A. B. FIELD.

DYNAMO ELECTRIC MACHINE.

APPLICATION FILED AUG. 22, 1913.

1,241,503.

Patented Oct. 2, 1917.

2 SHEETS—SHEET 1.

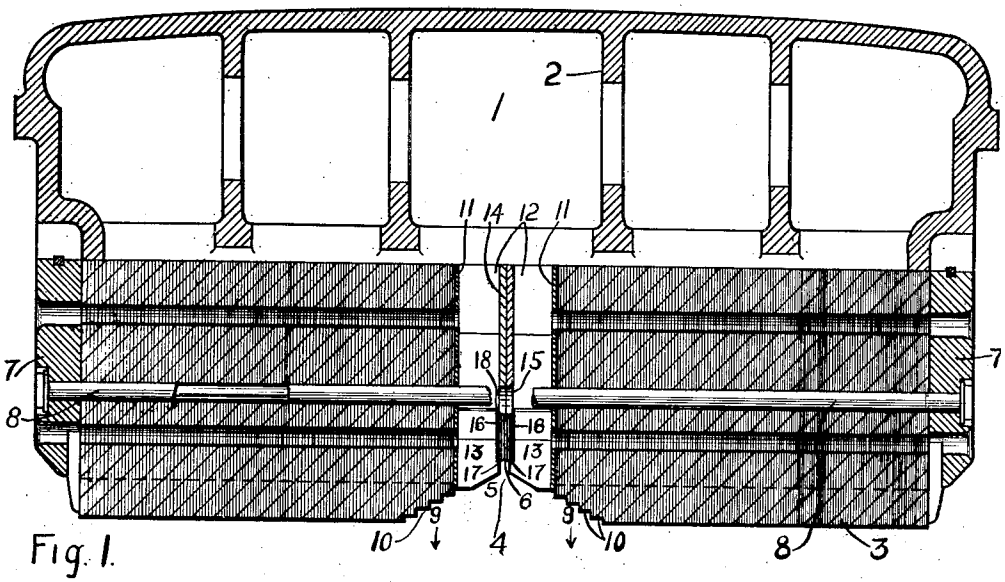


Fig. 1.

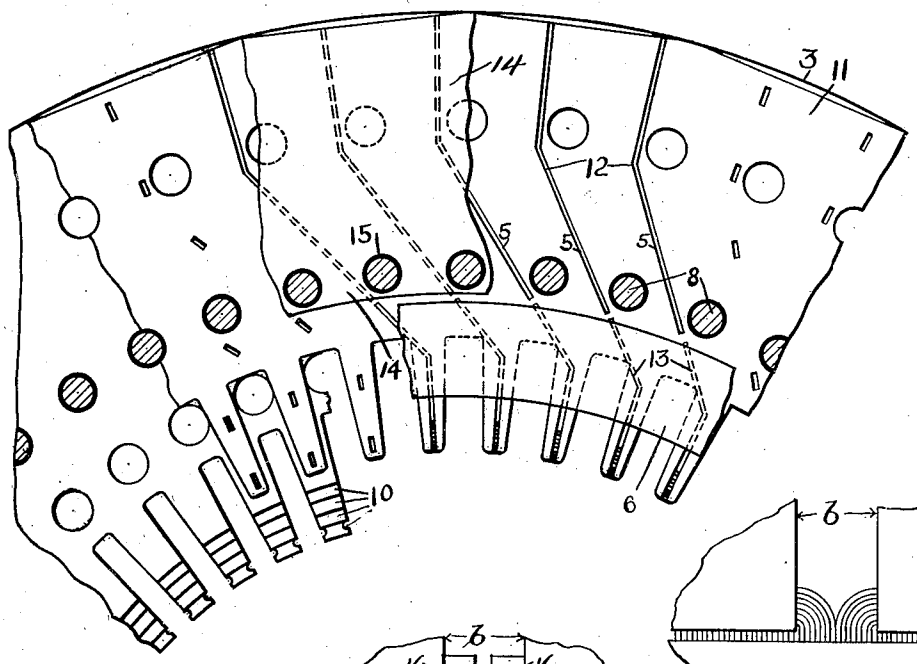


Fig. 2.

Fig. 6.

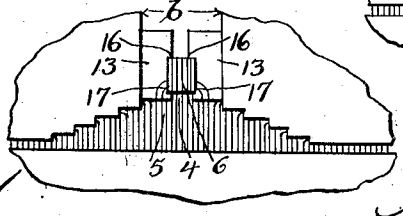


Fig. 5.

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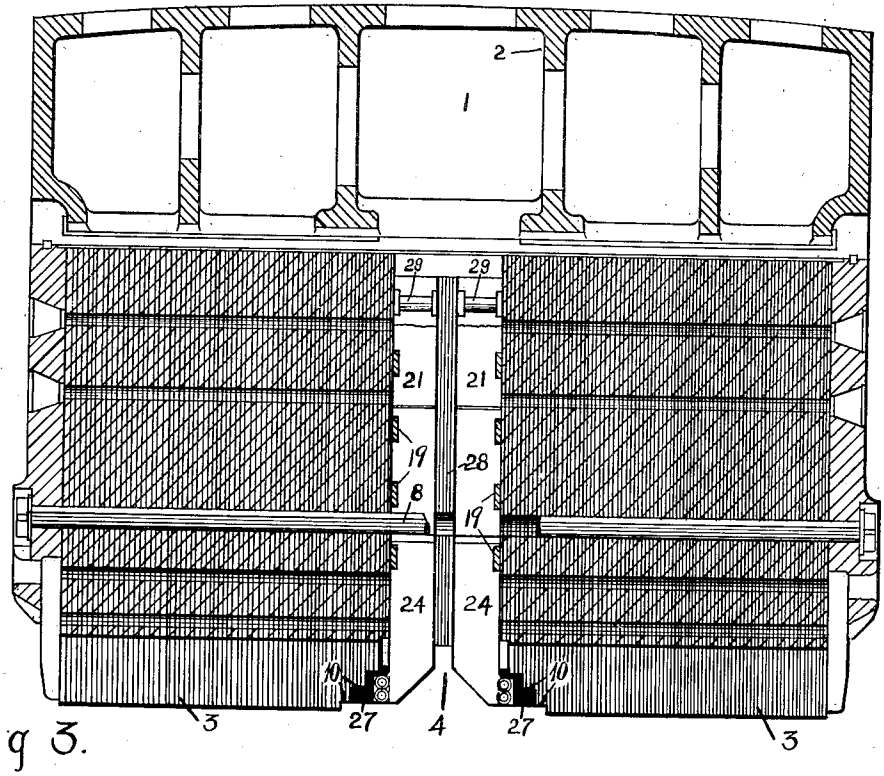


Fig 3.

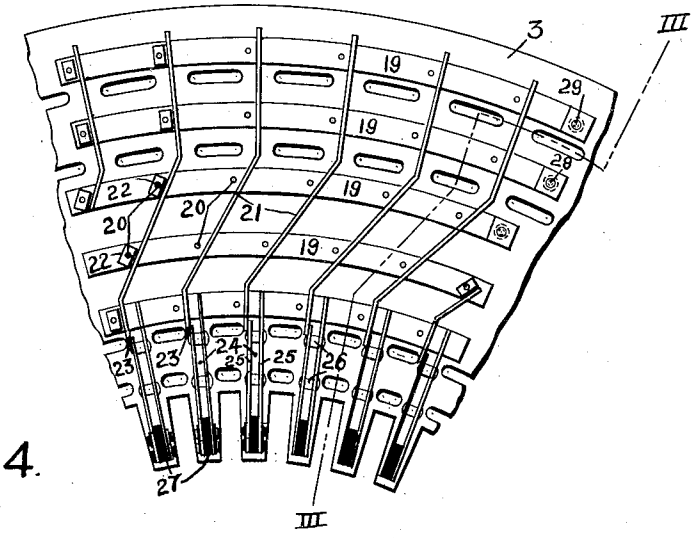


Fig 4.

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DYNAMO-ELECTRIC MACHINE.

1,241,503. Specification of Letters Patent. Patented Oct. 2, 1917.

Application filed August 22, 1913. Serial No. 786,063.

To all whom it may concern:

Be it known that I, ALLAN B. FIELD, a subject of the King of England, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Dynamo-Electric Machines, of which the following is a specification.

My invention relates to dynamo-electric machines provided with annular ventilating spaces in the magnetizable core members thereof, and it has for its object to provide means for reducing the circulation of eddy currents in the laminations caused by fringing of the magnetic lines of force in the said annular ventilating spaces.

A further object of my invention is to provide a simple and inexpensive construction embodying the above means that may be readily applied to dynamo-electric machines of the above indicated type and thereby increase their efficiency during operation.

In the construction of dynamo-electric machines of large capacity and employing axial ventilation, it has been found necessary to provide annular vent-spaces in the armature cores in order to allow the air to escape from the axial ducts and from the air gaps. However, considerable difficulty has been experienced from over-heating of the portions of the core adjacent to the annular vent-space due to the fact that the magnetic lines of force can pass into the vent-space and enter the sides thereof in a direction substantially perpendicular to the faces of the laminations thus inducing eddy currents therein. Obviously, the wider the vent-space, the more tendency there is for large flux in the sides of the laminations and, since a relatively large opening is required in order to allow the ventilating air to escape, various schemes have been proposed to prevent the circulation of excessive eddy currents in the laminations adjacent to the vent spaces.

By my invention, I provide an annular laminated ring of magnetizable material suitably disposed in the annular vent-space for the purpose of concentrating a greater portion of the magnetic lines of force entering the vent-space and diverting the path thereof in a direction parallel to that of the lines of force traversing the field magnet and magnetizable core members. This arrangement prevents, to a large extent, the fringing of the magnetic lines of force into the sides of the vent-space, with the resulting circulation of eddy-currents, as described above. As an additional aid toward the accomplishment of my result, I provide a series of introgressively stepped portions of the core on each side of the vent-space, the purpose of which will be hereinafter described.

In the accompanying drawings, Figure 1 is a view in longitudinal section of a portion of a dynamo-electric machine embodying my invention; Fig. 2 is an enlarged sectional view, with parts broken away, taken through a portion of the vent-space shown in Fig. 1; and Fig. 3 is a view, in longitudinal section, of a portion of a similar machine embodying a modification of my invention, the section across the vent-space being taken on the line III—III of Fig. 4, which is an enlarged sectional view, with parts removed, taken through a portion of the vent-space shown in Fig. 3. Figs. 5 and 6 are diagrammatic views respectively showing the approximate distribution of the magnetic lines of force in the vent-space of a machine embodying my invention and of a machine not embodying my invention.

Referring to the drawings, a dynamo-electric machine 1 embodies a suitable frame 2, a stator core 3 having a vent-space 4 disposed intermediate its ends, a plurality of spacing fingers 5 and an associated annular ring 6 of magnetizable material suitably disposed within said vent-space, and end-plates 7 clamped to said core by means of longitudinally-disposed through-bolts 8.

The stator core 3, as shown, is of the built-up laminated type and, on each side of the vent-space 4, the diameter of the central opening 9 in the laminations is made smaller in predetermined steps, thereby forming a series of introgressively stepped portions 10 for a purpose hereinbefore specified. A plurality of special annular plates 11 are severally assembled in the core 3 at the sides of the vent-space 4, and the spacing-fingers 5 are substantially radially attached at intervals to the plates 11. Each spacing finger 5 comprises two longitudinally-alined sets of members of sheet material each set comprising two reversely obtusely bent and independent strips 12 and 13, the outer strip 12 being preferably of either magnetizable or

non-magnetizable sheet material, and the inner strip 13 being preferably of brass or other suitable non-magnetizable sheet material. A plurality of flat annular plates 14 are disposed intermediate the pairs of strips 12 and are provided with a plurality of circumferentially arranged openings 15 adjacent their inner peripheries to receive the bolts 8. The pairs of non-magnetizable strips 13 severally have oppositely-disposed edge recesses 16 forming shoulders 17 and providing a substantially rectangular centrally-located pocket 18 within which the annular and relatively narrow ring 6 of preferably laminated magnetizable material is held at a suitable distance from the entrance of the vent-space. It will readily be seen from a comparison of the diagrams of flux distribution that, for a given width "*b*" of the vent-space, the eddy currents in the side laminations will be materially reduced by the use of my invention. The number of lines of force entering the laminations sidewise will not only be limited by the presence of the ring in the vent-space, but the arrangement of the stepped portions will serve to distribute the eddy currents induced in the side portions of the several steps among a number of separate laminations.

Reference may now be had to Figs. 3 and 4, in which a modification of my invention that is adapted for utilization in machines of relatively large size is shown. A plurality of concentrically disposed bands 19 of sheet material are suitably secured by rivets 20 or otherwise to the laminations of the core 3 on each side of the vent-space 4. A plurality of pairs of longitudinally alined and suitably bent spacing-fingers 21 of any suitable sheet material are substantially radially attached at intervals to the bands 19 by angle irons 22 and portions of the rivets 20, said fingers occupying the radially outer section of the laminations of the core 3. Severally attached to the inner ends of the spacing-fingers 21, by rivets 23 or otherwise, and extending radially inwardly, are a plurality of pairs of longitudinally alined spacing-fingers 24 of brass or other suitable non-magnetizable material severally having their respective two portions 25 rigidly assembled by a plurality of spacing-rivets 26 or other suitable means. Severally secured intermediate the inner ends of the portions 25 are a plurality of insulating blocks 27 that are adapted to engage the stepped portions 10 of the core 3.

Disposed in the several alined spaces intermediate the pairs of fingers 21 and the pairs of fingers 24, and with its inner periphery located a suitable distance from the entrance of the vent-space, is a comparatively wide annular ring 28 of preferably laminated magnetizable material through which the bolts 8 extend to act as supports. As an additional support for the ring 28, a plurality of pairs of alined spacing-pins 29 are disposed at intervals intermediate said ring and each face of the vent-space 4.

It should be noted that, in each case illustrated, the inner periphery of the ring of magnetizable material is located a sufficient distance from the entrance of the vent-space to prevent a concentration of the flux at the entrance, which would undesirably heat the ring and produce other bad magnetic effects.

It will be understood that many modifications of the structure herein set forth may be made within the spirit and scope of my invention, and I desire that only such limitations shall be imposed as are indicated in the appended claims.

I claim as my invention:

1. In a dynamo-electric machine comprising a field magnet member and a magnetizable core member having an annular vent space, the combination with the said core member, of means for directing the magnetic lines of force in the said vent space in a path parallel to that of the lines of force traversing the said field magnet and magnetizable core members.

2. In a dynamo-electric machine comprising a field magnet member and a magnetizable core member having an annular vent space, the combination with the said core member, of means for preventing a portion of the magnetic lines of force in the said vent space from entering the sides thereof.

3. In a dynamo-electric machine, the combination with a magnetizable core member having an annular vent-space and a plurality of spacing fingers disposed therein, of magnetizable material supported by said fingers at a predetermined distance from the entrance of said vent-space and from the sides thereof.

4. In a dynamo-electric machine, the combination with a magnetizable core member having an annular vent-space and a plurality of spacing fingers disposed therein, of magnetizable material supported by said fingers and disposed intermediate the ends of certain of said fingers.

5. In a dynamo-electric machine, the combination with a magnetizable core member having an annular vent-space and a plurality of spacing fingers disposed therein, of a ring of magnetizable material mechanically associated with said fingers within said vent-space.

6. In a dynamo-electric machine, the combination with a magnetizable core member having an annular vent-space and a plurality of spacing fingers disposed therein, of a laminated ring of magnetizable material mechanically associated with said fingers and located within said vent-space at a predetermined distance from the entrance thereof.

7. In a dynamo-electric machine, the combination with a magnetizable core member having an annular vent-space and a plurality of spacing fingers disposed therein and having portions of non-magnetizable material, of a ring comprising a plurality of annular punchings of magnetizable material disposed side by side and mechanically associated with the non-magnetizable portions of said fingers at a predetermined distance within said vent space and independent of the said core member.

8. In a dynamo-electric machine, the combination with a magnetizable core member comprising a plurality of sections having an annular vent-space disposed intermediate the same, and a plurality of spacing-fingers disposed in said space, of a ring of magnetizable material mechanically associated with said fingers within the said vent-space, certain of said sections adjacent to the said space being of different diameters.

9. In a dynamo-electric machine, the combination with a magnetizable core member comprising a plurality of sections having an annular vent-space disposed intermediate the same, and a plurality of spacing fingers disposed in said space, of magnetizable material mechanically associated with said fingers and disposed intermediate their ends, said sections embodying a series of oppositely disposed stepped portions on each side of said vent-space.

10. In a dynamo-electric machine, the combination with a magnetizable core member comprising a plurality of sections having an annular vent-space disposed intermediate the same, and a plurality of spacing fingers disposed in said space and having portions of non-magnetizable material, of a laminated ring of magnetizable material mechanically associated with the non-magnetizable portions of said fingers at a predetermined distance within said vent-space, said sections embodying a series of intro-gressively stepped portions on each side of said vent-space.

11. In a dynamo-electric machine comprising a field magnet member and a magnetizable core member having an annular vent space, the combination with the said core member, of means for reducing the eddy currents in the magnetizable material along the sides of the said vent space.

In testimony whereof, I have hereunto subscribed my name this 14th day of August 1913.

ALLAN B. FIELD.

Witnesses:
L. A. KEEYSER,
B. B. HINES.