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RADIAL COMMUTATOR FOR ELECTRIC MOTORS

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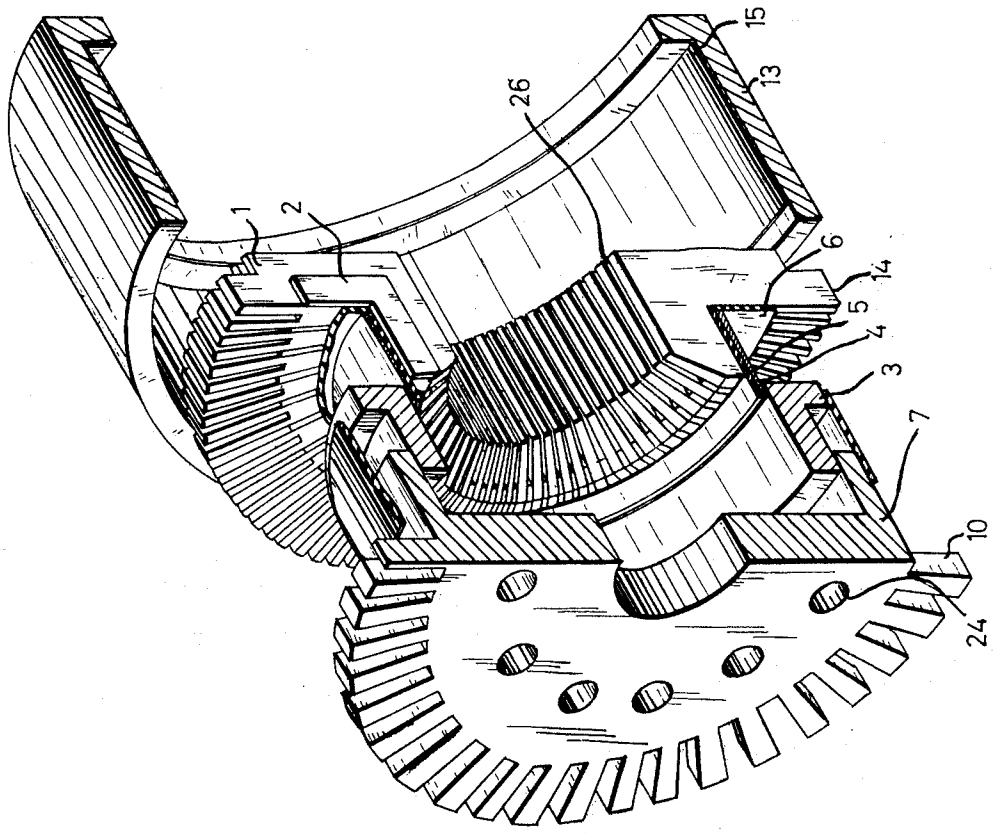

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RADIAL COMMUTATOR FOR ELECTRIC MOTORS

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The present invention relates to commutators for electric motors.

The dimensions of the various components of electric motor commutators are determined partly by the intensity of current at the brushes and partly by the centrifugal force acting upon the commutator segments and their securing means.

If it is desired to produce a motor of very small bulk for rotation at very high speed, it is practically impossible to reduce the bulk of the commutator if the conventional type of cylindrical commutator is retained.

The present invention has the main object to produce a radial commutator of small size which can support a very high speed of rotation and a high intensity of current.

The improved commutator is mainly characterised by the following points:

(1) It is secured inside the adjacent end plate which clamps the rotor laminations against the other end plate of the rotor, the commutator being therefore not secured directly on the rotor shaft.

(2) The insulating segments placed between the conductive segments are only partially in contact therewith, being so disposed as to provide air passages inside the commutator for ventillation.

(3) The commutator segments are held together by a sleeve or the like in such manner that the resultant of the centrifugal forces upon them during rotation acts in the immediate vicinity of the holding means.

The commutator is also provided with an outer sleeve or capping, which encloses the commutator segments and protects the end connectors from the rotor conductors to the segments and also prevents axial movement of the commutator in relation to the rotor.

The invention also provides for cooling the brushes which rub upon the segments of the radial commutator.

Further, the invention provides a brush-carrier suitable for any type of radial commutator but especially designed to co-operate with a radial commutator constructed in accordance with the invention.

This brush-carrier has the brush arranged to be capable of oscillating in such a way that all wear takes place along a plane parallel with the radial contact surface of the commutator, the position of the brush on the commutator surface being always correct, even in the event of slight axial movement of the rotor.

The invention will be described hereinafter with reference to the accompanying drawing which is a cross-sectional perspective view of the commutator of the invention, shown with the component parts partially severed.

As shown in the drawing the commutator is constituted by an assembly of conductive segments **1** and insulating segments **2**, disposed in the form of a ring or crown.

Segments **1** and **2** each have two legs normal to one another with conductor segments **1** being larger than insulating segments **2** which thus cover them only partially thus creating passages **26** between the projecting edges of the conductive segments **1** on the side where the latter make contact with the commutator brushes and also inside the ring or crown.

The segments **1** and **2** are held in assembled condition by a sleeve or band **3** pressed while hot over a metallic ring **4** surrounding an insulating tube **5**, which is engaged over the horizontal arms of the L-shaped segments **1** and **2**.

The ring **4** is of slightly wedge-shaped section in order to facilitate its engagement into the sleeve or band **3**, the internal face of which is correspondingly coned. This ring **4** also serves to protect the insulating tube **5** from the heat evolved by the sleeve or band **3** when it is being placed into position.

An insulating disc **6** is fitted between the conductive segments **1** and the adjacent face of the sleeve or band **3**.

The assembly thus constituted forms the actual commutator, which is pressed into place inside the overhanging flange of a plate **7** secured to the rotor of the motor; this plate **7** consists of one of the two end plates which clamp the laminations of the rotor together and secure them to the motor shaft.

This end plate **7** is provided on its periphery with an outwardly projecting comb **10**, the spaces between the teeth of this comb being in line with the slots of the rotor, the armature conductors being housed in these slots and their end connectors passed between the teeth of the comb **10** and soldered to the conductive segments **1**.

The end plate **7** is formed with a series of circumferentially spaced holes **24** facing the passages between the horizontal arms of the segments **1** where they are not covered by the segments **2**.

An outer sleeve or band **13** is fitted while hot directly upon the teeth of the comb **10** and upon the heels **14** on the outer arms of the segments **1**, with an interposed insulator **15**.

This outer sleeve or band prevents all axial displacement which could possibly occur by sliding of the inner band **3** in relation to the end plate **7**, and the insulator **15** keeps the end connectors and the ends of the armature conductors located between the teeth of the comb **10** and the heels **14** of the segments **1** out of contact with the motor frame despite the centrifugal force acting upon them when the rotor rotates at high speed.

Rotation of the motor fitted with the improved commutator will create an air turbulence in the body of the motor, the shaft **9** of which is provided at its other end with a conventional fan (not shown), the air movement taking place from right to left in the appended drawing, and serving to cool both the commuator and the brush.

The rotation of the fan will draw the air into the passages **26** between the segments **1** and then into channels provided in the body of the rotor in line with the holes **24** in the end plate **7**, this air current sweeping over a large area on the inner arm of the segments **1**.

Furthermore, part of the air flowing towards the holes **24** will be diverted by the rotation of the commutator so as to pass between the segments **1** on the side where they contact with the brushes; this acts to dissipate the heat produced by the friction of the brushes on the commutator and by the passage of current at the contact surfaces. Furthermore, this air current flows round the brushes and cools them.

It may also be seen from the drawing that the sleeve or band **3** extends over a large part of the width of the segments **1** and **2** and therefore resists firmly the centrifugal forces acting upon the segments, this being of particular importance when the motor is intended to rotate at very high speeds.

A supplementary advantage of the improved commutator resides in that its fastening inside the end plate **7** of the rotor permits a larger surface of contact between the commutator and the rotor than when the commutator is fixed on the shaft. Furthermore, the free space thus left around the shaft permits of housing therein the ball bearing which supports said shaft; this results in a decrease in the length of the shaft and in the bulk of the motor.

What I claim and desire to secure by Letters Patent is:

In an electric motor a radial commutator comprising an annulus of alternate conductive and insulating L-shaped segments, with arms extending axially and radially, the insulating segments having shorter and narrower arms than the conductive segments so as to provide air passages inside the commutator for ventilation, the assembly of segments being held together by a band or sleeve gripping the axial arms of the segments and comprising an inner insulating tube surrounded by a metal ring of wedge section over which a complementary coned metal sleeve or band is given a force fit, an insulating disc separating the radial arms of the segments from said band or sleeve, the commutator being held between an overhanging flange on one of the rotor end plates and an outer sleeve or band on the rotor provided with an inturned lip which grips inset heels in the peripheral ends of the conductive segments through the intermediary of an insulator, said rotor end plate having circumferentially spaced holes registering with axial channels through the rotor and a peripheral comb the spaces between the teeth of which register with the winding slots in the rotor.

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