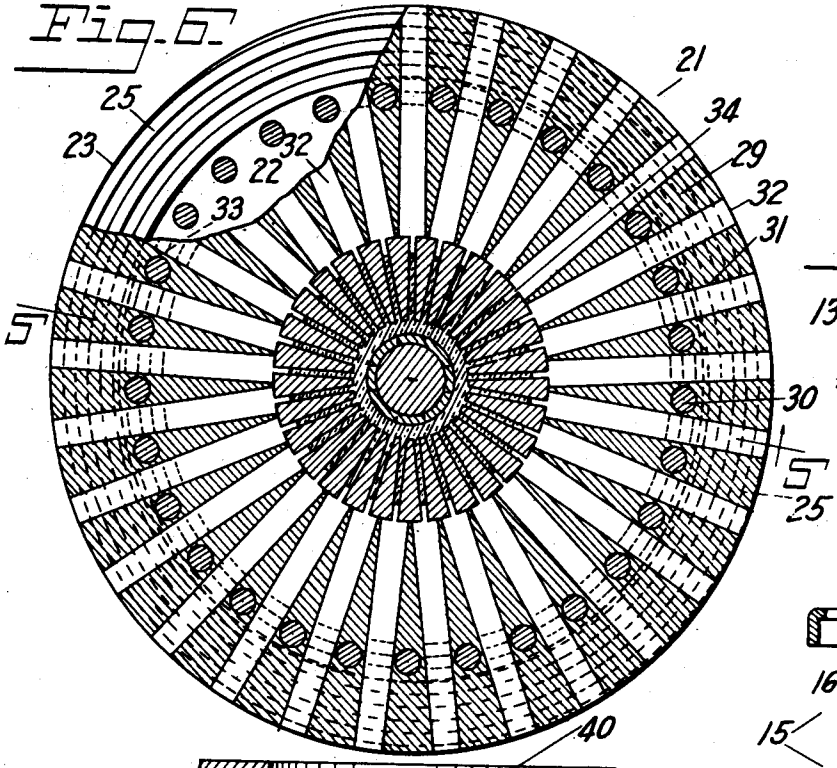
Feb. 16, 1932. V. G. APPLE ET AL 1,845,114

COMMUTATOR

Filed July 25, 1929

Fig. 6.



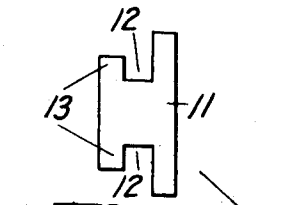


Fig. 1.



Fig. 2.

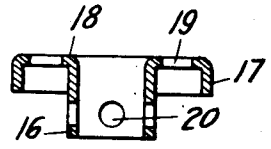


Fig. 3.

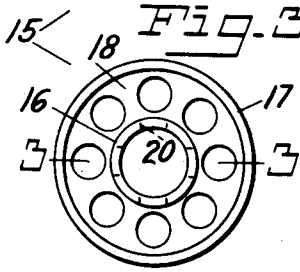
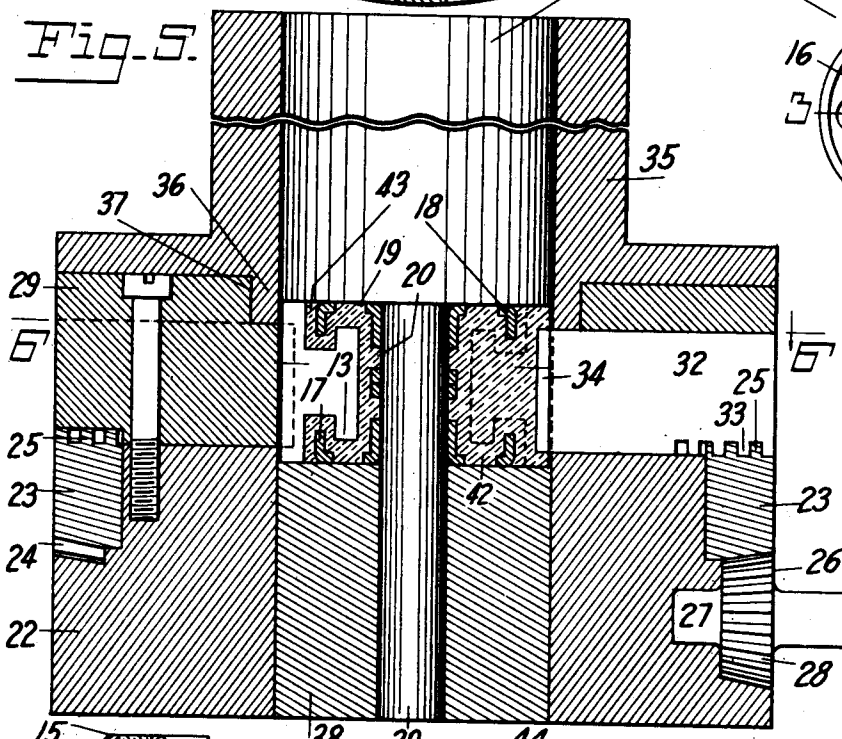
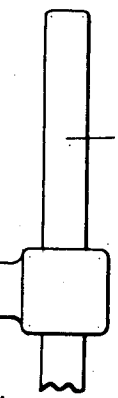


Fig. 4.

Fig. 5.





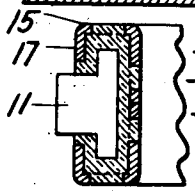


Fig. 7.

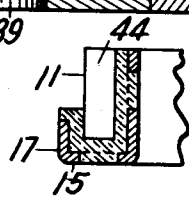


Fig. 8.

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UNITED STATES PATENT OFFICE

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COMMUTATOR

Application filed July 25, 1929. Serial No. 380,966.

This invention relates to commutators, and specifically to that type wherein a plurality of spaced apart segments of conductive material are held in spaced apart relation by a core of insulation which has been molded between and about them.

An object of the invention is to generally improve a commutator of this class.

Another object is to provide metal reinforcing means within the core of insulation which will take the bursting strain incident to pressing the commutator on a shaft, which strain must be taken by the core of insulation itself where no reinforcement is provided.

Another object is to so construct the aforesaid metal reinforcing means as to extend also around the core of insulation to hold it together against the bursting strains from a centrifugal force at high rotative speeds.

Still another object is to construct the aforesaid reinforcing means in such form as will securely unite with the insulation as it is pressed about the segments to form a core.

Still another object is to construct the aforesaid reinforcing means in such form as will serve also as a means to restrain the forcing of insulation about the segments until said insulation is made sufficiently mobile to be forced against the segments safely.

Further objects and meritorious features of the invention will readily become apparent to one skilled in the art from a consideration of the following description when taken in conjunction with the drawings, wherein—

Fig. 1 is an elevation of the commutator segment.

Fig. 2 is an end view of the segment.

Fig. 3 is an axial section taken at 3—3 of Fig. 4 through the reinforcing member.

Fig. 4 is a plan view of the reinforcing member.

Fig. 5 is a vertical axial section taken at 5—5 of Fig. 6 through the mold used for pressing insulation between and about the segments to compose a core.

Fig. 6 is a transverse section taken at 6—6 of Fig. 5.

Fig. 7 shows a modified form of the commutator.

Fig. 8 shows a further modification of the commutator.

Similar numerals refer to similar parts throughout the several views.

Referring to the drawings, bar stock of wedge shaped cross section, such as is commercially obtainable for commutator building, is punched into segments 10 having a wearing portion 11, notches 12, and projections 13. The sides 14 of the segments are inclined one to another as in Fig. 2. For illustrative purposes only, a commutator having twenty-nine of these segments is herein shown.

The reinforcing member 15 is preferably drawn from sheet metal, and comprises a tubular hub 16, a rim 17, and a flange 18 connecting the hub and rim. Holes 19 extend axially through flange 18 and holes 20 extend radially through hub 16. In the embodiment of the invention shown two reinforcing members 15 are required.

The mold 21 has a body 22 shouldered at its outer diameter to rotatably support ring 23 which has bevel gear teeth 24 in its lower edge and a scroll 25 in its upper edge. A bevel pinion 26 has a rotative bearing 27 in body 22 so located as to properly mesh the teeth 24 of ring 23 with the teeth 28 of pinion 26.

A relatively thick plate 29 is secured to the top of body 22 by screws 30. The under side of plate 29 has a series of radially extending grooves 31 into which an equal number of jaws 32 are slidably fitted. The lower edges of jaws 32 have teeth 33 fitting into the scroll 25, and their inner ends carry the radially extending segment-separating tangs 34.

The stock ring 35 is concentrically supported on plate 29 by annular rib 36 which fits snugly into a corresponding recess 37 in the plate. Body 22, plate 29 and stock ring 35 are all bored to a diameter very slightly larger than the commutator to be molded.

A plug 38 concentrically bored to receive the pilot 39 fits the bore of body 22, and a plunger 40 is slidably fitted to the bore of stock ring 35.

To make a commutator the stock ring 35 and the plunger 40 are removed from the mold. A reinforcing member 15 is placed, flange 18 downward, over pilot 39. Pinion 26 is then slightly rotated by handle 41 until jaws 32 are moved radially outward a very short distance. The radially outward movement of jaws 32 increases the circumferential distance between the segment-separating tangs 34 so that now the segments 10 may be assembled in the mold between the tangs.

When an entire set of segments 10 is assembled in the mold as shown, the pinion 26 is rotated by the handle 41 to move the jaws 32 radially inward until the segments are clamped in spaced apart relation between adjacent tangs 34. Another reinforcing member is then placed with the flange 18 upward, over pilot 39, the stock ring 35 is returned to place, insulating material 42 is put into the stock ring and forced downward by plunger 40 through holes 19 and spaces 43 between and about the segments and reinforcing members as shown.

Whether or not the mold needs to be heated to flux the insulation before the plunger 40 forces it into place depends on the nature of the insulation used, but where the insulating material is put into the mold in solid or granular form and fluxed in the mold before it is forced into place, there would ordinarily be danger that the solid material would be forced against the segments before it became sufficiently fluid, in which case some of the segments might be pressed together at their inner ends, but with flange 18 between the insulation and the free ends of the segments, the insulation must pass through holes 19 and narrow space 43 to get to the free ends of the segments. For this reason there is no danger that unfluxed insulation will be forced against the free ends of the segments to force some of them together into electrical contact while molding is being effected, since the insulation must be comparatively mobile to pass through holes 19 and space 43.

To remove the completed commutator from the mold the jaws 32 are first moved radially outward a distance slightly greater than the radial length of tangs 34, whereupon the plunger 40, the commutator, the plug 38 and the pilot 39 may together be pushed endwise out of the mold. Plunger 40 may then be set aside and pilot 39 pushed endwise out of plug 38 when the commutator will be complete except for a slight trueing up of the wearing portion 11 of the segments.

The completed commutator in its preferred form is sufficiently shown in the mold in Figs. 5 and 6 and is therefore not further illustrated, but in Fig. 7 a modified form of a completed commutator is shown wherein the axial length of the wearing surface 11 is considerably shortened, so that it does not extend over the rim 17 of the reinforcing member 15. Where there is sufficient end space the commutator Fig. 7 may be employed.

Fig. 8 shows how plain unnotched segments 44 may be used with reinforcing members 15 where there is no objection to having the rim 17 of larger diameter and extending endwise beyond the wearing surface 11 as shown.

From the description and drawings it will be apparent that an improved structure is provided; that the metal tube 16 will prevent bursting of the core 42 when it is forced over a shaft; that because the rim 17 overlaps the ends of the segments, the core 42 is reinforced against the bursting strains due to the radially outward pull of the segments caused by centrifugal force at high rotative speed; that the portion of the insulation mass 42 extending through holes 19 and 20, securely ties the insulation and the reinforcing means together; and that means is provided to restrain insulating material, while yet in an immobile state, being forced against the spaced apart inner ends of the segments to electrically short them one with another.

Having thus attained the objects of the invention as set forth, we claim—

1. A commutator comprising, a cylinder composed of a plurality of circumferentially spaced apart metal segments each having a deep notch in each end, two perforated metal reinforcing flanges, one at each end of said cylinder, each said flange having an integral inturned rim at its outer circumference extending into the said deep notches and an integral inturned hub at its inner circumference extending into the said cylinder, the hub of the one said flange meeting and resting against the hub of the other said flange within said cylinder, the said flanges, rims and hubs being spaced apart from the said cylinder, and a core of insulation extending between and about the segments, between the said segments and the said hubs, between the segments and the said rims and flanges, and into the perforations of said flanges.

2. The method of making a commutator of the character described in claim 1, which consists of placing one of the said perforated flanges in the bottom of a mold with the rim and the hub thereof extending upwardly, placing the said cylinder of circumferentially spaced apart metal segments in the mold around the said hub with the said rim extending into the said notches, gripping the segments at their outer edges, placing another one of the said flanges in said mold over the top of the said cylinder with the said rim extending downwardly into the said notches and the said hub extending downwardly into the said cylinder and resting on the first said hub, placing a predetermined quantity of unfluxed insulation on the top of the second

said flange over said perforations, applying downward pressure against said insulation, applying heat to said insulation, maintaining said pressure and heat until said heat fluxes said insulation and said pressure forces said fluxed insulation through said perforations between and about said segments, between said segments and said hubs, between the said segments and the said rims and flanges, and into the perforations of said flanges, then hardening said insulation.

In testimony whereof we affix our signatures.

VINCENT G. APPLE.
FREDERICK W. COTTERMAN.