May 9, 1933. A. OLDENBURG 1,907,561

COMMUTATOR

Filed Jan. 11, 1932

Fig. 1

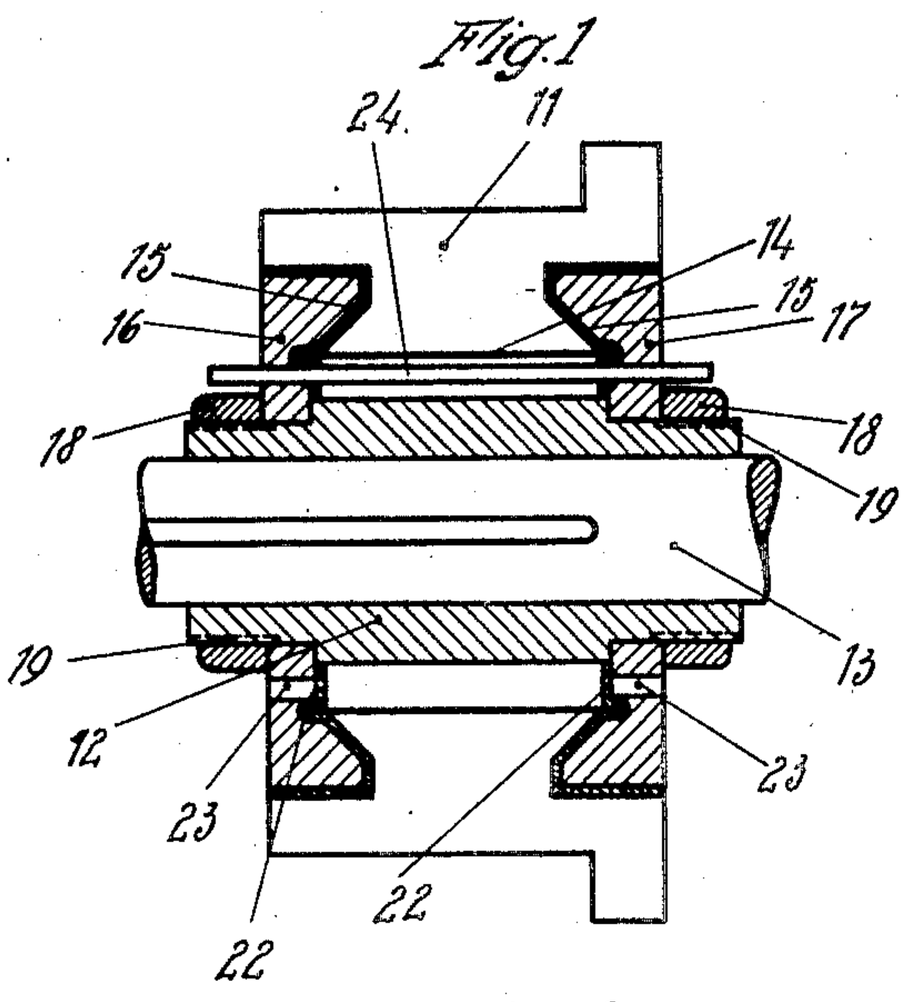
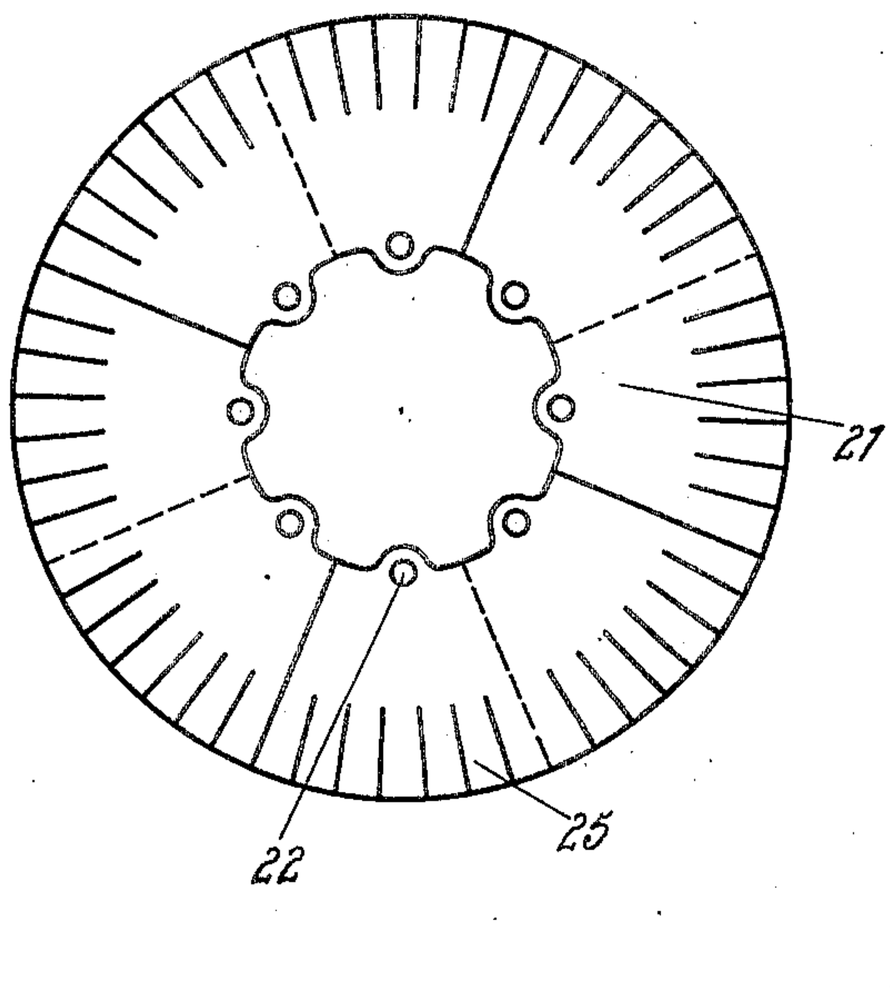


Fig. 2



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Patented May 9, 1933 1,907,561

UNITED STATES PATENT OFFICE

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COMMUTATOR

Application filed January 11, 1932, Serial No. 585,871, and in Germany January 20, 1931.

My invention relates to improvements in commutators, and more particularly to an insulation for commutator bars.

For the purpose of insulating the commutator bars or segments from the shell holding them, collars of insulating material, consisting of mica or other insulating material, pressed with adhesive substances into the required ultimate shape, are often placed between the bars and the shell. Collars of that kind are, however, expensive and can, owing to their stiffness, not be made to lie completely against the shell on the one side and the coned end rings holding the bars on the other. Besides, they are very sensitive to variations in temperature.

Through my invention it is rendered possible to use a completely non-adhesive insulating means, owing to the fact that the insulating intermediate layer placed between the commutator bars and the shell is not brought into the shape corresponding to the dove tails of the bars until the commutator is being assembled. For small commutators, a disk may be used which is provided with radial slits at its peripheral edge and which, when the commutator is compressed, places itself tightly between the bars and the shell. If the diameter of the commutator exceeds a certain size, so that it is not possible to use a disk in one piece, the disk may according to my invention be divided into a plurality of segments. In order to be able to assemble these segments to a ring, it is advisable to provide axially directed holes in the coned clamping rings and holes adjacent to the inner peripheral edge in the insulation ring segments, and to pass rods through these holes. The insulation segments are then assembled to a complete annular disk on these rods and thus securely held in position whilst being compressed. This disk formed from the mica segments is, when being compressed between the dove tails of the bars and the coned end rings of the shell, forced into a conically shaped ring or collar. After the assemblage of the commutator the rods may be removed.

The accompanying drawing illustrates an example for carrying out the invention. Fig. 1 shows a longitudinal section through the finished commutator, and Fig. 2 is a view of an insulating disk before it is placed into the commutator. In the finished commutator represented in Fig. 1, the commutator bars 11 are arranged on the shell 12, keyed or otherwise secured against shifting to the motor shaft 13.

The bars 11 are insulated from the shell 12 by a cylindrical sleeve 14 made of insulating material and by two partly coned mica collars or rings 15, made from disks such as is shown in Fig. 2. In clamped condition these rings are located between the inwardly cone-shaped clamping rings or flanges 16 and 17 forming the end parts of the commutator, and the bars. The rings 16 and 17 are passed over the ends of the shell 12 and pressed against the dove tails of the bars 11 by nuts 18 screwed onto the threaded end 19 of the shell 12.

The interposed insulating layers 15 are, as shown in Fig. 2, composed of separate segments 21 of mica or other suitable insulating material, placed in several layers the one upon the other and overlapping in a similar manner as the laminations of the stator of large alternators. The segments 21 are provided with holes 22 corresponding in position to holes drilled axially through clamping rings 16 and 17 of the shell.

To enable the disks formed by the segments 21 to assume the conical shape of the end flanges 16 and 17, radial slits are cut into the disks at their circumference. The method of assembling such a commutator is as follows:

First the end ring 17 is pushed onto the shell 12 by means of the nut 18, and the rods 24 are passed through the holes 23 of the end ring and the holes 22 of the mica segments, the latter being so placed in layers as to form disks 15 of uniform thickness. Then follow the commutator bars, already assembled and temporarily clamped in a holding ring in known manner not shown, and then the insulating sleeve 14 is inserted and the mica segments 21 of the other insulating disk are assembled on rods 24 on the other side of the commutator bars into a laminated disk of insulating material, as described above. When

the two end rings 16 and 17 are now drawn together by means of the nuts 18, the mica segments are forced by the clamping rings 16 and 17 respectively against the dove tails of the commutator bars and ultimately assume the conical shape corresponding to that of the dove tails. After the nuts 18 are thoroughly tightened, rods 24 may be removed. The remaining holes 22 and 23 and the space between the shell 12 and the insulating sleeve 14 then serve for the circulation of cooling air, which enters through the holes 23 of the ends rings 16 and 17 and carries away the heat from the commutator bars.

Through my invention the use of adhesive substances to hold the mica insulation together is avoided, so that the insulation of the commutator is capable of resisting considerably higher temperatures than was hitherto the case. In addition to this, the assembly of the commutator is cheaper than with the use of insulating collars previously used, which are pressed into the shape corresponding to that of the dove-tails of the bars and consist of micanite or other insulating material cemented together. Such previously prepared rings are more expensive and do not always ensure a tight fit.

I claim as my invention:

1. Method of assembling on a shaft a laminated dove-tail recessed commutator ring insulated between two correspondingly dove-tailed clamping rings, consisting in first mounting one clamping ring on the shaft, then adding a disk of insulating material of suitable diameter, then adding the commutator ring, then adding a second disk of insulating material of similar diameter, then adding the second clamping ring, and finally pressing the two clamping rings against the commutator ring, whereby said insulating disks are forced and folded by said clamping rings into the dove-tailed recesses of the commutator ring to form an insulating collar between said clamping rings and the commutator ring.

2. Method of assembling on a shaft a laminated dove tail recessed commutator ring insulated between two correspondingly dove-tailed clamping rings, consisting in first mounting one clamping ring on the shaft, then adding a laminated disk of insulating material of suitable diameter, then adding the commutator ring, then adding a second laminated disk of insulating material of similar diameter, then adding the second clamping ring, and finally pressing the two clamping rings against the commutator ring, whereby said insulating disks are forced and folded by said clamping rings into the dove-tailed recesses of the commutator ring to form an insulating collar between said clamping rings and the commutator ring.

3. Method of assembling on a shaft a laminated dove tail recessed commutator ring insulated between two correspondingly dove tailed clamping rings, consisting in first mounting one clamping ring on the shaft, attaching a plurality of axially directed guide rods to said clamping ring, then assembling on said guide rods a group of insulating disk segments into a laminated insulating disk, then adding the commutator ring, then assembling on said guide rods another, similar group of insulating disk segments into a second laminated insulating disk, then adding the second clamping ring, and finally pressing the two clamping rings against the commutator ring, whereby said insulating disks are forced and folded by said clamping rings into the dove-tailed recesses of the commutator ring to form an insulating collar between said clamping rings and the commutator ring.

In testimony whereof I affix my signature.

ALFRED OLDENBURG.