PATENT SPECIFICATION

Application Date: Apr. 19, 1920. No. 10,802/20. **153,234**

Complete Accepted: Nov. 4, 1920.

COMPLETE SPECIFICATION.

Improvements in Commutators for Electric Motors.

I, FRANK HORNBY, of Meccano Limited, Binns Road, Old Swan, Liverpool, Engineer, British Subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to commutators for electric motors and more particularly to disk commutators wherein the brushes contact with the commutator segments at the side face of the commutator.

The object of the invention is to simplify the construction of the commutator, to render it compact and to reduce the cost thereof by reducing the material of which the commutator is made and also by reducing the labour and time required to assemble the commutator. Disk commutators are commonly built up in the same way as ordinary commutators with insulating material such as mica between the segments but it has been suggested to employ a disk of insulating material in which circular pieces of copper are embedded with their contact faces flush with the surface of the insulating material and are held by radial set screws inserted at the periphery of the disk.

According to my invention, a disk or skeleton frame made of suitable insulating material has a plurality of commutator segments which are seated in openings formed in the disk and insulating disks are applied to the inner and outer faces of the commutator and radially overlap the segments, the latter being separated and insulated from each other by narrow radial spacing members, preferably constituting parts of the skeleton disk, and being held in place in the disk by contact of the edge faces of the segments with the disk.

The disk may be made from any suitable insulating sheet material by punching out the material from the spaces occupied by the segments, or said disk may be formed about segments properly spaced in relation one to the other by a molding operation with an insulating substance, such as bakelite, condensite or other suitable moldable insulating material. In each instance the segments, which are made of less radius than that of the disk, are embedded or inserted in the insulating material of the disk with their faces flush with the side faces of the disk and are spaced and insulated from each other by the material of the disk.

In the drawings is illustrated one particular embodiment of my improved commutator and its application to a motor. The motor herein shown is a small type of motor which is more particularly adapted for operating toys, talking machine mechanism, sewing machines and other like uses where small horse power output is required; although my improvements may be adapted to motors of larger capacity.

As shown in the drawings:—

Fig. 1. is an edge elevation, partly broken away, of a motor equipped with my improved commutator.

Fig. 2. is a partial side elevation and a partial section of the motor, the section being taken on line 2—2 of Fig. 1.

Fig. 3. is an inner face view of the commutator.

Fig. 4. is an outer face view thereof.

Fig. 5. is an axial section of the commutator.

Fig. 6. is a side view of the skeleton insulating disk.

Fig. 7. is a side view of one of the commutator segments.

The frame of the motor comprises upright side members 10, 10 which are connected by tie rods 11, 11 and spaced by spacing sleeves 12 which co-operates with nuts on the ends of the bolts to rigidly connect the side members.

14 designates the laminated field magnet and 15 the field coil. 16 designates as a whole the armature, herein shown as a three pole armature, which rotates between the field poles with the armature shaft 17 that is rotatively mounted in suitable bearings in the side members 10 of the frame and is provided with a driving pulley 18. 20 designates as a whole the commutator. It comprises, as herein shown, a skeleton disk 21, separately shown in Fig. 6. and which may be assumed to be cut or stamped from a sheet of suitable insulating material. In stamping the disk, parts are cut therefrom to produce angularly spaced and symmetrically arranged openings 22, disposed exteriorly to and centrally of an annulus 23 constituting a hub, and connected by narrow radial spacing members 24 to the outer part or rim.

25, 25 designate the commutator segments, one of which is separately shown in Fig. 7. They are shaped to correspond to the openings 22 of the disk, and when said disk is cut or stamped out from a sheet of insulating material, said segments are made of slightly larger dimensions than the openings. They are adapted to be pressed into said openings and have engagement only at their edge faces with opposing edges on the disk. The relatively larger segments are pressed into the disk openings to fixedly hold the segments in place. The said segments are herein shown as made of the same thickness of the disk so that their faces are flush with the side faces of the disk.

The radial members 24 of the disk constitute means to separate and insulate the segments from each other. An advantage of the construction described is that the air gaps between the segments are filled flush with the faces of the copper segments with an insulating material, so that the face of the commutator on which the brushes travel, by reason of the relative rotation of the commutator and brushes, is smooth and continuous. The space between the segments being thus filled with an insulating medium prevents metal particles from accumulating in the air gap between the segments, which would tend to short circuit the segments on each other. The disk is provided with a central opening 26 through which the armature shaft extends, and the disk is fitted tightly over the armature shaft against a suitable shoulder 26[1].

Arranged at the inner and at the outer sides of the disk are smaller insulating disks 27, 28, respectively, the disk 28 being smaller than the inner disk 27, and the latter disk being formed on a radius slightly smaller than that of the segments. The said inner larger disk is pressed upwardly against the shoulder of the shaft and the outer smaller disk 28 fits tightly on said armature shaft. Said disks 27, 28 increase the bearing area of the commutator on the shaft so as to provide a strong and rigid connection between the shaft and commutator. The presence of said inner and outer disks also serves the further function of assisting to support the segments in the event such segments should become slightly loosened.

The disks are connected to their respective armature windings by wires 29 which are soldered or otherwise connected to the inner faces of the segments near their margins and radially exterior to the disk 27, as herein shown.

30, 30 designate brushes which extend through and fit closely in parallel insulating plates 31, 31 arranged at the commutator side of the motor, and said plates are fixed to the motor frame by the upper tie bolts or rods 11. The said insulating plates 31 constitute a mounting for a reversing switch 32, which is rotatably mounted on the armature shaft.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A commutator for electric motors comprising a disk of insulating material and commutator segments embedded therein in the plane of the disk and spaced by material which is flush with the faces of said segments, and insulating disks applied to the inner and outer faces of said commutator and radially overlapping said segments.

2. A commutator for electric motors comprising a skeleton body comprising an exterior ring portion, an interior annulus or hub and radial members connecting said hub and ring portion and commutator segments seated in the openings between said radial portions and flush on their brush contact faces with the faces of said radial portions.

3. A commutator for electric motors

comprising a skeleton body comprising an exterior ring portion, an interior annulus or hub and radial members connecting said hub and ring portion and commutator segments seated in the open spaces between said radial portions and fixed in place by engagement of their edge faces with the edge faces of said radial portions, said ring and said annulus.

4. The improved commutator for electric motors, substantially as described and shown in the accompanying drawings.

Dated this 15th day of April, 1920.

For the Applicant,

A. J. DAVIES,
Patent Agent,
37, Moorfields, Liverpool.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1920.

FIG. 1.

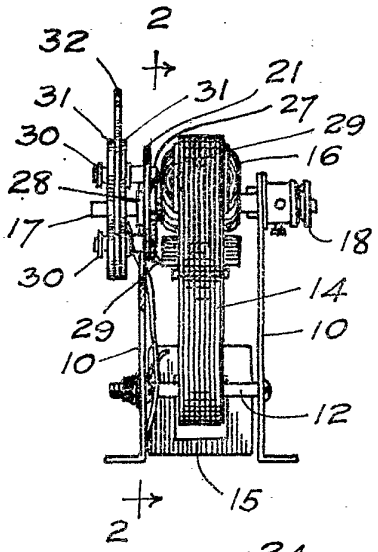


FIG. 2.

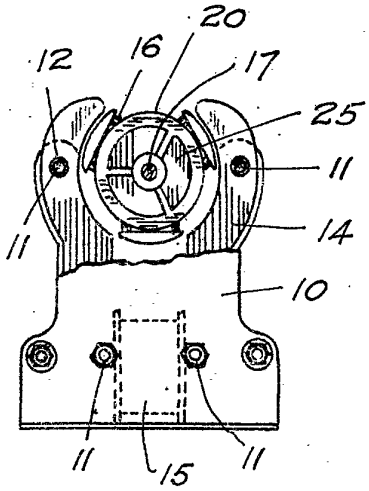


FIG. 3.

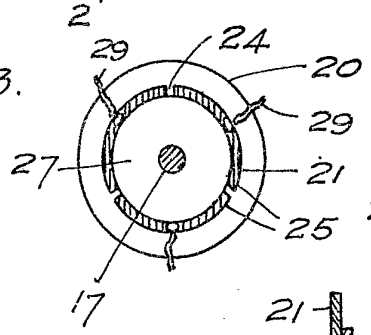
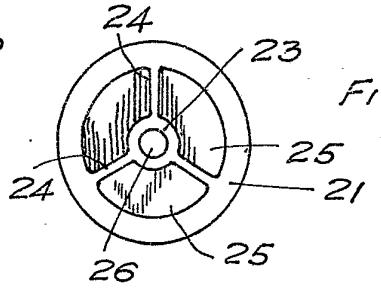


FIG. 4.



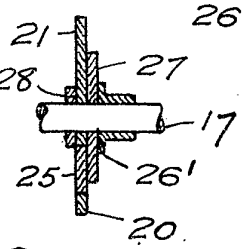


FIG. 5.

FIG. 7.

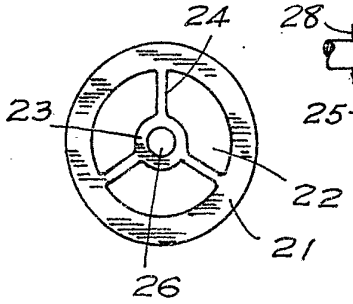


FIG. 6.

Malby & Sons, Photo-Litho.