March 12, 1940. E. R. KNIGHT 2,193,408

DYNAMO-ELECTRIC MACHINE

Filed March 10, 1937 2 Sheets-Sheet 1

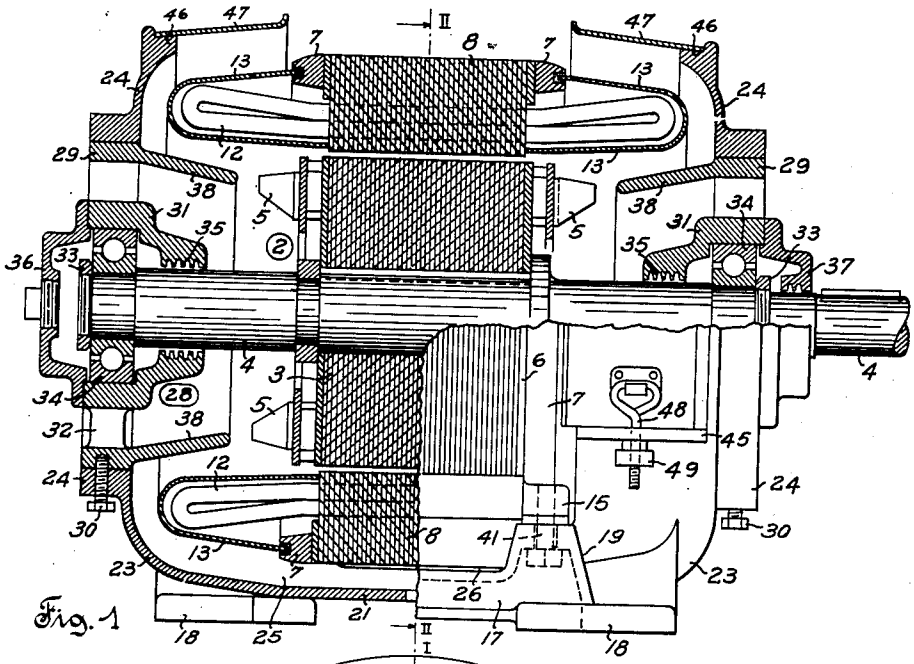


Fig. 1

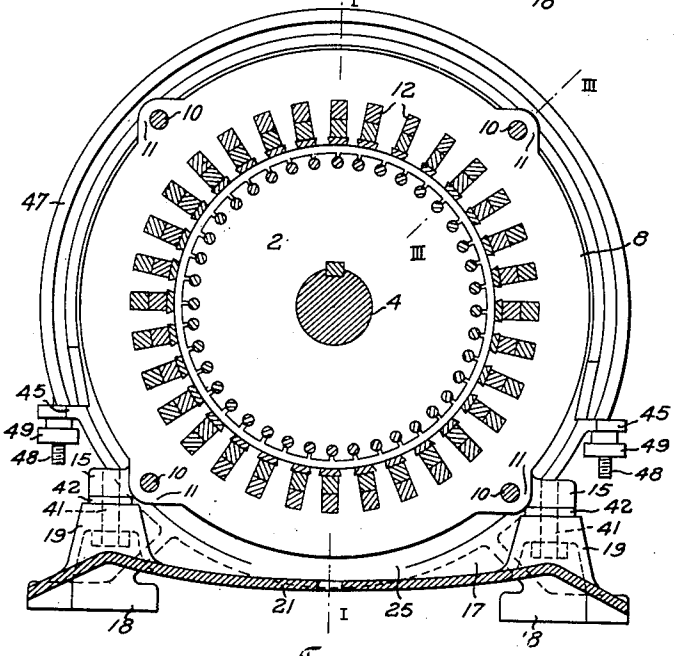


Fig. 2

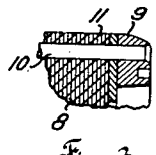


Fig. 3

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March 12, 1940. E. R. KNIGHT 2,193,408

DYNAMO-ELECTRIC MACHINE

Filed March 10, 1937 2 Sheets-Sheet 2

Fig. 4

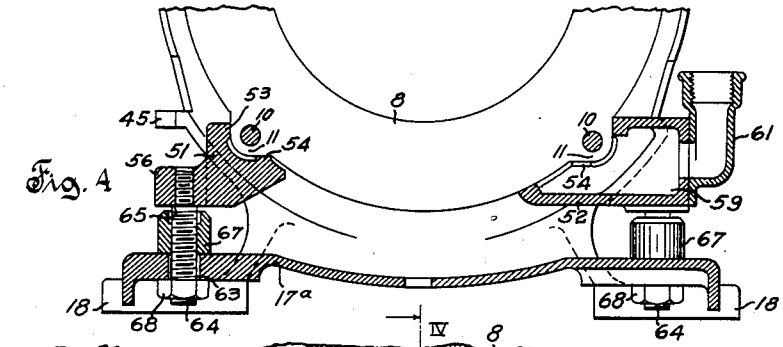


Fig. 5

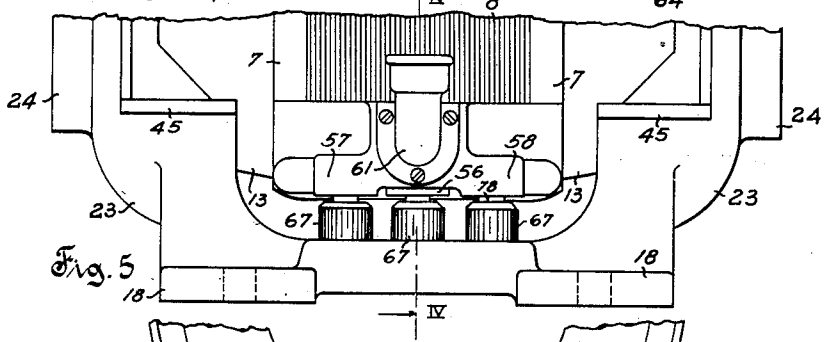


Fig. 6

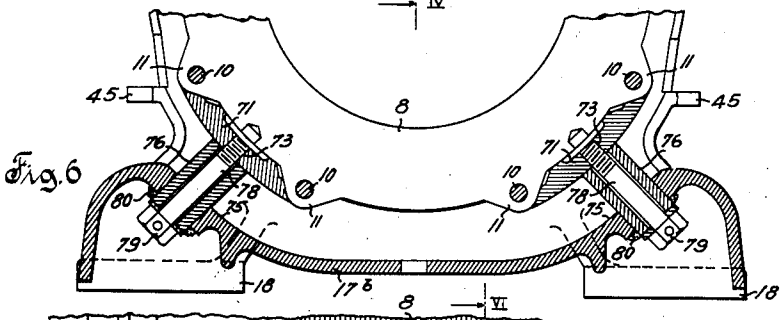


Fig. 7

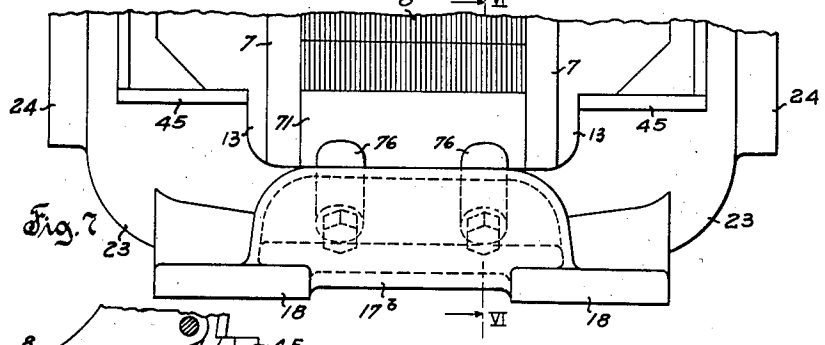
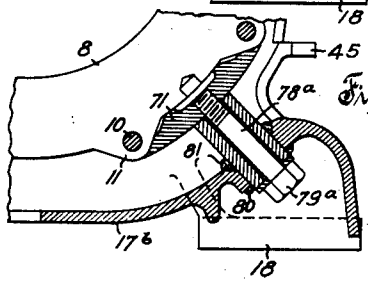


Fig. 8



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UNITED STATES PATENT OFFICE

2,193,408

DYNAMO-ELECTRIC MACHINE

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Application March 10, 1937, Serial No. 130,025

21 Claims. (Cl. 171—252)

This invention relates in general to dynamo-electric machines, and it has more particular relation to such machines of the ventilated type as are designed or intended for use in dust or lint laden atmospheres, as in the case of motors for operation in textile mills, where the lint in the air drawn over the parts of the motor structure clogs the ventilating passages and builds up a coating on parts of the motor structure, which interferes with the ready dissipation of heat from these parts to the ventilating air.

The matter of maintaining dynamo-electric machines, particularly electric motors, ordinarily of the induction type, used for driving machinery in textile mills and like plants, where the air contains a considerable amount of lint or dust, in a clean and relatively cool operating condition without excessive maintenance expense and inconvenience, has long been a considerable problem. In order to maintain an ordinary ventilated motor in efficient operating condition under such circumstances, it must be taken out of service at frequent intervals to permit a thorough cleaning and removal of accumulated lint and dust; and this operation, in addition to being a decided inconvenience and often resulting in rendering the driven machinery idle, is a considerable item of maintenance expense.

The present invention contemplates a design and construction of dynamo-electric machine of the ventilated type, wherein effective provisions are made for preventing or inhibiting the lodging of particles of lint or dust from the stream of ventilating air upon parts of the motor with which the moving current of ventilating air contacts and wherein ready inspection and access to the ventilating passages and parts of the motor, without removal of the machine from service, is permitted. And through the present invention, it is possible to secure these desirable results with a design and a construction of machine which is extremely simple and which permits ready assembling and disassembling of the motor, and through which, because of the substantial freedom of obstructions in the ventilating passages, the machine is practically self-cleaning during regular service, by reason of the forced passage therethrough of a substantially unobstructed flow of air.

Certain advantages of the present invention are secured by independently supporting the stator and rotor of the machine on the machine base, and by providing a form of support for the stator which insures a large area of ventilating space about the stator, and particularly about the lower portion thereof, where great liability to obstruction of air passages by lint and dust has heretofore existed in prior designs, with minimum obstruction to the flow of ventilating air and minimum tendency to catch and hold particles of lint or dust, and in providing end closures of a character that insure maximum facility for inspection and cleaning of the machine while in service and for ready disassembly of the machine.

It is an object of the present invention to provide a dynamo-electric machine of the ventilated type of improved design and construction and embodying features facilitating effective cooling of the machine and maintaining it in clean condition in service.

It is a further object of the present invention to provide an improved design and construction of dynamo-electric machine of the ventilated type providing minimum obstruction to the passage of ventilating air across heated surfaces of the stator of the machine and the discharge of heated air therefrom, and maximum ready accessibility to interior parts of the machine.

It is a further object of the present invention to provide an improved design and construction of dynamo-electric machine of the ventilated type embodying a stator element removably supported only at spaced points on a base and end housings supported on the base independently of the stator, providing ventilating air passages across the entire periphery of the stator element with minimum obstruction to the flow of the ventilating air.

The above and other objects and advantages attained through the present invention will be apparent from the description and drawings herein, disclosing embodiments of features of the invention, and will be more particularly pointed out in the claims.

In the drawings:

Figure 1 is a view in vertical section, in the plane of the line I—I of Fig. 2, with portions shown in elevation, of a dynamo-electric machine embodying features of the present invention;

Fig. 2 is a sectional view, in the plane of the line II—II of Fig. 1;

Fig. 3 is a fragmental section in the plane of the line III—III of Fig. 2, showing a detail;

Figs. 4 and 5 are views in broken section and elevation, respectively, of a somewhat modified form of the machine of Figs. 1 and 2, the section of Fig. 4 being in the plane of the line IV—IV of Fig. 5;

Figs. 6 and 7 are views in broken section and elevation, respectively, of a modified form of the machine of Figs. 1, 2, 4 and 5, as to the stator mounting thereof, the section of Fig. 6 being in the plane of the line VI—VI of Fig. 7; and

Fig. 8 is a fragmental view similar to Fig. 6, showing a further modified form of stator mounting.

The invention is applied, in the embodiments thereof illustrated in the drawings, to an induction motor such as is particularly applicable for driving textile machinery.

Considering Figs. 1 and 2 more particularly, the rotor 2 may be of conventional design, embodying a core 3 having slots at or adjacent its periphery and in which are disposed conductor bars of a squirrel cage winding, the core being suitably mounted, as by means of a key, and held against longitudinal movement, on a shaft 4. A ventilating fan 5 including a plurality of blades, of the substantially axial inflow and radial discharge type, is provided at each end of the rotor core.

The active stator 6 of the motor is made up of a plurality of annular laminae pressed and held together by end heads or clamping rings 7 to form the core 8, the laminae being secured together and to the end heads by bolts or rods riveted or otherwise secured in conventional manner. In the form shown, the end heads 7 are provided with spaced apertured peripheral enlargements 9, and the ends of clamping bolts 10, passing through these peripheral enlargements and corresponding peripheral enlargements 11 of the stator core laminae, are secured to the end heads 6 by riveting, welding, or like method, to provide a compact and solid structure. The outer periphery of the end heads, with the peripheral enlargements thereof, are preferably rounded over in smooth curves, as indicated in Figs. 1 and 3, so as to easily merge into the outer periphery of the adjacent portions of the core, thus eliminating obstructions to flow of ventilating air along the surfaces and avoiding pockets in which lint or dust, carried by the ventilating air, might lodge.

A conventional form of distributed type winding 12 is disposed and secured in slots at the inner periphery of the stator core, the end projecting turns of the winding being enclosed within relatively stiff, thin protecting shields 13, preferably of insulating composition, of channel or V-shape in cross section, with the open edges at the side adjacent the stator core. The inside surface of each protecting shield conforms to and fits quite closely about the outline of the end turns, and the shields are held in position by having the radially outer edges thereof secured to the adjacent end head, as by cementing such edge to the adjacent face of the end head, and the inner edge of the shield is preferably cemented to the adjacent end laminae of the core and preferably to adjacent portions of the radially inner surface of the extending end turns. Through the arrangement described, the end protecting shields provide an enclosing housing for the end turns of the winding, with smooth and easily curving exterior which eliminates pockets and obstructions to the ventilating air stream, as well as protecting the windings from an accumulation of lint and dirt thereon which would retard the ready dissipation of heat from the windings; and the material utilized in these protective shields, as well as the reduced thickness thereof, are such as not to offer any appreciable hindrance to the ready dissipation of heat from the windings to the outer surfaces of the shields.

Each end head is provided at its lower portion with two supporting lugs or projections 15, one at the rear and one at the front side of the stator, shown as extending laterally from the end heads, and disposed with their lower or seating surfaces arranged in substantially the same plane, these lugs being disposed substantially equidistant from the vertical central longitudinal plane of the stator. These supporting lugs are provided with vertical, preferably threaded, apertures.

A base 17 is provided, the same having supporting feet 18 at its lower side and raised projections or pedestal-like supports 19 suitably spaced and disposed to constitute seats on which the supporting lugs 15 of the stator may seat and the stator may thereby be suitably positioned relative to the base.

The body portion of the base comprises a central basin-like portion 21 and outwardly extending and upwardly curving end portions 23 constituting, along with the annular frame-like element 24 extending upwardly therefrom and laterally clear of the stator, portions of end housings or closures of the machine, these annular frame portions 24 also serving, as described hereinafter, as supports for bearings for the rotor shaft 4. As will be apparent from the drawings, with these supporting lugs 15 of the stator properly seated on the spaced seating projections 19 of the base, the stator is spaced at all points from the base to a substantial degree, except at the seating projections 19, thus providing enlarged passages 25 between the base and the under side of the stator; and the assembled stator may be readily withdrawn, in a substantially vertical direction, from its operative position on the base and between the end frames 24, to a point outside of the base and end frames, for any purpose, such as inspection or repair of the stator windings. And the axial dimension of the assembled stator may be slightly greater than the minimum axial distance between the upper portions of the end frames 24 and still permit the substantially vertical removal of the stator and its insertion to operative position on the base, in this case the substantial space between the end shields 13 of the stator and the end frames permitting the necessary tilting of the stator to permit its movement between the upper portions of the end frames.

Particularly where it is contemplated that cooling air will be forced about the exterior of the stator from both axial sides toward the central portion thereof, as is contemplated in connection with the machine illustrated, the front edge, as viewed in Fig. 1, of the base, is thoroughly open to the surrounding atmosphere, as indicated at 26, between the adjacent seating pedestals 19.

An annular bearing support 28 is removably mounted in position in each of the annular supporting frame portions 24 carried by the end extensions of the base. This bearing support comprises an outer rim portion 29 seated preferably with a machined fit, in the supporting frame, and being held in fixed position in the frame by one or more holding screws 30. The diameter of the opening in the end frames in which the bearing supports fit is greater than the maximum diameter of the rotor so as to permit removal or insertion of the latter through one of these openings when the corresponding bearing support is removed. Radially within the rim 29 and spaced therefrom is a bearing housing proper 31, the latter being united to the rim 29 by circumferentially

spaced ribs 32, the spaces between the ribs being of sufficient cross sectional area to provide an axial inlet for ventilating air currents to be supplied for cooling the machine. Within the housing 31 is mounted a conventional form of bearing 34, indicated as being of the ball type and comprising a series of bearing balls disposed in a race fixed in position in the bearing housing and cooperating with a complementary race held in position on the shaft 4 in suitable manner, as by means of a nut or collar threaded on the shaft. A sealing device 35 for lubricating material is formed integral with the bearing housing at the axially inner side thereof, the shaft 4 passing therethrough in desired fluid-tight sealing engagement therewith. The bearing housing at the left hand end of the machine may be closed by a removable end cap 36, and the bearing housing at the right hand end of the machine may have a removable annular sealing device 37 through which the shaft 4 passes in effective fluid sealing relation therewith.

The rim 29 is provided with an integral annular extension 38 at its inner side projecting toward the rotor 2, but inclined slightly toward the axis of the motor, to a point adjacent the blades of the fan 5, this annular extension serving as a shield or guide defining an inlet passage from the apertures between the ribs 32 of the bearing support to the fan 5; and this shield, in conjunction with the radially inner side of the protecting shield 13, also defines the passage from the discharge edge of the fan toward the end housing frame 23, 24 carried by the base.

The stator 6 is held in desired operative position on the base 17 by means of threaded bolts 41 passing upwardly through apertures in the seating pedestals or supports 19 and threaded into the threaded apertures of the supporting projections or lugs 15 on the end heads 7, the bolts being threaded home to desired firm securing position. In order to insure proper axial alinement of the stator and rotor and the desired uniform air gap between these parts, one or more shims, indicated at 42, may, if necessary, be disposed between the seating faces of the supporting pedestals 19 of the base and the supporting lugs 15 of the stator. With the stator adjusted to and secured in desired operative position, the parts may, if desired, be definitely held in this position in any suitable manner.

The end housing portions 23 integral with the base are provided with supporting ledges, indicated at 45, at their forward and rear sides, and the annular end housing frames 24 extending vertically from the portions 23, are each formed with an external shouldered seat, indicated at 46. A removable and slightly flexible shield or closure element 47 of generally arc shape has its lower ends or edges seated at the front and rear ledges 45 with its axially outer edge portion seated on the shouldered seat 46 of the end head 24. This shield 47 preferably slightly enlarges, and may be slightly bell shaped, toward its axially inner edge, and the dimensions of the parts are such that this shield or closure element is spaced from the outer surface of the protecting shield 13 to substantially the same extent as the lower portion 23 of the end housing and the base 17 is spaced from the lower side of the shield and core. The removable closure element 47 may be secured in desired operative position by means of bolts 48, having a removable bail connection to hooks on the lower portions of the closure and fitting in apertures in the ledges 45 on the housing portions 23 integral with the base; and an adjustable locking nut 49 serves, when the upper bail end of the bolt is in engagement with its cooperative hook on the lower end of the closure element, to draw the latter down into and hold the same in desired secure seating and sealing arrangement on the end housing frame, the locking nut 49 bearing on the under side of the ledge 45 directly or through the intermediary of a bearing washer.

With the parts assembled in the manner described, the stator core and windings are spaced to a substantial degree from the detachable closure elements 47 and the base, with its integral end housing portions 23, 24, except at four spaced points where the stator is supported on the base. There is thus provided a substantially unobstructed and clear passage or path for ventilating air from the inlet, between the ribs 32 of the bearing support, to the fans 5, about the end turns of the stator, to the discharge from the space between the outer surface of the stator and the removable closure elements 47, and the base 17, at the lower side of the machine.

In the operation of this embodiment of the invention, air is drawn into the machine through the openings between the ribs 32 of the bearing housing support and is guided by the shield or guide 38 to the fans 5, and is discharged from the fans in contact with the protecting shields 13, to permit ready removal of heat therefrom, and is guided by the radially outer surface of the guides 38 and the inner surfaces of the adjacent end head portions 23, 24 and the base 17 and removable closure elements 47, discharging substantially axially therefrom across the outer periphery of the stator core in intimate heat dissipating engagement therewith, before finally discharging to the surrounding atmosphere. The cooling air passing over the outer surfaces of the protecting shields 13 and the stator core at the lower side of the machine is eventually turned at right angles and discharged over the open front and rear edges of the central portion of the base.

In order to reduce to a minimum the impeding effect to the passage of air the supporting lugs 15 on the stator and the seating projections 19 on the base, the outer surfaces of these lugs or projections are preferably of easily rounded shape to avoid the formation of pockets.

As will be apparent, the design of the several parts includes the provision of continuous air passages from the air inlet to the machine to the air discharge therefrom, without the presence of any appreciable projections or pockets which would catch and hold lint or dirt carried by the stream of cooling air and permit the building up of coverings of lint and dirt which would reduce the heat dissipation from the heated surfaces, and likewise reduce the effective size of the ventilating passages, the design being such as to be practically self-cleaning in service, in that any lint or dust with which the cooling air may be laden is carried along through the ventilating passages and discharged from the machine while still suspended in the cooling air.

It will be apparent that the removable end closures 47 may be detached and removed from operative position at any time, leaving the machine almost fully open to inspection as to the condition of the ventilating passages, and this without removing the motor from active service.

In case an intimate inspection or repair of the motor is desired, the bearing supports, with the bearings therein may be removed, after removal of one of the securing nuts which hold the bearing in position on the shaft. And with one or both of the bearing housing supports removed, the rotor with the shaft on which it is mounted may be readily removed endwise through one of the end head frames 24, the diameter of the opening in the end frame being greater than the diameter of the rotor core. Or the bearing supports may be removed with the shaft and bearings. The matter of reassembling the machine, by inserting the rotor through the opening in the end frame 24 will be fully apparent from the description hereinabove as to disassembling the machine. If it is desirable to inspect or repair the stator windings while the rotor is removed from the supporting structure, the stator may be drawn upwardly from the space between the end frames, and thereafter replaced in operative position, as will be apparent from the description hereinabove.

In Figs. 4 and 5, a modified form of stator supporting means for the machine of Fig. 1 is shown. As indicated, the supporting portions of the stator, instead of being in the form of lugs 15 on the end heads, as shown in Fig. 1, are in the form of supports 51, 52 secured to the core structure 8 near the lower side thereof at opposite sides of the vertical axial plane of the machine. The support 51 at the rear side of the machine is shown as a casting or stamping having seating shoulders 53, 54 engaging the stator core 8 on opposite sides of a peripheral enlargement 11 of the core, the element 51 preferably extending across the full length of the core and over or into engagement with the end heads 7, and being secured to the core and end heads as by welding thereto. This element 51 is provided with a substantially horizontally extending projection 56 disposed at a point located centrally between the ends of the stator core, and this projection 56 is provided with a threaded aperture.

A supporting element 52 is disposed in position on the core 8 at the front side thereof and is secured in position to the core and end heads in the same manner as described with respect to the element 51. This element 52 is provided adjacent each end with horizontal projections 57, 58 extending outwardly from the body portion of the element. The central portion of the element 52 is hollow, as indicated at 59, providing a space for reception of leads from the stator winding, these leads being brought out through a detachable conduit outlet connection 61.

The under side of the supporting lugs or projections 56, 57, 58 are provided with machined faces. The base 17a is provided with apertures 63 for reception of supporting bolts or studs 64, the latter fitting fairly closely, but still being slidable, in the apertures 63. The upper end of each stud 64 is of reduced diameter and threaded, providing a shoulder 65 which, when the reduced end portions of the studs are threaded into the apertures of the seating projection 56, 57, 58, the shoulder sits solidly against the under side of the projection. Once the stud 64 is screwed into normal position, with the shoulder 65 of the stud bearing firmly against its seat on the lower face of the supporting lug, the stud may be held securely in this position in any suitable manner. An adjusting nut 67 is provided on each stud 64 above the base, and a locking nut 68 is also provided on each stud below the base. With the adjusting nut seating on the upper surface of the base, it acts as a support for the stud and stator connected thereto; and the locking nut 68, when turned up against the under side of the base, secures the stud and parts carried thereby in adjustably fixed position.

With the stator supporting arrangement of Figs. 4 and 5, it will be apparent that each of the supporting studs 64 may be adjusted independently, through its adjusting nut 67 and locking nut 68, to secure any desired suitable positioning of the stator and air gap clearance.

While but a single supporting lug 56 is provided at the rear of the motor, thus providing, in conjunction with the two supporting lugs 57, 58 at the front side of the motor, a three point support for the stator on the base 17a, it will be apparent that a four point support may as readily be secured, by providing two supporting lugs, instead of the single supporting lug 56, at the rear side of the motor, these lugs being spaced apart in the same manner as the lugs 57, 58 on the supporting element 52 at the front side of the motor.

As described in connection with Figs. 1 and 2, the external surfaces of the supporting elements 51, 52, in the path of the streams of ventilating air entering through the annular end frames or closures 24 and passing over the protecting shields 13 and the stator core, are rounded along smooth curves, and the adjustable supporting nuts 67 are preferably of annular cross section, so as to present a minimum of obstruction to the flow of such ventilating currents and to avoid pockets in which lint and dust may accumulate and build up.

With the described arrangement, it will be apparent that the stator is supported in adjustably fixed position on the base and in desired spaced relation thereto, to provide for a maximum freedom of flow of ventilating air about all parts of the stator and through a path which affords minimum obstruction to such flow, with the advantage that the machine, in operation will be practically self-cleaning, as in the case of the machine of Figs. 1 and 2, in the matter of carrying along with the air streams any lint or dust particles suspended therein.

In Figs. 6 and 7, a further modified form of stator support is shown. As indicated in the drawings, the stator supports include supporting elements 71 in the form of wedgelike braces extending between the end heads 7, each having its longitudinal edges beveled to fit against the opposing sides of two adjacent peripheral enlargements 11 at the lower side of the core, and the supporting elements being secured in position on the core, as by welding the edges of such elements to the adjacent portions of the core and end heads. Each supporting element is provided with two threaded apertures 73, spaced in the direction of the axis of the machine, which may extend into the material of the core, the apertures having their axes substantially in radial planes of the core. The outer faces of the supporting elements 71 are preferably provided with machined seats in the vicinity of the apertures, and these seats are preferably portions of a cylindrical surface described about the axis of the machine as a center.

The forward and rear edges of the base 17b at the central portion thereof may extend upwardly to a slight extent, as indicated at 75 and the outer edges of these extensions extend downwardly, providing a hollow space beneath.

These portions 75 are each provided with two supporting pedestals 76, preferably of cylindrical outline, and each having its axis in a radial plane of the machine, the positioning and spacing of the pedestals being such as to correspond with the apertures 73 in the supporting elements 71 of the stator. The ends of the pedestals adjacent the stator are machined to provide seating surfaces similar to the corresponding seating surfaces on the supporting elements 71 about the apertures 73 therein.

The stator is secured in position on the pedestals 76 and in desired spaced relation to the base through bolts or studs 78 passing freely through, but preferably with a fairly close fit in, the supporting pedestals 76 and threaded into the apertures 73 of the supporting elements 71, as by a nut 79 fixed on the lower end of the stud and serving as a head therefor, so that the supporting elements can be drawn into and secured in desired seating engagement upon the corresponding pairs of pedestals 76. Minor adjustments of the seating position of the stator on the base, so as to insure uniform air gap, may be secured by inserting shims about the bolts 78 between the pedestals 76 and the supporting elements 71.

As a matter of facilitating commercial production of the base, with its supporting pedestals 76, the base may be cast or pressed without the pedestals, apertures being provided at the points corresponding to the desired positions of such pedestals. And the pedestals, in the form of sleeves, may have their lower ends secured, as by welding, as indicated at 80, to the adjacent portions of the base, in desired position within these apertures, with the extreme lower end of the pedestals protruding slightly beyond the material about the apertures in the base. With limited clearance below the pedestals, the studs 78, without heads, may be inserted downwardly through the hollow pedestals after the same are secured in position on the base, and adjusting nuts 79 then pinned or otherwise secured to the lower ends of the studs. Or, as shown in Fig. 8, bolts 78^a, with integral heads 79^a, may be used; and in this latter case, these bolts 78^a, with their heads of such size as to readily pass through the openings in the base portions 75 in which the pedestals are secured, may be inserted in the pedestals before the pedestals are mounted and fixedly secured, as by welding, as indicated at 81, in position on the base.

The matter of assembling and disassembling the machines of Figs. 4, 5, 6 and 7 and the paths of the ventilating air streams therethrough will be fully apparent from the description hereinabove in connection with the machine of Figs. 1 and 2 as to corresponding features of such machine.

Through use of features of the present invention, it is possible to provide an efficiently ventilated dynamo-electric machine wherein minimum obstruction or hindrance is offered to the passage of ventilating air and there is minimum tendency of lint or dust carried by the air becoming lodged on parts of the machine and thus interfering with the desired heat dissipating effects, and wherein maximum facility is provided for inspecting, repairing and cleaning parts of the machine, and, in many cases, even without taking the machine out of operating service.

It should be understood that the invention claimed is not limited to the exact details of design and construction illustrated and described herein, for obvious modification within the scope of the appended claims will be apparent to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. In combination in a dynamo-electric machine, a supporting base having apertured annular end frames carried thereby and integral therewith and constituting a portion of a housing for the machine, a stator element detachably mounted on said base at spaced points of support thereon and wholly at the lower side of said stator, the lower surface of said stator element and the upper surface of said base constituting a ventilating space extending throughout the major portion of the distance from front to rear of said base, a rotor element within said stator element and rotatably mounted on said end frames and removable axially from operative position through one of said apertured end frames, said stator element being mounted on said base independently of said end frames and being bodily removable from the space between said end frames through movement of the stator in a direction transverse to the axis of the machine, and means associated with said rotor for forcing a cooling gas through said space between said stator element and said base and about said stator element.

2. In combination in a dynamo-electric machine, a supporting base having upward extensions adjacent its ends carrying annular end housing frames, bearing supports detachably mounted in said end housing frames, a stator element detachably mounted in position on the central portion of said base on spaced raised seats thereon and independently of said end housing frames and providing a spaced relation of said stator element to said base over the major portion of the periphery of said stator element adjacent said base, said stator element being disposed axially within said end housing frames and being bodily removable upwardly from said base to a point outside of said end housing frames, while said end housing frames are in normal position on said base, and a rotor element within said stator element and rotatably supported in bearings carried by said bearing supports, said rotor being removable endwise from within said stator element through an end housing frame after removal of the bearing support therefrom.

3. In combination in a dynamo-electric machine, a supporting base having upward extensions adjacent its ends carrying annular end housing frames, bearing supports detachably mounted in said end housing frames, a stator element detachably mounted in position on the central portion of said base at spaced points thereon and independently of said end housing frames and providing a spaced relation of said stator element to said base over the major portion of the periphery of said stator element adjacent said base, said supporting base with its end housing frames being open at the upper side thereof to permit bodily removal of said stator element from operative position by movement of said stator element in an upward direction, a rotor element within said stator element and rotatably supported in bearings carried by said bearing supports, said bearing supports being provided with through apertures, and fan means carried by said rotor element and operative to draw air through one of said bearing supports

and to force the same over the surface of said stator element.

4. In combination in a dynamo-electric machine, a supporting base having upward extensions adjacent its ends carrying annular end housing frames, bearing supports detachably mounted in said end housing frames, a stator element detachably mounted in position on the central portion of said base at spaced points thereon through the intermediary of spaced raised seats on said base and independently of said end housing frames and providing a spaced relation of said stator element to said base over the major portion of the periphery of said stator element adjacent said base, said stator element being disposed axially within said end housing frames and being removable from said base to a point outside of said end housing frames, a rotor element within said stator element and rotatably supported in bearings carried by said bearing supports, said rotor being removable endwise from within said stator element through an end housing frame after removal therefrom of the bearing support carried thereby, said bearing support being provided with through apertures and having an inwardly extending shield for directing air passing through said bearing housing support, and fan means carried by said rotor for drawing air through said apertures in said bearing support and forcing said air between said stator element and said base and over said stator element.

5. In a dynamo-electric machine, a supporting base having annular end frames integral with end portions of said base and provided with removable supports for bearings for rotatably supporting the rotor of the machine, a stator element mounted in position on said base independently of said end frames and disposed over the central portion of said base and between said end frames and in spaced relation to said base, said stator element being provided with spaced and apertured seating portions at its forward and rear sides, said base being provided with apertured seating pedestals adjacent its forward and rear sides, and headed studs within said apertures of said pedestals and threaded into the apertures of said seating portions of said stator element and serving to draw and removably hold said stator element in secure seating engagement on said pedestals.

6. In a dynamo-electric machine, a supporting base having end frames fixedly connected to end portions of said base and provided with removable supports for bearings for rotatably supporting the rotor of the machine, a stator element mounted in position on said base independently of said end frames and disposed over the central portion of said base and between said end frames and in spaced relation to said base, said stator element being provided with spaced seating portions at its forward and rear sides, said base being provided with corresponding spaced seating pedestals adjacent its forward and rear sides, said pedestals being provided with axially disposed apertures, the seating faces of said pedestals and the cooperative seating portions of said stator element at one side of the vertical axial plane of the machine being at an angle to the corresponding seating surfaces at the other side of said plane, and means for removably securing said stator element in position with the seating portions of said element in seating engagement on the pedestals of said base.

7. In a dynamo-electric machine, a supporting base having annular end frames fixedly connected to the end portions of said base and provided with removable supports for bearings for rotatably supporting the rotor of the machine, the stator element comprising a winding and a laminated core carrying said winding and secured between relatively stiff end heads separate and spaced from said end frames, the central portion of said base being provided with spaced raised seating portions adjacent its forward and rear edges, said end heads being provided with corresponding spaced seating portions adjacent the forward and rear sides of the stator element, and means for detachably securing said stator element in operative position on and in spaced relation to said base with the spaced seating portions of said end heads in seating engagement with the seating portions of said base, said supporting base with its end frames being open at its upper side to permit bodily removal and replacement of said stator element with respect to said supporting base by movement of said stator element in a direction transverse to the axis of rotation of the machine.

8. In combination in a dynamo-electric machine, a supporting base having end housing frames fixedly connected to the end portions of said base and provided with alined apertures, a stator element separate and spaced from said end frames and mounted independently thereof in position over the central portion of said base and in spaced relation thereto, bearing supports removably mounted in said end frames, a rotor element comprising a core mounted on a shaft rotatably carried in bearings mounted on said supports, removable end closures mounted on said end frames and projecting inwardly over extending end portions of said stator element and spaced throughout from said stator element, and fan means mounted on said rotor operative to provide a circulation of air within said end closures and over the entire exterior of said stator element.

9. In combination in a dynamo-electric machine, a supporting base having end frames fixedly connected to the end portions of said base and provided with alined apertures, a stator element comprising a core provided with windings having projecting end turns, said stator element being detachably mounted in position over an intermediate portion of said base and in spaced relation thereto, apertured bearing supports removably mounted in said end frames, a rotor element comprising a core mounted on a shaft rotatably carried in bearings on said bearing support, removable closures mounted on said end frames and removably attached to end portions of said base and projecting inwardly over the extending end portions of said stator to a point adjacent said stator core and spaced throughout from said stator, said removable closures in conjunction with the adjacent end portions of said base enclosing the projecting end turns of said winding over the full circumference thereof, and means mounted on said rotor at each side of the core thereof and operative to provide a circulation of air inwardly through the openings in said bearing supports and about the radially inner and outer surfaces of the end portions of said stator and to discharge said air outwardly from the stator core.

10. In combination in a dynamo-electric machine, a supporting base having annular end frames fixedly connected to the end portions of said base and provided with alined apertures, a

stator element comprising a core provided with windings having projecting end turns, said stator element being detachably mounted in position over an intermediate portion of said base and in spaced relation thereto and independently of said end frames, bearing supports removably mounted in the apertures of said end frames, a rotor element comprising a core mounted on a shaft rotatably carried in bearings mounted on said bearing supports, removable closures mounted on said end frames and projecting inwardly over the extending end portions of said stator element to a point adjacent said stator core and spaced throughout from said stator element, and fan means mounted on said rotor at each side of the core thereof and operative to provide a circulation of air about the radially inner and outer surfaces of the end portions of said stator element and to discharge said air outwardly from the stator core.

11. In combination in a dynamo-electric machine, a supporting base having annular end frames fixedly connected to the end portions of said base and provided with alined apertures, a stator element comprising a core provided with windings having projecting end turns, protecting shields of substantially U-shape in cross section enclosing said projecting end turns, said stator element being detachably mounted in position independently of said end frames and disposed over the central portion of said base and in spaced relation thereto, the means for mounting said stator on said base comprising spaced pedestals on one of said parts adjacent the front and rear sides thereof and engaging and detachably secured to correspondingly spaced seating portions on the other part, the cross section of said pedestals and the spacing thereof being such as to permit passage of air axially across substantially the full periphery of said stator adjacent said base, apertured bearing supports removably mounted in said end frames, a rotor element comprising a core mounted on a shaft, said shaft being mounted in bearings carried by said bearing supports, said rotor element being of a maximum diameter less than the diameter of the opening in one of said end frames and being removable through said end frame on removal of the bearing support therefrom, removable closures mounted on said end frames and projecting inwardly over said protecting shields for the stator winding to a point adjacent the stator core and being spaced at all points from the stator element, and fan means mounted on said rotor and operative to provide a circulation of air inwardly through the apertures in said bearing supports and about the radially inner and outer surfaces of said protecting shields and over all portions of the outer periphery of said stator core.

12. In combination in a dynamo-electric machine, a supporting base having end frames integral with the end portions of said base and provided with alined apertures, the end portions of said base adjacent said end frames rising upwardly above the body portion of said base at the forward and rear sides of the base, a stator element comprising a core provided with windings having projecting end turns, said stator element being detachably mounted in position on said base independently of said end frames and disposed over the central portion of said base and in spaced relation thereto throughout, apertured bearing supports removably mounted in said end frames, a rotor element comprising a core mounted on a shaft, said shaft being mounted in bearings carried by said bearing supports, arc-shaped removable closures mounted on said end frames and detachably secured to said upwardly rising end portions of said base and projecting inwardly over the extending end portions of said stator to a point adjacent the stator core and being spaced at all points from the stator element, said removable end closures in conjunction with the adjacent upwardly extending end portions of the base enclosing the end portions of said stator element over the full periphery thereof, and fan means mounted on said rotor and operative to provide the circulation of air inwardly through the openings in said bearing supports and about the radially inner and outer surfaces of the end portions of the stator and over all portions of the outer periphery of the stator core, and to discharge said air outwardly from the stator core at all points.

13. In a dynamo-electric machine, a supporting base, a stator element having extending end portions and removably mounted in fixed position over an intermediate portion of said base in spaced relation thereto, one of said parts being provided with a plurality of seating pedestals disposed at its forward and rear portions, and the other part being provided with correspondingly spaced seating portions, the front and rear edges of said base at said intermediate portion thereof being open to provide access to the space between said base and said stator element, end portions of said base at the front and rear sides thereof being provided with integrally formed upwardly extending curved walls gradually merging into the adjacent portion of said base, and annular end frames having integrally formed curved lower portions which gradually merge into the adjacent portions of said base and said upwardly extending walls rising from the end portions of said base, bearing housings detachably mounted in the openings of said end frames, a rotor comprising a core mounted on a shaft rotatably mounted in bearings carried by said bearing housings, and arc-shaped end closures removably supported on said end frames and said upwardly extending projections at the end portions of the base and projecting over and spaced from the extending end portions of said stator.

14. In a dynamo-electric machine, a supporting base, a stator element having extending end portions and removably mounted in fixed position over an intermediate portion of said base in spaced relation thereto, one of said parts being provided with a plurality of seating pedestals disposed at its forward and rear portions, and the other part being provided with correspondingly spaced seating portions, the front and rear edges of said base at said intermediate portion thereof being open to provide access to the space between said base and said stator element, end portions of said base at the front and rear sides thereof being provided with integrally formed upwardly extending curved walls gradually merging into the adjacent portion of said base, and annular end frames having integrally formed curved lower portions which gradually merge into the adjacent portions of said base and said upwardly extending walls rising from the end portions of said base, bearing housings detachably mounted in the openings of said end frames, a rotor comprising a core mounted on a shaft rotatably mounted in bearings carried by said bearing housings, arc-shaped end closures removably supported on said end frames and said

upwardly extending projections at the end portions of the base and projecting over and spaced from the extending end portions of said stator, and fan means mounted on said rotor at each side thereof and operative to cause a circulation of air inwardly through openings in said end frames and thence about the extending end portions of said stator element.

15. In combination in a dynamo-electric machine, a supporting base having spaced end housing frames of unitary construction therewith, a stator element comprising a core and windings thereon, said stator element being detachably mounted on said base in spaced relation thereto and intermediate and independently of said end frames, said supporting base with its end housing frames being open at the upper side thereof to permit bodily removal of said stator element from operative position through movement of said stator element in a direction transverse to the axis of rotation of the machine, a rotor element within said stator element and rotatably mounted in said end frames, and means for causing circulation of cooling gas about the extending end portions of the winding of said stator element and through the space between said stator element and said base.

16. In combination in a dynamo-electric machine, a supporting base having spaced end housing frames of unitary construction therewith, a stator element comprising a core and windings thereon, said stator element being detachably mounted on said base in spaced relation thereto and intermediate and independently of said end frames, said supporting base with its end housing frames being open at the upper side thereof to permit bodily removal of said stator element from operative position through movement of said stator element in a direction transverse to the axis of rotation of the machine, a rotor element within said stator element and rotatably mounted in said end frames, end shields detachably mounted on said end frames to close the opening in the upper portion thereof and serving therewith to provide an enclosure for the extending end portions of the stator winding and spaced from said stator element throughout, and means for causing the circulation of cooling gas about the extending end portions of said stator element and through the space between the latter and said base.

17. In combination in a dynamo-electric machine, supporting means having spaced end housing frames thereon, a stator element comprising a core and windings thereon, said windings extending axially within said end housing frames, said stator element being detachably mounted on said supporting means in spaced relation to and independently of said end frames and above the portion of said supporting means intermediate said end frames, said end housing frames being open at the upper side thereof to permit bodily removal of said stator element from operative position by upward movement of said stator element, a rotor element within said stator element and rotatably mounted in said end frames, and means for causing the circulation of cooling gas about the extending end portions of the winding of said stator element and through the space between the latter and said supporting means.

18. In combination in a dynamo-electric machine, supporting means having spaced end housing frames thereon, said stator element comprising a core and windings thereon, said stator element being mounted on said supporting means in spaced relation thereto and intermediate and independently of said end frames, a portion of the windings of said stator element projecting axially within said end housing frames, and said end housing frames being open at the upper side thereof to permit bodily removal of said stator element from operative position by movement in a direction transverse to the axis of rotation of the machine, a rotor element within said stator element and rotatably mounted in said end frames, end shields detachably mounted on said end frames to close the openings in the upper portion thereof and serving therewith to provide an enclosure for the extending end portions of the winding of said stator element and spaced from said stator element throughout, and means for causing the circulation of cooling gas about the extending end portions of said stator element and through the space between the latter and said supporting means and end shields.

19. In combination in a dynamo-electric machine, a supporting base having spaced end housing frames mounted thereon, a stator element comprising a core and windings thereon and detachably mounted on said base in spaced relation thereto and independently of said end frames, extending end portions of said winding projecting axially within said end housing frames, and said supporting base with its end housing frames being of open construction at the upper side thereof to permit bodily removal and replacement of said stator element with respect to said supporting base through movement of said stator element in a direction transverse to the axis of rotation of the machine, a rotor element rotatably mounted in bearings carried by and removable from said end frames, and means associated with said rotor element for providing a circulation of cooling gas about the extending end portions of said stator element and through the space between said stator element and said base.

20. In a dynamo-electric machine, a unitary supporting structure comprising spaced end housing frames and a base portion intermediate said frames, a rotor operatively mounted in bearings carried by said end housing frames, and a stator element surrounding said rotor and comprising a core and windings carried thereby, said windings having end extending portions projecting axially within said end housing frames, and said stator element being disposed over said base portion and mounted in operative position thereon independently of said end housing frames and being in spaced relation to said base portion throughout the major portion of the distance between the front and rear of said base portion, said supporting structure, including the end housing frames thereof, being open at the upper side to an extent to permit bodily removal of said stator element from operative position by movement in a direction transverse to the axis of rotation of the machine, and means for forcing a cooling gas about the periphery of said stator element and between the latter and said base portion.

21. In combination in a dynamo-electric machine, a supporting base provided at the end portions thereof with apertured bearing supporting end housing frames, a rotor operatively supported in bearings in said end housing frames, a stator surrounding said rotor and mounted in operative position over and in spaced relation to an intermediate portion of said base wholly

through spaced cooperative supporting portions on said base and the lower side of said stator, said stator being free of engagement with and spaced from said end frames, and said rotor being removable from within said stator through one of said apertured end housing frames, and said base and end housing frames being open at the upper side thereof to an extent to permit bodily removal of said stator element from operative position by upward movement of the stator element past said end housing frames.

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