March 26, 1940. L. SCRUGGS 2,194,619

SWITCH FOR HAND OPERATED ELECTRICAL DEVICES

Filed April 15, 1937

FIG. 1.

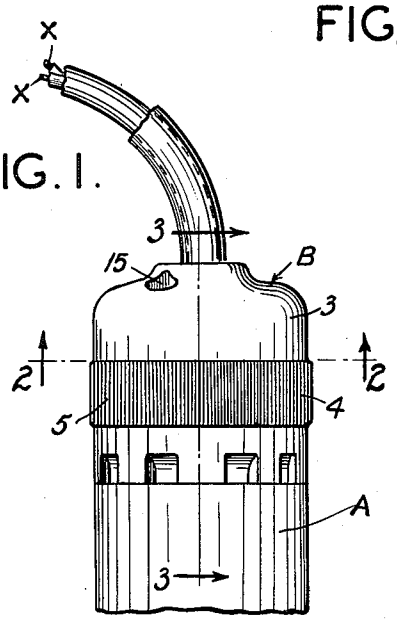



FIG. 2.

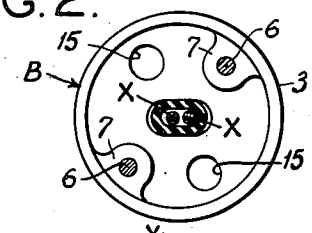



FIG. 3.

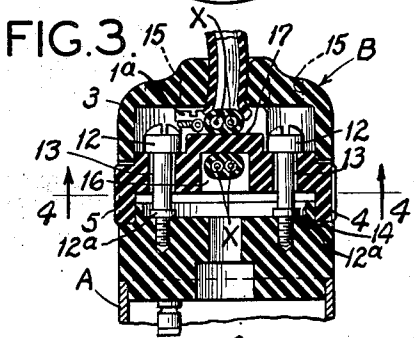



FIG. 4.

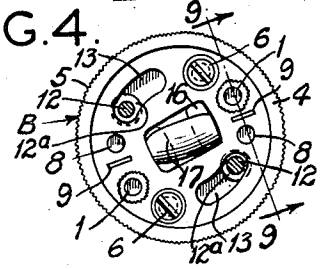



FIG. 5.

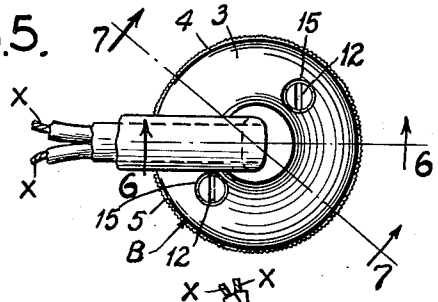



FIG. 6.

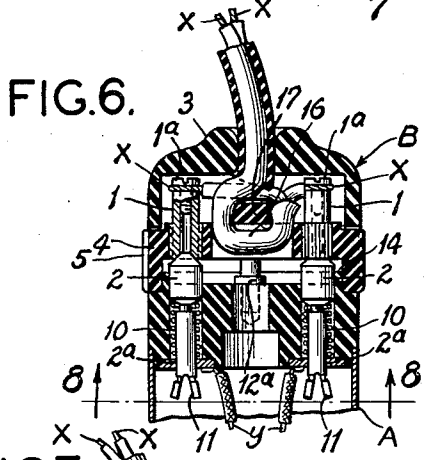



FIG. 7.

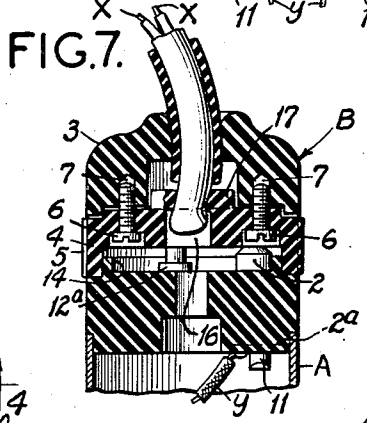



FIG. 8.

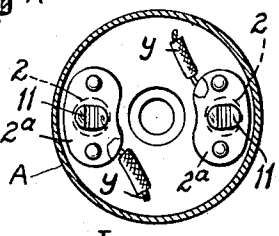
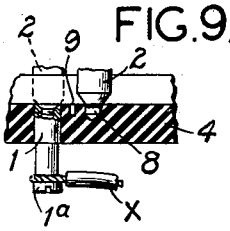



FIG. 9.




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# UNITED STATES PATENT OFFICE

2,194,619

## SWITCH FOR HAND-OPERATED ELECTRICAL DEVICES

Loyd Scruggs, University City, Mo.

Application April 15, 1937, Serial No. 137,029

1 Claim. (Cl. 200—153)

This invention relates to switches of the kind that are used on hand operated electrical devices of the type that comprise a small electric motor whose housing is shaped and proportioned so as to be capable of being held in the hand of the user.

The objects of my present invention are to provide a switch of the kind referred to that is reliable in operation, inexpensive to construct and easy to assemble, and equipped with a rockable or oscillating control member which is of such design that it will be held securely against accidental movement when in its "on" and "off" positions and short circuiting of the current from the supply contacts to the field contacts is effectively prevented when the control member is in its "off" position.

Figure 1 of the drawing is a fragmentary side elevational view of a small electric motor of the general type mentioned, equipped with a switch constructed in accordance with my invention.

Figure 2 is a horizontal sectional view taken on the line 2—2 of Figure 1, looking in the direction indicated by the arrows.

Figure 3 is a vertical sectional view taken on the line 3—3 of Figure 1, looking in the direction indicated by the arrows.

Figure 4 is a horizontal sectional view taken on the line 4—4 of Figure 3, looking in the direction indicated by the arrows.

Figure 5 is a top plan view of the motor.

Figure 6 is a vertical sectional view taken on the line 6—6 of Figure 5, looking in the direction indicated by the arrows.

Figure 7 is a vertical sectional view taken on the line 7—7 of Figure 5, looking in the direction indicated by the arrows.

Figure 8 is a horizontal sectional view taken on the line 8—8 of Figure 6, looking in the direction indicated by the arrows; and

Figure 9 is a fragmentary sectional view taken on the line 9—9 of Figure 4, looking in the direction indicated by the arrows.

In the accompanying drawing which illustrates the preferred form of my invention, A designates the housing of a small electric motor that is intended to be held in the hand of the user and employed to drive a rotatable tool (not shown) connected to the armature shaft of the motor. The switch that constitutes the subject matter of my present invention is used to open and close the electric circuit that energizes the motor, and is mounted on or combined with the motor housing A in such a way as to form in effect the terminal portion of said motor housing. The movable part of said switch that establishes and interrupts electrical connection between the contacts connected to the field coils of the motor and the contacts to which the wires of the supply circuit are attached is formed by a rockable or oscillating member arranged so that when it is turned in one direction the motor will start to operate and when it is turned in the reverse direction back to its former position, the motor will cease operating.

The rockable or oscillating control member above referred to is designated as an entirety by the reference character B and is provided with two line contacts 1 to which are attached the two wires $x$ of a conventional duplex cord that is adapted to be connected with a supply circuit, the said line contacts 1 being housed inside of the control member B and provided with binding screws 1$a$ for attaching the supply wires $x$ to said contacts. The line contacts 1 coact with field contacts carried by the motor housing A and formed preferably by spring-pressed metal plungers 2 reciprocatingly mounted in the end portion of the motor housing A and arranged in metallic contact with metal plates 2$a$ that are connected by wires $y$ with the field coils (not shown) of the motor. The coacting line contacts and field contacts 1 and 2 respectively, are so arranged that they will be in engagement when the control member B is in its "on" position, thereby causing the field coils of the motor to be energized and movement of said control member into its "off" position opens the circuit and causes the motor to cease operating.

Preferably, the control member B is composed of two parts which, for convenience, I will refer to as a cap piece 3 and a base piece 4, both of said parts being made of insulating material, such as hard rubber or Bakelite. The cap piece 3 is recessed on its underside and arranged in superimposed relationship with the base piece 4 which is also recessed on its underside, the bottom edge of the flange or rim of the cap piece butting against the top face of the base piece 4 and arranged so as to surround a rib or upwardly projecting portion on the top side of the base piece that holds the cap piece and base piece in concentric relation with each other. Preferably, the peripheral edge of the base piece is knurled or serrated so as to form a finger-grip 5 for the control member B. Any suitable means may be used to connect said cap piece and base piece together such, for example, as screws 6 projecting upwardly through the top side of the base piece and threaded into lugs 7 located in the recessed portion of the cap piece as shown in Figure 2, the

underside of the top wall of the recessed portion of the base piece being counter-sunk as shown in Figure 7 so as to receive the heads of the screws 6.

The plungers 2 which constitute the field contacts are preferably tapered or rounded slightly and the lower ends of the line contacts 1 are recessed or shaped so that when the control member B is moved into its "on" position, the plungers 2 will snap into engagement with said line contacts 1 and thus effectively prevent the control member from moving accidentally in a direction to open the circuit. In order to hold the control member B against accidental movement when said member is in its "off" position, recesses or depressions 8 are formed in the underside of the base piece 4 of the control member at such points that the plungers 2 will snap into the recesses 8 when the control member reaches its "off" position. When the control member is moved from one position to the other, the ends of the plungers 2 rub against the underside of the base piece of the control member and, in view of the fact that said plungers are usually made of brass and the base piece of the control member is made of non-conducting material or insulating material, there is a possibility that such rubbing action will cause a film of metal to be deposited on the control member between the line contacts 1 and the recesses 8 which receive the plungers 2 when the control member is in its "off" position. Such a metallic film might cause the current to short circuit from the line contacts 1 to the plungers 2 and thence to the field coils when the control member B is in its "off" position, and in order to guard against this I form slots 9 in the non-conducting portion of the control member against which the plungers 2 rub at points between the line contacts 1 and the recesses 8 as shown in Figures 4 and 9 so as to eliminate the possibility of a continuous conducting film of metal being formed on the control member by the rubbing action of the plungers 2 thereon. The specific construction of the plungers 2 is immaterial, but I prefer to provide each of said plungers with a relatively large tapered end portion arranged at one end of a reduced shank that reciprocates in a hole of substantially the same diameter as said shank formed in the part 2*a* of the contact to which the field wire *y* is attached, said plunger being surrounded by a spring 10 (see Figure 6) that forces the plunger outwardly. The outward movement of the plunger is limited by a bifurcated portion 11 at the lower end of the plunger which can be produced easily simply by sawing a slit in the end of the shank and then bending the slitted portions of the shank laterally.

The control member B is maintained in operative position on the motor housing A by means of two screws 12 threaded into the terminal end of the motor housing A and positioned in elongated slots 13 in the base piece 4 of the control member with the heads of said screws lapping over the base piece and positioned in the recess in the cap piece 3 of the control member. As shown in Figure 3, the screws 12 are provided with flanges 12*a* that bear against the end of the motor housing and thus prevent the screws 12 from being tightened to such an extent that the heads of same will exert friction on the base piece of the control member and thus interfere with the free movement of said member. The control member B as an entirety is held in concentric relationship with the motor housing by a flange 14 on the end of the motor housing that is positioned inside of the recessed portion of the base piece of the control member and surrounded by an annular portion of said base piece. The screws 12, in addition to holding the control member in operative position on the motor housing, also serve as stops to limit the movement of the control member and define the "on" position and "off" position of said control member inasmuch as the elongated slots 13 which receive the screws 12 are made of such length that when the control member is turned in one direction, one end of the slots 13 will strike against the screws 12 and when said control member is turned in the opposite direction, the other ends of the slots 13 will strike against the screws 12. Obviously, other means might be employed to retain the control member B in operative position and limit the movement of same, but a means of the construction above described is inexpensive, it is efficient and it permits the control member to be easily disassembled from the motor housing simply by turning said control member into a position to bring holes 15 in the cap piece of same in alignment with the screws 12 after which a screw driver can be engaged with the heads of said screws to screw them out of the motor housing.

In order that the terminal portions of the supply wires *x*, which are attached to the line contacts 1, will be effectively protected against strains tending to loosen the binding screws 1*a* when the duplex cord is pulled or jerked, the control member B is so constructed that when the two parts 3 and 4 of same are assembled and connected together, there will be portions on the interior of said control member that coact with each other to absorb or take up strains, jerks or pulls exerted on the duplex cord. In the form of my invention herein illustrated, the base piece 4 of the control member is provided with an elongated slot 16 (see Figures 3 and 6) over which a cross-bar 17 is arranged at a point intermediate the ends of said slot, said cross-bar 17 being of such width with relation to the length of the slot 16 that the duplex cord can be wrapped around the cross-bar 17 as shown in Figure 6. Said cross-bar projects upwardly into the recessed portion of the cap piece 3 and the recess or depression in the cap piece is made of such a depth that the cap piece, after being combined with the base piece 4, will exert a cramping action on the duplex cord and produce a bend in said cord between the portion of the cord which projects outwardly through the cap piece and the portion of the cord that extends around the cross-bar 17. To attach the cord to the control member B, the cap piece 3 of said control member is disconnected from the base piece 4. The cord is then inserted through the hole in the cap piece and a portion of the sheathing of the cord is removed so as to permit the terminal portions of the wires *x* to be separated, after which the cord is forced downwardly into one end of the slot 16 in the base piece, then passed under the cross-bar 17 and then brought upwardly through the other end of said slot, the terminal portions of the supply wires being then attached to the line contacts 1 by the binding screws 1*a*. Thereafter, the base piece and cap piece are moved into nested relationship and are joined together by the screws 6, the above described operations causing the duplex cord to be cramped between coacting portions on the interior of the control member and bound to said member in such a way that a strain or jerk on the cord will not be transmitted to the

terminal portions of the supply wires that are attached to the line contacts 1.

A switch of the above construction is inexpensive to manufacture, it is easy to assemble with the motor housing, and it is reliable in operation as the parts of same which conduct the current from the supply wires to the field coils of the motor are of rugged construction and so arranged that there is no possibility of the current short circuiting through the switch when the control member is in its "off" position. Another advantage of such a switch is that the control member of same is easy to operate, inasmuch as it is formed by a rockable or oscillating part that forms a cap piece for one end of the motor housing.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

A switch for electrically-operated devices of the kind that include a housing proportioned and shaped so as to be held in the hand of the user, said switch comprising a control member oscillatingly mounted on one end of the housing of the device and composed of a base piece and a hollow cap piece superimposed upon said base piece, an integral centering portion on the base piece surrounded by a part on said cap piece, concealed means for detachably connecting said cap piece to said base piece, spring-pressed contacts mounted in the end portion of the housing of the device and provided with enlarged tapered head pieces, co-acting recessed contacts mounted in the base piece of said control member and adapted to receive said tapered head pieces when the control member is in its "on" position, depressions in said base piece arranged in proximity to said recessed contacts for receiving the tapered head pieces of said spring-pressed contacts when the control member is in its "off" position, slots in said base piece located between said recessed contacts and said depressions, for the purpose described, and retaining screws in the end portion of the housing of the device positioned in elongated slots in the base piece of the control member and provided with heads that lap over said control member, the cap piece of said control member having holes that provide access to said retaining screws.

LOYD SCRUGGS.