F. I. HISS, JR.

DYNAMO ELECTRIC MACHINE.

APPLICATION FILED DEC. 21, 1910.

1,162,482.

Patented Nov. 30, 1915.

2 SHEETS—SHEET 1.

Fig. 1.

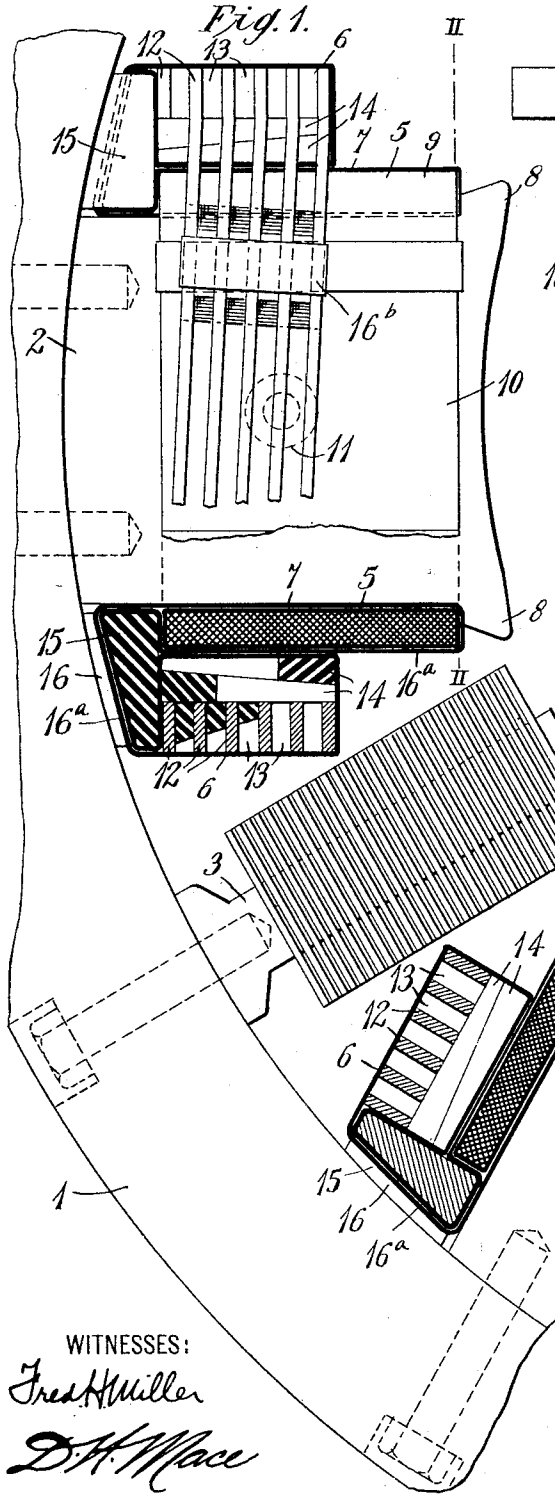
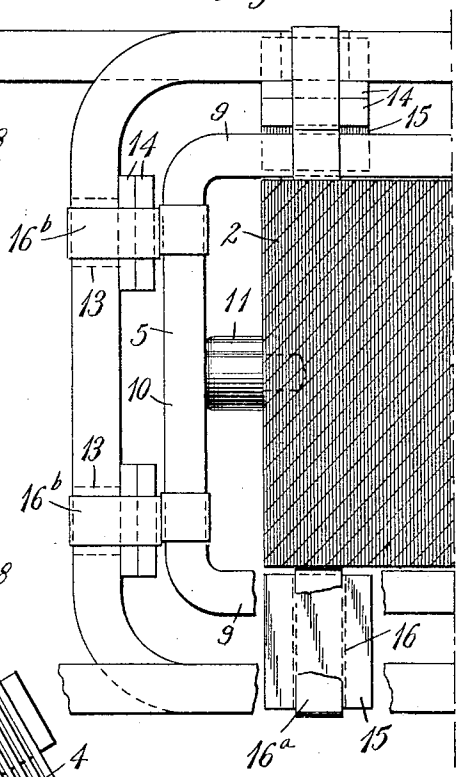


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

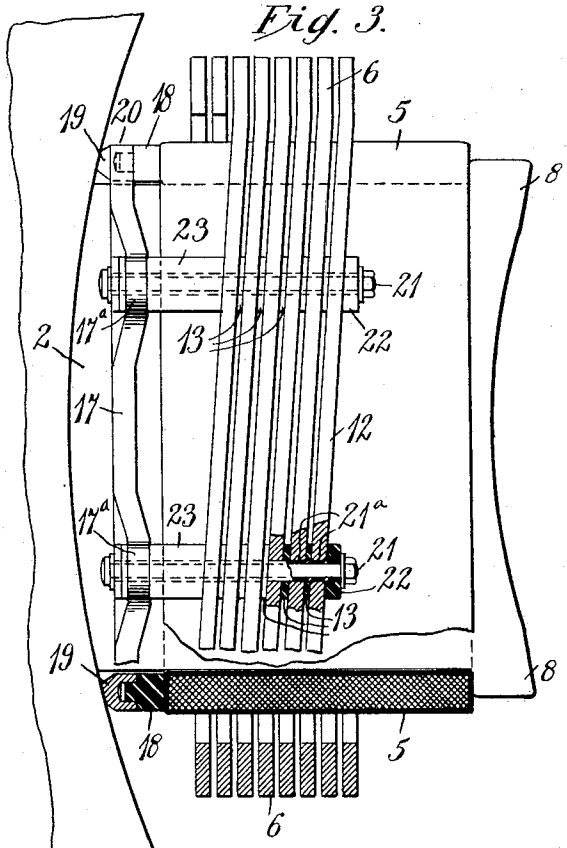
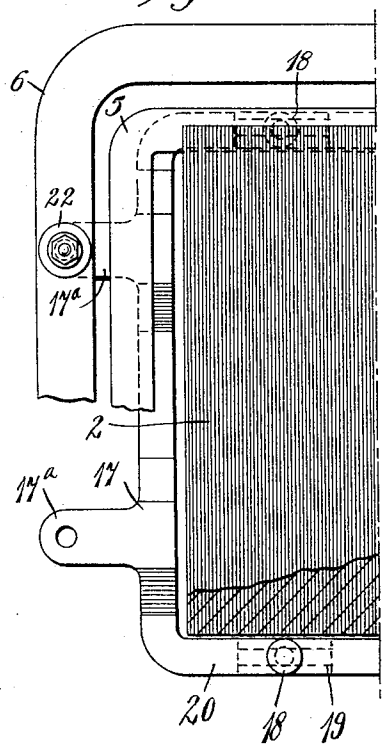
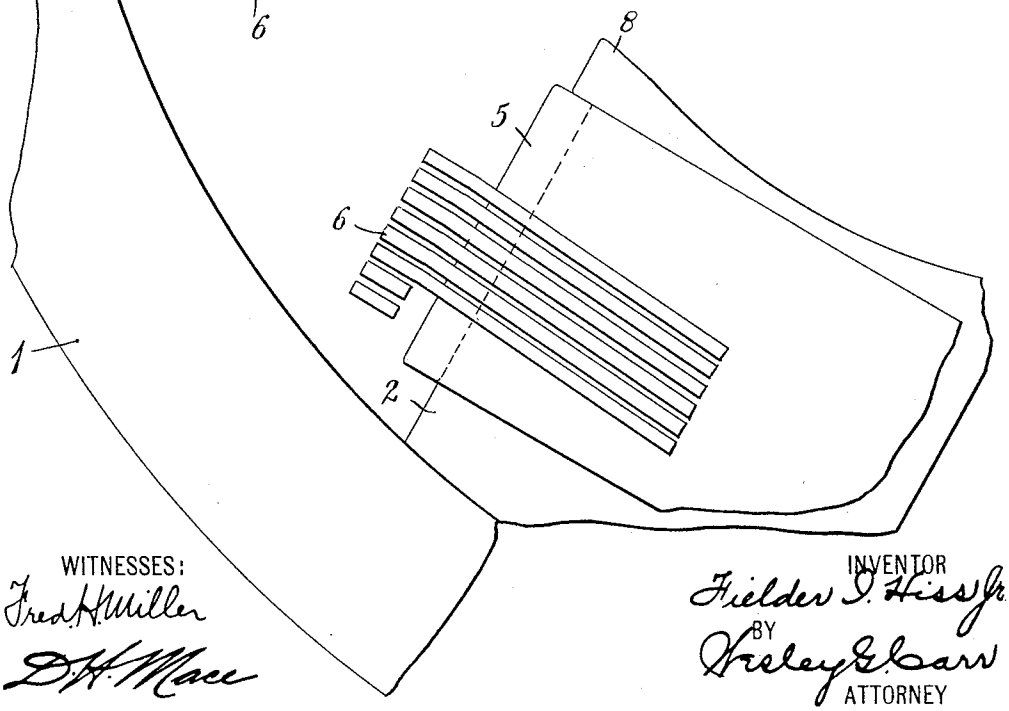


Fig. 4.





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DYNAMO-ELECTRIC MACHINE.

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To all whom it may concern:

Be it known that I, FIELDER I. HISS, JR., a citizen of the United States, and a resident of Wilkinsburg, 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 and it has special reference to the field coil structure of such apparatus.

The object of my invention is to provide a well ventilated structure of the above-indicated class which shall be simple and durable in construction and shall be constructed in such manner that particularly free and effective radiation is obtained, whereby a material increase of economy in both copper and insulating material is effected.

Another object of my invention is to utilize the available space between adjacent polar projections of a field magnet structure to the best advantage, whereby the previously unused space is made to serve a useful purpose which permits a decrease in the diameter of the field magnet yoke and, consequently, of the machine as a whole.

When dynamo-electric machines are provided with the customary radially projecting pole pieces and field magnet coils of uniform thickness, it is manifest that, although the pole tips and the inner ends of adjacent magnet coils may be in close proximity, a considerable space exists between the base portions of the pole pieces, near the yoke, which is not utilized.

It has been common in the prior art to provide field magnet coils of a tapered form which are comparatively thin near the pole tips and increase gradually in thickness toward their bases. This type of coil, of course, tends to make use of the otherwise unused space, but, on account of its peculiar shape, it requires special coil forms and is expensive and impracticable to employ commercially.

In compound wound dynamo-electric machines in which both shunt and series coils are placed on each polar projection, it is usual to dispose the coils one above the other which necessitates comparatively short and thick coils having the undesirable feature of poor heat radiation. Furthermore, the available space near the field magnet yoke is not economically utilized and the size of the machine is unnecessarily large.

My invention has particular reference to compound-wound field coil structures and is intended to utilize the available space without the use of specially wound coils or the inferior heat-radiating features of the usual short and thick coils. I accomplish this result by providing a relatively long and thin shunt coil of standard form which extends approximately the length of the polar projection, and I surround the outer end of the shunt coil with a standard-wound series coil which is of considerable less winding length than the shunt coil and is disposed at the base of the polar projection near the yoke. The series coil is liberally spaced from the shunt coil for ventilating purposes and is effectively secured in position in a novel manner, to be hereinafter set forth.

Although the field coil structure hereinbefore mentioned is applicable to any class of compound-wound dynamo-electric machines, it is particularly adapted to machines having intermediate commutating poles, since, in this case, strict economy of space is essential and the heating conditions are severe by reason of the proximity of the commutating and main field coils.

In the accompanying drawings, Figure 1 is a view, partially in vertical section and partially in end elevation, of a portion of the stationary field magnet structure of a dynamo-electric machine which embodies my invention. Fig. 2 is a bottom plan view of portions of certain of the field coils shown in Fig. 1, the polar projection being shown in section along the line II—II. Figs. 3 and 4 are views similar to Figs. 1 and 2, respectively, and illustrate a modified form of my invention.

Referring particularly to Figs. 1 and 2, the structure here shown comprises a field magnet yoke or frame 1 having main polar projections 2 and intermediate polar projections 3, an auxiliary coil 4, shunt coils 5 and series coils 6. The field magnet yoke 1 and the polar projections 2 and 3 are of well-known construction, said polar projections being detachably secured to the field magnet yoke in the usual manner. The shunt coils 5 are of like construction and each comprises a plurality of convolutions of wire conductor which are wound in ac-

cordance with usual practice and are bound together by a sheath 7 of tape or other insulating material. The axial length of the shunt coil 5 is relatively great in comparison to its thickness, whereby a coil is produced which embodies the desired free heat-radiating features. Each of the shunt coils 5 is disposed around a main polar projection 2 and rests upon pole tips 8 in the usual manner. The side portions 9 of said shunt coils fit closely against the corresponding sides of the main polar projections 2, while the side portions 10 extend materially beyond the corresponding sides of the polar projections 2 and are suitably spaced therefrom by means of disks or blocks 11 of insulating material. The series coils 6 are of like construction and each comprises a plurality of turns or convolutions of strap conductor 12, said turns being severally spaced from each other by means of insulating blocks 13. The series coils 6 are of materially less axial length than the shunt coils 5, and are disposed around the ends of the shunt coils which are adjacent to the field magnet yoke 1. Furthermore, the series coils 6 are liberally spaced from the shunt coils 5 and are secured in position by means of a plurality of narrow insulating wedges 14 which are disposed at intervals between said coils and coöperate with each other in a well known manner to force the series coils 6 outwardly from the shunt coil 5.

In order to space the associated shunt and series coils from the field magnet yoke 1 and to maintain them in their desired positions, small insulating blocks 15 are provided which are spaced along the ends of the coils 5 and 6 and directly above the wedges 14. The insulating blocks 15 are tapered toward one side to conform to the field magnet yoke, and are provided with grooves or channels 16 to receive narrow strips of insulating tape 16^a, or the like, which envelop the shunt and series coils 5 and 6 and the wedges 14 in such manner as to securely bind the component parts of the field core structure into an integral and rigid unit. Similar strips or bands of tape 16^b envelop the coils 5 and 6 and the side wedges 14 for a similar purpose.

There are, of course, many ways in which the field coils 5 and 6 may be assembled and bound together, but the following method is readily applied and serves to accomplish the desired end: Two strips of tape 16^a may be first placed between the shunt coil 5 and the adjacent wedges 14 after which the wedges are driven to lock the coils and interposed tape together. The free ends of the two strips are then drawn in opposite directions over the upper insulating block 15, and are sewed or otherwise secured together, after which the two lower free ends are drawn in opposite directions respectively around the shunt coil 5 to the insulating block 15, and around the wedges 14 and series coil 6 to the insulating block 15 where the ends thereof are sewed or otherwise united together.

Reference may now be had to Figs. 3 and 4, in which corresponding parts are designated by the same reference characters. Inasmuch as the field magnet yoke 1, the main polar projections 2 and the shunt and series coils 5 and 6, respectively, are similar to those hereinbefore described, no further detailed description of the same is considered necessary.

The relative position of the shunt and series coils 5 and 6 is the same as that hereinbefore set forth, the distinctive difference residing in the means of supporting the series coil, which comprises a grid or supporting frame 17 having side projecting lugs 17^a and provided with a plurality of insulating buttons or studs 18 which are adapted to rest upon the outer ends of the shunt coils 5 and to insulate the grid 17 therefrom. Furthermore, a plurality of projecting portions 19 are provided on the end members 20 of the grid 17 for the purpose of engaging the inner surface of the field magnet yoke 1 whereby the grid 17 and shunt coil 5 are maintained securely in position.

The series coil 6 is securely fastened to the lugs 17^a of the grid 17 by means of insulated clamping bolts 21 which project through suitable openings 21^a in the several convolutions of the strap conductor 12. Suitable insulating blocks 13, 22 and 23 are provided to properly space the convolutions of the series coil 6 and to maintain said series coil in the desired position, as will be readily understood.

While I have shown and described field coil structures of particular forms and of specific structural details, those skilled in the art will readily understand that various modifications may be effected without exceeding 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. A field magnet for dynamo-electric machines comprising a yoke having radially projecting pole pieces, shunt coils surrounding said pole pieces and supported thereby, series coils surrounding the ends of said shunt coils adjacent to the yoke and spaced from said yoke and said shunt coils, and means for securing said shunt and series coils in position.

2. A field magnet for dynamo-electric machines comprising a yoke having radially projecting pole pieces, relatively thin shunt coils surrounding said pole pieces and supported thereby, series coils disposed around

the ends of said shunt coils adjacent to said yoke and spaced from both the yoke and the shunt coils, and means for holding said series coils rigidly in position.

3. A field magnet winding for dynamo-electric machines comprising a relatively thin shunt coil composed of a plurality of convolutions of wire conductor, and a series coil comprising a plurality of turns of strap conductor spaced apart by insulating means and suitably secured together, said series coil being disposed around one end of said shunt coil and being spaced therefrom and secured thereto.

4. A field magnet for dynamo-electric machines comprising a yoke having radial pole pieces, relatively long shunt coils disposed on said pole pieces, series coils of less length than said shunt coils severally disposed around said shunt coil adjacent to the yoke and spaced therefrom, and means for securing said coils in position.

5. A field magnet for dynamo-electric machines comprising a yoke having radial pole pieces, long shunt coils, relatively short series coils disposed around said shunt coils adjacent to the yoke, and having their turns spaced apart, and means for securing said shunt and series coils in position.

6. A field magnet winding for dynamo-electric machines comprising a shunt coil, a series coil composed of a plurality of turns of strap conductor spaced apart by insulating means and adapted to surround one end of said shunt coil, said series coil being spaced from said shunt coil, wedging means of insulating material disposed at intervals between said coils, and narrow insulating bands for fastening said coils rigidly together.

7. In a dynamo-electric machine, the combination with a field magnet frame having radial polar projections, a long and thin shunt coil disposed about each polar projection and supported thereby, and a shorter series coil surrounding each shunt coil and disposed adjacent to said field magnet frame, of means for securing said series coil to said shunt coil.

8. A field magnet for dynamo-electric machines comprising a yoke having radially projecting pole pieces, shunt coils surrounding said pole pieces and supported thereby, series coils surrounding the ends of said shunt coils adjacent to said yoke and spaced from said yoke and said shunt coils, and means for binding said coils together to form a unitary structure.

9. A field magnet for dynamo-electric machines comprising a yoke having radially projecting pole pieces, shunt coils surrounding said pole pieces and supported thereby, series coils surrounding the ends of said shunt coils adjacent to said yoke and spaced from said shunt coil, and insulating bands for binding said coils together at intervals.

10. A field magnet for dynamo-electric machines comprising a yoke having radially projecting pole pieces, shunt coils surrounding said pole pieces and supported thereby, series coils surrounding the ends of said shunt coils adjacent to said yoke and comprising spaced convolutions of uncovered conductors, and narrow bands of insulating material disposed at intervals for securing the coils firmly together.

11. A field magnet for dynamo-electric machines comprising a yoke having radially projecting pole pieces, shunt coils surrounding said pole pieces and supported thereby, series coils surrounding the ends of said shunt coils adjacent to said yoke and spaced from said shunt coils, insulating blocks resting at intervals upon the ends of said series and shunt coils between said coils and said yoke and insulating bands for binding said coils and said blocks firmly together.

12. A field magnet for dynamo-electric machines comprising a yoke having radially projecting pole pieces, shunt coils surrounding said pole pieces and supported thereby, series coils surrounding the ends of said shunt coils adjacent to said yoke, wedge shaped members interposed between said series and said shunt coils, insulating blocks disposed adjacent to the corresponding ends of said coils and means for binding said coils and said blocks into a unitary structure.

In testimony whereof, I have hereunto subscribed my name this 12th day of Dec., 1910.

FIELDER I. HISS, JR.

Witnesses:
DORA W. BLAKESLEE,
B. B. HINES.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents Washington, D. C."