Jan. 28, 1964 L. H. STITES 3,119,915

RESILIENT OPERATING MEANS FOR ELECTRIC SWITCH

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Fig. 1

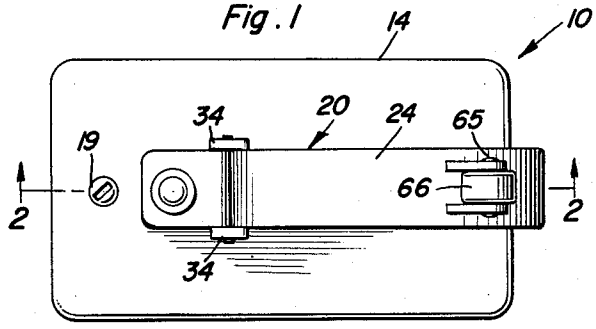


Fig. 2

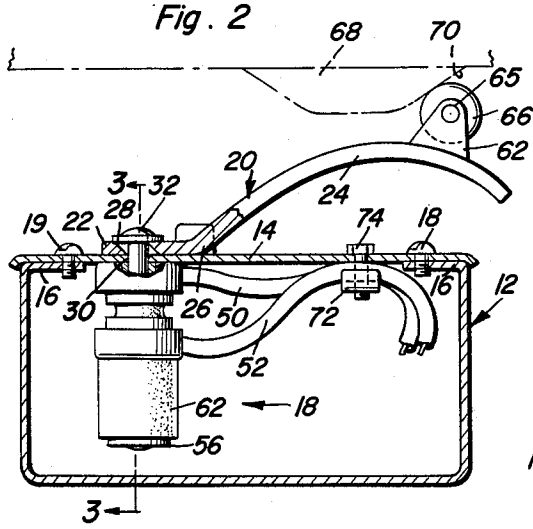


Fig. 3

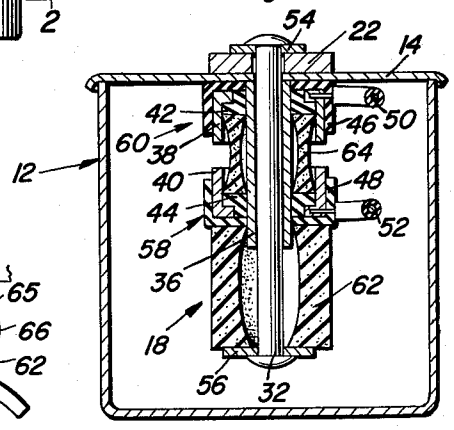


Fig. 4

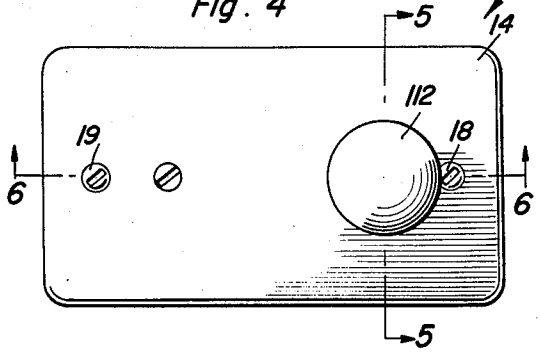
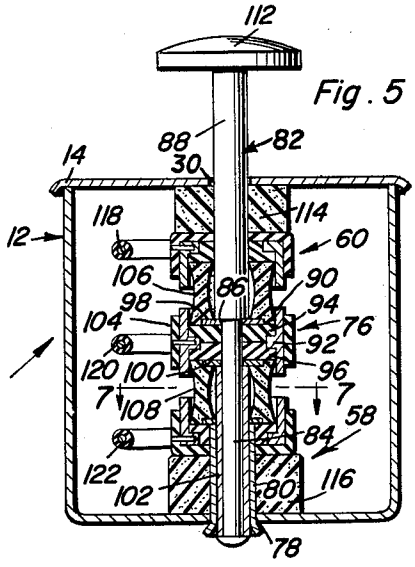


Fig. 5



Loren H. Stites

INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson

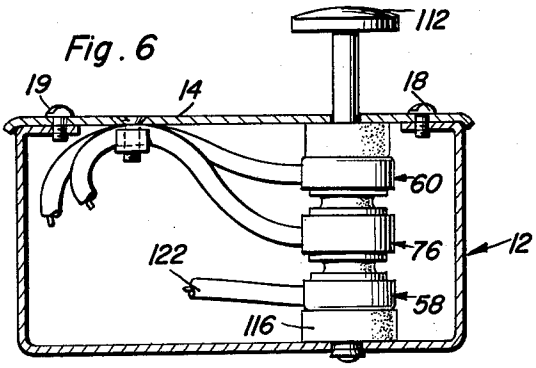
Attorneys

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RESILIENT OPERATING MEANS FOR ELECTRIC SWITCH

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Fig. 6



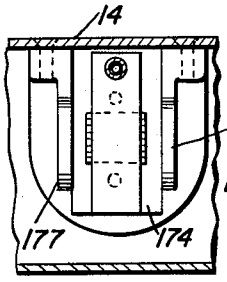


Fig. 11

Fig. 7

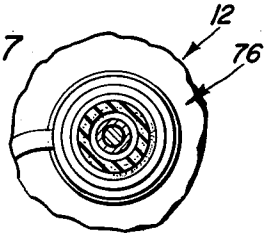
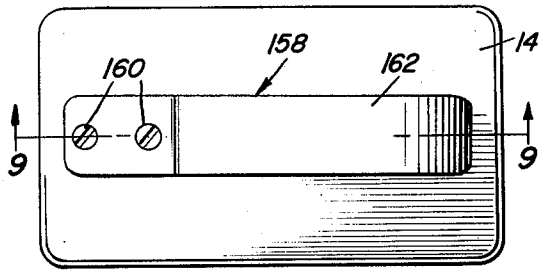


Fig. 8



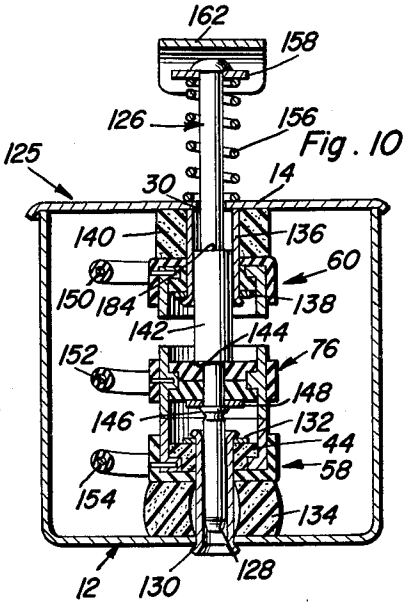
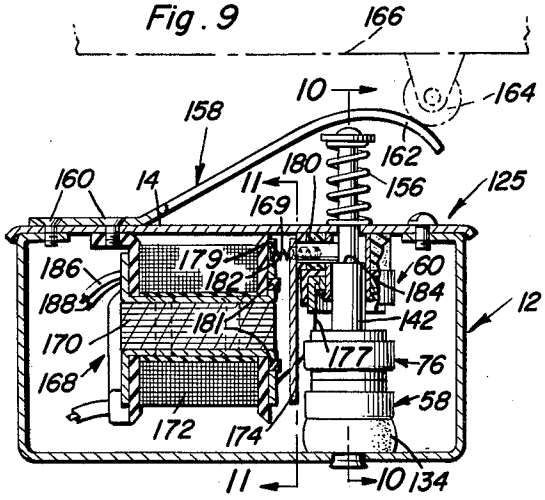


Fig. 10

Fig. 9



Loren H. Stites

INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

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RESILIENT OPERATING MEANS FOR ELECTRIC SWITCH

Loren H. Stites, 3114 Corunna Road, Flint, Mich.

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8 Claims. (Cl. 200—165)

This application is a continuation-in-part of my copending application, Serial No. 773,659, filed November 13, 1958 for Switch, now Patent No. 3,019,313.

This invention relates to switches, and more particularly to improvements in switches which may be used for general purposes or which may be used for special applications.

An object of this invention is to provide improvements in switches enabling the switches to operate considerably more satisfactorily over extended periods with no service, no maintenance, and with great dependability.

It is another object of the invention to provide a switch which has resilient operating means and resilient bumpers which also function as insulating means.

Another object of the invention is to provide a switch which has a large contact surface for effectively conducting large amounts of current.

It is another object of the invention to provide a switch which is cam operated and may be locked in one position by electromagnetic means.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a plan view of one form of the switch device of the present invention;

FIGURE 2 is a vertical cross-sectional view taken substantially on the plane of line 2—2 in FIGURE 1;

FIGURE 3 is a vertical cross-sectional view on an enlarged scale taken substantially on the plane of line 3—3 in FIGURE 2;

FIGURE 4 is a plan view of a modified form of this switch;

FIGURE 5 is an enlarged vertical cross-sectional view taken substantially on the plane of line 5—5 in FIGURE 4;

FIGURE 6 is a vertical cross-sectional view taken substantially on the plane of line 6—6 in FIGURE 4;

FIGURE 7 is a cross-sectional view taken substantially on the plane of line 7—7 in FIGURE 5;

FIGURE 8 is a plan view of a third form of this invention;

FIGURE 9 is a vertical cross-sectional view taken substantially on the plane of line 9—9 in FIGURE 8; and

FIGURE 10 is an enlarged cross-sectional view taken substantially on the plane of line 10—10 in FIGURE 9.

FIGURE 11 is a section taken along line 11—11 of FIGURE 9.

With continuing reference to the drawings wherein like reference numerals indicate indentical parts, it can can be seen that the switch assembly 10 shown in FIGURES 1 through 3 includes a hollow rectangular box-like housing 12 having an open top which is normally covered by a cover 14. The end walls of the housing 12 terminate at their upper edges in horizontally inwardly extending flanges 16 which have threaded apertures therein for receiving screws 19 which extend through bores in the cover 14 for retaining it in proper covering position on the housing 12. The switching mechanism 18 is mounted on the cover 14, and comprises an operating lever 20 of arcuate shape and terminating in an outwardly deflected flat portion 22. The flat portion 22 is connected to the arcuate portion 24 by means of a slightly curved corner portion 26. The flat portion 22 is provided with a canted bore 28 extending therethrough. The cover 14 is also provided with a bore 30 in alignment with the bore 28.

A rivet 32 having heads at both ends extends through the bores 28 and 30 for retaining the lever 20 on the cover 14. A pair of guide ears 34 project upwardly from the cover on opposite sides of the corner portion 26 of the lever for preventing it from pivoting about the axis of the rivet 32. The rivet 32 extends through the operating components comprising the switch mechanism and maintains them in assembled relationship.

The switch mechanism includes a sleeve 36 which surrounds the rivet 32 and may be tack welded at its upper end to the cover 14. Mounted on and concentric with the sleeve 36 are two cup-shaped, brass washer members 38 and 40 which are arranged with their bottoms away from each other. The washer members 40 and 38 have enlarged central bores therein which receive the reduced extensions of annular insulating washers 42 and 44. The washer members 38 and 40 are received in and surrounded by cup-shaped annular insulators 46 and 48. The upper switch element comprising the members 38, 42 and 46 are all secured to the sleeve 36 and cover 14. The lower switch element comprising the members 40, 44 and 48 are all secured together by conventional means such as cement and are slidable on the sleeve 36. Insulated conductors 50 and 52 extend through bores in the members 46, 38, 48 and 40, and are silver soldered to the washer members 38 and 40 respectively.

The upper end of the rivet 32 has a washer 54 between its upper head and the lever 20, and the lower portion of the rivet is provided with a washer 56 adjacent its lower head.

As shown in FIGURE 3, the switch element 58 is maintained in inoperative position by two rubber sleeves 62 and 64 which are compressed between the members 48 and 56 and the members 44 and 42 respectively.

The upper surface of the arcuate portion 24 of the lever 20 is provided with a pair of ears 62 through which a pin or rivet 65 extends. An anti-friction roller 66 is journaled on the pin 65 between the ears 62. If friction is not important, members 62, 65 and 66 may be omitted and lever 20 may be operated directly by cam 68.

In operation, the housing 12 is mounted parallel to and adjacent a reciprocating cam member 68 which moves in a direction parallel to the cover 14. When the cam surface 70 of the cam member 68 contacts the roller 66, the arcuate portion 24 of lever 20 is pushed downwardly towards the cover 14 whereby the lever pivots on the corner portion 26 and the flat portion 22 moves away from the cover 14 and urges the rivet 32 out of the housing. As the rivet 32 moves out of the housing 12, it compresses the resilient members 62 and 64 which causes the switch element 58 to move towards the switch element 60 and the annular surface of washer 40 to contact the annular surface of washer 38. When the washers contact, the switch is closed and a circuit is completed through the switch so as to connect the conductors 50 and 52.

The conductors 50 and 52 are normally clamped to the cover 14 by means of a clamp member 72 and bolt 74.

A second form of switch 11 is shown in FIGURES 4 through 7. This switch also includes a rectangular housing 12 and a cover member 14 identical to those shown in FIGURES 1 through 3. The switch 11 is a three-way switch and in addition to the switch elements 60 and 58, this switch also includes a central switch element 76. The bottom of the housing 12 is provided with an aperture or bore 78 in axial alignment with the bore 30 and

cover 14. A guide sleeve 80 extends through and is secured within the bore 78. An operating rod 82 extends downwardly through the bores 30 and 78 and through the sleeve 80. The lower end of the operating rod has a reduced extension 84. The reduced portion 84 joins the upper portion 88 at an annular shoulder 86. The central switch assembly 76 includes an annular contact sleeve 90 having an inwardly extending annular rib 92 at its central portion. A pair of insulating washers 94 and 96 are received within the contact member 90 and have adjacent annular grooves formed therein for receiving the rib 92 and maintaining the washers 94 and 96 in fixed relation with respect to the contact member A pair of metal washers 98 and 100 are on each side of the washers 94 and 96. An elongated sleeve 102 abuts the lowermost head of the operating rod 82 and compresses the washers 98, 100, 94 and 96 tightly together and against the shoulder 86. An insulating sleeve 104 surrounds the contact member 90 and is secured thereto.

Annular resilient rubber sleeves 106 and 108 surround the operating rod 82 and contact opposite sides of the central switch element 76 so as to maintain its centered in relation to the switch elements 58 and 60.

The weight of the operating rod 82 and the central switch element are supported by rubber members 106, 108 and 116. Switch elements 60 and 58 are slidable on the operating rod 82 and the sleeve 80 respectively. Resilient annular bumper members 114 and 116 surround the operating rod 82 and sleeve 80 and are slightly compressed between the cover 14 and between the switch element 60, and between the switch elements 58 and bottom of the housing 12 respectively.

Insulated conductors 118, 120 and 122 are silver soldered to the switch elements 60, 76 and 58 respectively in the same manner as the conductors 50 and 52 are connected to their switch elements.

To connect the conductors 118 and 120 by means of the switch elements 60 and 76, it is only necessary to pull upwardly on the operating head 112. To connect the conductors 120 and 122 by means of the switch elements 58 and 76, it is only necessary to push downwardly on the operating head 112.

FIGURES 8 through 10 illustrate a third form of switch 125 which also includes a rectangular housing 12 and a cover 14. An operating rod 126 extends downwardly through the bore 30 in the cover 14 and the lower ends 128 extends into and is guided by a sleeve 130 which extends through the bore 78 in the bottom of the housing 12 and is secured therein.

The sleeve 130 extends through the switch element 58 and its upper end is flared over a washer 132 which abuts against the insulating member 44 of the switch element so as to limit its upward movement. A rubber bumper 134 surrounds the sleeve 130 and is compressed between the housing 12 and the bottom of the switch element 58 so as to urge it upwardly against the washer 132.

In a similar manner, a sleeve member 136 is secured to the cover 14 in alignment with the bore 30 and extends through the valve element 60. The lower end of the sleeve 136 is also flared over a washer 138 for retaining the switch element 60 against the annular rubber bumper 140 which surrounds the sleeve 136 and is compressed between the cover 14 and switch element 60.

An enlarged portion 142 is provided on the central portion of the operating rod 126 and forms an annular shoulder 144 on the operating rod. The lowermost end 128 of the operating rod extends through the central aperture in the switch element 76 and this lower portion is peened at 146 so as to compress the switch element 76 between the annular shoulder 144 and a washer 148. This securely locks the switch element 76 to the operating rod 126.

Conductors 150, 152 and 154 are connected in the manner explained above to the switch elements 58, 60 and 76. A coil spring 156 is compressed between the

cover 14 and a washer 158 abutting the head of the operating rod. The spring 156 normally urges the switch elements 60 and 76 into contact with one another for completing a circuit between the conductors 150 and 152.

A resilient arm 158 is connected to the cover 14 by screws 160. The upper end of the arm 158 is curved as shown at 162 for contacting the roller 164 (or a cam member 63 as shown in FIGURE 2) on reciprocable operating member 166. The member 166 moves parallel to the cover 14 so that the roller 164 may cam the curved portion 162 of the arm 158 downwardly for contacting the operating rod 126 and thereby overcoming spring 156 so as to open switch elements 60—76 and close switch elements 58—76.

A conventional electric solenoid 168 is rigidly secured to the cover 14 and includes an iron core 170 which is surrounded by an electric coil 172. A flat armature 174 extends perpendicular to and adjacent one end of the core 170. The armature 174 is rectangular and is guided between two parallel plastic ears 177 fixed to insulator 179 at one end of the solenoid 168. The upper end of the armature is connected to a plunger 180 which has a bore therein receiving a coil spring 182. Rubber bumpers 181 project from 179 to act as a sound deadener for armature 174. Plunger 180 is surrounded by a washer 169 of resilient material.

The enlarged portion 142 of operating rod 126 also forms an annular upper shoulder 184. When the operating rod is pushed downwardly for closing the switch elements 58—76, the spring 182 forces plunger 180 over shoulder 184 and thereby locking the contacts 58 and 76 in closing relationship. Conductors 186 and 188 are connected between remote control means and the solenoid 168 so as to selectively energize the solenoid. When the solenoid 168 is energized, the armature 174 is drawn toward the solenoid which in turn withdraws the plunger 180 from adjacent shoulder 184 thereby permitting spring 156 to disengage switch elements 58—76 and engage the switch elements 60—76.

If desired the switch element 58 could be omitted from the third switch assembly 154. Also, the switch assembly 18 shown in FIGURES 1 through 3 could also be provided with a locking solenoid similar to the solenoid 168 if desired.

Another important form of single limit switch includes the form shown in FIGURES 8–10 modified by placing 58 to take the place of 76 and omitting solenoid 168, plunger 180, enlarged portion 142, conductor 154 and assembly 58.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A switch comprising first and second contacts adjacent one another, each of said contacts having a recess in its central portion opposing the recess in the opposite contact, resilient means in said recesses urging said contacts apart, operating means connected to at least one of said contacts for compressing said resilient means and urging said contacts together, said operating means including an elongated member extending through bores in the centers of said contacts, means connecting said member to one of said contacts, means connected to said member for moving it through the other contact.

2. A switch comprising first and second contacts adjacent one another, each of said contacts having a recess in its central portion opposing the recess in the opposite contact, guide means connecting said contacts for movement toward and away from one another, the peripheral edges of said contacts surrounding said recess adapted to

conductively engage when said contacts are forced together, said contacts being cup shaped and having aligned apertures in the bottoms thereof, said guide means including rod means extending through said apertures and slidably guiding at least one of said contacts toward and away from the other contact during operation of the switch.

3. A switch as defined in claim 2 wherein spring means surrounds said rod means and urges one of said contacts in one direction relative to the other contact.

4. A switch as defined in claim 3 wherein said spring means includes a tubular resilient member of insulating material surrounding said rod and having opposite end portions in said recesses, said spring means urging said contacts apart.

5. A switch as defined in claim 3 wherein a third contact similar to said first contact is located on the opposite side of said second contact as said first contact, a second recess in the second contact opposing the recess in the third contact, housing means enclosing said switch, said

rod means secured to said second contact and extending through an opening in said housing, said first and third contacts being secured to said housing.

6. A switch as defined in claim 5 wherein rubber bumpers are located between each of said first and third contacts and said housing.

7. A switch as defined in claim 3 wherein switch lock means is mounted adjacent said rod means for selectively engaging said rod means and securing it in one position, remote control means operatively connected to said lock means.

8. A switch as defined in claim 3, wherein said rod means is operatively connected to an operating lever, cam means movably mounted adjacent said lever for operating same.

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