June 2, 1942. E. H. FREIBURGHOUSE 2,285,199

DYNAMO ELECTRIC MACHINE

Filed May 2, 1941

Fig. 1.

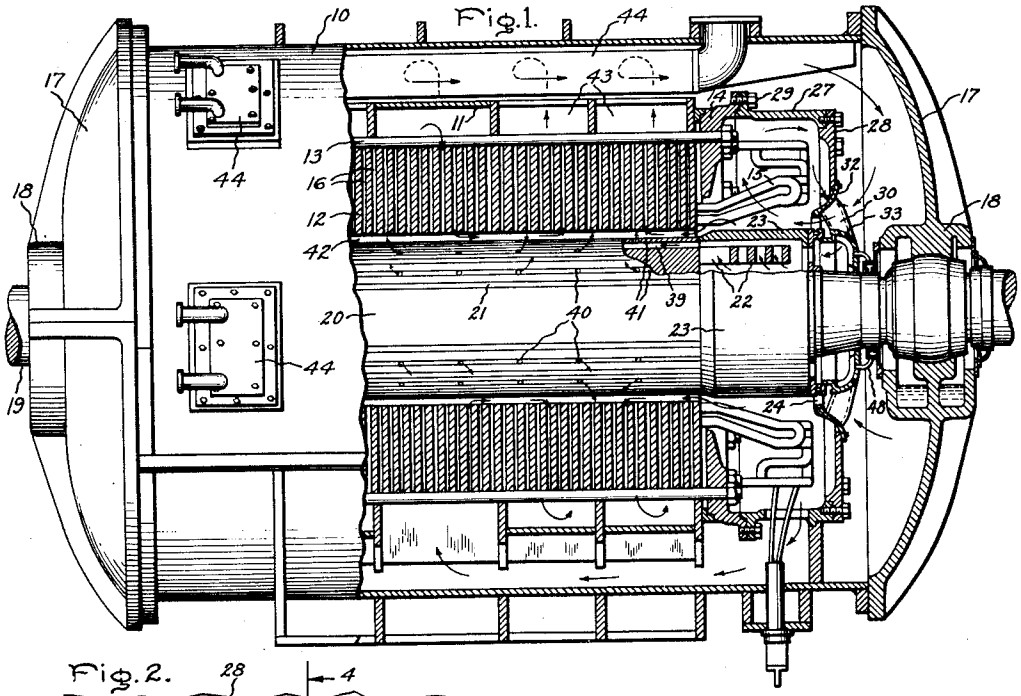


Fig. 2.

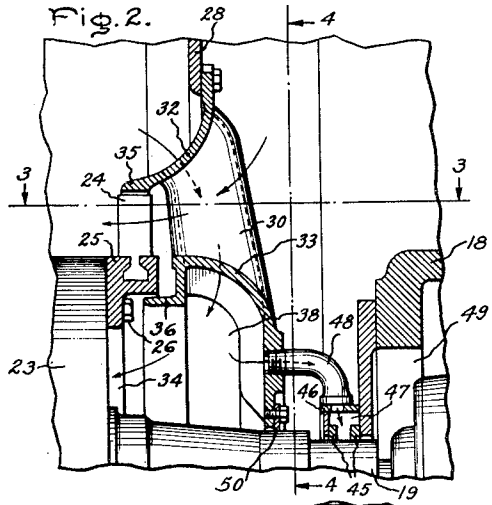


Fig. 3.

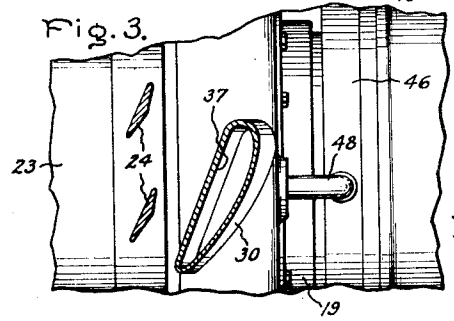
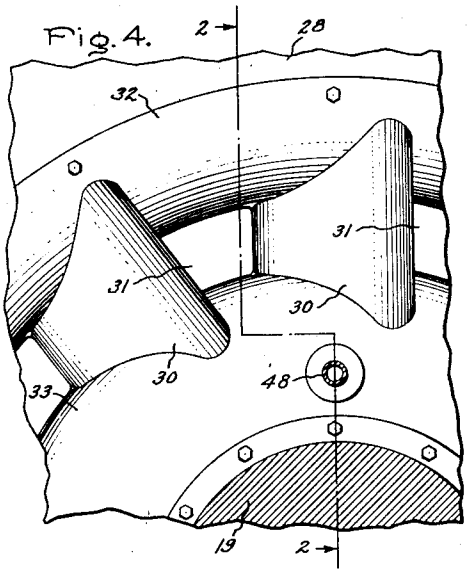


Fig. 4.



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UNITED STATES PATENT OFFICE

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DYNAMOELECTRIC MACHINE

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Application May 2, 1941, Serial No. 391,511

9 Claims. (Cl. 171—252)

My invention relates to improvements in dynamo-electric machines and more particularly to constructions for improving the ventilation thereof.

An object of my invention is to provide an improved dynamo-electric machine ventilating system.

Another object of my invention is to provide an improved end shield having a hollow guide vane for minimizing rotational losses of the ventilating impeller due to rotational velocity of ventilating medium at the intake side of the impeller.

Further objects and advantages of my invention will become apparent and my invention will be better understood from the following description referring to the accompanying drawing, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

In the drawing, Fig. 1 is a side elevational view, partly in section, of a dynamo-electric machine embodying my invention; Fig. 2 is an enlarged view of my improved guide vane and associated ventilating arrangement as shown in Fig. 1 and is a section taken along line 2—2 of Fig. 4; Fig. 3 is a sectional view taken along line 3—3 of Fig. 2; and Fig. 4 is a sectional view taken along line 4—4 of Fig. 2.

Referring to the drawing, I have shown a dynamo-electric machine including a stationary member having an outer frame 10 in which an inner frame 11 is arranged for supporting a stationary member core 12 of magnetic material. The core 12 is formed of a plurality of laminations which are retained in assembled relationship by clamping bolts 13 which secure end plates 14 about the ends of the assembled laminations. A stationary armature winding 15 is arranged in winding slots formed in the core 12 and the entire stationary member core and winding are adapted to be cooled by a ventilating medium which is drawn through radial ventilating passages 16 formed between laminations of the core 12. The stationary member is provided with an outer end shield 17 at each end thereof which is provided with a bearing member 18 adapted to support a rotatable member shaft 19.

The rotatable member is adapted to provide a rotating field for exciting the stationary armature winding 15 and includes a core member 20 of magnetic material mounted upon the shaft 19 and is adapted to be excited by a field exciting winding arranged in radially extending slots 21. The winding is provided with end turns 22 extending between the winding slots 21, and a retaining end ring 23 is arranged about the end turns at each end of the rotatable member to assist in retaining the winding in position.

In order to circulate ventilating medium through the machine, a ventilating medium impeller having blades 24 supported on an impeller ring 25 is mounted on the rotatable member of the machine by a plurality of bolts 26 and is adapted to be driven thereby. An inner end shield including an outer ring 27 and a radially extending plate 28 is secured to the inner frame 11 by a plurality of bolts 29 and is provided with a plurality of hollow guide vanes 30 of air foil section with openings 31 between adjacent guide vanes for guiding ventilating medium to the intake side of the impeller blades 24. These vanes are connected together at the upper and lower ends thereof by curved surfaces 32 and 33 arranged about the openings 31 and the air foil surfaces of these vanes are arranged to minimize the passage through the openings 31 of ventilating medium having a rotational velocity. This arrangement of the guide vanes is more clearly illustrated in Fig. 3. Such an arrangement providing separate ventilating medium passages between as well as through the guide vanes increases the efficiency of the impeller and decreases the losses thereof. The portion of the end shield including the curved surfaces 32 and 33 and the guide vanes 30 form a chamber about the end of the rotatable member. This chamber communicates with the exhaust side of the impeller blades 24 on the interior of the machine through the hollow guide vanes 30 and also communicates with the interior of the rotatable member through openings 34 formed in the impeller mounting ring 25. A clearance seal is formed between the outer ends of the impeller blades 24 and the end shield by an annular flange 35 formed on the upper curved surface 32, and another clearance seal is formed between the impeller mounting ring 25 and the end shield by an annular flange 36 formed on the lower curved surface 33. With this construction, ventilating medium is adapted to cool the rotatable member of the machine by being blown therethrough by the impeller blades 24 which direct the ventilating medium, as shown by arrows in Figs. 1 and 2, into the interior of the machine through the openings 37 in the hollow guide vanes 30 into the chamber 38 formed about the end of the rotatable member by the end shield, through the openings 34 about the end turns of the rotatable member winding, through axially extending pas-

sages 39 formed in the rotatable member, and out through radially extending openings 40 formed in slot wedges 41 which close the upper surface of the axially extending passages 39. The stationary member of the dynamo-electric machine is cooled by ventilating medium which is forced over the end turns 15 of the armature winding by the impeller blades 24 and axially through an air gap 42 between the stationary member core 12 and the rotatable member core 20. The ventilating medium then passes through the radial ventilating passages 16 in the stationary member core 12 and into ducts 43 formed in the inner frame 11 and is cooled by passing through surface coolers 44 arranged between the inner frame 11 and the outer frame 10, and then is drawn back into the space between the outer end shield 17 and the inner end shield from which it is redirected between the hollow guide vanes 30 back to the impeller blades 24 to be recirculated through the machine.

In order to insure against the passage of lubricant from the bearing 18 along the shaft 19 to the windings of the machine, I provide a pair of sealing rings 45 mounted in axially spaced apart relationship on the end shields of the machine. An annular element 46 is arranged between the end shields and about the two sealing rings 45 to provide a closed chamber 47 about the sealing rings. Ventilating medium is adapted to be blown into the chamber 47 through connecting tubes 48 which communicate with the chamber 47 and the chamber 38 at the end of the rotatable member, and thereby provide a relatively higher pressure in the chamber 47 than in a chamber 49 which forms a lubricant reservoir for the bearing 18. This minimizes the passage of lubricant into the chamber 47 from the chamber 49 and the inner sealing ring 45 further insures against the passage of lubricant along the shaft 19. Another sealing ring 50 is mounted on the lower curved surface 31 to provide an additional seal for preventing the passage of lubricant to the rotatable member of the machine and to minimize the leakage outwardly of ventilating medium which is blown into the chamber 38 by the impeller 24.

While I have illustrated and described a particular embodiment of my invention, modifications thereof will occur to those skilled in the art. I desire it to be understood, therefore, that my invention is not to be limited to the particular arrangement disclosed, and I intend in the appended claims to cover all modifications which do not depart from the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent in the United States is:

1. A dynamo-electric machine having a stationary member and a rotatable member with ventilating passages therethrough, a ventilating medium impeller on said rotatable member, means including a stationary end shield member having hollow guide vanes with openings therebetween for guiding a ventilating medium to the intake side of said impeller, a chamber formed by said end shield about an end of said rotatable member communicating with said rotatable member ventilating passages, and means including the arrangement of said hollow guide vanes and said end shield wherein the interiors of said vanes communicate with said chamber and with the interior of said dynamo-electric machine on the exhaust side of said impeller for conducting ventilating medium to said chamber.

2. A dynamo-electric machine having a stationary member and a rotatable member with axial ventilating passages therethrough, radial ventilating passages through said stationary member, a ventilating medium impeller arranged to be driven by said rotatable member, means including a stationary end shield member having hollow guide vanes with openings therebetween for guiding a ventilating medium to the intake side of said impeller, a chamber formed by said end shield about an end of said rotatable member communicating with said axial ventilating passages in said rotatable member, and means including the arrangement of said hollow guide vanes and said end shield wherein the interiors of said vanes communicate with said chamber and with the interior of said dynamo-electric machine on the exhaust side of said impeller for conducting ventilating medium to said chamber.

3. A dynamo-electric machine having a stationary member and a rotatable member with ventilating passages therethrough, ventilating passages through said stationary member, a ventilating medium impeller on said rotatable member, means including a stationary end shield member having hollow guide vanes with openings therebetween for guiding ventilating medium to the intake side of said impeller, a chamber formed by said end shield about an end of said rotatable member, means including the arrangement of said hollow guide vanes and said end shield wherein the interiors of said vanes communicate with said chamber and with the interior of said dynamo-electric machine on the exhaust side of said impeller for conducting ventilating medium to said chamber, a shaft for supporting said rotatable member, means for providing a seal about said shaft, and means for conducting ventilating medium from said chamber to said shaft seal.

4. A dynamo-electric machine having a stationary member and a rotatable member with axial ventilating passages therethrough, radial ventilating passages through said stationary member, a ventilating medium impeller arranged to be driven by said rotatable member, means including a stationary end shield member having hollow guide vanes with openings therebetween for guiding ventilating medium to the intake side of said impeller, a chamber formed by said end shield about an end of said rotatable member axial ventilating passages, means including the arrangement of said hollow guide vanes and said end shield wherein the interiors of said vanes communicate with said chamber and with the interior of said dynamo-electric machine on the exhaust side of said impeller for conducting ventilating medium to said chamber, a shaft for supporting said rotatable member, means for providing a seal about said shaft, and means for conducting ventilating medium from said chamber to said shaft seal.

5. A dynamo-electric machine having a stationary member and a rotatable member with ventilating passages therethrough, ventilating passages through said stationary member, a ventilating medium impeller on said rotatable member, means including a stationary end shield member having hollow guide vanes with openings therebetween for guiding ventilating medium to the intake side of said impeller, said vanes being arranged to minimize passage through said openings of ventilating medium having rotational velocity, curved upper and lower surfaces about said openings, a chamber formed by said end

shield about the end of said rotatable member communicating with said rotatable member ventilating passages, and means including the arrangement of said hollow guide vanes and said end shield wherein the interiors of said vanes communicate with said chamber and with the interior of said dynamo-electric machine on the exhaust side of said impeller for conducting ventilating medium to said chamber.

6. A dynamo-electric machine having a stationary member and a rotatable member with axial ventilating passages therethrough, radial ventilating passages through said stationary member, a ventilating medium impeller arranged to be driven by said rotatable member, means including a stationary end shield member having hollow guide vanes with openings therebetween for guiding ventilating medium to the intake side of said impeller, means including annular flanges on the upper and lower inner sides of said vanes for providing clearance seals with said impeller and forming a chamber between said end shield and an end of said rotatable member communicating with said rotatable member axial ventilating passages, and means including the arrangement of said hollow guide vanes and said end shield wherein the interiors of said guide vanes communicate with said chamber and with the interior of said dynamo-electric machine on the exhaust side of said impeller for conducting ventilating medium to said chamber.

7. A dynamo-electric machine having a stationary member and a rotatable member with axial ventilating passages therethrough, radial ventilating passages through said stationary member, a ventilating medium impeller arranged to be driven by said rotatable member, means including an inner stationary end shield member forming a wall of a ventilating medium return passage for conducting ventilating medium from said dynamo-electric machine members ventilating passages to said impeller, hollow guide vanes on said end shield having openings therebetween communicating with said return passage and with said impeller, a chamber formed by said end shield about the end of said rotatable member communicating with said axial ventilating passages in said rotatable member, and means including the arrangement of said hollow guide vanes and said end shield wherein the interiors of said vanes communicate with said chamber and with the interior of said dynamo-electric machine on the exhaust side of said impeller for conducting ventilating medium to said rotatable member axial passages.

8. A dynamo-electric machine having a stationary member and a rotatable member with axial ventilating passages therethrough, radial ventilating passages through said stationary member, a ventilating medium cooler, passages for conducting the ventilating medium from said stationary member radial passages to said cooler, a ventilating medium impeller arranged to be driven by said rotatable member, a return ventilating medium passage from said cooler to said impeller including an inner stationary end shield member forming a wall, hollow guide vanes on said end shield having openings therebetween communicating with said return passage and with said impeller, a chamber formed by said end shield about an end of said rotatable member communicating with said axial ventilating passages in said rotatable member, and mean including the arrangement of said hollow guide vanes and said end shield wherein the interiors of said vanes communicate with said chamber and with the interior of said dynamo-electric machine on the exhaust side of said impeller for conducting ventilating medium to said rotatable member axial passages.

9. An end shield having hollow guide vanes of air foil section with openings therebetween for guiding ventilating medium to the intake side of an impeller providing separate ventilating medium passages between said vanes and through said vanes, said vanes being arranged to minimize passage through said openings of ventilating medium having a rotational velocity, and curved upper and lower surfaces about said openings.

EDWARD H. FREIBURGHOUSE.