H. ROOS.

MEANS FOR COOLING DYNAMO ELECTRIC MACHINES.

APPLICATION FILED OCT. 18, 1907.

957,102. Patented May 3, 1910.

2 SHEETS—SHEET 1.

Fig. 1

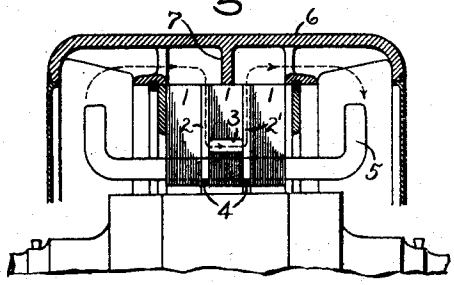


Fig. 2

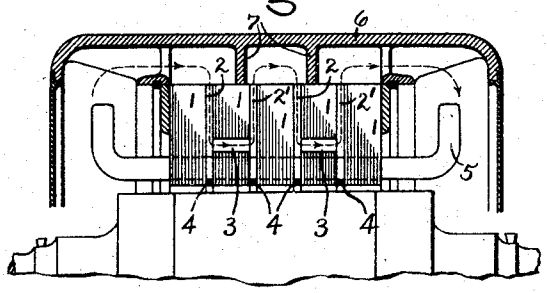


Fig. 3

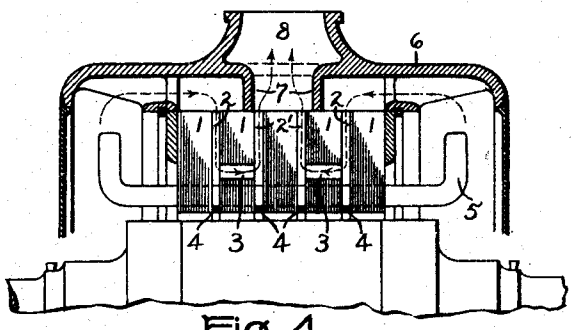
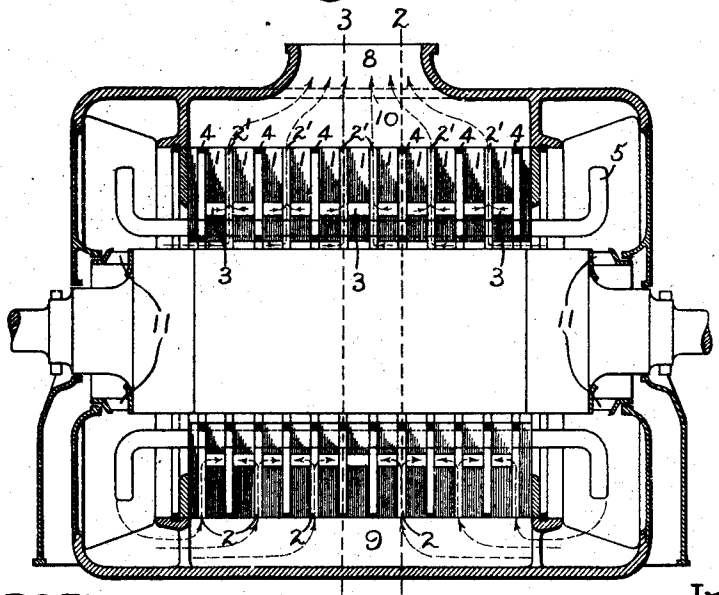


Fig. 4



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2 SHEETS—SHEET 2.

Fig. 5

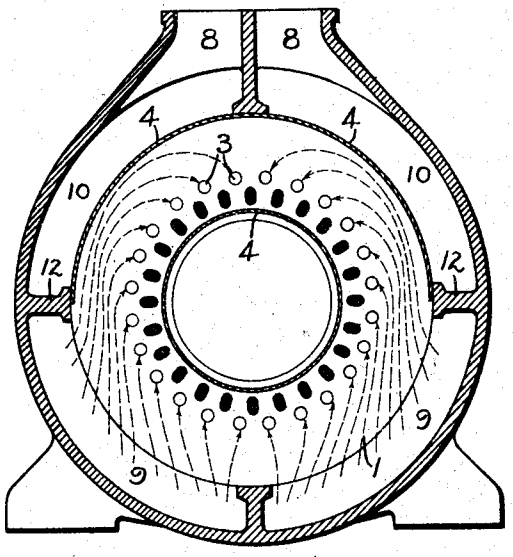
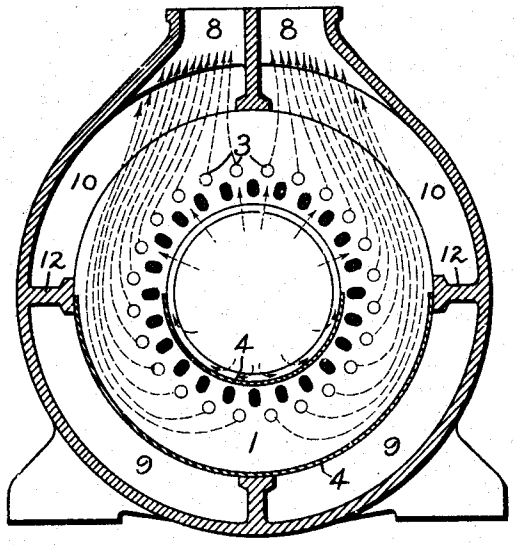


Fig. 6.



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UNITED STATES PATENT OFFICE.

HERMAN ROOS, OF BERLIN, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

MEANS FOR COOLING DYNAMO-ELECTRIC MACHINES.

957,102. Specification of Letters Patent. Patented May 3, 1910.

Application filed October 18, 1907. Serial No. 398,029.

To all whom it may concern:

Be it known that I, HERMAN ROOS, a subject of the Emperor of Germany, residing at Berlin, Germany, have invented certain new and useful Improvements in Means for Cooling Dynamo-Electric Machines, of which the following is a specification.

My invention relates to dynamo-electric machines and has for its object to provide improved cooling means for such machines, whereby the heat generated during their operation may be carried away in a quick and effective manner. The cooling of high speed generators, such as turbine driven machines, presents great difficulties, since the radiating surface is small in proportion to the losses which must be dissipated.

To the above end my invention consists in certain novel features of construction, which will be pointed out with particularity in the claims appended to and forming a part of this specification.

For a better understanding of my invention reference may be had to the following detailed description taken in connection with the accompanying drawing, in which—

Figures 1, 2 and 3 show the cross-sections of the upper portions of dynamo-electric machines embodying my invention; Fig. 4 is the cross-section of an electric generator also embodying my invention; Fig. 5 is a vertical section of the machine shown in Fig. 4 on the line 2—2, and Fig. 6 is a similar section on the line 3—3.

Similar reference numerals will be used throughout the specification and the several figures of the drawing to indicate like parts.

The simplest embodiment of my invention is shown in Fig. 1. The laminations 1 are divided into three bundles, separated by ventilating spaces 2 and 2^1. These ventilating spaces are connected together by the axial channels 3 formed in the middle bundle of the laminæ. The ventilating spaces 2 and 2^1 are cut off from the rotor by the separating or space blocks 4. 5 is a coil of the stator winding, and 6 the cast iron casing of the stator. A rib 7 extending to the middle bundle of laminations compels the cooling air to flow through the iron. The cooling air is forced by means of fans, or other suitable means, into the cast metal casing at one side and follows the course indicated by the dotted line arrows, through the inlet ventilating space 2, through the axial channel 3, passes out through the outlet ventilating space 2^1 into the other side of the metal casing and thus into the air. Although the axial channels 3 are shown in the drawings in their most advantageous position, namely, as near as possible to the inner periphery of the laminations where the greatest heating takes place, it would, of course, only be a special embodiment of my invention to put the axial channels more toward the outer periphery of the laminations. Likewise, it is not absolutely necessary to form the channels 3 in a circle about the inner periphery of the laminations, but these may be distributed in any desired arrangement.

In Fig. 2, the path of cooling air, shown in Fig. 1, is twice repeated in series arrangement, so to speak. The cooling air follows the path indicated by the dotted line arrows, entering on the left side of the casing and passing out on the right side.

In Fig. 3 is shown an improvement over Fig. 2, in which the cooling air is forced into the casing from both sides, passes through the laminations, as indicated, and out through the funnel 8. Of course the two exit ventilating spaces 2^1 in this arrangement may be combined into one. Although both the spaces 2 and 2^1 are shown in this figure as cut off from the rotor, the spaces 2^1 may be left open so that the cooling air flowing in the air gap between the stator and rotor finds an outlet through the exit spaces 2^1. An arrangement like this latter one increases the ventilation, as both the air from the air gap and the channels 3 tend to flow away from the rotor.

Figs. 4, 5 and 6 show a still greater number of entrance and exit spaces arranged in the laminations and alternating with each other. All of the inlet spaces 2 are connected with a common inlet chamber 9 formed in the casing, and all the exit spaces 2^1 with a common outlet chamber 10, also formed in the casing. The latter chamber opens into the funnel 8. It is necessary to separate the inlet chamber 9 together with the inlet air, or ventilating spaces 2 connect-

ed therewith, from the outlet chamber 10, and the exit spaces 2^1 by means of a suitable arrangement of the spacing or separating blocks 4. This consists in arranging the blocks 4 for the inlet spaces 2 in the upper half, and for the exit spaces 2^1 in the lower half of the outer periphery. The inner periphery of the inlet air spaces 2 are closed against the stator by separating blocks 4. These blocks are connected to axially directed ribs 12 preferably formed on the casing so that the desired separation of the inlet chamber 9 from the outlet chamber 10 is secured. As seen in Fig. 4, the exit spaces 2^1 may remain partially open to the air gap between the stator and rotor, with the effect described in connection with Fig. 3. The cooling air is drawn from the exterior of the machine into entrance chambers situated at both ends of the machine, by fans 11 and driven against the coils, from there to the inlet chamber 9, thence through the inlet spaces 2, through the axial channels 3, through the exit spaces 2^1 and into the exit chamber 10, passing from there through the funnel 8 into the open air. It is seen in Fig. 4 that it is not necessary to separate the channels 3 from each other as in Figs. 2 and 3, but they may be carried through all the bundles of laminæ in communication with each other.

The terms "stator" and "rotor" are used throughout this specification in their broad sense of stationary and rotary members.

The construction shown in Figs. 4, 5 and 6 is claimed more specifically in a divisional application, Ser. No. 529,566, filed by me on Nov. 23, 1909.

I desire it to be understood that my invention is not limited to the particular construction shown and described, and I aim in the appended claims to cover all modifications which do not depart from the spirit of my invention.

What I claim as new and desire to secure by Letters Patents of the United States, is,—

1. In a dynamo electric machine, a rotary member, a stationary laminated core body having radial inlet and outlet ventilating spaces and axial channels connecting the spaces, and separating blocks to close the inlet and outlet spaces against the rotary member.

2. In a dynamo-electric machine, a rotary member, a stationary laminated core body having radial inlet and outlet ventilating spaces, axial channels connecting the spaces so arranged that cooling air flows into the inlet spaces, through the axial channels and out through the outlet spaces, said inlet spaces being alternately distributed with said outlet spaces, and separating blocks to close the inlet spaces against the rotary member.

3. In a dynamo-electric machine, a rotary member, a stationary laminated core body having radial inlet and outlet ventilating spaces and axial channels connecting the spaces, and separating blocks to separate the inlet spaces from the rotary member.

4. In a dynamo-electric machine, a casing having inlet and outlet chambers, a stationary laminated core body having radial inlet and outlet ventilating spaces and axial channels connecting the spaces, and separating blocks to close the inlet and outlet spaces on the inner periphery of the core body and also the inlet spaces against the outlet chamber and the outlet spaces against the inlet chamber, said inlet spaces communicating with said inlet chamber, and said outlet spaces with said outlet chamber.

5. In a dynamo-electric machine, a casing having entrance chambers at both ends for the admission of air and inlet and outlet chambers, said entrance chambers communicating with said inlet chambers, a funnel communicating with said outlet chamber or chambers, a stationary laminated core body having radial inlet and outlet ventilating spaces and axial channels connecting the spaces, and separating blocks to close the inlet and outlet spaces on the inner periphery of the core body and also the inlet spaces against the outlet chamber and the outlet spaces against the inlet chamber, said inlet spaces communicating with said inlet chamber and said outlet spaces with said outlet chamber.

6. In a dynamo-electric machine, a rotary member, fans secured to both ends of said rotary member, a casing having entrance chambers at both ends for the admisison of air and inlet and outlet chambers, said entrance chamber communicating with said inlet chamber or chambers, a funnel communicating with said outlet chamber or chambers, a stationary laminated core body having radial inlet and outlet ventilating spaces and axial channels connecting the spaces, and separating blocks to close the inlet and outlet spaces on the inner periphery of the core body and also the inlet spaces against the outlet chamber and the outlet spaces against the inlet chamber, said inlet spaces communicating with said inlet chamber and said outlet spaces with said outlet chamber.

7. In a dynamo-electric machine, a rotary member, fans secured to both ends of said rotary member, a casing having entrance chambers at both ends for the admission of air, and inlet and outlet chambers, said entrance chamber communicating with said inlet chamber or chambers, a funnel communicating with said outlet chamber or chambers, and a stationary laminated core body having radial inlet and outlet ventilating spaces alternating with each other and axial channels connecting the spaces, said inlet

spaces communicating with said inlet chamber and said outlet spaces communicating with said outlet chamber.

8. In a dynamo-electric machine, a casing having inlet and outlet chambers, a stationary laminated core body having radial inlet and outlet ventilating spaces and axial channels connecting the spaces, and separating blocks to close the inlet spaces on the inner periphery of the core body and the outlet spaces from the inlet chamber, said inlet spaces communicating with said inlet chamber and said outlet spaces with said outlet chamber.

In witness whereof, I have hereunto set my hand this fifth day of October, 1907.

HERMAN ROOS.

Witnesses:
JULIUS RUMLAND,
KARL MICKELSEN.