W. H. POWELL.

DYNAMO ELECTRIC MACHINE.

APPLICATION FILED JULY 30, 1906.

977,220. Patented Nov. 29, 1910.

Fig. 1

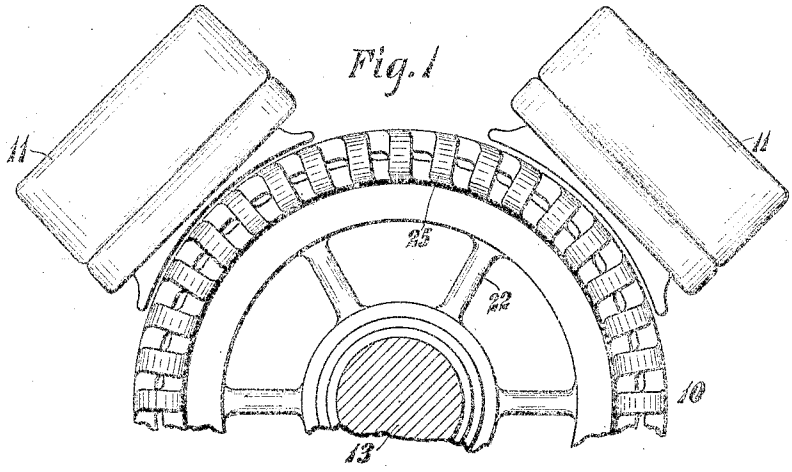


Fig. 2

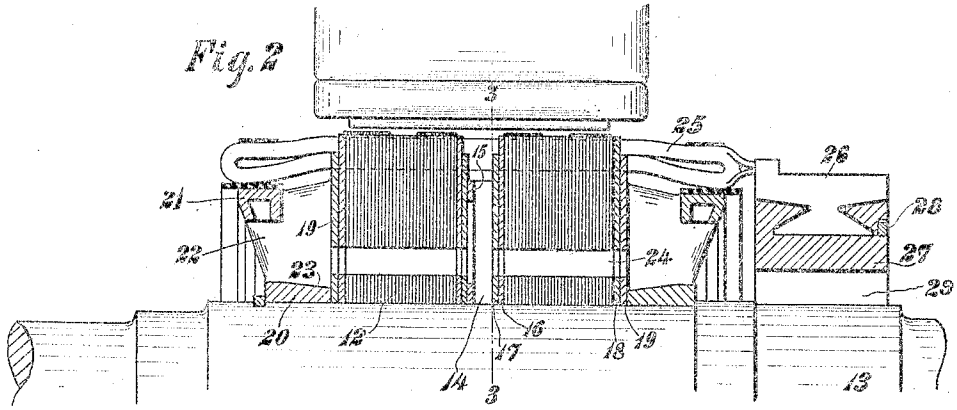
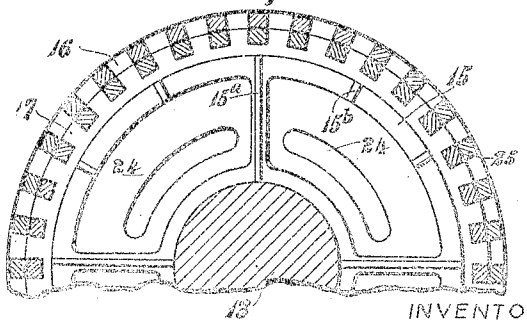


Fig. 3.



WITNESSES

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WILLIAM H. POWELL, OF NORWOOD, OHIO, ASSIGNOR TO ALLIS-CHALMERS COMPANY, A CORPORATION OF NEW JERSEY, AND THE BULLOCK ELECTRIC MANUFACTURING COMPANY, A CORPORATION OF OHIO.

DYNAMO-ELECTRIC MACHINE.

977,220. Specification of Letters Patent. Patented Nov. 29, 1910.

Application filed July 30, 1906. Serial No. 329,325.

To all whom it may concern:

Be it known that I, WILLIAM H. POWELL, citizen of the United States, residing at Norwood, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Dynamo-Electric Machines, of which the following is a full, clear, and exact specification.

My invention relates to dynamo-electric machines and particularly to the construction of the rotary armature cores although the main feature of my invention can as well be applied to the stationary cores.

As is well known the armature of a generator or motor becomes heated during operation and it is necessary to provide effective means for ventilating the same. This is generally accomplished by dividing the laminæ of the armature into groups and spacing the groups apart by spacing segments or disks, consisting usually of cast iron or brass skeleton frames having fingers extending outward almost to the ends of each armature tooth so that the teeth are properly braced. Similar skeleton frames with the projecting fingers are provided at the ends of the core, the end-heads being clamped tightly against these end skeleton frames. A rotary armature core is provided with axial ventilating passageways which communicate with the radial passageways formed by the spacing segments so that when the armature is rotated air is drawn into the armature at the ends and forced outward at the ventilating spaces formed by the spacing members.

It has been found that the fingers, which extend outward along each tooth, block the openings to such an extent that the air is materially choked back. This is particularly true of small machines which have narrow teeth. In some machines at the narrowest portion of the tooth, namely at the base thereof, the bracing finger occupies almost the entire ventilating space so that a very small volume of air can be forced through the core.

It is customary to make the spacing members from cast brass on account of the brittleness of cast iron and the danger of the comparatively narrow teeth being broken off, and the spacing member thereby rendered useless. But brass is objectionable because, by reason of its softness and flexibility, the bracing fingers of the spacing members between the end-heads and core are often bent outward, partially by the pressure of the teeth of the laminæ, causing the teeth to spread and become loose, which is very undesirable. Furthermore, since there must be a bracing finger for each tooth of the armature, it is necessary to provide new patterns and castings for armatures having different numbers of teeth. Since the patterns are difficult to make, the cost of the machines is thereby considerably increased.

One of the objects of my invention is to provide an armature construction having means for spacing apart the laminæ, and for bracing the teeth, which do not obstruct the ventilating passageways, so that a sufficient circulation of air is easily maintained.

A further object is to provide spacing members which can be employed on any machine of a given size regardless of the number of armature teeth, and to provide in connection therewith, bracing means for the armature teeth, which are inexpensive and have a sufficient degree of stiffness and elasticity to prevent the teeth at the ends of the groups of laminæ or at the ends of the core from being bent outward.

In carrying out one feature of my invention I provide spacing members between the groups of laminæ of the toothed core, which spacing members extend approximately to the bases of the teeth, preferably a little below the teeth, and provide other means in addition to the spacing members for bracing the teeth so that there can be an unobstructed flow of air radially outward.

In another aspect my invention consists in providing improved bracing means for the teeth of a laminated core, comprising two or more adjacent toothed disks of sheet metal preferably having a greater thickness than the laminæ, the teeth of one disk being shorter than the teeth of the other.

More specifically considered my invention consists in a rotary armature for a dynamo-electric machine consisting of toothed laminæ arranged in groups, adjacent groups being spaced apart by a separator having ribs or other projections, and there being provided at the ends of each group of laminæ one or more toothed sheet metal disks having preferably a greater thickness than the laminæ, the separators extending substan-

tially to the bases of the teeth and bearing against the sheet metal disks, the teeth of which have sufficient stiffness and elasticity to brace the teeth of the laminæ. The end-heads bear directly against the outer sheet metal disks at the end of the core.

My invention still further consists in the details of construction and the combinations and arrangements of parts described in the specification and set forth in the appended claims.

For a better understanding of my invention, reference is had to the accompanying drawings in which—

Figure 1 is a partial end elevation of a machine, the armature of which is equipped with my invention; Fig. 2 is a partial longitudinal section of such a machine, Fig. 3 is a transverse section taken approximately along the line 3—3 of Fig. 2.

Referring now to the figures of the drawing in which I have illustrated one form of my invention, I have shown at 10 a rotary armature and at 11 radial field poles, the machine here illustrated being a four-pole machine. At 12 is shown a laminated core, the laminæ in this case being mounted directly upon the shaft 13. If desired, however, the laminæ may be mounted on a spider. The laminæ are arranged in groups, two groups only here being shown, which are spaced apart to form a ventilating space 14. The groups of laminæ are spaced apart by a separator or spacing member 15 having projections, in this case ribs 15^a and lugs 15^b, which extend approximately to the bases of the teeth, in this instance terminating a short distance below the teeth. The spacing member 15 does not bear directly against the laminæ as in the usual constructions, but there are provided between a separator and each group of laminæ toothed disks of sheet metal 16 and 17, the disks being more elastic and preferably of greater thickness than the laminæ. If these disks are of iron or steel they can be considered as forming end laminæ of the core. The teeth of the disks 16 and 17 in this case brace the teeth of the laminæ and prevent the latter from being bent inward. The teeth of the disks 17 are shorter than the teeth of the disks 16, being approximately half as long. I prefer this construction for some machines for the reason that it has been found, by providing one disk with shorter teeth, the teeth of the disks have greater elasticity so that in case the teeth of a group of laminæ are sprung outward therefrom, they again assume their original position. I may provide a different number of disks than that shown and if desired may make all the teeth of the bracing disks of the same length. Similar disks 18 and 19 are also provided at each end of the core, the teeth of the disks bracing the teeth of the laminæ and preventing them from being bent outward. While I prefer that the bracing disks have a greater thickness than the laminæ, they may have the same or even less thickness, in which case a greater number of disks would be employed side by side to obtain the proper stiffness. When a large number of disks are thus employed in a group, the disks may have teeth of gradually varying length, from the disk adjacent the laminæ to the disk most remote to obtain the leaf spring effect. End-heads 20 are provided at each end of the core, each of which end-heads consists principally of a ring 21, radial ribs 22 and a hub or sleeve 23. The ribs 22 bear directly against the outer disks 19 and serve to clamp the laminæ and disks tightly together. The core is provided with a number of longitudinal ventilating openings 24 which are opened at the ends of the machine and communicate with the ventilating openings between the groups of laminæ.

Located in the slots of the armature are coils 25 having end-turns which rest upon the end-heads 20 and are connected to the commutator bars 26 mounted on a spider or hub 27, and held thereon by a nut 28. The spider is provided with longitudinal ventilating openings 29.

It is seen that since the ribs of the spacing members do not extend outward beyond the bases of the teeth, the passageways between the slots in the core are not closed and the flow of air is unobstructed. Furthermore, since the ribs of the spacing member do not correspond in number to the teeth of the armature, the same spacing member can be employed in machines having different numbers of armature slots. The teeth of the laminæ are well braced by the disks which occupy little space. These disks can be easily punched from sheet metal and are inexpensive. At the ends of the core the air currents created by the ribs 22 strike directly against the end-disks and end-turns of the coils, cooling the ends of the machine.

It is evident that many changes can be made without departing from the spirit and scope of my invention, and I do not wish to be confined to the exact details shown, especially as to the number of sheet metal disks and to the details of the spacing members.

What I claim as new and desire to secure by Letters Patent is:—

1. In a dynamo-electric machine, a laminated toothed core, spacing members between the laminæ, said spacing members not extending substantially beyond the base of the teeth of the core, and a plurality of toothed disks stiffer than the laminæ of the core and located at each side of each of said spacing members for bracing the teeth of the

core, the teeth of the disks remote from said spacing members being longer than those of the disks adjacent thereto.

2. In a dynamo-electric machine, a core consisting of laminæ arranged in groups, toothed sheet metal disks at each end of each group, said disks having a greater stiffness than the laminæ and being successively shorter in the teeth, a support separate from the disks, and spacing members mounted on said support and bearing against the disks and extending substantially to the base of the teeth.

3. In a dynamo-electric machine, a core consisting of toothed laminæ, and means for bracing the teeth of the laminæ comprising a plurality of toothed sheet metal disks having greater stiffness than the laminæ, the teeth of one of said disks being shorter than the teeth of the disk adjacent thereto.

4. In a dynamo-electric machine, a rotary core comprising toothed laminæ, toothed sheet metal disks of greater stiffness than the laminæ and located at each end of the core, the teeth of said disks being successively shorter and bracing the teeth of the laminæ, and end-heads having circumferentially spaced ribs bearing against the outer disks.

5. In a dynamo-electric machine, a core comprising a plurality of groups of toothed laminæ, and a plurality of spring metal disks at each end of each group of laminæ and bracing the teeth thereof, said disks being of greater thickness than the laminæ and having successively shorter teeth.

6. In a dynamo-electric machine, a core comprising a group of toothed laminæ, a plurality of toothed disks of different thickness from the laminæ located at each end of such group, said disks being successively shorter in the teeth.

7. In a dynamo-electric machine, a core consisting of toothed laminæ arranged in groups, spacing members between said groups, and a plurality of toothed sheet metal disks at each end of each group, the teeth of the disks more remote from the laminæ being shorter than the teeth of the disks less remote therefrom, the disks being thicker than the laminæ.

8. In a dynamo-electric machine, a core comprising a group of toothed laminæ, several laminæ at the end of the group being thicker than the rest and having successively shorter teeth.

In testimony whereof I affix my signature, in the presence of two witnesses.

WILLIAM H. POWELL.

Witnesses:

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