage.

321, for such piezoelectric devices, per se, which include some structure other than the piezoelectric element itself to mechanically establish the resonant frequency of the device.

326, for such piezoelectric devices wherein the resonant frequency is established by mechanically damping undesired frequencies.

348+, for such piezoelectric devices, per se, in which the piezoelectric element itself determines the resonant frequency.

316.02 Traveling wave motor:

This subclass is indented under subclass 316.01. Subject matter wherein two or more groups or piezoelectric elements lying along a driving surface expand and contract in repetitive cycles generating a mechanical output having a crest or high point which appears to move along the surface of the piezoelectric elements along a direction of travel (typically rotary or linearly) whereby a driven surface pressed resiently against the driving surface is carried along the direction of the crest or high point.

316.03 Charging and discharging:

This subclass is indented under subclass 316.01. Subject matter having specific circuitry (e.g., capacitor, coil, combination etc.) either (a) to source electrons flowing to the piezoelectric element, or (b) to sink electrons flowing from the piezoelectric element.

SEE OR SEARCH CLASS:

361, Electricity: Electrical Systems and Devices, subclasses 225+ for the step of merely charging or polarizing piezoelectric material.

317 Input circuit for mechanical output from piezoelectric element:

This subclass is indented under subclass 314. Subject matter having electric circuit elements for driving the piezoelectric element for the purpose of producing a usable mechanical output therefrom.

SEE OR SEARCH THIS CLASS, SUBCLASS:

316, for similar subject matter having, in addition, an electrical output which is fed back to the input.

318 Input circuit for electrical output from piezoelectric element:

This subclass is indented under subclass 314. Subject matter having electric circuit elements for driving the piezoelectric element for producing an electrical output from the piezoelectric element.

(1) Note. The output may be fed back to the input circuitry or to additional circuitry. Examples of devices in this subclass are circuits in which the piezoelectric element behaves or functions as an electric circuit element rather than being utilized for any mechanical output, e.g., oscillators, resonators.

SEE OR SEARCH THIS CLASS, SUBCLASS:

316, for similar subject matter having, in addition a utilizable mechanical output.

SEE OR SEARCH CLASS:

329, Demodulators, particularly subclass 328 for a demodulator including a piezoelectric element.

331, Oscillators, subclass 73 for electron coupled oscillators employing piezoelectric crystals, subclass 116 for transistor oscillators employing an electromechanical resonator which may be of the piezoelectric type, subclass 139 for crystal bridge type oscillators, subclass 155 for oscillators utilizing a piezoelectric crystal to couple an electromechanical oscillator frequency determining resonator to the oscillator system, and subclasses 158+ for piezoelectric crystal type oscillator systems in general.

332, Modulators, especially subclasses 139+ for piezoelectric elements used in frequency modulators.

368, Horology: Time Measuring Systems or Devices, subclasses 155+ for electric oscillators used in clocks which may utilize a piezoelectric element.

319 Electrical output circuit:

This subclass is indented under subclass 314. Subject matter having an electric circuit element which receives the electric output from the piezoelectric element.

(1) Note. This subclass is generally restricted to devices that have a mechanical input to the piezoelectric device. However, an exception is where an electric input to a piezoelectric device is acknowledged as prior art or merely nominally disclosed (e.g., as by schematically representing an A.C. or D.C. source as the input), or where the piezoelectric device functions as both an electromechanical transducer and a mechanical to electrical transducer and the electric input circuit is acknowledged as prior art or merely nominally disclosed (the output circuit may be to “protect” the input circuit from the voltage produced by the mechanical-electrical function).

320 Piezoelectric slab having different resonant frequencies at different areas:

This subclass is indented under subclass 311. Subject matter wherein a unit of piezoelectric material is disclosed as having a resonant region and at least one other region that has a deliberately different resonant frequency from the first resonant region, e.g., energy trapped, dot resonator, or monolithic filter devices.

(1) Note. Devices which use the energy trapping concept are specifically included since the regions in which the energy is trapped (usually under electrodes) must be different from that of the surrounding region (usually not electrodes). Thus, even if the device has only one resonator, it has two regions with different resonant frequencies. The same reasons apply to monolithic filters.

(2) Note. Typical ways of providing different resonant frequencies on the same slab of piezoelectric material are loading

portions of the material, or removing portions of the material, or providing changes in the cross section of the slab.

SEE OR SEARCH THIS CLASS, SUBCLASS:

322, for acoustic wave generators which may utilize a wedge or other shape element which has different resonant frequencies in different areas.

SEE OR SEARCH CLASS:

333, Wave Transmission Lines and Networks, subclasses 187+ for electric filters that may utilize such a piezoelectric slab.

321 Combined with resonant structure:

This subclass is indented under subclass 311. Subject matter wherein the piezoelectric element is combined with structure whose natural frequency of vibration is disclosed as being the same as the operating frequency of vibration of the piezoelectric element.

(1) Note. “Resonant structure” is intended to be structure other than a mere support for a piezoelectric resonator.

(2) Note. Examples of devices found in this subclass would be composite resonators (e.g., tuning forks or electric filters) comprised of piezoelectric elements mounted on structure which together have a resonant frequency within the operating frequency of the device, the piezoelectric element(s) being either input and/or output transducers for the device.

SEE OR SEARCH THIS CLASS, SUBCLASS:

345, and 348, for mounting devices for piezoelectric elements that may resonate.

SEE OR SEARCH CLASS:

84, Music, subclass 409 for tuning forks.

178, Telegraphy, subclass 70 for tuning forks.

333, Wave Transmission Lines and Networks, subclasses 187+ for piezoelectric wave filters (combination of piezoelectric element and resonator).

368, Horology: Time Measuring Systems or Devices, subclasses 155+ for resonant vibrators.

322 Acoustic wave type generator or receiver:

This subclass is indented under subclass 321. Subject matter wherein the mechanical energy applied to or produced by the resonant structure is disclosed as being caused by or producing traveling compressions in an elastic material.

(1) Note. The combination of a piezoelectric element and a cavity resonator is included in this subclass even though the wave is a “standing wave” rather than a traveling wave.

(2) Note. Since devices which produce or receive acoustic waves can sometimes be structurally similar to mechanically coupled devices, the search notes for subclasses 323 and 328 should be consulted.

SEE OR SEARCH THIS CLASS, SUBCLASS:

334, and 335, for acoustic wave devices that don't necessarily use a resonant structure.

SEE OR SEARCH CLASS:

47, Plant Husbandry, Digest 12 for ultrasonic generators which may utilize a piezoelectric element.

68, Textiles: Fluid Treating Apparatus, subclass 3 for use of supersonic energy in washing machines.

73, Measuring and Testing, subclasses 67+ and 522 for piezoelectric transducers which couple an alternating current, electric circuit and a device having mechanical vibrations for testing purposes.

99, Foods and Beverages: Apparatus, subclass 451 and Digest 12 for use of supersonic energy in food processing.

116, Signals and Indicators, subclasses 137+, Digests 18 and 19 for acoustic wave signaling devices, e.g., noise makers.

134, Cleaning and Liquid Contact With Solids, subclass 1 and 17 for processes of cleaning or fluid treatment

of solids which may include the application of ultrasonic energy.

166, Wells, subclass 177 and 249 for processes and apparatus to apply acoustic or vibrational energy to the material surrounding a well bore.

181, Acoustics, subclass .5, 106, 108, 113, 139, and 142 for acoustic wave generators and detectors.

200, Electricity: Circuit Makers and Breakers, subclass 61.01 and Digest 20 for acoustically actuated switches.

210, Liquid Purification or Separation, subclass 738 for processes or apparatus involving coagulation by ultrasonic vibrations, and subclass 542 for apparatus for coagulating suspensions utilizing piezoelectric means.

340, Communications: Electrical, subclass 870.3 for piezoelectric transmitters, and subclasses 384.1+ for electrically driven noise makers.

366, Agitating, subclass 127 for apparatus for agitating which utilize piezoelectric means.

367, Communications, Electrical: Acoustic Wave Systems and Devices, subclasses 140+ for piezoelectric transducers used in electrical acoustic wave communication; and subclasses 197+ for sound responsive selective devices.

422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclass 20 and 127+ for process and apparatus using acoustic wave generating means.

600, Surgery, subclasses 437+ for systems using acoustic or vibratory energy for medical treatment or diagnosis.

601, Surgery: Kinesitherapy, subclasses 46+ for systems using acoustic or vibratory energy for medical treatment or diagnosis.

323.01 Direct mechanical coupling:
This subclass is indented under subclass 321. Subject matter in which the resonant structure physically contacts a body on which it performs work, or from which it receives energy.

(1) Note. Examples of subject matter in this subclass include ultrasonic tools, vibrators and atomizers.

SEE OR SEARCH THIS CLASS, SUBCLASS:

328+, for devices which may be similar, but don't operate at resonance.

SEE OR SEARCH CLASS:

30, Cutlery, subclass 45 for a vibratory cutting device which may be driven by a piezoelectric element.

74, Machine Element or Mechanism, subclass 1 for supersonic tools which may be driven at resonance by a piezoelectric element. Note that this class contains mechanical amplitude transformers, per se.

228, Metal Fusion Bonding, subclass 1.1, 110.1+ and 262 for ultrasonic welders which may use a piezoelectric element.

366, Agitating, subclass 127 for agitators or vibrators which may be driven by a piezoelectric element.

408, Cutting by Use of Rotating Axially Moving Tool, subclass 700 for ultrasonic cutters which may be driven by a piezoelectric element.

433, Dentistry, subclass 86 and 119 for ultrasonic dental tools driven by a piezoelectric element.

451, Abrading, subclass 165 and 910 for ultrasonic abrading.

601, Surgery: Kinesitherapy, subclasses 46+ for vibrators which may be driven by a piezoelectric element.

323.02 Motor producing continual motion:
This subclass is indented under subclass 323.01. Subject matter wherein the piezoelectric element expands and contract cyclically and repeatedly to produce motion of an armature or rotor along a single direction.

(1) Note. Motion can be linear or rotary.

323.03 Traveling wave motor:
This subclass is indented under subclass 323.02. Subject matter wherein two or more groups or piezoelectric elements lying along a driving surface expand and contract in repetitive cycles generating a mechanical output having a crest or high point which appears to move along the surface of the piezoelectric elements along a direction of travel (typically rotary or

linearly) whereby a driven surface pressed resiently against the driving surface is carried along the direction of the crest or high point.

323.04 Stator:
This subclass is indented under subclass 323.03. Subject matter wherein significance is attributed to either (a) the structure which generates the traveling wave or (b) means for bearing the weight of the structure which generates the traveling wave.

323.05 Support:
This subclass is indented under subclass 323.04. Subject matter having a specific mounting apparatus (attachment device) to hold the stator.

SEE OR SEARCH THIS CLASS, SUBCLASS:
345, and subclass 348, for mounting devices for piezoelectric elements that may resonate.

323.06 Piezoelectric element or electrode:
This subclass is indented under subclass 323.04. Subject matter having a specific detail of either (a) the piezoelectric element (e.g., geometry, shape, placement etc.) or (b) an electric conductor for connecting the piezoelectric element to a source of current.

SEE OR SEARCH THIS CLASS, SUBCLASS:
323.11, for specific material or composition of the piezoelement in a vibration wave or traveling wave motor.

323.07 Oval track:
This subclass is indented under subclass 323.04. Subject matter wherein either the stator or the driving surface has a closed loop shape with at least one set of parallel straight portions.

323.08 Armature:
This subclass is indented under subclass 323.03. Subject matter having a specific detail directed to the driven member of the motor such as shape, geometry or structure.

323.09 Pressing means detail:
This subclass is indented under subclass 323.08. Subject matter wherein significance is attributed to resilient means used for pushing the driven member against the driving surface such as shape, type, or orientation.

323.11 Specific material or composition:
This subclass is indented under subclass 323.03. Subject matter wherein significance is attributed to a specific substance or compound used to construct the traveling wave motor.

SEE OR SEARCH CLASS:
252, Compositions, subclass 62.9 for compositions specialized and designed for use as piezoelectric materials and processes of making said compositions.

323.12 Langevin or pencil type motor:
This subclass is indented under subclass 323.02. Subject matter wherein an ultrasonic motor comprises either (a) a stator having of a longitudinal-torsional composite resonator or (b) a stack of piezoelectric elements stacked longitudinally in a direction along the length of a generally long cylinderical shaped armature.

323.13 Output member detail:
This subclass is indented under subclass 323.12. Subject matter wherein the motor armature is provided with specific means to facilitate coupling to a driven body.

323.14 Roller or ball elements:
This subclass is indented under subclass 323.13. Subject matter wherein the output member has a structure employing either cylindrical or spherical shaped members.

323.15 Material or material property:
This subclass is indented under subclass 323.13. Subject matter wherein significance is attributed to a specific substance or has a specific characteristic.

323.16 Elliptical motion at fixed point (i.e., walking) or Ratchet and Pawl motor:
This subclass is indented under subclass 323.02. Subject matter having either (a) an actuator with a fixed base and two or more piezoelectric elements each causing the actuator to move in a direction, the combined

motion of the two or more piezoelectric elements causes the actuator to orbit, whereby repetitive orbits of the actuator pushes the driven member along a direction of travel or (b) a rotor or a driven member is constrained by a hinged or pivoted device adapted to fit into a notch or sloping tooth of a bar or wheel to permit motion in one direction only.

323.17 Positions an object:

This subclass is indented under subclass 323.01. Subject matter a piezoelectric element expands or contracts to locate or adjust a member into a desired location.

SEE OR SEARCH CLASS:

347, Incremental Printing of Symbolic Information, subclass 68, and 70 for a piezoelectric element which contracts to deform a vibration plate attached directly to the piezoelectric element to expel ink droplets.

323.18 Device performs work on an object (e.g., welding, cutting):

This subclass is indented under subclass 323.01. Subject matter wherein the piezoelectric element applies an oscillating force to a body for moving the body a distance.

323.19 Horn or transmission line:

This subclass is indented under subclass 323.01. Subject matter wherein either (a) the piezoelectric element is used as a transducer to convert electric energy into sound energy or (b) the piezoelectric element is combined with specific means to conduct sound energy.

SEE OR SEARCH CLASS:

333, Wave Transmission Lines and Networks, subclasses 187+ for piezoelectric wave filters (combination of piezoelectric element and resonator).

323.21 Detector (e.g. sensor):

This subclass is indented under subclass 323.01. Subject matter wherein the piezoelectric element has a characteristic which changes in response to a change in a physical parameter or condition, and assessment is made of the physical parameter or condition.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclass 35.11 for a piezoelectric vibration sensor, for detecting engine knock. Subclasses 290, 721, 727, 763+, and 861.18+ for various force or pressure measuring and indicating devices or systems which may utilize a piezoelectric transducing element. Subclasses 763+ for strain sensors which may use a piezoelectric element, subclasses 861.18 for flow meters which may use a piezoelectric element, subclass 290 for depth or liquid level gases which may utilize a piezoelectric element, and Digest 4 for various piezoelectric measuring and testing devices.

324 Diaphragm:

This subclass is indented under subclass 321. Subject matter in which the resonant structure is a diaphragm mechanically associated with the piezoelectric element, the combination being resonant at the operating frequency of the piezoelectric element.

SEE OR SEARCH THIS CLASS, SUBCLASS:

328, for the combination of a diaphragm driven by a piezoelectric element which diaphragm is not resonant with respect to the operating frequency at the element.

SEE OR SEARCH CLASS:

181, Acoustics, subclasses 148+ for acoustical devices which use diaphragms.

340, Communications: Electrical, subclass 338 for a noise generator which may include a piezoelectric element mounted on a diaphragm.

325 Sandwich or langevin type:

This subclass is indented under subclass 321. Subject matter in which the piezoelectric element or elements are coupled to a front and/or rear mass, which combined structure is disclosed as being resonant at the operating wavelength.

(1) Note. Devices of this subclass type may consist of, for example, a piezoelectric

element connected to the wall of a cleaning tank, the combined structure being resonant at the operating wavelength or a piezoelectric element connected to a mechanical amplifier (horn) and a tool, the combined structure being resonant at the operating wavelength. Devices of this subclass type may be referred to as the Boldine type.

SEE OR SEARCH CLASS:
366, Agitating, Cross-Reference Art Collection, 600 for similar resonant structures.

326 Combined with damping structure:
This subclass is indented under subclass 311. Subject matter having the piezoelectric element combined with structure designed to absorb, or attenuate undesired energy emanated from or applied to the element.

(1) Note. Subject matter under subclass type does not include structure which merely mounts a piezoelectric resonator.

SEE OR SEARCH CLASS:
181, Acoustics, appropriate subclasses for various specific acoustic wave attenuators or modifiers.

327 On back of piezoelectric element:
This subclass is indented under subclass 326. Subject matter in which an absorber or attenuator is in intimate contact with a first part of the surface of the piezoelectric element to remove mechanical energy therefrom while mechanical energy is allowed to emanate from or into another part of the surface not in the same plane with the first part.

SEE OR SEARCH THIS CLASS, SUBCLASS:
335, for piezoelectric devices which eliminate back waves by reflecting them to recombine them either constructively with the front wave, or destructively with the back wave.

SEE OR SEARCH CLASS:
73, Measuring and Testing, subclasses 67+ for nondestructive testing apparatus which may use a piezoelectric element with an attenuating element on a surface.

328 With mechanical energy coupling means:
This subclass is indented under subclass 311. Subject matter having means to apply mechanical energy from an external source to the piezoelectric element to mechanically stress the element, or means to apply mechanical energy produced by the element to an external load.

(1) Note. The means of this subclass type are other than those whose only proximate function is to contribute to the proper operation of the piezoelectric element itself such as by supporting, housing, prestressing, or damping the element. The means of this subclass type may, however, perform such contributory functions in addition to its energy transferring function. In such cases, the means may be considered as having two coequal proximate functions, i.e., a contributory function and a transferring function, the transferring function being the basis for classification in this subclass. Whether or not such means renders a recited combination classifiable in this subclass may depend on the disclosed intended use of the means. For example, if a piezoelectric element is recited in combination with a housing, the proximate function of the housing may be assumed to be contributory, i.e., to contribute to the proper operation of the piezoelectric element by protecting it from its environment, which is insufficient basis for placement in this subclass. However, it may be disclosed that the housing is additionally intended to transfer mechanical energy from the piezoelectric element to a load external to the housing (e.g., air, as in the case of certain acoustic transducers) in which case the combination is classifiable here.

(2) Note. The coupling means of this subclass type is not necessarily limited to motion transmitting members such as mechanical linkages, diaphragms, etc., but may include reaction members which cooperate with the piezoelectric element to render the element itself

capable of directly applying its mechanical energy to a load or receiving mechanical energy from source. Such means may, for example, be recited as a "support" which in addition to merely fixing the element in a particular location relative to the support itself, is disclosed as a means against which forces produced by the element may react in order that the element may do work on an external load. In this case, the "support" is considered as having two proximate functions [see (1) Note above], i.e., to fixedly locate the element with respect to the support itself and to render the combination capable of applying the mechanical energy of the element to an external load.

(3) Note. Refer to the SEARCH CLASS notes of subclass 323 for the loci of similar art which may contain a piezoelectric device (which may or may not be resonant).

SEE OR SEARCH THIS CLASS, SUBCLASS:

323, and 325, for similar devices which may be designed to be resonant at the driving frequency.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 763+ for strain sensors which may use a piezoelectric element, subclasses 861.18 for flow meters which may use a piezoelectric element, subclass 290 for depth or liquid level gases which may utilize a piezoelectric element, and Digest 4 for various piezoelectric measuring and testing devices.

84, Music, subclasses 730+ for electric tone generators or pickups combined with a musical device, wherein said generator or pickup could utilize a piezoelectric element, and Digest 24 for various piezoelectric devices mechanically coupled to a musical instrument.

137, Fluid Handling, subclass 827, 828 and 831 for fluid control devices (e.g., fluid amplifier) which may be combined with a piezoelectric element.

181, Acoustics, subclass .5 for seismic vibration detectors which may use a piezoelectric element.

200, Electricity: Circuit Makers and Breakers, subclass 181 for switching which may utilize a piezoelectric element.

366, Agitating, subclass 127 for an agitating apparatus utilizing a piezoelectric actuating means.

369, Dynamic Information Storage or Retrieval, subclasses 128+ for electromechanical storage or retrieval; and subclass 144 for piezoelectric phonograph pickups.

417, Pumps, subclass 322 for pumps which may use a piezoelectric element.

329 Including inertia type operator:

This subclass is indented under subclass 328. Subject matter wherein the coupling means includes a massive body which is mechanically connected to a part of the peripheral surface of the piezoelectric element and which is movable relative to another part of the peripheral surface of the element in at least one direction so that when an accelerating force is applied to the combination in the one direction, the resulting acceleration of the massive body causes the part of the peripheral surface to which it is connected to move relative to the other part of the peripheral surface to thus stress the element between the two parts of its peripheral surface.

(1) Note. This subclass relates, for example, to acceleration or velocity sensing elements, per se.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclass 71 for vibration sensing apparatus utilizing an inertia element, and subclasses 516+ for inertia-type accelerometers.

102, Ammunition and Explosive Devices, subclass 210 and Digest 5 for inertia operated ignites.

367, Communications, Electrical: Acoustic Wave Systems and Devices, subclass 158 for inertia operated piezoelectric transducers for use in underwater electrical acoustic wave communications.

330 Bending type:
This subclass is indented under subclass 328. Subject matter wherein the mechanical stresses applied to or produced within the piezoelectric element include a coplanar pair of oppositely directed moments of mechanical force.

331 Plural elements:
This subclass is indented under subclass 330. Subject matter having two or more piezoelectric elements and wherein bending type mechanical stresses are produced in at least one of the elements.

332 Multimorph:
This subclass is indented under subclass 331. Subject matter having at least two piezoelectric elements so joined and oriented that one expands while the other contracts to produce a bending type mechanical stress in the composite structure.

(1) Note. The elements of the multimorphs of this subclass type may be in direct physical contact with each other or may be separated by a spacing means or "center vane".

SEE OR SEARCH CLASS:
369, Dynamic Information Storage or Retrieval, subclass 144 for the structure of piezoelectric phonograph pickup s which utilize multimorphic elements.

333 Shear or torsional type:
This subclass is indented under subclass 328. Subject matter wherein the mechanical stresses applied to or produced within the piezoelectric element include a pair of noncolinear, oppositely directly linear forces, or a pair of oppositely directed moments of mechanical force acting in parallel planes.

334 Acoustic wave type generator or receiver:
This subclass is indented under subclass 328. Subject matter wherein the mechanical energy applied to or produced by the piezoelectric element is disclosed as being caused by or producing traveling compressions in an elastic material.

(1) Note. See the SEARCH CLASS notes of subclass 322 above, for the loci of similar art which may contain a piezoelectric device (which may or may not be resonant).

SEE OR SEARCH THIS CLASS, SUBCLASS:
322, for acoustic generators and receivers using a resonant structure.

SEE OR SEARCH CLASS:
333, Wave Transmission Lines and Networks, subclass 149 and 187+ for electric delay lines or filter networks having, as a part thereof, means for coupling vibrational energy between a piezoelectric crystal and a mechanical delay line or filter.

335 With lens or reflector:
This subclass is indented under subclass 334. Subject matter combined with means to change the direction of a ray of the acoustic wave energy.

SEE OR SEARCH CLASS:
181, Acoustics subclasses 175+ for acoustic transducers combined with a sound modifier.
367, Communications, Electrical: Acoustic Wave Systems and Devices, subclass 150 and 151 for acoustic transducers combined with a lens or reflector, respectively.

336 Nondestructive testing type:
This subclass is indented under subclass 334. Subject matter disclosed as being used in the determination of physical characteristics of a body or material by producing acoustic wave energy to be applied to the body or material and/or by being mechanically stressed by acoustic wave energy received from the body or material.

SEE OR SEARCH CLASS:
73, Measuring and Testing, subclasses 67+ for systems which utilize the above transducers.

337 Underwater type:

This subclass is indented under subclass 334. Subject matter wherein the piezoelectric element is enclosed in a submergible watertight housing, which housing provides for the transmission of acoustic energy between the element and the water in which the housing is submerged.

SEE OR SEARCH CLASS:

367, Communications, Electrical: Acoustic Wave Systems and Devices, subclasses 141+ for similar underwater piezoelectric transducers.

338 Force or pressure measuring type:

This subclass is indented under subclass 328. Subject matter wherein the electrical output of the piezoelectric element is disclosed as being used to indicate the magnitude of the mechanical force or forces stressing the element.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclass 290, 721, 727, 763+, and 861.18+ for various force or pressure measuring and indicating devices or systems which may utilize a piezoelectric transducing element.

600, Surgery, subclasses 481+ for a cardiovascular pressure transducer which may utilize a piezoelectric transducing element.

339 Voltage, spark or current generator:

This subclass is indented under subclass 328. Subject matter wherein mechanical energy from an external source is applied to the piezoelectric element to produce an electric potential difference between at least two electrically accessible points on the surface of the element.

SEE OR SEARCH CLASS:

84, Music, Digest 24 for piezoelectric signal generators stimulated by a musical instrument.

102, Ammunition and Explosive Devices, subclass 18, 210 and Digest 5 for voltage generators which may include a piezoelectric element.

123, Internal-Combustion Engines, subclass 148 for a piezoelectric spark generator.

200, Electricity: Circuit Makers and Breakers, subclass 61.01 and Digest 20 for sound or vibration devices which produce a signal and may include a piezoelectric element.

315, Electric Lamp and Discharge Devices: Systems, subclass 55 and 209 for piezoelectric element spark generators.

340, Communications: Electrical, subclass 365 for pressure sensitive keyboards which generate an electric signal and may use a piezoelectric element.

361, Electricity: Electrical Systems and Devices, subclasses 247+ and particularly subclass 260 for piezoelectric ignites.

431, Combustion, subclass 43, 128, 132, 254+, 258+, and Digests 58, 60 and 63 for electric ignites which may utilize a piezoelectric element.

340 Encapsulated or coated:

This subclass is indented under subclass 311. Subject matter having a protective means in direct, intimate contact with all surfaces of the piezoelectric element.

SEE OR SEARCH CLASS:

156, Adhesive Bonding and Miscellaneous Chemical Manufacture, appropriate subclasses for laminating methods including adding a moisture proof layer to an object.

264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclass 272 for electrical component encapsulating.

427, Coating Processes, appropriate subclasses for moisture proofing by coating.

428, Stock Material or Miscellaneous Articles, appropriate subclasses for a stock material product in the form of a single or plural layer web or sheet, including a waterproof component, note especially subclass 321 and 351 (in which the web or sheet is structurally defined or has a structurally defined element or component), and subclasses 411+ for a nonstructural laminate defined merely by the composition of the layers.

341 With temperature modifier and/or gas or vapor atmosphere control:

This subclass is indented under subclass 311. Subject matter having means to maintain or change the temperature of the piezoelectric element, or having means to control or confine gas or vapor around the element.

(1) Note. Subject matter of this subclass type includes, for example, heat sinks, heat shields, fans, and cooling fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

346, for a piezoelectric element combined with structure whose properties compensate for undesired changes in the device which would result from temperature change.

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, appropriate subclasses for housing and envelopes having means for conducting electricity between the inside and outside of the housing or envelope, including such devices as are used for piezoelectric elements. See subclass 9 for those involving the use of a vacuum, subclass 14 for those having fluid conditioning or maintenance means, subclasses 15.1+ for those having temperature modifying means, subclasses 17.05+ and 50.5+ for hermetically sealed envelopes, and subclasses 50+ for miscellaneous boxes and housings.

219, Electric Heating, subclasses 19+ for electric heating apparatus, per se, designed to produce a constant temperature.

220, Receptacles, appropriate subclasses for the structure of housings, casings, and envelopes, per se. Note particularly subclasses 2.1+ where the housing, casing, or envelope is of the electric discharge tube or similar (such as piezoelectric crystal) type.

331, Oscillators, subclass 69 for oscillators with outer casing or housing provided with means to modify the temperature therein and wherein the oscillator may utilize a piezoelectric crystal element, and subclass 70 for oscillators which may utilize a piezoelectric crystal element with means to modify the crystal temperature.

342 For plural piezoelectric elements:

This subclass is indented under subclass 341. Subject matter which includes more than one piezoelectric element.

343 With heating element:

This subclass is indented under subclass 341. Subject matter having means to add heat to the piezoelectric element, which means is a heat producing element (e.g., resistive heater within the crystal housing or directly in contact with the crystal).

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, subclasses 15+ for enclosures for circuit elements which may include a heater.

219, Electric Heating, subclass 210 for the combination of a piezoelectric element and a heating device.

236, Automatic Temperature and Humidity Regulation, subclass 1 for temperature control devices which may include, or protect a piezoelectric element.

331, Oscillators, subclass 69 and 70 for oscillators with outer casing or housing provided with means to modify the temperature therein, which oscillator may utilize a piezoelectric element.

344 Sealed unit:

This subclass is indented under subclass 341. Subject matter including an airtight housing around the crystal element.

SEE OR SEARCH THIS CLASS, SUBCLASS:

343, for sealed enclosures which are heated.

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, subclasses 8+, 17.05+ and 50.5+ for hermetically sealed housings combined with an electric circuit element which may be a piezoelectric element.

345 Supported by elastic material:
This subclass is indented under subclass 311. Subject matter wherein the only member (other than a lead wire for electrical connection to the electrodes) physically contacting the piezoelectric element is comprised of rubber, bulk fiber (e.g., glass wool), foam rubber, or other elastomer.

346 With temperature compensating structure:
This subclass is indented under subclass 311. Subject matter having structure whose properties compensate for undesired changes in the device which would result from temperature change.

(1) Note. Undesired changes of this subclass type cause, for example, force to be applied to the crystal as a result of expansion or contraction of the crystal or structurally associated member due to temperature variation. Structure of this subclass type may have, for example, matching or mismatching coefficients of thermal expansion. Devices that merely modify the temperature, or keep the temperature around the crystal unchanged (e.g., heat sinks, fans, ovens, etc.), however, are provided for elsewhere. See the search notes below.

SEE OR SEARCH THIS CLASS, SUBCLASS:
341, for the combination of a piezoelectric element and a temperature modifying means.

347 Compensated air gap:
This subclass is indented under subclass 346. Subject matter wherein the device includes at least one electrode for the piezoelectric element which is spaced from the piezoelectric element to form an air gap, and the temperature compensating structure either keeps the air gap constant for changes in temperature, or else purposely varies the air gap so that the piezoelectric element's output remains constant for changes in temperature.

348 With mounting or support means:
This subclass is indented under subclass 311. Subject matter having means to spatially position the piezoelectric element relative to some reference structure or reference point.

(1) Note. This subclass and those indented hereunder include, for example, means for mounting piezoelectric elements that function merely as resonators, filters, or other circuit element types of devices, i.e., an electrical-to-mechanical-back-to-electrical type of transducer. The devices may be viewed as “passive” in that they don't perform mechanical work on something, or receive mechanical energy from something.

349 Air gap:
This subclass is indented under subclass 348. Subject matter wherein the device includes at least one electrode for the piezoelectric element which is spaced from the piezoelectric element or contacts the piezoelectric element without being mechanically attached to it, i.e., the electrode merely lays on the piezoelectric element, or the piezoelectric element merely rests on the electrode.

SEE OR SEARCH THIS CLASS, SUBCLASS:
347, for air gap type devices which include a means to compensate for the effects temperature change could have on the device due to change in the air gap.

350 Adjustable:
This subclass is indented under subclass 349. Subject matter having means to adjust the position of the electrode.

SEE OR SEARCH THIS CLASS, SUBCLASS:
354, for similar adjustable mounting structure but which clamps the piezoelectric element.

351 Suspended by thin member:
This subclass is indented under subclass 348. Subject matter in which each member that physically contacts the piezoelectric element is relatively long and thin (e.g., rod, wire, spring, thread, string, etc.), and supports the piezoelec-

tric element in the direction of its (the member's) long dimension.

(1) Note. If the thin rod member also exerts a significant clamping pressure on the piezoelectric element, the device is classified under subclasses 354+ below.

352 Point contact on major surface only:
This subclass is indented under subclass 351. Subject matter wherein the suspension member contacts the piezoelectric element only on a major surface or surfaces, and the area of contact is small relative to the total area of the major surface.

353 Contact at edges only:
This subclass is indented under subclass 351. Subject matter wherein each suspension member contacts the piezoelectric element only at an edge or edges of the element.

354 Clamped:
This subclass is indented under subclass 348. Subject matter wherein the mounting means exerts a compressive stress on the piezoelectric element to secure it to a base or support and not merely for the purpose of preloading an element.

SEE OR SEARCH THIS CLASS, SUBCLASS:
350, for adjustable mounting structure which does not actually clamp the piezoelectric element.

355 Spring bias:
This subclass is indented under subclass 354. Subject matter in which the clamping force is the result of a resilient member (e.g., a spring).

356 90 degrees to major surface and margin clamped only:
This subclass is indented under subclass 355. Subject matter wherein the clamping force is applied in a direction perpendicular to the major surfaces, and the crystal surface is in physical contact with its support structure only along the outer, peripheral edge of the major surfaces or portion thereof.

357 Orientation of piezoelectric polarization:
This subclass is indented under subclass 311. Piezoelectric noncrystalline materials and elements in which the direction of polarization is significant with respect to the piezoelectric property of the material and/or in adopting the element to its intended function.

(1) Note. This subclass may contain methods of polarizing materials, per se, wherein such polarizing produces a piezoelectrically active element.

(2) Note. This subclass includes noncrystalline piezoids such as amorphous quartz, or quartz crystals in a binder which may then have various axis aligned.

SEE OR SEARCH CLASS:
29, Metal Working, subclass 25.35 for methods of making piezoelectric devices which may include the step of polarizing.
252, Compositions, subclass 62.9 and the classes specified in the notes thereto for piezoelectric compositions.
361, Electricity: Electrical Systems and Devices, subclass 233 for methods of treating articles with electric energy which may include polarizing.
427, Coating Processes, subclasses 457+ and 472 for polarization or oriented vapor deposition of a possibly piezoelectric element.

358 Ceramic composition (e.g., $BaTiO_3$):
This subclass is indented under subclass 357. Subject matter in which the piezoelectric material is comprised of an oriented (polarized) solid polycrystalline aggregate material, e.g., $BaTiO_3$.

SEE OR SEARCH CLASS:
106, Compositions: Coating or Plastic, subclass 391.5 for ceramic compositions in general.

359 More than one poling direction (e.g., rosen transformer):
This subclass is indented under subclass 358. Subject matter wherein a piezoelectric element is polarized in a curvilinear or more than one linear direction.

(1) Note. This subclass may include memory devices wherein the polarization direction is changed to represent a stored bit of information.

SEE OR SEARCH CLASS:
340, Communications: Electrical, subclass 173.2 for ferroelectric storage systems.

360 Rotation of crystal axis (e.g., cut angle):
This subclass is indented under subclass 311. Subject matter comprising piezoelectric crystalline materials and elements wherein the orientation of the crystallographic axis with respect to the piezoelectric property of the materials is recited and significant in adapting the element to its intended function.

361 Quartz:
This subclass is indented under subclass 360. Subject matter in which the piezoelectric material is crystalline silicon dioxide.

362 Rochelle salt:
This subclass is indented under subclass 360. Subject matter in which the piezoelectric material is potassium sodium tartrate.

363 Electrode materials:
This subclass is indented under subclass 311. Subject matter having electrodes attached to the piezoelectric element wherein the composition of the electrode is uniquely selected to enhance either the performance of the element/electrode combination or facilitate its manufacture.

(1) Note. Subject matter of this subclass type includes, for example, materials selected because they easily adhere to a piezoelectric material and materials that don't effect the piezoelectric's characteristics, etc.

364 Multilayer:
This subclass is indented under subclass 363. Subject matter wherein the electrode is made up of two or more layers of materials.

(1) Note. Subject matter of this subclass type may include, for example, a material directly adhered to the piezoelectric element chosen for its bonding ability, then covered with a layer of a material which may have superior conductivity, followed by a layer that resists oxidation, etc.

365 Electrode arrangement:
This subclass is indented under subclass 311. Subject matter involving the position of the electrodes with respect to the piezoelectric material, including electrode size, shape, and placement.

(1) Note. This subclass relates, for example, to piezoelectric elements having coated electrodes, electrodes cemented on or otherwise attached, and the structure of the electrode or its position with respect to the piezoelectric material or another electrode.

SEE OR SEARCH CLASS:
228, Metal Fusion Bonding, appropriate subclasses, especially subclasses 120 through 124.7 and 903 for a process of bonding a metallic part to a nonmetallic part.
403, Joints and Connections, appropriate subclasses for joints of general utility.

366 More than two:
This subclass is indented under subclass 365. Subject matter where the device has three or more separate electrodes.

(1) Note. The electrodes may be spaced about in a single surface of the piezoelectric material, or may be on two or more different surfaces or one of the three or more electrodes may be interposed between two layers of piezoelectric material so as to form a “sandwich”.

SEE OR SEARCH THIS CLASS, SUBCLASS:

331+, where the element has combined therewith means to transmit to or receive from the element mechanical force.

SEE OR SEARCH CLASS:

331, Oscillators, subclass 163 for crystal oscillator systems with a piezoelectric crystal having three or more electrodes in circuit.

367 Piezoelectric element shape:

This subclass is indented under subclass 311. Subject matter comprising piezoelectric materials and elements wherein the shape, proportions, or dimensions of the element or material is significant.

(1) Note. "Element" for the purpose of this subclass includes any structure consisting essentially of a plurality of pieces of piezoelectric material intimately joined together to form a composite structure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

357+, where the specific polarization direction is significant with respect to the piezoelectric property.

360+, where the specific orientation of the crystal axis of the material is significant with respect to the piezoelectric property.

368 Rectangular plate:

This subclass is indented under subclass 367. Subject matter wherein the shape of the piezoelectric element is essentially that of a solid rectangle, i.e., having three pairs of parallel sides.

(1) Note. Subject matter of this subclass type may include, for example, a cube.

(2) Note. Slight deviations from the exact shape specified above will not operate to exclude the device from this subclass if the overall appearance of the element remains rectangular, i.e., one or more pairs of sides may not be exactly parallel, one or more surfaces may be grooved or machined, edges may be rounded, or holes may be in or pass through the device.

369 Circular disc, ring, or cylinder:

This subclass is indented under subclass 367. Subject matter wherein the overall shape of the piezoelectric element is essentially that of a right solid cylinder.

(1) Note. Subject matter of this subclass type may include, for example, hollow cylindrical piezoelectric elements, split-ring or C-shaped elements and such elements having machined or textured surfaces if the overall shape is essentially as described above.

370 "U" or "tuning fork" shape:

This subclass is indented under subclass 367. Subject matter wherein the piezoelectric element is, or includes a portion shaped essentially like the letter "U" or "Y" or the letter "V" with a stem attached to the base (thus resembling a tuning fork).

(1) Note. This subclass is intended to include elements that may consist of a plurality of the above shapes, e.g., H-shaped elements and W-shaped elements.

371 Sphere or hemisphere:

This subclass is indented under subclass 367. Subject matter wherein the shape of the piezoelectric element is such that its outer surface can be essentially generated by the revolution of a circle about one of its diameters or by one half of such a generated surface.

(1) Note. Subject matter of this subclass type may specifically include, for example, hollow spherical or hemispherical piezoelectric elements.

(2) Note. Slight deviations from the exact shape defined above will not exclude a piezoelectric element from this subclass if the overall shape of the element is spherical or hemispherical.

400 End shield:

This subclass is indented under subclass 40. Subject matter including structure that bridges an open axial end of a stator.

(1) Note. An end shield generally encloses a stator opening, and may or may not provide support for rotor bearings. It may serve as one component of an overall enclosure or housing, and, in the case of providing support for a rotor by including bearings, act as a frame. It is not a requirement that a shield completely cover an end opening, since the shield may, for example, contain cooling openings therein, be comprised of a spoke- or mesh-type of structure, etc.

(2) Note. An end shield should be distinguished from an end ring, which is structure for bridging across axial ends of core laminations or core sections to bind them together as a unit.

(3) Note. An end shield should be distinguished from a frame, which is structural element for supporting a core. Although an end shield may act as a frame member, an end shield must bridge or enclose an axial end opening.

SEE OR SEARCH THIS CLASS, SUBCLASS:

85 through 89, for a mechanical shield or protector for a rotary machine, particularly subclass 89 for a housing, window or cover.
90, 90.5, for bearing or air-gap adjustment or bearing lubrication.
91, for supports.
216.114 through 216.119, for a core end ring or plate.
418 through 431, for frame structure, particularly subclass 425, for a base platform including a bearing support.

401 Having legs for supporting a bearing (e.g., spokes):

This subclass is indented under subclass 400. Subject matter including an end shield having structure including a plurality of elongated members extending in a direction radially away from the rotary axis of the rotor for supporting a rotor bearing.

SEE OR SEARCH THIS CLASS, SUBCLASS:

90, 90.5, for bearing or air-gap adjustment or bearing lubrication.
425, for a base platform including a bearing support.

402 Having particular frame- or core-mating feature (e.g., keyed, projection/recess):

This subclass is indented under subclass 400. Subject matter including an end shield having a specifically recited detail relating to structure providing for a cooperatively abutting relationship between the end shield and a stator support structure (i.e., frame) or the axial end of a core.

403 Threaded mating surface:

This subclass is indented under subclass 402. Subject matter including an end shield including an integral helical rib (i.e., screw thread) projecting from a surface thereof and arranged to mate with a corresponding screw thread on an element to which the end shield is to be attached or supported.

(1) Note. The end shield is commonly threadably attached to a frame or core end. The threaded surface of the end shield should be distinguished from a threaded surface of a separate and distinct member (e.g., bolt, etc.) used to fasten the end plate.

404 Folded Rim:

This subclass is indented under subclass 402. Subject matter including an end shield having a peripheral edge region that is bent, crimped, or otherwise deformed from the general shape of the remainder of the end shield to be matingly engageable with the corresponding mating surface of the support structure.

405 Recessed into frame or core:

This subclass is indented under subclass 400. Subject matter including an end shield that is sized, shaped, or otherwise structurally arranged to be located inside of the periphery of an axial end surface of a frame or core.

406 Cup-shaped end shield connected to another end shield:
This subclass is indented under subclass 400. Subject matter including an end shield that having a shape gene rally resembling a cup with an open end and a closed end, where the closed end is attached to a separate and distinct end shield.

(1) Note. The cup-shaped end shield commonly functions as an integrated stator support frame and end shield for one axial end of the stator with the other end shield arranged at the opposite axial end, together forming a frame and enclosure.

407 Two cup-shaped end shields:
This subclass is indented under subclass 406. Subject matter including two cup-shaped end shields joined together at their respective open ends.

(1) Note. The joined end shields commonly function as an enclosure and/or frame.

408 Having distinct connecting frame:
This subclass is indented under subclass 407. Subject matter including two cup-shaped end shields joined structurally together at their respective open ends by core support structure located between the respective open ends of the end shields.

SEE OR SEARCH THIS CLASS, SUBCLASS:
410, for a core-supporting frame located between two end shields.

409 Having overlapped open ends (e.g., telescoped open ends):
This subclass is indented under subclass 407. Subject matter including two cup-shaped end shields joined together by locating the open end of one end shield inside of the open end of the other end shield.

410 Having frame between two end shields:
This subclass is indented under subclass 400. Subject matter having an end shield, respectively, at each axial end of a stator, and a separate and distinct core support (i.e., frame) structurally positioned at a location intermediate the two end shields.

(1) Note. The frame is commonly supports the stator and is connected to each end shield to collectively operate as an enclosure or housing.

SEE OR SEARCH THIS CLASS, SUBCLASS:
85 through 89, for a mechanical shield or protector for a rotary machine, particularly subclass 89, for a housing, window, or cover.
90, for a support.
408, for a core supporting frame located between two cup-shaped end shields.
418, through 431, for a frame, per se.

411 Particularly adapted to be secured to a core end ring:
This subclass is indented under subclass 400. Subject matter including an end shield particularly constructed and arranged to be structurally attached to a band (i.e., end ring) generally mounted along the periphery of an axial end face of a core, or a generally flat or planar member attached to an axial end face of a core, for securing core elements together as an integral body.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.114, for an end ring.

412 Particularly adapted for use with impregnated core:
This subclass is indented under subclass 400. Subject matter including an end shield particularly constructed and arranged to be structurally associated with a core having inner spaces filled with a material for binding laminations of the core together or for otherwise minimizing vibration of the laminations in the core.

(1) Note. The material used to fill the spaces is commonly a resin. The particular structure of the end shield may include a structural arrangement for permitting or aiding insertion of impregnating material after the end shield is structurally supported with respect to the core, or any other particular feature such as, but not limited to, a fastening arrangement particularly for use with an impregnated core.

413 Having particular mounting fastener detail:
This subclass is indented under subclass 400. Subject matter including an end shield having a specific recitation of a means for attaching the end shield to a frame, core or other structure to which the end shield is to be attached.

(1) Note. The particular detail may include recitation of auxiliary or perfecting elements of the fastener, including, but not limited to, o-rings, spacers, nuts, collars, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
403, for an end shield having an integral threaded surface for attaching an end shield to another structure.
404, for an end shield having a folded rim.

414 Core fastener with insulated bushing:
This subclass is indented under subclass 413. Subject matter including an end shield with means to attach the end shield to a core, where the means to attach includes an elongated member capable of extending into and/or through a bore in the core, the elongated member further including an electrically non-conductive sleeve (i.e., bushing) surrounding the elongated member for the purpose of keeping the fastener from directly contacting the bore s surface.

415 Plural distinct mounting fasteners:
This subclass is indented under subclass 413. Subject matter including at least one first structural member (i.e., fastener) for attaching an end shield to a frame or other structure to which the end shield is to be attached, and at least one second fastener in addition to the first mentioned fastener that is characterized by a dissimilar structure or dissimilar fastening mode from that of the first fastener.

416 Having coil lead retainer:
This subclass is indented under subclass 400. Subject matter including an end shield including means for supporting and holding a wire (i.e., lead) that extends from a core winding.

417 Having ventilation hole:
This subclass is indented under subclass 400. Subject matter including an end shield having an opening there through specifically constructed and arranged to provide a passage for heat to escape from the interior of the motor or generator by the passage of air or other heat laden fluid through the end shield.

SEE OR SEARCH THIS CLASS, SUBCLASS:
16, for cooling of a reciprocating motor or generator.
12.29, for cooling of a linear dynamoelectric machine.
52 through 65, for general cooling in a dynamoelectric machine by circulation of a cooling fluid, especially subclass 60, for circulation via hollow passages and subclass 64, for a heat exchange structure in a dynamoelectric machine.
216.014, for a cooling fin on a core having circumferentially offset laminations in a rotary dynamoelectric machine.
216.056, for a cooling fin on a laminated core of a rotary dynamoelectric machine.
216.119, for a cooling channel in the end ring of a core of a rotary dynamoelectric machine.
227, for current collector cooling in a rotary dynamoelectric machine.

418 Frame:
This subclass is indented under subclass 40. Subject matter including a structural element or plurality of interrelated elements, per se, that are constructed and arranged to support a core.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.113 through 216.065, for a core having structure for securing the core to a support structure.

SEE OR SEARCH CLASS:
336, Inductor Devices, subclasses 65 through 68 for mounting or support structure for an inductor.

419 Adjustable:
This subclass is indented under subclass 418. Subject matter including a frame that is repositionable with respect to a supported core, or includes elements that are repositionable with respect to each other.

420 Shaft mounted spider (e.g., spokes):
This subclass is indented under subclass 418. Subject matter including a frame having a plurality of radially extending arms (i.e., spokes) extending from an axle.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.053, for a laminated core having a lamination with an integral spider.

421 Having particular spoke:
This subclass is indented under subclass 420. Subject matter including a specifically recited structural detail of a radial spoke member in the spider.

422 Having particular core securing means:
This subclass is indented under subclass 420. Subject matter including a specifically recited structural detail of a means for connection of a core to its supporting structure.

(1) Note. A core support (e.g., frame) having a means for supporting a nominal core is classified in this and indented subclasses; whereas subject matter including significant core structure adapted for supporting the core via the core structure itself, a detailed structural relationship between a separate fixing means and the core, or a particular structure of the fixing means, per se, are classified elsewhere. See Search Notes, below.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.049 through 216.052, for a laminated core having laminations with integral mounting projections.
216.113, for a core having structure for securing the core to a support structure.

423 Resilient:
This subclass is indented under subclass 422. Subject matter including a core connection having an elastic, springy, or flexible characteristic.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.124, for a resilient mounting means for a core.
431, for a resilient core attachment means associated with a frame other than a spider type frame.

424 Having a particular hub:
This subclass is indented under subclass 420. Subject matter including a specifically recited structural detail of a means for structural connection between a spoke or spokes and the shaft.

425 Base with bearing support:
This subclass is indented under subclass 418. Subject matter including a frame comprising an open platform, stage or foundation (i.e., base) for supporting a core, with at least one structural element extending from the base, the structural element including means for supporting a shaft for sliding movement (i.e., bearing) with respect to the base.

SEE OR SEARCH THIS CLASS, SUBCLASS:
90, and 90.5, for bearing or air-gap adjustment, or bearing lubrication.
401, for an end shield having a bearing support.

426 Leg-supported from base:
This subclass is indented under subclass 418. Subject matter including a frame having a platform, stage or foundation (i.e., base) from which the frame is held by one or more elongated beams (i.e., legs) extending between the base and the frame to hold the frame in spaced relation to the base.

427 Supported by axial bar:
This subclass is indented under subclass 418. Subject matter including a frame having an elongated beam or rail (i.e., bar) connected to the frame in a manner that the bar s longitudinal dimension extends generally parallel to the

line (i.e., axis) about which the rotor rotates, the bar serving to hold the frame in position.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.129, for an axially extended bar for holding core elements together.

428 Axially split frame:
This subclass is indented under subclass 418. Subject matter including a frame having a plurality of sections joined together along a joint or seam that runs generally parallel to a shaft or rotor axis.

(1) Note. A split frame should be distinguished from a pair of end shields joined together, as by axially extending portions of a frame, end shields mated together by a seam generally perpendicular to the rotor axis, etc. A split frame is commonly composed of, for example, half cylinder members joined together along a seam parallel to the rotor axis.

SEE OR SEARCH THIS CLASS, SUBCLASS:
400 through 417, for plural end shields that may be mated to form a frame, or mated to a separate frame.

429 Having air gap:
This subclass is indented under subclass 428. Subject matter including a split frame that does not completely surround its supported core.

(1) Note. The gap may, for example, be positioned between adjacent ends of a pair of sections; as by, for example, two half cylindrical sections being joined only along one axial seam, with their other ends spaced apart.

430 Welded sections:
This subclass is indented under subclass 428. Subject matter including a plurality of frame sections having an axially extending joint united by heat fusion.

431 Having resilient core attachment means:
This subclass is indented under subclass 418. Subject matter including an elastic, springy or flexible member for connecting a core to the frame.

(1) Note. The spring mount is commonly used to support the core in a manner to reduce vibration and/or noise through the machine, to promote cooling ventilation, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.124, for a core structure including a resilient securing means.
423, for a resilient core attachment means associated with a spider type frame.

432 Having axial tie bar for attaching core:
This subclass is indented under subclass 418. Subject matter including an elongated beam mounted on the inner periphery of a frame, and extending along the axial direction of the frame, the bar being connectably engageable with a core for supporting the core from the frame.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.129, for a core having an axially extending bar for holding core elements together.

433 Dovetailed to core:
This subclass is indented under subclass 432. Subject matter including an axial tie bar that is connectably engageable with a core via an interlocking mortise and flaired-tenon joint.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216.051, for a laminated core having dovetail mounting ears.

CROSS-REFERENCE ART COLLECTIONS

The following subclasses are collections of published disclosure pertaining to various aspects of the electrical generator or motor art which aspects do not form an appropriate base for subclass classification in the classification schedule.

(1) Note. Disclosures are placed herein for value as a search aid and in no instance do they represent the entire extent of the prior art.

800 PIEZOELECTRIC POLYMERS (E.G., PVDF):
Polymeric materials which are disclosed as being either inherently piezoelectric or have been treated (e.g., via polarizing) to give them usable piezoelectric properties (for example, PVDF, polyester films, frozen rubber, PVC, etc.).

(1) Note. This cross reference art collection is intended as an aid to the searcher for locating these materials and the structure they are associated with.

FOREIGN ART COLLECTIONS

The definitions below correspond to abolished subclasses from which these collections were formed. See the Foreign Art Collection schedule of this class for specific correspondences. [Note: The titles and definitions for indented art collections include all the details of the one(s) that are hierarchically superior.]

FOR 100 Permanent magnet stator (310/154):
Foreign art collection in which the permanent magnet is the stator of the dynamoelectric machine.

FOR 101 Permanent magnet rotor (310/156):
Foreign art collection having a permanent magnet rotor.

FOR 102 Linear:
Foreign art collection for subject matter in which the dynamoelectric effect takes place between two relatively movable elements which are constrained to substantially straight line motion.

(1) Note. This subclass relates, for example, to devices which normally act only in a single direction such as an aircraft of projectile launching mechanism.

FOR 103 With assembling, metal casting or machining feature:
Foreign art collection for subject matter in which separate means are provided, or in which one or more parts are modified, to facilitate the process of (1) associating together, (2) casting of molten metal, or (3) surface cutting, of one or more of component parts.

FOR 104 Step-by-step:
Foreign art collection for subject matter having means to cause rotation between two or more positions of rest and to stop at a selected position of rest until an adjustment is made which causes rotation to another position of rest.

(1) Note. This subclass relates, for example, to magnetic motors which are in the nature of servo motors or follow-up devices.

FOR 105 Core features:
Foreign art collection for subject matter relating to core features.

FOR 106 Securing laminae:
Foreign art collection for subject matter relating to means for securing laminae.

FOR 107 Pole assembly and securing means:
Foreign art collection for subject matter relating to pole assembly and securing means.

FOR 108 Stator structure:
Foreign art collection for subject matter relating to pole assembly and securing means.

FOR 109 Frame and core type:
Foreign art collection for subject matter relating to stator structure of the frame and separate core type.

FOR 110 Core assembly:
Foreign art collection for subject matter relating to core assembly.

FOR 111 Rotor structure:
Foreign art collection for subject matter relating to rotor structure, per se.

END