May 6, 1930. A. SCHMID 1,757,393

COMMUTATOR

Filed July 18, 1927

Fig. 1

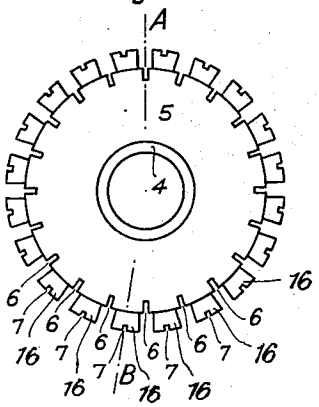


Fig. 2

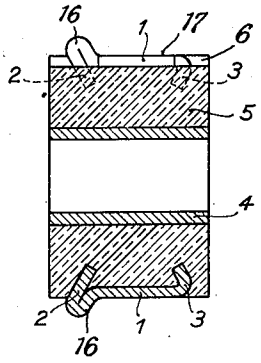


Fig. 3

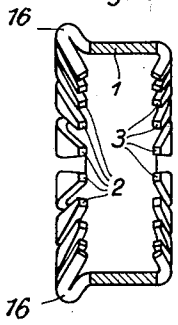


Fig. 4

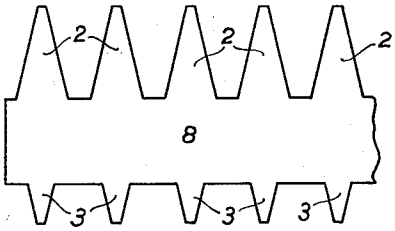


Fig. 5

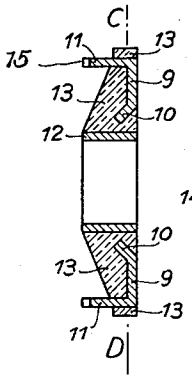


Fig. 6

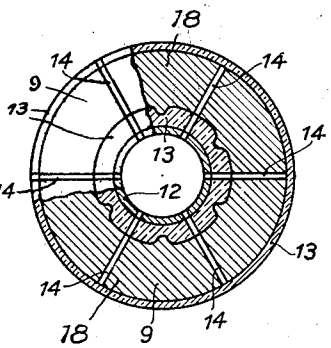


Fig. 7

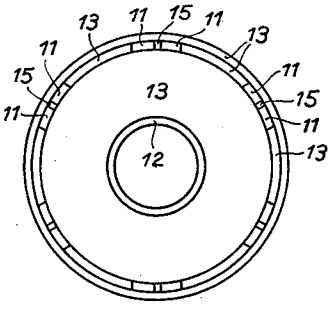
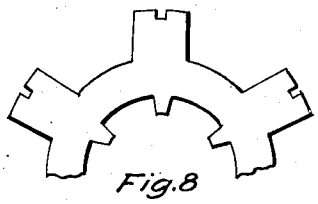


Fig. 8



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Patented May 6, 1930 1,757,393

UNITED STATES PATENT OFFICE

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COMMUTATOR

Application filed July 18, 1927, Serial No. 206,777, and in Germany July 22, 1926.

The present invention relates to commutators for rotary electric machines and methods of manufacturing the same, and has particular reference to commutators of the type formed by securing a ring or sleeve of metal on an insulating hub or bushing and thereafter cutting the ring into separate commutator bars.

In commutators of the above type, due to heating and the difference in the coefficients of expansion of the insulating material and the metal commutator bars or sections, there is a tendency for the commutator sections to become loose due to the lack of adequate means of securing or fastening them in the insulating material.

It is the chief object of the present invention to overcome the above objections by providing a simple inexpensive commutator and method of manufacturing same in which the commutator bars or sections are secured in the insulating hub in such a way that they cannot come loose even under the operating conditions previously mentioned.

Other objects of the invention will be apparent from a perusal of the following specification and the drawings accompanying the same.

In the drawings:

Fig. 1 is a front end view of a drum-shaped commutator embodying the invention.

Fig. 2 is a section taken on the line A—B of Fig. 1.

Fig. 3 is a section on the axis of the metal ring used in the commutator of Figs. 1 and 2.

Fig. 4 is a blank from which the ring of Fig. 3 may be formed.

Fig. 5 is a section through a disk-shaped commutator embodying my invention.

Fig. 6 is a front view partly in section on the line C—D of Fig. 5.

Fig. 7 is a back view of the commutator of Figs. 5 and 6.

Fig. 8 is a fragmentary plan view of the annular blank.

Referring to the drawings in particular and first to Figs. 1 to 4, the metal sleeve or ring 1 from which the commutator bars or sections are formed is made, as shown in Fig. 3, in the form of a cylinder of sheet metal with anchor or locking portions made, in the present example, in the shape of reentrant hook-shaped lugs 2 and 3, the lugs 2 being doubled on themselves to form a reflex or double bend with an outwardly extending loop 16. This sleeve as shown in Fig. 3 may be formed by pressing, spinning or otherwise forming a metal cylinder with reentrant ends having the same cross section as that of the lugs 2 and 3 and subsequently forming the lugs by milling out at the ends; or it may be formed from a blank 8 as shown in Fig. 4, punched out from a flat metal strip, the lugs 2 and 3 formed on the opposite edges of the blank being first turned down in the hook form shown in Fig. 3, and the whole then bent into the sleeve or ring form of Fig. 3.

The sleeve of Fig. 3 and a suitable bushing 4 are imbedded in a body or hub 5 of insulating material, the insulating material being pressed around the ring and the lugs 2 and 3 while in a plastic state to bring it into intimate contact with the ring and the lugs and completely fill the space between the reentrant hook-shaped lugs, as clearly shown in Fig. 2.

The body or hub 5 is preferably formed of any suitable insulating material which can be molded or pressed in the plastic state. Any one of the many well-known resinous materials, such as "bakelite" for example, which are initially plastic, but which harden under the application of heat and pressure, may be used. After the insulating material has set or hardened, the sleeve 1 is cut through longitudinally between the lugs to form the commutator bars 17 separated by slots 6. The outwardly extending bent portions 16 of the hook-shaped lugs 2 serve as convenient connecting posts for connecting the commutator sections with the armature winding, to facilitate which portions 16 are provided with notches 7 in which the ends of the armature wires may be soldered or otherwise attached.

It will be clear from an inspection of Fig. 2 that each of the commutator bars or sections 17 is securely held in the hub 5 against loosening by the hook-shaped lugs 2 and 3 which extend radially from the inside of the arcuate commutator sections, each lug extend-

ing at an acute angle from its respective section.

In the disk-shaped embodiment of the invention shown in Figs. 5 to 7, the metal plate 9 from which the commutator bars or segments are formed is made in the form of a flat ring with lugs 10 and 11 extending laterally and to one side. This ring with its lugs is backed by and imbedded in a body or hub 13 of insulating material such as "bakelite" or the like, the ring 9 and hub 13 together with a suitable bushing 12 being pressed together, while the material of the hub is in a plastic state, to cause the insulating material to surround the inner and peripheral edges of the ring 9, to entirely imbed the lugs 10, and to imbed all except the extreme end portions of the lugs 11. After the hub 13 has set or hardened, the flat ring 9 is cut through radially between the lugs to form from the metallic ring 9 the separate commutator segments 18 shown in section in Fig. 6. In this form of the device the free ends of the lugs 11 serve as connecting posts for connecting the commutator segments 18 with the armature windings of the machine on which the commutator is to be used, to facilitate which the ends of these lugs are provided with notches 15.

In either the drum-shaped or disk-shaped forms of the device, the outer surface of the metal ring may be trued by turning down on a lathe before separation into segments with the advantage that the turning operation may be performed on a continuous surface.

Although both forms of the commutator have been shown provided with a bushing 4 or 12, this may be omitted, if desired, and the insulating body merely bored out to the desired size.

In both forms, the locking or anchor portions or lugs extend at such angles from the respective commutator section or bar that the commutator sections are securely locked or secured in the insulating body or hub at all times, irrespective of the direction from which the stresses tending to loosen the parts may come.

It is to be understood that the invention is not limited to the exact construction or procedure illustrated and described as many modifications within the scope of the appended claims may be adapted.

What I claim is:

1. A commutator comprising a disk-shaped hub of insulating material, a commutator segment, a lug on the segment substantially wholly imbedded in the hub, and another lug on the segment extending through and out of the hub parallel to the axis and near the periphery to form a circuit connecting post.

2. A commutator consisting of a disk-shaped body member formed of insulating material, and spaced metallic commutator segments in the form of segmental sections of a flat ring imbedded in one face of said member with their inner and outer circular edges countersunk in and covered by the material of said member and their radial edges free of the material of said member, said sections being provided with laterally extending inner and outer anchor lugs, a substantial portion of each of said lugs being embedded and locked in said body member against radial movement, said outer lugs extending through and clear of the insulating material to form connecting posts.

3. A disk-shaped commutator comprising commutator segments in the form of and arranged as segments of a flat ring, and a disk-shaped body of insulating material imbedding and covering one flat surface and the entire inner and outer circular edges of the flat ring segments, and undercut between the adjacent radial edges of said segments, a portion of each of said segments extending axially through and clear of the disk-shape body of insulating material to form connecting posts.

4. A disk commutator comprising a disk-shaped hub reduced in thickness toward its periphery, commutator segments imbedded in one of the faces of said disk-shaped hub, a lug extending laterally from each segment through the reduced portion of the hub and out beyond the opposite face of said hub to form a circuit connecting post and a second lug on each segment embedded in the thick portion of the disk-shaped hub.

In testimony whereof I have hereunto affixed my signature.

ANTON SCHMID.