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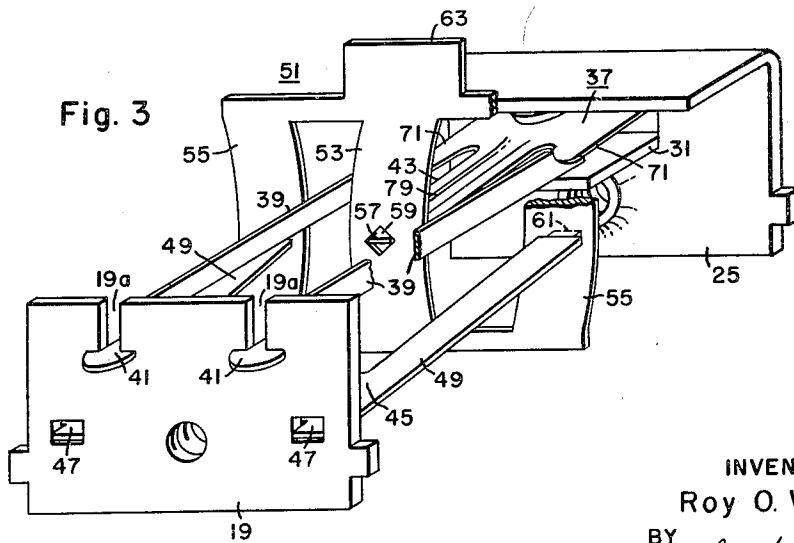
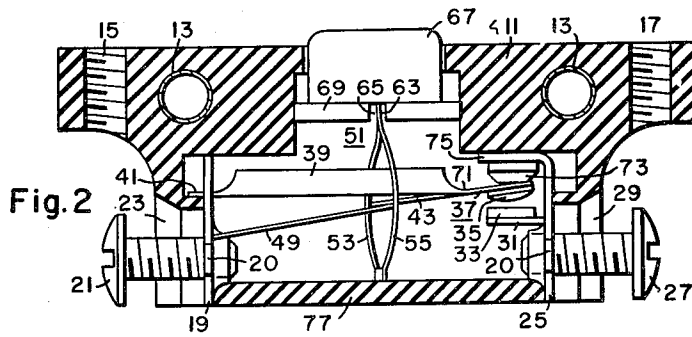
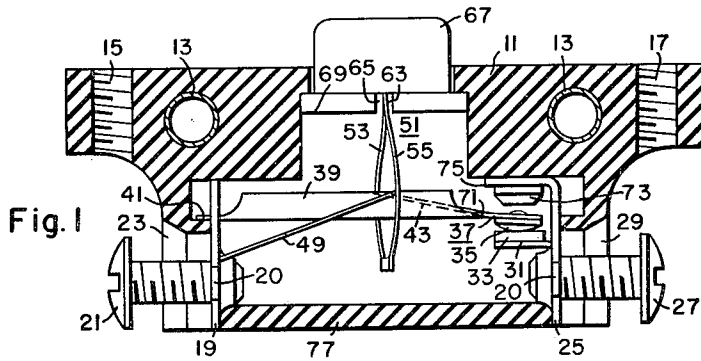
R. O. WILEY

2,985,730

SWITCH

Filed April 30, 1958

2 Sheets-Sheet 1



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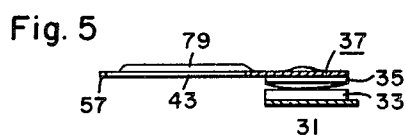
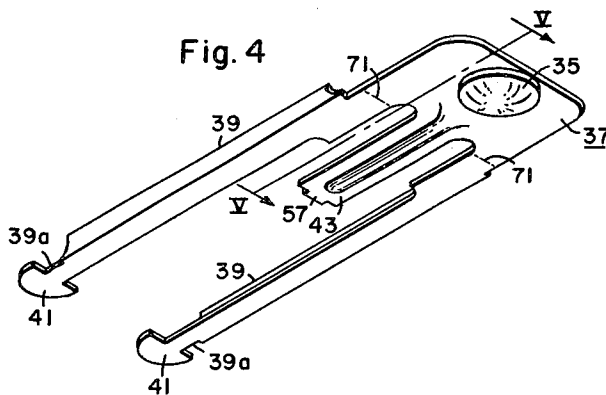
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2 Sheets-Sheet 2



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2,985,730

SWITCH

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10 Claims. (Cl. 200-67)

This invention relates to electrical switches and more particularly to improvements in the operation of switch contacts.

An object of the invention is to provide an improved electric switch of the momentary contact type which utilizes an overcenter toggle and is operated by a single push button.

Another object of the invention is to provide an improved electric switch of the momentary contact type with an operating spring blanked from a flat piece of pretempered spring stock.

Another object of the invention is to provide an improved electric switch operated by a single push button in which the contacts have a rolling and wiping action.

Another object of the invention is to provide an electric switch wherein the operating parts are enclosed in a housing comprising a pair of identical members of molded insulating material, the parts being mounted in the housing without being positively fastened thereto.

Another object of this invention is to provide a novel snap action switch wherein a positive rolling and/or wiping is provided between the switch contacts prior to separation thereof.

Another object of this invention is to provide a novel snap-acting type of switch having a spring for producing the snap action while at the same time maintaining the switch contacts at one position thereof when external operating forces are not present.

Another object of this invention is to provide a novel snap-acting type of switch having a spring for producing the snap action and for holding all moving parts of the switch in place without benefit of any fastening means.

Another object of this invention is to provide a snap-acting type of switch wherein operation of the contacts is effected by a leaf-type of spring in a novel manner.

The invention, both as to structure and operation together with additional objects and advantages thereof, will be best understood from the following detailed description of a preferred embodiment thereof, when read in conjunction with the accompanying drawings.

In said drawings:

Figure 1 is an elevational view of an electric switch, with one part of the housing removed, embodying the principles of the invention, the switch being shown in the closed contact position;

Fig. 2 is a view similar to Fig. 1 but showing the switch in the open contact position;

Fig. 3 is a perspective view of the operating mechanism of the switch;

Fig. 4 is a perspective view of the moving contact member; and

Fig. 5 is a sectional view taken on line V—V of Fig. 4 showing the center leg of the moving contact carrier.

Referring to Figs. 1 and 2 of the drawings, the switch is illustrated as being mounted in a two-part housing of identical portions 11 (only one being shown) of molded insulating material having surfaces and recesses molded therein for receiving and supporting the parts of the

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switch without any of the parts being positively fastened to the housing. After the switch parts are assembled in the housing the two parts 11 thereof are rigidly secured together by suitable means such as rivets 13. Threaded mounting openings are provided in the housing by molding one-half of the threaded openings at 15 and at 17 in each of the parts 11 so that when the two parts 11 are secured together a fully threaded opening results adjacent each end of the housing.

10 Disposed adjacent one end of the housing is a terminal member 19 having a terminal screw 21 extending through an opening 23 molded in the housing parts 11. The terminal screw 21 threadedly engages an opening in the terminal member 19. A terminal member 25 15 is disposed adjacent the other end of the housing and a terminal screw 27 extending through an opening 29 in the adjacent end of the housing threadedly engages an opening in the terminal member 25. The terminal members 19 and 25 are mounted in the housing by having 20 opposite side edges thereof received in opposed grooves formed in the parts 11 of the housing, and movement longitudinally along these grooves is prevented by side projections 20 which are received in recesses provided in the housing grooves. The terminal 25 extends up- 25 wardly along the adjacent end wall of the housing and has an inwardly extending portion 31 struck out therefrom on which is rigidly mounted a stationary contact 33. A movable contact 35 is mounted at one end on the bight portion of a generally U-shaped moving contact carrier 30 37, the spaced legs 39 of which are pivotally supported at their free ends on the terminal member 19 by means of knife-edge bearings. As seen in Figs. 3 and 4 the movable contact carrier 37 has a center leg 43 which extends to the left or toward the center of the switch from 35 the movable contact 35. The contact carrier 37 is formed from sheet metal stock of a good electrical conducting material, such as copper or an alloy thereof, with the bight portion, center leg 43 and the parts of the outer legs 39 adjacent the bight portion essentially formed 40 flat. However, at points spaced outwardly from the bight portion of the contact carrier 37, the outer sides of the legs 39 are bent at right angles to a point adjacent the outer ends thereof where they have reduced area portions 39a of a size to be received in notches 19a 45 formed in the upper edge of the terminal member 19. The extreme outer ends of the legs 39 of the contact carrier 37 have enlarged flat heads 41 to prevent longitudinal movement of the contact carrier 37 away from the terminal member 19 when the reduced area portions 39a 50 are received in the notches 19a. The contact carrier 37 is biased to the right as viewed in Figs. 1, 2 and 3 and as will be hereinafter pointed out, so that the inner edges of the enlarged flat heads 41 of the arms 39 in effect form knife-edge bearings on the outer side of the terminal member 19.

55 There is also provided a U-shaped lever or strut 45 having spaced projections 47 (Fig. 3) on its bight portion at the left end (Figs. 1, 2 and 3) which extend into spaced openings in the terminal member 19. The strut 45 is biased to the left as viewed in Figs. 1 to 3 and as will be hereinafter explained, and accordingly, the outer edge of the bight portion of the strut 45 forms in effect a knife-edge bearing against the inner side of the terminal member 19 about which the strut 45 pivots. The strut has spaced legs 49 which extend toward the right from the terminal member 19 and toward the center of the switch. The strut 45 need not be of the same material as contact carrier 37 but should be of a relatively rigid material, such as steel.

70 An operating spring indicated generally at 51 is formed from a flat strip of pretempered stock of a suitable resilient material, such as spring steel. The spring 51 has two

slots extending lengthwise thereof dividing the spring into three portions, namely, a center portion 53 and two outer portions 55. In its initial form before it is assembled in the switch the spring 51 is flat, but it is placed under an initial stress (Fig. 1) by the center leg 43 of the movable contact carrier and the legs 49 of the strut. The inner end of the center leg 43 of the contact carrier 37 engages the adjacent side of the center leg 53 of the spring 51 and is provided with a projection 57 which engages an opening 59 at about the mid-point of the center portion 53 of the spring 51 to properly locate it. Similarly, the inner ends of the legs 49 of the strut 45 engage the opposite sides of outer portions 55 of the spring 51 and have projections 61 (only one being shown) thereon which engage openings in the outer portions 55 of the spring 51 for locating purposes. The dimensions of the parts are such that the spring 51 is stressed by having its center leg 53 deflected in one direction and its outer legs 55 deflected in the opposite direction thus acting to exert pressure on the knife-edge bearings on the heads 41 and bight portion of the strut 45, with the contact carrier legs 39 being under tension and the legs 49 of the strut 45 being under compression.

The center leg 43 of the contact carrier 37 and the strut 45 form an overcenter operating toggle which in the closed position of the switch (Fig. 1) is biased overcenter by the opposing forces of the center portion 53 and outer portions 55 applied respectively to the contact carrier 37 and the strut 45. The upward movement of the spring 51 and the toggle 43—49 is limited by the engagement of a projection 63 of the spring 51 with a notch 65 in the bottom of a push button 67 which is slidably mounted in an opening one-half of which is molded in each of the two housing parts 11. The upward movement of the ensemble is then limited by a shoulder 69 on the push button 67 engaging the housing.

The center leg 43 and the outer legs 39 of the contact carrier form a second toggle, the portions of which pivot at its flexible point 71. In the closed position (Fig. 1) the toggle 39—43 is overcenter above a line through the pivot point 71 and the bearings of the heads 41 of the legs 39 and the center portion of the spring 51 apply a force to the center leg 43 biasing the contacts closed.

When the push button 67 is moved downwardly from the position shown in Fig. 1, the spring 51 moves therewith and since the inner end of the center leg 43 of the contact carrier and of the legs 49 of the strut 45 are connected to the spring they move downward with the spring. This movement causes the strut 45 to pivot downwardly about its bearing on the terminal member 19. Downward movement of the contact 35 is prevented by the stationary contact 33 causing the movable contact carrier 37 to flex at its flexible point indicated at 71 (Figs. 3 and 4). As the spring 51 is moved farther down by continued downward movement of the push button the strut 45 flexes the outer portions 55 of the spring toward the right (Figs. 1 and 2) and the center leg 43 of the movable contact carrier flexes the center portion 53 of the spring toward the left, thus increasing the force exerted by the spring on these parts. When the button 67 has been depressed sufficiently to bring the contact carrier 37, the point of connection of the strut 45 with the outer portions 55 of the spring and the bearings of the heads 41 of legs 39 of the contact carrier into a common plane, the downward force of the movable contact 35 becomes zero. At this point the toggle 39—43 is in an unstable position and any further downward movement of the spring moves the toggle 39—43 overcenter and, due to an upward force component exerted thereby on the center leg of the moving contact carrier, causes upward movement of the contact end of the contact carrier and opening of the contacts with a snap action. The opening movement of the contact end 37 of the moving contact carrier is limited by engagement with a stop button 73 mounted on the formed-over upper end 75 of the terminal member 25.

The downward movement of the spring 51 is limited by engagement of its lower end with the bottom portion 77 of the housing as seen in Fig. 2. In this position the toggle 43—49 is in a slightly overcenter position above a plane through the pivots 47 of the strut and contact end 37 of the movable contact carrier and an upward component of force is exerted on the spring 51 which is sufficient to move the spring and the button 67 upwardly when the external force is removed from the button. As the spring 51 moves upwardly it carries the center leg 43 of the movable contact carrier above a plane through 37, 61 and 41 whereupon the force of the center portion 53 of the spring exerted on the center leg 43 causes the carrier to flex at the point 71 and close the contacts with a snap action.

By interchanging the stop 73 and the stationary contact 33 and placing the movable contact 35 on the upper side of the contact carrier 37 the switch would be normally open and momentarily closed by inward movement of the push button 67.

The center leg 43 of the movable contact carrier is provided with a stiffening rib 79 (Figs. 4 and 5) for rigidity so that the flexing occurs in the legs 39 adjacent the contact end 37 of the carrier at the point indicated at 71. Thus, the movement of the inner end of the center leg 43, when the button 67 is depressed or released, causes an angular movement of the moving contact 35 relative to stationary contact 33 which provides a rolling action between the contacts. Also since the point of flexure of the contact carrier does not coincide with the point of initial contact of the two contacts nor with the bearing point of the movable contact carrier, the moving contact 35 will have a linear motion relative to the stationary contact 33. This rolling and wiping action tends to keep the surfaces of the contacts clean and to prevent welding of the contacts.

The invention provides an improved switch structure in which the parts are enclosed in an insulating housing composed of two identical members of molded insulating material without any of the parts being positively fastened to the housing. A single operating spring is blanked from pretempered spring stock and is utilized to hold the parts of the switch mechanism together, to actuate the movable contact to open and closed positions and to hold the movable contact in the closed position with sufficient force to maintain good electrical contact with the stationary contact. The single spring also resets the device upon release of the manual push button. Making the single flat spring from pretempered stock eliminates the tendency to warp and hardness variations which could result from heat treating the spring after it is fabricated.

Having described the invention in accordance with the provisions of the patent statutes, it is to be understood that various changes and modifications may be made in the particular embodiment disclosed without departing from the spirit of the invention.

I claim as my invention:

1. In an electric switch, a housing comprising a pair of housing members of molded insulating material, a first terminal member disposed adjacent one end of said housing and having a stationary contact thereon, a second terminal member disposed adjacent the other end of said housing, a movable contact carrier pivotally supported on said second terminal member, a movable contact on said contact carrier for cooperation with said stationary contact, a movable strut pivotally mounted on said second terminal member and extending toward said first terminal member, a spring interlocking and activating to motion said movable parts and stressing said movable parts in position, and manual means for moving said spring to cause said spring to actuate said movable contact carrier and effect opening movement of said movable contact carrier.

2. In an electric switch, a housing comprising a pair of housing members of molded insulating material, a

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first terminal member disposed adjacent one end of said housing and having a stationary contact thereon, a second terminal member disposed adjacent the other end of said housing, a movable contact carrier pivotally supported on said second terminal member, a movable contact on said contact carrier for cooperating with said stationary contact, a movable strut pivotally mounted on said second terminal member and extending toward said first terminal member, a spring made from a flat piece of pretempered resilient metallic material interlocking and activating to motion said movable parts and applying a force in opposite directions to said movable parts for holding said parts in position, and manual means for moving said spring to cause said spring to actuate said movable contact carrier and effect opening movement of said movable contact carrier.

3. An electric switch comprising stationary and movable contact means, a housing of molded insulating material, a first terminal member disposed at one end of said housing supporting said stationary contact means, a second terminal member at the opposite end of said housing, a contact carrier movable to two positions pivotally supported on said second terminal member and extending toward said first terminal member, said contact carrier having said movable contact means thereon, a lever pivotally mounted on said second terminal member and extending toward said first terminal member, a flat spring interlocking and activating to motion said carrier and said lever and applying a force to hold said carrier and said lever in position, said spring normally biasing said contact carrier to one of its positions, and means for actuating said spring to cause movement of said contact carrier to the other of its positions.

4. An electric switch comprising stationary and movable contact means, a housing of molded insulating material, a first terminal member disposed at one end of said housing supporting said stationary contact means, a second terminal member at the opposite end of said housing, a contact carrier movable to two positions pivotally supported on said second terminal member and extending toward said first terminal member, said contact carrier having said movable contact means thereon, a lever pivotally mounted on said second terminal member and extending toward said first terminal member, a flat spring interlocking and activating to motion said carrier and said lever and applying a force in opposite directions to hold said carrier and said lever in position, said spring normally biasing said contact carrier to one of its positions, and means for actuating said spring to cause movement of said contact carrier to the other of its positions, said spring upon release of said actuating means moving said contact carrier to said one position.

5. An electric switch comprising stationary and movable contact means, a housing of molded insulating material, a first terminal member disposed at one end of said housing supporting said stationary contact means, a second terminal member at the opposite end of said housing, a contact carrier movable to two positions pivotally supported on said second terminal member and extending toward said first terminal member, said contact carrier having said movable contact means thereon, a lever pivotally mounted on said second terminal member and extending toward said first terminal member, a flat spring interlocking and activating to motion said carrier and said lever and applying a force in opposite directions to hold said carrier and said lever in position, said spring normally biasing said contact carrier to one of its positions, and means including a push button for actuating said spring to cause movement of said contact carrier to the other of its positions, said spring upon release of said push button returning said contact carrier and said push button to said one position.

6. An electric switch comprising stationary and movable contacts, a housing comprising a pair of identical housing members of molded insulating material, terminal

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members at opposite ends of said housing, one of said terminal members having said stationary contact thereon, a movable contact carrier movable to two positions having the movable contact on one end thereof, said contact carrier having spaced outer legs and an inner leg extending from said contact end toward the other of said terminal members, said outer legs pivotally supporting said contact carrier on said other terminal member, a U-shaped lever pivotally supported at one end on said other terminal member and having spaced legs extending toward the contact end of said housing, a spring formed from a flat piece of pretempered resilient metallic material, said spring having an inner portion engaging said inner leg of said contact carrier and outer portions engaging the legs of said lever, said spring being disposed to apply a force in opposite directions to said center leg of said contact carrier and to said lever to hold said parts in position, said spring also biasing said contact carrier to one of its positions, and manual means for actuating said spring to cause it to move said contact carrier to the other of its positions.

7. An electric switch comprising stationary and movable contacts, a housing of molded insulating material, terminal members at opposite ends of said housing, said stationary contact being mounted on the terminal member at one end of said housing, a movable contact carrier pivotally supported on the terminal member at the other end of said housing and having said movable contact resiliently extending therefrom, a lever pivotally supported on said other terminal member and extending toward said one terminal member, a spring interlocking and stressing said contact carrier and said lever in assembled position, said spring means being operable to cause said contact carrier to separate said contacts prior to which separation said contact carrier is caused to flex about said movable contact causing a rolling and wiping action between the contacts.

8. In an electric switch, a housing of molded insulating material, a first terminal member disposed adjacent one end of said housing, stationary contact means on said first terminal member, a second terminal member disposed adjacent the other end of said housing, a movable contact carrier pivotally supported on said second terminal member and extending toward said first terminal member, a movable contact means resiliently extending from said carrier for cooperating with said stationary contact means, a lever pivotally mounted on said second terminal member and extending inwardly toward said first terminal member, spring means engaging the inner end of said lever and engaging said contact carrier at a point spaced from said movable contact, said spring means stressing said carrier and said lever in opposite directions thereby holding these parts in assembled position in said housing, said spring means being operable to cause said contact carrier to separate said contact means prior to which separation said contact carrier is caused to flex about said movable contact means causing a rolling and wiping action between the contact means, said spring means further being operable to cooperate with said lever and said contact carrier to reclose said contact means.

9. An electric switch comprising a housing and a stationary contact supported in said housing and a movable contact positionable against said stationary contact, an operating toggle being supported in said housing and having said movable contact on a portion thereof and being operable overcenter in one direction to arrange said contacts selectively in engaged and disengaged positions with one another, a spring providing resilient support for an arm of said operating toggle, an actuating member being supported in said housing and being effective when actuated to impart substantially linear movement to said spring generally laterally of said arm of said operating toggle and thereby to cause overcenter movement of said operating toggle, a restoring toggle including said operating toggle arm and another arm and

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being supported in said housing, and said spring providing resilient support for said other arm of said restoring toggle and enabling said restoring toggle to move said operating toggle overcenter in the direction opposite said one direction when said actuating member is released so as to arrange said contacts in the other of said positions.

10. An electric switch comprising a housing of insulating material and stationary and movable contacts, terminal members being electrically common to said contacts respectively, means for supporting said terminal members in said housing, means for operating said contacts comprising a pair of toggles, one of said toggles being operable overcenter in one direction to effect an engagement of said contacts and the other of said toggles being operable to effect overcenter movement of said one toggle in the direction opposite said one direction and a disengagement of said contacts, said one toggle including an elongated carrier supporting said movable contact and being supported adjacent one of its ends by

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5 one of said terminal members, said other toggle including a lever member being supported adjacent one of its ends by said one terminal member, and spring means positioned intermediately of said terminal members and supporting resiliently said carrier and said lever for urging overcenter movement of said one toggle in said one and said opposite directions.

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