

ELECTRIC MOTOR

This invention relates to electric motors and more particularly to motor casings therefor and to end fittings for the motor case.

As is discussed hereinafter, in so-called "miniature electric motors" it is common practice to mount at least one permanent magnet internally of a generally cylindrical motor case and to ensure that it remains properly longitudinally positioned to form a stator therefor, by means of bosses formed on the end fitting for the cylindrical case which extends internally of the motor case. As we shall explain below, the conventional arrangement suffers from a number of disadvantages which we have sought to overcome by the present invention.

In accordance with the present invention, an electric motor is provided with a motor casing comprising a generally cylindrical motor case with an open end and having at least one permanent magnet mounted against its inner circumferential wall to provide a stator for the motor; and an end fitting formed of synthetic resin material and closing said open end, the motor brush gear being mounted on the end fitting, the end fitting having at least one boss extending internally of the motor case in the longitudinal direction of the motor and making contact with a corresponding longitudinal end surface of the magnet, the boss being a press fit in a corresponding hole or recess in the end fitting and located in said hole or recess during assembly of the motor by engagement with a said longitudinal end surface of the magnet as the end

fitting is offered up to the motor case.

The present invention also provides an end fitting formed of synthetic resin material for a generally cylindrical motor case of an electric motor, the end fitting being adapted to support brush gear for the motor and provided with at least one boss adapted to extend internally of the motor case when the end fitting is offered up thereto so as to make contact with a corresponding longitudinal end surface of a permanent magnet fitted internally of the motor case, the boss being formed separately from the remainder of the end fitting but partially press fitted in a corresponding hole or recess in the end fitting in such a manner that it is urged further into said hole or recess by engagement with the longitudinal end surface of a said magnet as the end fitting is offered up to the motor case.

According to one variant within the scope of the invention, the boss is integrally moulded with the remainder of the end fitting but connected thereto by narrow breakable regions whereby, as a result of contact with the corresponding longitudinal end surface of the permanent magnet in the casing, these regions break as the end fitting is offered up to the motor case and the boss urges further into the hole or recess in the end fitting.

The invention is hereinafter more particularly described by way of example only and with reference to the accompanying drawings, in which:-

Fig. 1A is a plan view of an end fitting constructed in accordance with the present invention for the motor case of an electric motor, as seen from the internal side of the motor;

5 Fig. 1B is a side elevational view of the end fitting of Fig. 1;

Fig. 2A is a cross-sectional view of the end fitting of Figs. 1A and 1B in the region of one boss;

10 Fig. 2B is a view similar to Fig. 2B partially in section of an alternative arrangement;

Fig. 3 is a side elevational view, partly cut away, of a previously proposed electric motor;

15 Fig. 4A is a side elevational view of a boss of one previously proposed electric motor, shown to scale much greater than in Fig. 3; and

Fig. 4B is a side view of the boss of Fig. 4A.

Referring first to Fig. 3, the previously proposed electric motor illustrated therein is provided with a motor casing comprising a generally cylindrical motor case 1 which is generally closed at one axial end and has one or more permanent magnets 2 mounted internally of its circumferential wall. The open end of the case 1 is provided with an end fitting 3 formed of synthetic resin material and having one or more bosses 4 described in more detail below serving to retain the magnet 2 more or less in position so as to act as the stator in combination with the rotor 5 mounted on a shaft 6. The shaft 6 also carries a commutator 7 and is mounted for rotation in a bearing 8 held by the end fitting 3. The end fitting 30 also mounts brush gear including brushes 9 adapted for co-operation with the commutator, the brush gear being associated with terminals 10 which extend to the exterior of the end fitting for connection in an external electric circuit.

With a construction of this general type, where the magnet retaining bosses 4 are too short then, as indicated in Fig. 3, a gap G results between the magnet 2 and the boss 4 allowing unwanted movement of the magnet.

5 Conversely, if the boss 4 is too long, then either the end fitting cannot be properly offered up to the case 1, or it needs to be cut by an operative as part of a fitting operation.

10 With a view to overcoming these difficulties, it has been suggested to form integral ribs 4' at the distal end of the boss 4, as shown in Figs. 4A and 4B, the ribs 4' being chosen to have a length such that they bear against the end surface of the magnet 2 in the fully assembled condition of the motor, being slightly flexed.

15 While this construction represents an improvement over the arrangement where the magnet is loose, the following difficulties are still encountered:

20 (a) Because the ribs 4' are of necessity of a fixed length, there is only a limited range of size of gap G for which the ribs can accommodate;

(b) With very small electric motors there is limited space available within the motor making the arrangement impracticable;

25 (c) The ribs may be damaged if the end fitting has to be removed from the case for any reason;

30 (d) The construction of a metal mould to produce an end fitting with the boss of the construction shown in Figs. 4A and 4B is necessarily complex involving increased man-hours and therefore increased manufacturing cost.

In Figs. 1A to 2B, parts which correspond to parts of the arrangement of Figs. 3 to 4B employ the same reference numerals.

In this case, the end fitting 3 is formed of two parts, namely an inner part which includes the brush holder arrangement formed of synthetic resin and identified by the numeral 3-1, and an outer metallic shield plate 3-2.

5 In one arrangement (Fig. 2A) the boss 4 is integrally injection-moulded with the brush holder 3-1, but is connected thereto by relatively narrow breakable regions 11 behind which lie a hole or recess 12. The arrangement is such that in offering the end fitting up to
10 the motor case, the distal end of the boss 4 comes into contact with the corresponding longitudinal end surface of the permanent magnet 2 resulting in a force in the direction of the arrow D shown in Fig. 2A, the result of which is to separate the boss 4 from the remainder of the
15 brush holder 3-1 and to force it into the hole or recess 12. The cross-sectional dimensions ϕA and ϕB of the boss and recess and the length C of the recess are suitably chosen so that the boss forms an appropriate press fit in the hole or recess. As a result, the end fitting of
20 Figs. 1A, 1B and 2A will result in an arrangement in which the distal end of a boss 4, after fitting of the end fittings of the motor case, will be in contact with the magnet 2. There is no question of a gap G remaining. Equally well, since the amount by which the boss is
25 pushed into the recess depends on the longitudinal location of the magnet 2, there is no need to cut the boss. The system is self adjusting.

In the alternative arrangement of Fig. 2B, the boss is separate from the remainder of the brush holder 3-1,
30 being received in the hole or recess and then being pushed into the hole or recess as the end fitting is offered up to the motor case to whatever extent is required to accommodate the permanent magnet 2.

CLAIMS

1. An electric motor, provided with a motor casing comprising a generally cylindrical motor case with an open end and having at least one permanent magnet mounted against its inner circumferential wall to provide a stator
5 for the motor; and an end fitting formed of synthetic resin material and closing said open end, the motor brush gear being mounted on the end fitting, the end fitting have at least one boss extending internally of the motor case in the longitudinal direction of the motor and making
10 contact with a corresponding longitudinal end surface of the magnet, the boss being a press fit in a corresponding hole or recess in the end fitting and located in said hole or recess during assembly of the motor by engagement with the longitudinal end surface of a said magnet as the end
15 fitting is offered up to the motor case.

2. An end fitting formed of synthetic resin material for a generally cylindrical motor case of an electric motor, the end fitting being adapted to support brush gear for the motor, and provided with at least one boss
20 adapted to extend internally of the motor case when the end fitting is offered up thereto so as to make contact with a corresponding longitudinal end surface of a permanent magnet fitted internally of the motor case, the boss being formed separately from the remainder of the
25 end fitting but partially press fitted in a corresponding hole or recess in the end fitting in such a manner that it is urged further into said hole or recess by engagement



with the longitudinal end surface of a said magnet as the end fitting is offered up to the motor case.

3. An end fitting formed of synthetic resin material for a generally cylindrical motor case of an electric

5 motor, the end fitting being adapted to support brush gear for the motor, and provided with at least one boss adapted to extend internally of the motor case when the end fitting is offered up thereto so as to make contact with a corresponding longitudinal end surface of a
10 permanent magnet fitted internally of the motor case, the boss being integrally moulded with the remainder of the end fitting but being connected thereto by narrow breakable regions whereby, as a result of contact with the corresponding longitudinal end surface of a said permanent
15 magnet in the casing, the boss is adapted to be pushed into a corresponding hole or recess formed in the end fitting and lying behind the boss in the longitudinal direction of the motor, breaking said regions, as the end fitting is offered up to the motor case.

20 4. For a generally cylindrical motor case for an electric motor, and end fitting substantially as described herein with reference to Figures 1A, 1B and 2A or Figures 1A, 1B and 2B of the accompanying drawings.

5. An electric motor substantially as described herein
25 with reference to Figures 1A, 1B and 2A of the accompanying drawings, or Figures 1A, 1B and 2B of the accompanying drawings.

