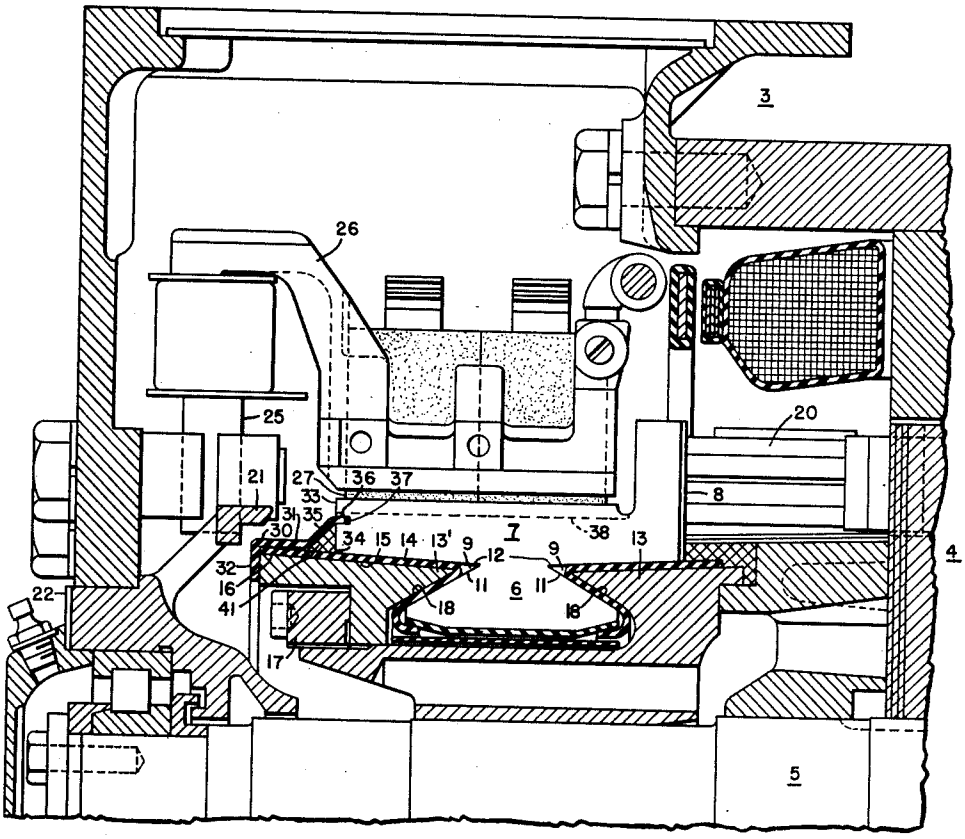
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COMMUTATOR CAP CONSTRUCTION

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WITNESSES:

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COMMUTATOR CAP CONSTRUCTION

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My invention relates to a molded insulating cap which fits over the front extension of the mica V-ring of the commutator of a dynamo-electric machine, such as a direct-current motor or generator. This front extension of the mica V-ring has usually heretofore been protected, either by a string band, or by a molded cap such as is described and claimed in a Patent No. 2,400,-968, granted to Norman H. Willby and myself on May 28, 1946.

The object of my present invention is to provide a protecting-cap construction which is a further improvement over that which is described in the aforesaid patent. In brief, my improved insulating cap has an integral rear flange-portion which protects the vulnerable front corner of the commutator where it comes in contact with the front extension of the mica V-ring.

In the accompanying drawing, the single figure shows a fragmentary longitudinal sectional view of a portion of a motor embodying my invention.

In the drawing, I have shown my invention applied to a commutator-type dynamo-electric machine in the form of a direct-current railway traction-motor, comprising a stator-member 3 and a rotor-member 4, the latter being mounted on a shaft and carrying a commutator-assembly 6 embodying my invention. The commutator-assembly is made up of a number of copper commutator-bars 7 separated by mica or other insulating bars 8, the two kinds of bars being of similar size and shape, except that the insulating bars are thinner and commonly project back about one-eighth of an inch behind the commutator-bars, as indicated by the numeral 8; that is, the mica bars 8 are longer than the copper bars 7. The bars 7 and 8 are provided with V-grooves 9 in the ends thereof, said V-grooves having an inclined inner, arch-binding surface 11, usually at a 30° angle, and an outer surface 12, usually at a 3° angle, or sometimes a 6° angle.

The V-grooves 9 are insulatingly engaged by clamping V-rings 13 and 13' usually of steel, having conical surfaces inclined at the same angles as the surfaces of the V-grooves. The insulating engagement is provided through the intermediary of insulating V-rings 14, preferably made of sheet-mica of sufficient thickness to withstand the maximum voltage which is applied to the commutator-member.

At least the outer clamping V-ring 13', or the one at the front end of the machine, has an outer conical surface 15 which extends out of the associated V-groove 9, beyond the end of the commutator-bars 7. The corresponding insulating

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V-ring 14 likewise has an extended outer conical portion 16 which fits against the extended portion 15 of the clamping V-ring, and which preferably extends out substantially to the large end of the outer conical surface 15 of the clamping V-ring 13'. It is this free or extended portion 16 of the insulating V-ring 14 which was formerly held down by a string-band, or by the molded insulating cap which is described and claimed in the afore-mentioned patent.

The clamping-rings 13 and 13' are held in clamping-position by means of a nut 17 applied to the ring 13' so as to hold the inner conical surface 18 of each clamping-ring in arch-binding clamping-engagement with the corresponding surface 11 of the respective V-grooves.

The commutator-bars 7 are provided with armature-connections 20 which cause the commutator-bars to operate at such voltage as to involve the danger of flashovers to ground, under operating conditions of the machine, particularly when the machine is utilized as a street-car or electric-locomotive motor which is operated close to the ground, in wet, dirty weather. Such flashovers may take the form of arcs from the free ends of one or more commutator-bars 7, to any adjacent grounded surface, such as the end of the associated clamping V-ring 13', or, as shown, I provide flashing-sectors 21 which are carried by the bearing-cartridge 22, between the brush-holder-supporting structures 25 which support the brushholders 26 for carrying the brushes 27 which bear on the cylindrical surface of the commutator.

In accordance with my invention, the free, extending ends 16 of the mica V-rings 14 are held down, and at the same time the commutator is protected against flashings, by means of a rigid insulating cap 30, which is preferably molded of layers of impregnated asbestos-paper, so as to provide a rigid structure of sufficient mechanical strength to resist centrifugal forces. This cap 30 has a substantially cylindrical portion 31, which extends over said extending portion 16 of the insulating V-ring 14. Preferably, this substantially cylindrical portion 31 is of such diameter that its inner surface is substantially in direct contact with the end-portion, or largest end, of the extended portion 16 of the insulating V-ring 14. The cap also has an integral front flange-portion 32 which extends down radially over the end of the associated clamping V-ring 13'.

The construction so far described is similar to that which is described and claimed in the aforesaid patent. Such a construction admirably ac-

complishes the functions of retaining the insulating V-rings 14, and guarding against commutator-to-ground flashovers as described in the aforementioned patent.

However, there is another vulnerable point of direct-current commutators, and that is the lower or inner half of the front end-face 33 of the commutator-bar assembly 7, and particularly the lowest or innermost corner of said front-face 33, as indicated at 34, where the commutator-bars 7 come in contact with the free extending ends 16 of the mica V-rings 14. Experience has shown that this corner 34 is a vulnerable spot, where dirt and moisture may collect. In motors which operate under conditions of high volts between adjacent bars, the exposed, or front-end, portion of each bar is thinnest at this point, and under certain conditions arcs may take place from bar to bar at this point, damaging both the bars and the insulation. The voltage-gradient, or volts per inch, around the circumference, are also the highest here, as compared with the voltage-gradient for any other exposed part of the commutator.

In accordance with my present invention, the molded cap 30 is also provided with an integral rear flange-portion 35 which extends radially outward, at an angle, from the rear end of the substantially cylindrical portion 31, so as to protect the vulnerable front inner corner 34 of the commutator. This rear flange 35 is joined to the substantially cylindrical portion 31 through an integral rounded junction which provides a smooth surface which tends to resist the accumulation of dirt and dust, and which, moreover, can be readily wiped clean when necessary. The upper or outer peripheral end of the rear flange 35 terminates in a rearwardly directed cylindrical flange 36, which enters a cylindrical groove 37 which is machined in the front face 33 of the commutator-bars 7. The diameter of this cylindrical groove 37 is as large as is consistent with the maximum wearing-depth (or minimum worn diameter) of the commutator, as shown by the line 38. This cylindrical groove 37 is made slightly deeper, in the depth of its axial cutting into the commutator assembly, than is ordinarily required, so as to allow for variations in the axial dimension between the front face 33 of the commutator-assembly and the front face of the clamping V-ring 13'.

In using my invention, the cap 30 is slid on axially over the extending end 16 of the insulating V-ring 14, after first smearing the inside of the cap 30, the vulnerable corner 34, and the cylindrical groove 37 with a hardenable insulating cement or cements 41. The result is a cap-construction which not only holds the extending end 16 of the insulating V-ring 14 in place, and guards against arcing-grounds, but also protects the vulnerable front corner 34 of the commutator-bar assembly, while at the same time providing a smooth, glossy surface, without any sharp angles or corners, which resists the accumulation of dirt, and which may easily be wiped clean if necessary.

I claim as my invention:

1. A V-ring commutator-assembly of commutator-bars and insulating bars separating the commutator-bars, said bars having V-grooves in the ends thereof, said bars also having a cylindrical groove in at least the front end thereof, insulating V-rings, clamping V-rings having a conical surface tightly engaging a corresponding surface of the V-grooves, with the insulating V-rings interposed in between, at least the front clamping V-ring having an outer conical surface which extends out of the associated V-groove, beyond the end of the commutator-bars, the outer conical portion of the corresponding insulating V-ring likewise having an extended portion fitting against the extended portion of the clamping V-ring, a separately formed, rigid, insulating cap, having sufficient mechanical strength to resist centrifugal forces, said cap having a substantially cylindrical portion extending over said extended portion of the insulating V-ring, and further having an integral front flange-portion extending over the end of the associated clamping V-ring, and still further having an integral rear flange-portion extending radially outwardly in front of a portion of the front end of the commutator-bars, said rear flange-portion being integrally joined to said substantially cylindrical portion with a smooth rounded surface, and terminating in a rearwardly extending cylindrical flange which enters said cylindrical groove in the front end of the bars, and a filling of an insulating cement substantially filling the space between the cap, the extended portion of the insulating V-ring, the covered portion of the front end of the commutator-bars, and the aforesaid cylindrical groove in the front end of the commutator-bars.

2. A commutator-type dynamo-electric machine having a V-ring commutator-assembly as defined in claim 1, characterized by having armature-connections to said commutator-bars for causing the same to operate at such voltage as to involve the danger of flashovers to ground, and flashovers from bar to bar, under operating conditions of the machine, except for the presence of said cap.

CLARENCE A. ATWELL.

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