March 30, 1943. M. ANDIS 2,315,035

ELECTRIC SWITCH

Filed July 19, 1941

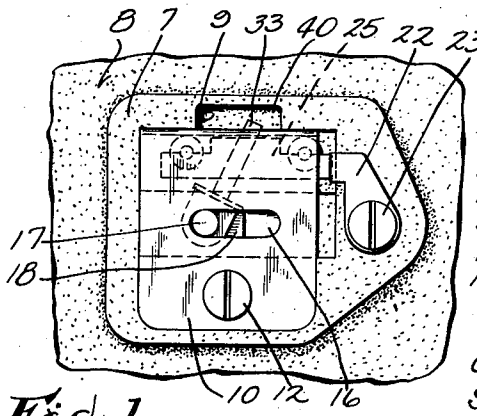

Fig. 1.

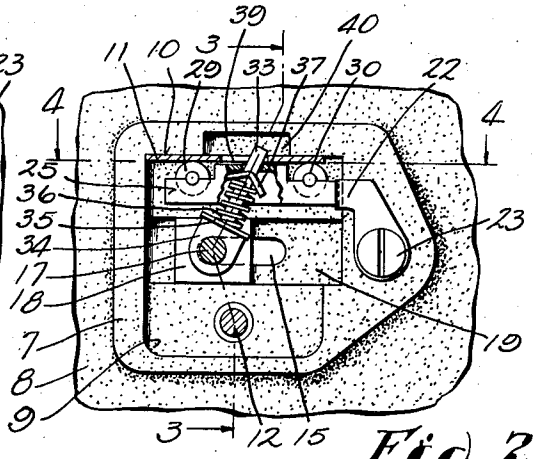

Fig. 2.

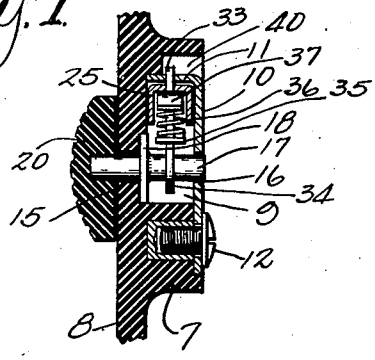

Fig. 3.

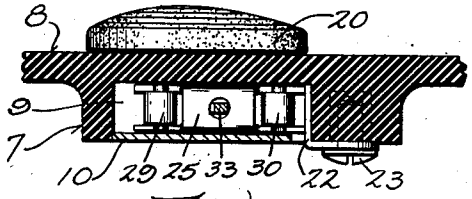

Fig. 4.

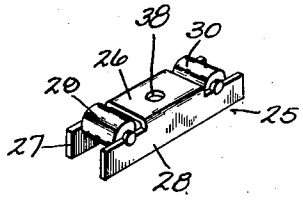

Fig. 5.

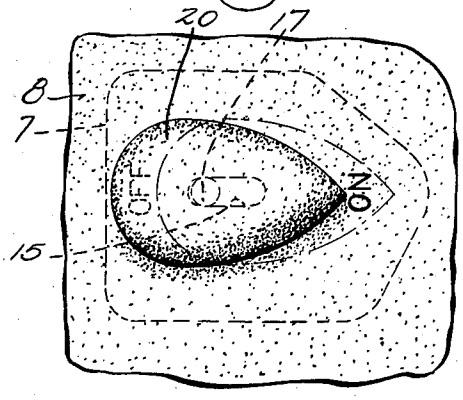

Fig. 6.

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ELECTRIC SWITCH

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Application July 19, 1941, Serial No. 403,179

12 Claims. (Cl. 200—67)

This invention relates to improvements in electric switches.

It is the primary object of the invention to provide a novel, simple and exceptionally compact form of electric switch and one which has an exceptionally smooth snap action.

It is a further object of the invention to provide a switch which is not merely compact and smooth in its operation, but is also very inexpensive, requiring but few simple parts. The switch as hereinafter disclosed was particularly designed for use in the control of an electric hair clipper but it has a wide range of utility for other purposes, as will be apparent to those skilled in the art from study of the following disclosure of the invention.

In the drawing:

Fig. 1 is a bottom plan view of the switch assembly.

Fig. 2 is a bottom plan view of the switch mechanism as it appears with the retaining plate removed.

Fig. 3 is a detail view taken in section on the line 3—3 of Fig. 2.

Fig. 4 is a detail view taken in section on the line 4—4 of Fig. 2.

Fig. 5 is a detail view in perspective of the contactor preferably used in the improved switch.

Fig. 6 is a top plan view of the assembled switch.

Like parts are identified by the same reference characters throughout the several views.

Due to its unusual compactness this switch is adapted to be mounted in a relatively shallow boss 7 molded of plastic material as a part of the hair clipper case 8. For other purposes the switch case may obviously be molded as a separate item.

The boss 7 which here comprises the side wall of the switch case, surrounds a chamber 9 having a rear closure plate 10 of metal. The flange 11 of the closure plate is received into the side of the chamber 9 and so positioned thereby that a single screw 12, also serving as a terminal screw, holds the plate 10 in assembly.

The mounting plate 8 or back of the switch casing has a slot at 15 and the closure plate 10 has a complementary slot at 16. Through the registering slots 15 and 16 extends a cross pin 17 mounted on slide 18 which is guided for movement in a channel 19 molded into the mounting plate 8 at the back of chamber 9. A projecting end of the cross pin 17 carries the switch button 20 which is located on the outside of the mounting plate as shown in Figs. 3, 4 and 6, and is movable with the cross pin 17 between the full and dotted line positions of Fig. 6. Symbols indicative of the operative positions of the switch are preferably printed on the mounting plate 8 to be exposed appropriately as the button is pushed in one direction or the other.

Mounted on the switch wall of boss 7 is the stationary switch contact 22 exposed at one side of the chamber 9 and provided with terminal screw 23.

The movable contact, which is operable to and from engagement with the fixed contact 22, comprises a carriage 25 which is best illustrated in Figs. 2, 4 and 5. It may conveniently be made by cutting away portions of the web 26 between flanges 27 and 28 of a minute channel section and notching the remaining flanges to receive the spindles of rollers 29 and 30. The inwardly turned flange 11 of the closure plate 10 provides a track upon which these rollers ride to substantially eliminate friction in the reciprocation of the contact carriage 25, thus contributing to the smooth snap action of the device. While the carriage would be operative in sliding bearing contact with plate 10 or flange 11, the operation as shown is more satisfactory to a notable extent. When the carriage is in its extreme right position as illustrated in the drawing, the ends of its flanges 27 and 28 abut the fixed contact 22, thus completing an electrical connection between the terminal screw 23 of contact 22 and the terminal screw 12 of closure plate 10.

When the carriage is moved to the left from the position illustrated, the electrical connection between the terminal screws is broken, there being no metallic part engaged with the fixed contact 22 under such circumstances.

Snap action movement is imparted to the carriage from the handle 20 and pin 17 as follows.

A link 33 has a head 34 provided with an aperture pivoted upon the pin 17. The head provides a shoulder abutted by the spring seat 35. Compression spring 36 is confined between the spring seat 35 and a V-shaped spring seat 37 apertured to receive the link member 33. The V-shaped spring seat 37 floats upon the link member in abutment with the inner side of the web portion 26 and carriage 25. The carriage has an aperture at 38 (Fig. 5) through which the link member 33 projects. The flange 11 of the back plate 10 is slotted at 39 and the switch wall is recessed at 40 to receive the projecting end of link 33, the portions of the flange 11 at the end of the slot

providing stops for limiting longitudinal movement of the end of the link in the slot.

The length of the slot 39 which restricts the movement of the projecting end of the link 33 is less than the length of slots 15 and 16 in the mounting plate and the closure plate of the switch in which the actuating pin 17 is reciprocable. Accordingly, with the parts in the position illustrated in the drawing, with particular reference to Fig. 2, it is possible, by manipulation of the button, to operate the cross pin 17 to the right as viewed in Fig. 2, with the result that the direction of thrust of the compression spring becomes reversed and the spring, instead of pressing the carriage to the right into engagement with the fixed contact 22, now exerts its thrust to the left, and the carriage immediately reacts to move away from the fixed contact 22 and thereby to open the circuit.

Similarly, with the circuit open, the switch button and actuating pin may be moved to the left as viewed in Fig. 2 toward the positions in which the parts there appear. Again, the length of the guide slots for the cross pin 17 is such that the angularity of the cross pin becomes reversed in the course of its movement and the thrust of the compression spring upon the link 33 thereupon throws the link to the right as viewed in Fig. 2 and impels the contactor or carriage 25 to the right, thereby again closing the circuit between the terminals 12 and 23.

Due to the fact that the contactor carriage is wheeled, a very slight displacement of the actuating linkage across a position normal to the carriage will be adequate to induce carriage movement with a sharp snap action. As an incident to the snap action movement of the carriage it will be noted that the carriage is not only biased to remain in its new position, but the handle and cross pin become oppositely biased to remain in their new positions of adjustment. As soon as energy is stored in the compression spring on the link 33 by movement of the handle button from the position to which it is biased by the spring, the carriage responds with exceptional smoothness and positiveness.

Another noteworthy characteristic of the improved switch consists in the fact that the contact connections between terminals are positively made and broken through solid metal independently of any springs. That is to say, the flow of current through the springs in the manner such as to tend to ruin the springs is avoided by providing a current path elsewhere. Moreover, due to the fact that the ends of the carriage flanges 27 and 28 simultaneously engage and disengage the fixed contact 22, a dual make and break is provided and arcing is reduced.

The rollers or wheels of the contact carriage are in permanent contact with the track, so that there is no arc at this point. Moreover, in their rotation the rollers do not return with precision to the same positions and thus are constantly presenting new current-carrying surfaces to the track when the carriage moves to and from circuit closing position.

I claim:

1. In a switch, the combination with a fixed contact, of a carriage guideway, a wheeled carriage substantially rectilinearly reciprocable on the guideway to and from the contact, an actuator guideway approximately parallel to the carriage guideway, an actuator reciprocable upon the actuator guideway, supporting means carrying said guideways and providing an insulated mounting for said contact, and a thrust link mechanism between the actuator and the carriage reversible as to its angle of thrust upon the carriage according to the position of the actuator for impelling the carriage to and from the contact with snap motion.

2. A switch comprising the combination with a dielectric mounting plate provided with an actuator guide, and an actuator reciprocable substantially rectilinearly thereon, of means providing an electrically conductive track in general parallelism with the path of reciprocation of the actuator on said guide, a carriage having rolling means operable upon the track and an electrical connection therewith, a contact engageable by the carriage at one extreme position of its movement along the track, means supporting the contact and including means for the insulation thereof from the track, and a thrust mechanism reversible as to angle interconnected between the carriage and the actuator for producing carriage movement to and from the contact.

3. A switch comprising dielectric case means and an electrically conductive back plate having a portion disposed within the case means and constituting a track, a carriage provided with anti-friction bearing support from said track, and an electrically conductive connection therewith, said carriage comprising a moving contactor, a fixed contact mounted on the case in insulated relation to the back plate and in the path of movement of the contactor to be engaged thereby at one extreme of such movement, a sliding actuator manually operable in general parallelism with the path of carriage movement, a link in pivotal connection therewith and in pivotal and sliding connection with the carriage, a compression thrust spring interposed between the actuator and the carriage along the link, and means limiting the range of movement of that portion of the link adjacent the carriage to a range less than the range of movement of the actuator and generally symmetrically with reference to a link position normal to the carriage, whereby the reciprocation of said actuator reverses the angular thrust of said spring along said link upon the carriage to impart snap action movement thereto.

4. A carriage contactor for a switch, said contactor comprising in combination a channeled element having lateral flanges and an intervening web upon which the flanges are dependent for position, the web being materially shorter than the flanges and the flanges being provided at each side of the web with rollers peripherally projecting beyond the web to provide bearing support for the carriage the space between the flanges being open but for said web.

5. In a switch, the combination with means providing a track and a contact adjacent one end thereof, of a pair of spaced rollers operable upon the track and provided with bearing spindles axially projecting from their respective ends, a carriage having bearing notches in which said spindles are engaged and provided at an intermediate point with a thrust-receiving portion, an actuator, means providing a guideway for the actuator roughly paralleling the direction of the track, and a thrust link mechanism between the actuator and the thrust-receiving portion of the carriage comprising a thrust spring adapted to impart snap action to the carriage and to hold the carriage upon the roller spindles and to hold the rollers to the track, said thrust link mechanism being reversible as to its angular position respecting the carriage upon the reciprocation of

the actuator, whereby to impart snap motion to the carriage to and from the contact.

6. The combination with a slotted mounting plate having a boss providing a switch case at its rear face, of a closure plate for said switch case having a slot in registry with that of the mounting plate, an actuating pin guided in the slots of said plates and provided at said mounting plate with an actuating button, a flange on the closure plate within the case and constituting a track, a wheeled contact carriage reciprocable upon the path in a direction generally paralleling the direction of said slots, a thrust link pivoted to said pin and to said carriage, a compression spring extending along said link between said pin and carriage, said track providing means limiting the movement of said link to an extent less than the movement of said actuating pin, whereby the movement of said pin is adapted to reverse the angle of said link respecting said carriage and thereby to reverse the thrust of said spring as between the actuator and the carriage for imparting snap movement to the carriage in response to displacement of the actuator.

7. The combination with a manually reciprocable member and means providing a guideway upon which said member is reciprocable upon a predetermined path, of a contact plate upstanding laterally adjacent said path and extending generally parallel thereto, a second contact adjacent one end of said path and in spaced relation to the plate, supporting means for said contact plate and second contact including means for insulating each from the other, a carriage provided with roller means bearing upon said plate, said carriage being movable along said plate to and from engagement with said second contact, and means limiting the movement of said carriage away from said second contact, a link pivotally connecting said manually operable member with said carriage, said member having a greater range of movement than said carriage and being so disposed respecting said carriage that the angle of said link is reversible upon the movement of said member respecting said carriage, a compression spring extending along the link between said member and carriage and guided thereby for reversal of its direction of thrust upon said carriage, whereby to impart snap movement to the carriage in response to displacement of said member.

8. A compact switch comprising the combination with a slotted mounting plate, of a terminal plate having a central portion in spaced relation to said mounting plate and having a flange extending substantially at right angles between said central portion and said mounting plate at one side of the slot in the mounting plate and in general parallelism therewith, a carriage confined between the mounting plate and the central portion of the terminal plate and having roller means riding upon said flange in electrically conductive relation to the terminal plate, an actuator reciprocable in the slot of the mounting plate and having a portion entering the space between the mounting plate and the terminal plate, snap action mechanism between said portion and said carriage, means for limiting the reciprocation of the carriage to a range less than the range of movement of the actuator in said slot, said last mentioned means including a fixed contact terminal with which said carriage is engageable at one extremity of its range of movement for closing the circuit between said terminal plate and the contact terminal last mentioned, said snap action mechanism including a compression spring interposed between the said inner actuator portion and the carriage and serving not only to move the carriage with snap action but also to maintain said carriage upon said flange.

9. In a switch, the combination with a slide actuator and an insulating mounting provided with guide means upon which said actuator is slidable, of a contact track laterally adjacent said actuator, said mounting including means supporting said track and spacing it from said guide means, a carriage reciprocable along the track between the track and actuator, a snap action link and spring mechanism connecting the actuator with the carriage and disposed laterally adjacent the actuator and between the actuator and carriage, and means limiting carriage movement along said track and including a contact carried by said mounting and engageable by said carriage at one extreme of its movement.

10. In a switch, the combination with a mounting plate and a back plate spaced therefrom, one of said plates being provided with means connecting it in spaced relation to the other, both of said plates being slotted, of an actuator including a thumbpiece slidable externally of the mounting plate and provided with an extension rod projecting through the slots of both plates, a track between said plates laterally adjacent said rod, a carriage slidable along said track between the track and rod, a snap action link and spring mechanism between the rod and carriage providing an operative snap action connection therebetween, and means connected with one of said plates for limiting carriage movement to a range less than the range of movement of said rod and actuator, said means including contact means engaged by said carriage adjacent one extreme of its movement, and said last plate comprising means for insulating the contact means.

11. In a compact switch, the combination with a slotted mounting plate having a rear face provided with a boss surounding the slot and constituting a shallow switch case, a closure plate for said switch case having a flange entering said case at one side of the slot of said plate and generally paralleling the direction of said slot, said plate having within said boss means providing a guideway including shoulders extending at each side of the slot in general parallelism therewith, a slide operable along said guideway between said shoulders, an actuator including a button operable along the face of said plate and a rod extending from said button through the slot of said plate and engaged with said slide, a carriage comprising a channeled member reciprocable along said flange and provided with open bearings and with rollers riding on said flange and provided with spindles loosely engaged in said bearings, a pivoted seat carried by said carriage, a link pivoted upon said rod and slidable through said pivoted seat, a compression spring extending along said link and confined between said rod and seat and urging said carriage toward said flange, whereby to maintain said carriage upon the roller spindles and to maintain said rollers in electrically conductive relation to said flange, said actuator rod, link, and spring constituting snap action means for the reciprocation of said carriage, and a fixed terminal carried by said boss and including a portion extending into the case adjacent one extremity of carriage movement whereby to receive engagement by said

carriage and to receive current through said carriage and rollers from said flange.

12. A carriage contactor for a switch, said contactor comprising the combination with a channel having side flanges integrally connected by an intervening web upon which the flanges are dependent for position, the web being materially shorter than the flanges and centrally connected thereto whereby to expose marginal portions of the flanges beyond the web, the space between the flanges being open at its ends and at the side opposite the web, and rollers peripherally projecting beyond the web and disposed between the flanges and provided with trunnions engaging the exposed margins of said flanges at each end of the web, said flange margins being notched to receive the trunnions.

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