Oct. 24, 1939. J. SCHICK 2,177,080

ELECTRIC MOTOR

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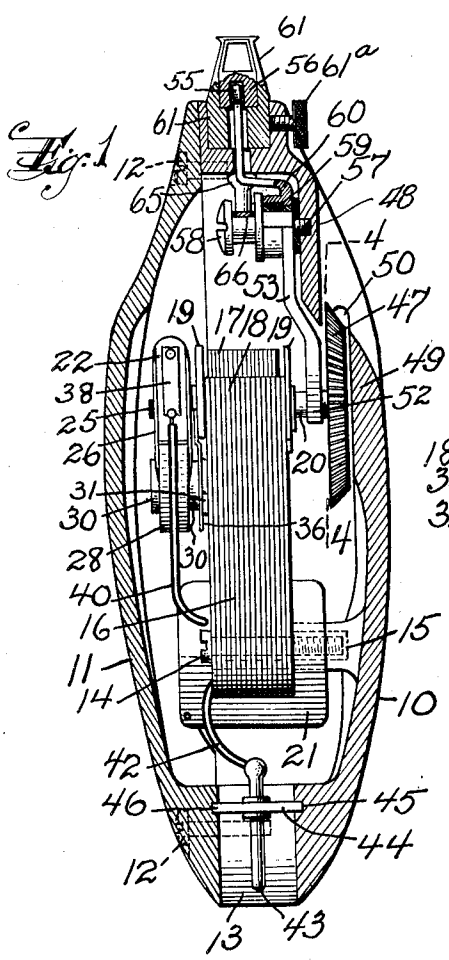


Fig. 1

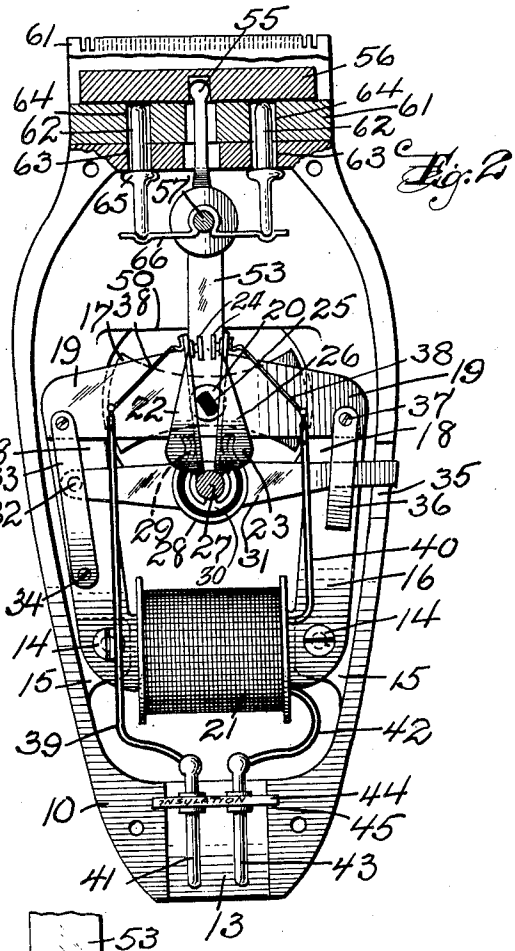


Fig. 2

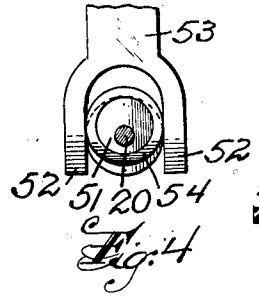


Fig. 4

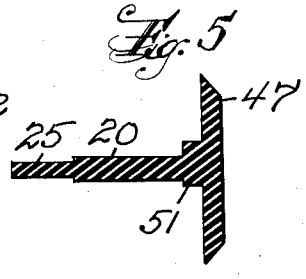


Fig. 5

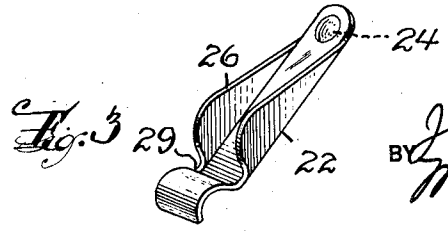


Fig. 3

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ELECTRIC MOTOR

Jacob Schick, Stamford, Conn.

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4 Claims. (Cl. 172—36)

This invention relates to an electric motor of the magnetic type and particularly to small motors such as used in casings held in the hand as in dry shavers and similar articles.

The improved operation of the motor is due to a novel make-and-break device including contact arms that do not warp under increase in temperature incidental to the operation of the motor. The former type of contact arm is made of insulating material, usually of the "Bakelite" type and is rather bulky. When the contacts on the arms heat up this causes the arms to warp which warping causes a wider separation of the contacts. The adjustment made when the motor is cold is thus destroyed when the contacts get warm and then hot, resulting in an unsatisfactory and hesitating performance of the motor. I remedy this by making the contact arms of thinner material, such as sheet metal and of a form to readily absorb and dissipate or radiate the heat thus preventing the accumulation of heat around the contacts and contact arms. The best material so far used is sheet metal stamped to form radiating fins or ribs which also serve to stiffen the arms against warping.

In order to use the metal arms which conduct electricity I insulate them from the operating cam part of the armature shaft, as by making the latter of insulating material or with an insulating sleeve or enamel.

A feature of the invention is the use of such armature shaft having a starting wheel, an armature support and a contact operating end all in one piece, preferably molded and easily and economically manufactured. Such molded shaft requires no machining, is accurate, and is light in weight.

The invention is illustrated in the accompanying drawing. Figure 1 is a cross-section of the shaving device with the motor in elevation. Figure 2 is a face view of the machine shown in Figure 1, the lid being removed and the upper part of the casing and the cutters broken away and shown in section. Figure 3 is a perspective view of an improved contact arm embodying my invention. Figure 4 is a section on line 4—4 in Figure 1. Figure 5 is a section of my improved form of shaft.

The casing is of a size to be conveniently held in the hand and consists of a tray part 10 and a cover 11 held together by the screws 12. The casing is generally oval in shape with flattened side walls and having a recess 13 in the bottom for reception of a plug which is connected to a source of electrical energy.

The motor is assembled before insertion in the casing and is secured by screws 14 to the lugs 15. The casing and lugs are molded from a material of Bakelite type and inserts of metal are placed in the lugs 15 to receive the screws 14. This makes for a more secure fastening and prevents damage to the more fragile material of the casing.

The motor is of the magnetic type and comprises a field magnet 16 of laminated iron and an unwound armature 17. The field magnet is U-shaped and its free ends form poles 18. The two poles form supports for two bearing plates 19 which bridge the gaps between the poles and support a shaft 20, made of insulating material on which the armature is fixed.

The cross arm of the field magnet is provided with a coil 21 which is in series with the contacts of the make-and-break device operated from the shaft 20. The make-and-break device consists of two contact arms 22 and 23 which are placed on opposite sides of the shaft 20 and are provided with contact points 24. As shown, the arms are identical therefore interchangeable. The shaft 20 has non-circular portion 25 against which the contact arms rest and the rotation of the non-circular portion of the shaft causes spreading of the contact arms against the influence of a spring, thus making and breaking the circuit. The contact arms 22 and 23 are strips of relatively thin stiff material preferably sheet metal with stiffening fins or ribs 26. The contact arms of this shape have a large area for the radiation and dissipation of the heat caused by the operation of the make-and-break device. The stiffness of the arms and the quick dissipation and radiation of heat prevents warping of the contact arms and keeps the contact points in proper relationship for the best and most consistent operation of the motor. The contact arms 22 and 23 are so mounted as to be quickly and easily removed and replaced and accordingly their ends are bent to approximately semi-circular form to provide suitable bearing surfaces to engage their pivot means. The latter may take the form of a single stud 27 and a spring 28, the ends of which are placed against the outside faces of the arms. The spring serves to yieldingly hold the contact arms against the stud 27 and against the cam 25. The stud 27 has two shoulders 30 between which the contact arms are placed and thereby held in their plane of movement but nevertheless readily releasable upon the removal of the spring 28 or by snapping them out from under the spring 28.

The stud 27 is so mounted as to provide for adjusting the distance between the shaft 20 and the fulcrum of the arms 22 and 23. One manner of doing this is by mounting the stud 27 on a lever 31 pivoted at one end, as at 32, to a strip 33 fastened to the field member by screws 34. The other end of the lever extends through a slit 35 in the casing and can be moved by the finger. One means of holding the lever 31 in adjustment is the spring 36 held in place by the screw 37.

The contact arms 22 and 23 have fastened to them, by soldering or some other means, flexible metallic strips 38 of conducting material. The strips are soldered or otherwise secured to the wires 39 and 40. The wire 39 leads directly to the terminal post 41. The wire 40 leads to the coil 21. A wire 42 leads from the other end of the coil to the terminal post 43.

The preferred form of securing the posts 41 and 43 is a platform 44 of stiff insulation held in the recess 45 of the tray 11 and recess 46 of the cover 10. The posts 41 and 43 are fastened to the platform 44 and so placed so that they are protected by the recess 13. The two terminal posts can be connected by any suitable means to a source of electrical energy.

The shaft 20 has two other functions beside holding the armature firmly and making and breaking the circuit through the contact by the non-circular part. One additional function is acting as a stopping and starting medium for the motor and second, transmitting motion to the parts to be driven.

The starting wheel 47 may be made as an integral part of the shaft. The casing has its outer face provided with a recessed bulged part 49 in the lower part of which is a slot 50. The starting wheel 47 has its rim projecting through the slot and is preferably tapered and roughened as shown in Figure 1. The construction allows ready access to the wheel for starting and stopping purposes and shields the wheel from accidental engagement when the casing is being held in the hand when in use.

The shaft 20 has a crank 51 which is formed by a circular portion eccentrically arranged at the end of the shaft. The crank operates inside the yoke 52 of the lever 53. Between the crank 51 and the yoke 52 is a freely rolling ring 54 which acts as a bearing between the crank and the yoke of the lever 53. The lever 53 is pivoted intermediate its ends to the casing and extends beyond to have the end 55 of the lever engage the inside cutting member 56 of the shaving head. The lever is pivoted on the shank 57 of the screw 58. A bushing 59 is placed on the shank 57 and the sleeve 60 of the lever 53 envelopes the bushing. This pivot provides adequate bearing surface and is easily and economically assembled.

The improved contact arm of metal is of further advantage in that the contact point 24 can be directly fastened to it by welding without any necessity of drilling and the use of stems to fit in the end of the arm. This assures electrical contact and also a firm attachment of the contact point.

Various changes can be made in the shape and proportion of the parts without departing from the scope of the invention.

I claim:

1. A motor for hand tools, said motor comprising a field magnet, an armature rotatable in the field magnet, a shaft supported from the field magnet and supporting the armature, stiff contact arms in circuit with said field member, contact points on the free ends of the arms, a stud on which the contact arms are fulcrumed, the shaft having one end non-circular and rotatable between the contact arms, the contact arms being made of metal for heat dissipation, the said end of the shaft being made of insulating material.

2. An electric motor for hand tools comprising a field magnet, bearings on the field magnet, a shaft of insulating material rotatable in the bearings, the shaft being integral and formed with a starting wheel on one end, an eccentric boss adjacent the wheel and a non-circular end, an armature mounted on the shaft, a lever operable from the eccentric and contact arms bearing on the non-circular end.

3. In an electric motor, a make-and-break device including a pivot means, a cam, a pair of identical contact arms each arm having a substantially semi-circular portion to lie against the pivot means and allow the arms to be readily removed from the pivot means, and spring means for yieldingly holding the contact arms against the pivot means and the cam.

4. In an electric motor, a make-and-break device including a stud, a cam, a stiff metal contact arm having a contact point at one end and having a semi-circular portion bearing on the stud and adapted for ready removal therefrom, the contact arm bearing on the cam intermediate the ends of the arm, and flanges on the contact arm at said intermediate portion for stiffening the arm at said part against the action of the cam and for readily dissipating the heat generated in said arm during the operation of the motor.

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