

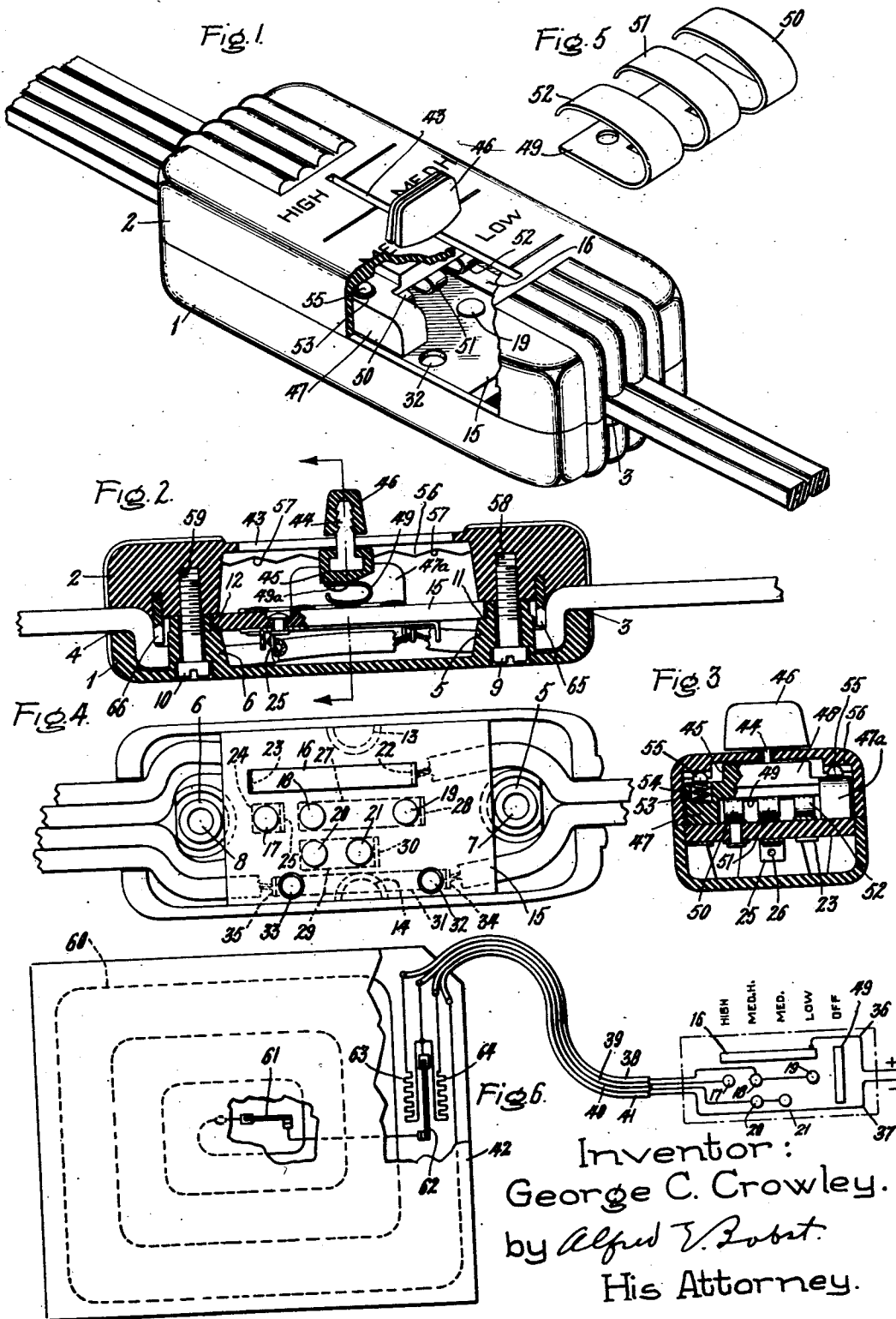
Nov. 9, 1948.

G. C. CROWLEY

2,453,498

ELECTRIC SWITCH

Filed April 15, 1947



Inventor:
George C. Crowley.
by *Alfred V. Zobst.*
His Attorney.

UNITED STATES PATENT OFFICE

2,453,498

ELECTRIC SWITCH

George C. Crowley, Bridgeport, Conn., assignor
to General Electric Company, a corporation of
New York

Application April 15, 1947, Serial No. 741,560

1 Claim. (Cl. 200—16)

1

The present invention relates to electric switches of the type whereby a plurality of circuit connections may be established for controlling the operation of a device, such as for controlling the speed of a motor or the heating of a heating device such as an electric heating pad. More particularly, the present invention relates to slide type switches and to so-called through switches.

It is an object of the present invention to provide a switch of the aforementioned type which is simple, rugged, and which can be manufactured at a low cost.

An embodiment of the present invention is shown in the accompanying drawing in which Fig. 1 is an enlarged perspective view of my switch with a portion of the cover broken away to disclose some of the operating mechanism; Fig. 2 is a partial vertical section taken longitudinally through the central portion of the switch; Fig. 3 is a section taken along the line 3—3 of Fig. 2; Fig. 4 is a plan view of the switch with the cover removed; Fig. 5 is an enlarged perspective view of the movable brush; and Fig. 6 is a schematic wiring diagram of my switch connected to an electric heating pad.

As shown in the drawing, my switch has a hollow housing comprising a base member 1 and a cover member 2, both made of insulating material and preferably of a molded plastic. Both base and cover are partly cut away at the ends as at 3 and 4 to form an aperture for the entrance of connecting wires.

The base of the switch, which is substantially a hollow shell, is provided with upwardly extending bosses 5 and 6 having apertures 7 and 8 therein adapted to receive the screws 9 and 10 for holding the base and cover in assembled relation. The bosses 5 and 6, which are located along the longitudinal axis having inwardly extending shoulders 11 and 12. Two inwardly and upwardly extending bosses 13 and 14 are also provided at the sides of the base. These latter bosses have flat surfaces of the same height as the shoulders 11 and 12.

Fitted on top of the shoulders 11 and 12 and the bosses 13 and 14 is an insulating contact carrying plate 15. Mounted on the plate 15 are a plurality of stationary contacts which are adapted to be connected together by a movable contact mounted in the cover as will be described later. All circuit connections to my switch are made to the stationary contacts and preferably on the under side of the plate 15. In the embodiment of my switch as shown in the

2

drawing, the carrier plate 15 is provided on its upper surface with three longitudinal rows of contact elements. The first comprises a conducting bar 16. The second row consists of three contacts 17, 18, and 19 while the third row has two contacts 20 and 21. The contact bar 16 and the other contacts may be secured to the carrier plate 15 in any desired manner. I prefer, however, to provide the bar 16 at its ends with right angled ears 22 and 23 which are pushed through slots in the plate 15. The ear 23, in so far as no connections need be made to it, may be bent over the under side of the plate, while the ear 22, to which connection must be made, may be given a slight twist. The remaining contacts 17 to 21 are preferably formed by the heads of rivets fastened to the plate 15. Contact 17 holds in place underneath the plate 15 a short metal strip 24 having a downwardly projecting ear 25 provided with an aperture 26 to which a wire connection may be fastened as by soldering. Contacts 18 and 19 are connected together by a metal bar 27 mounted beneath the plate 15 and having at one end a wire connection ear 28. Similarly, the contacts 20 and 21 are connected together beneath the plate by a bar 29 having a connection ear 30. There is also mounted beneath the plate 15 a conducting bar 31 secured to the plate by rivets 32 and 33 whose heads are recessed in the plate as shown in Fig. 2. The bar 31 has wire connection ears 34 and 35 at its ends.

All connections to the switch are made to the contacts on the plate 15. As shown in Fig. 6, two line conductors 36 and 37 may be connected to the bars 16 and 31 at the ears 22 and 34 respectively. Four wires 38, 39, 40, and 41 may be connected to the controlled device as, for example, the heating pad 42. Conductor 38 may be connected to contacts 18 and 19 by being soldered to the ear 28 of bar 27; conductor 39 to contact 17 at the ear 25; conductor 40 to contacts 20 and 21 at the ear 30 on bar 29; and conductor 41 to bar 31 at the ear 35, thus providing a through connection from one side 37 of the line to the controlled device. The operation of the circuit in Fig. 6 will be further described below.

Referring now to the movable switch element which is mounted in the cover, it will be seen from the drawing that the cover 2 is provided with a centrally disposed longitudinal slot 43. Projecting upward through the slot 43 is an operating member 44 preferably made of metal. The member 44 is fastened to an insulating movable contact carrier 45, preferably by being molded directly into it. An operating knob 46 is

pressed on the member 44 on the outside of the cover 2.

The movable contact carrier 45 is U-shaped in transverse section. It consists of two side members 46 and 47 which act as runners or sliders and bear against the upper surface of plate 15 near its outer edges. The runners 46 and 47 are joined by a central bridging portion 48 which supports the actuating member 44 as described. To the under side of the bridging member 48 there is secured the movable contact 49 as by means of rivets 49a. The movable contact 49, shown separately in Fig. 5, consists of a thin metal strip having three spring fingers 50, 51, and 52 positioned to bear respectively against the three rows of contacts on the plate 15.

To provide a "snap" positioning action for the slider, the upper surface of each of the runners 46 and 47 is recessed as at 53 along its transverse axis. A small coil spring 54 surmounted by a ball bearing 55 is inserted in each recess. The ball bearings 55 bear against flat cam surfaces 56 in the nature of corrugated ridges formed one on each side of the upper inner surface of the cover 2 and preferably molded integrally therewith. There are as many corrugations or notches 57 in each ridge as there are positions for the switch. In the embodiment shown there are four circuit closed positions and one "off" position, making five positions in all. When the assembly screws 9 and 10 are screwed into the suitably located threaded holes 58 and 59 in the cover, the coil springs 54 are under compression. They thereby force the spring contact fingers 50, 51 and 52 downward against the fixed contacts and simultaneously press the runners 46 and 47 against the plate 15. Longitudinal motion of the knob 46 thereby moves the spring contacts longitudinally over the various fixed contacts. The pressure of the balls 55 against the cam surfaces or corrugations 56 provides definite stop positions at each contact position.

The solid end portions of the cover 2 are provided with slots in which thin insulating strips 65 and 66 are positioned. These extend across the wire entrance openings 3 and 4 at the ends of the switch and project downward into the hollow portion of the base 1. If desired, the members 65 and 66 may be made integral with the cover 2. The members 65 and 66 provide a strain relief for the terminal connections of the wires, since the wires, in order to enter the switch, are thereby required to make two right angle bends as shown in Fig. 2. Therefore, no strain is placed on the soldered connections to the fixed contacts if the wires are pulled.

In the assembly wiring of my switch; it will be noted that the stationary contact plate 15 can be removed from the base and the wires attached to their respective contacts. Thereafter the plate is laid back into the base and the wires laid into the end cut-outs 3 and 4. The cover 2, carrying the movable contact, is then placed on the base and pressed into contact with it, whereby the strain relief members force the wires to assume two right angled bends. With the fastening of screws 9 and 10, the switch assembly is completed.

In the embodiment shown in the drawing which, by way of example, is specifically directed to a switch for the control of a heating device such as the heating pad 42, four "heat" and one "off" positions can be provided. The four heat positions may correspond to "low," "medium," "medium high," and "high" heat. It will be noted

that in all but the "off" position, the contact finger 52 is always in contact with the bar 16. All three contact fingers are thereby connected to one side of the supply line. In the "low" position of the switch, contact finger 51 makes connection with fixed contact 19. In the "medium" position, contact finger 50 makes connection with fixed contact 21. In the "medium high" position, contacts 50 and 51 connect with fixed contacts 20 and 18 respectively. In the "high" position contact 51 makes connection with fixed contact 17. Since the contact fingers are all connected together, the action is to connect the various stationary contacts 17 to 21 inclusive to one side of the supply line in the selective manner just described.

When the switch is used to control the heating pad 42 shown in Fig. 6, the various control arrangements obtained are as follows: The heating pad 42 has a single heating winding 60. One or more series safety thermostats 61 may be provided if desired. In addition, there is provided a control thermostat 62 whose operation is governed by heating resistors 63 and 64. These are so dimensioned in the local heat produced by them to cause the thermostat 62 to open its contacts and therefore the heater circuit intermittently so as to maintain the desired temperature in the heating pad.

In all positions of the switch the heating element 60, through conductor 41 and switch bar 31, is connected directly to one side 37 of the supply line. Connection to the other side 36 of the supply line is made through the switch in the following manner: In the "low" heat position, conductor 38 is energized; thermostat heater 63 is thereby connected in series with thermostats 62 and 61 and the heating winding 60, producing maximum local heat and causing thermostat 62 to open most frequently. In the "medium" position of the switch, conductor 40 is energized and thereby the circuit is completed through thermostat heater 64 and thermostats 62 and 61 to the heating winding 60. In the "medium high" position of the switch, both conductors 38 and 40 are energized, placing heaters 63 and 64 in parallel and together in series in the heating circuit; the parallel combination dissipates less heat than either of resistors 63 or 64 alone and, therefore, permits thermostat 62 to remain closed longer to give a higher pad temperature. In the "high" position of the switch, conductor 39 is energized, heaters 63 and 64 being entirely out of the circuit, whereby full current flows continuously through the heating winding 60 unless interrupted by the safety thermostat 61.

While I have described my invention by way of example as specifically embodied in a heating pad switch, it will be evident to those skilled in the art that my switch is equally adaptable to other wiring arrangements for heating devices, as well as to motor speed or direction control circuits. For these purposes a different arrangement of the fixed contacts may be provided, if desired. Moreover, the movable brush may be provided with as many contact fingers as required. In general, it will be obvious to those skilled in the art that various changes and modifications may be made without departing from my invention in its broader aspects and I, therefore, aim in the appended claim to cover all such changes and modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

An electric switch of the through switch type comprising an elongated hollow housing having wire receiving openings at both ends and formed in two parts comprising a recessed base member and a cover member, a stationary contact mounting element comprising a flat insulating plate, means integral with said base member and extending upwards therefrom for removably supporting said plate spaced from the bottom of said base member, a plurality of rows of stationary contacts on the upper surface of said plate, said stationary contacts having integral conductive means extending through said plate and having terminal members on the lower surface of said plate adapted to receive all wire connections for circuits to be controlled by the switch, said cover member having a longitudinal slot formed therein, a movable contact carrier positioned beneath the cover and having means extending through said slot to the outside of the cover for the operation of the carrier, a movable contact on said carrier comprising a spring contact finger having a total width sufficient to span all of said rows of stationary contacts, said movable contact being mounted on said carrier in position to cooperate with said stationary con-

tacts for selectively completing circuits between them, said carrier having smooth bottom surfaces adapted to slide on the upper surface of said plate, corrugated ridges extending inwardly from the surface of said cover member, spring tensioned ball bearings mounted in said carrier and positioned to bear against corrugations and thereby to press said movable contact against said stationary contacts, whereby said plate is held in position on its supporting means and there is provided a snap positioning action as said carrier is moved, the number of corrugations corresponding to the number of switch positions, and means holding said base and cover members together against the pressure of said movable contact and ball bearings.

GEORGE C. CROWLEY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,544,446	Goodridge	June 30, 1925
2,347,874	Bluemle	May 2, 1944
2,294,953	Bluemle	Sept. 8, 1942
2,279,753	Knopp	Apr. 14, 1942