Aug. 12, 1952 R. C. WOOFTER 2,606,980

DOOR SWITCH

Filed May 4, 1950

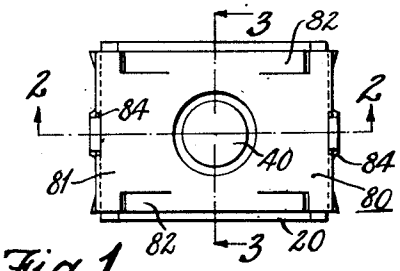


Fig. 1.

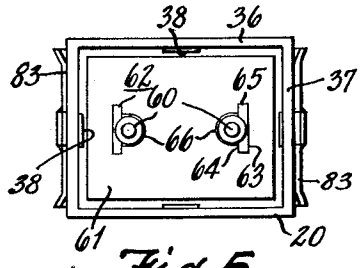


Fig. 5.

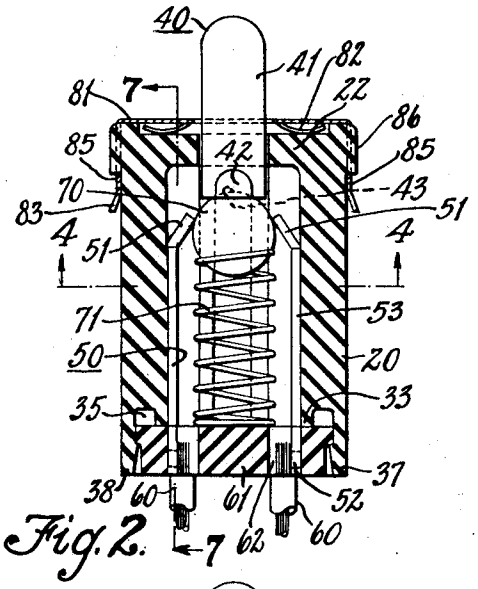


Fig. 2.

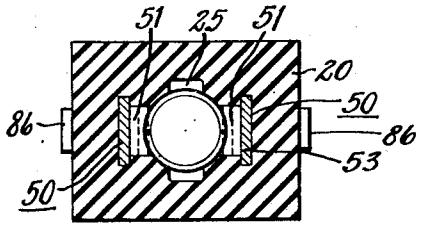


Fig. 4.

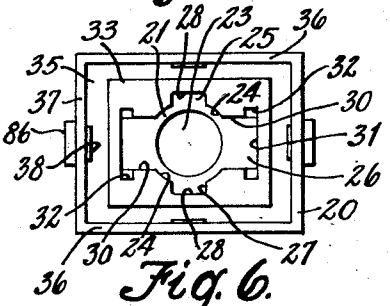


Fig. 6.

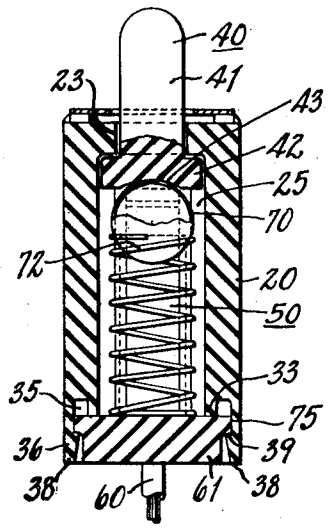


Fig. 3

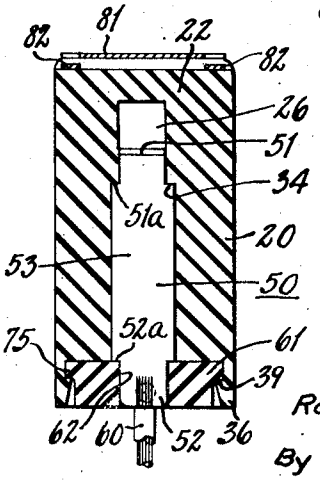


Fig. 7.

INVENTOR
ROBERT C. WOOFTER
By
Willits, Hardman & Fehr
HIS ATTORNEYS

Patented Aug. 12, 1952 2,606,980

# UNITED STATES PATENT OFFICE

2,606,980

## DOOR SWITCH

Robert C. Woofter, Cortland, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application May 4, 1950, Serial No. 159,916

6 Claims. (Cl. 200—54)

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This invention relates to improvements in electric switches and more particularly to switches of the door operated type.

An object of the present invention is to provide a compact, durable and dependable electric switch which may be made economically. To accomplish these and other objects, the switch housing comprises a body and a cover of molded plastic without inserts embedded therein and providing for attachment of the cover to the body without the use of additional fastening parts. The body and cover when assembled retain properly in assembled relation the switch parts including the fixed contacts of the switch, a movable contact, a spring for engaging the contacts and a plunger for separating them. The body is shaped to provide means for locating the fixed contacts for engagement by the movable contact, means for guiding the movable contact into engagement with the fixed contacts independently of the plunger and for retaining the spring in position to urge the movable contact into engagement with the fixed contacts, and means for guiding the plunger into engagement with the movable contact to separate it from the fixed contacts.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Fig. 1 is a top plan view of the switch embodying the present invention with a mounting clip attached thereto.

Fig. 2 is a sectional view through the switch and taken on line 2—2 of Fig. 1.

Fig. 3 is a sectional view through the switch taken on line 3—3 of Fig. 1.

Fig. 4 is a sectional view through the switch and taken on line 4—4 of Fig. 2.

Fig. 5 is a bottom plan view of the switch.

Fig. 6 is a bottom plan view of the casing.

Fig. 7 is a sectional view taken on line 7—7 of Fig. 2.

Referring to the drawings, 20 designates a one-piece molded body or housing of molded insulating material or plastic. The body 20 is formed with a recess 21 extending from one end and terminating short of the other end to provide an end wall 22 having an opening 23. The recess has cylindrical walls 24 interrupted by two pairs of diametrical grooves 25 and 26. The grooves 25 are defined by two spaced, parallel side walls 27 extending to a third wall 28. The grooves 26 are defined by two spaced parallel side walls 30 extending to a third wall 31. The side walls 30 are interrupted by diametrically opposite grooves

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32 at the juncture of the walls 31 with the walls 30. The grooves extend from a shoulder or ledge 33 within the body and terminate short of the end wall 22 of the body to provide shoulders or abutments 34.

The lower end of the body 20 is enlarged at the mouth of the recess to provide the ledge 33. The ledge is surrounded by a channel 35 to provide resilient parallel side wall portions 36 and parallel end walls 37. The walls 36 and 37 are each provided with an integral tapered projection 38 on their interior surface and are so formed so as to provide horizontal shoulders 39 on the same plane. The shoulders 39 are spaced from the normal plane of the ledge 33.

The recess 21 receives an operating member or plunger 40. The plunger is formed from molded insulating material or molded plastic and includes a stem 41. The lower end of the plunger is formed with integral diametrical lateral lugs or extensions 42. The lower end of the plunger is formed with a spherical seat 43 located centrally with respect to the axis of the plunger 41. The plunger is assembled with the body by inserting same at the mouth of the recess with the lateral lugs 42 received by the grooves 25 and the stem passing through opening 23. The lugs 42 have a sliding fit with the grooves 25 to guide the plunger in straight line axial movements with respect to the body. The lugs 42 are capable of engaging the underside of the wall 22 to limit the outward movement of the plunger.

A pair of combined contact-terminal members 50 as best shown in Fig. 4 are punched from sheet metal and have at one end a narrow portion which is bent out of the normal plane of the member 50 to provide a contact 51. The other end of member is also narrow to provide a terminal portion 52. The narrow portions 51 and 52 form shoulders 51*a* and 52*a* respectively. The wire intermediate portion 53 is substantially the length of the grooves 32 which extend from the ledge 33 to the abutments 34.

When the combined contact terminal members 50 are assembled with the body 20, the contact portions 51 will be located between the side wall 30 of the groove 26 and extend a short distance beyond the cylindrical walls 24, but not far enough to extend into the grooves 25 so as to interfere with the movement of the lugs 42 extending into the groove 25.

Before the combined contact and terminal members are assembled in the recesses bared ends of cable 60 are soldered or otherwise secured to the terminal portions 52. A pair of the members 50 are supported on a closure 61 having suitable formed openings to receive terminal portions 52

and cables see Fig. 5. In this instance the openings are shown as having a rectangular portion 62 in cross section and is bounded by side walls 63 and 64 and end walls 65. The side wall 64 of the opening is interrupted by a generally circular cable receiving channel 66 communicating with the opening 62. When the pair of members 50 are assembled with the base the terminal portions 52 will extend into the opening with the shoulders 52a resting on the upper face thereof of the closure 61.

Before the assembly of terminal member 50 and closure 61 are secured to the body a movable contact or hollow ball contact 70 and a helical-coil spring 71 are assembled in tandem relation on the base 61. The coil spring has a loop 72 at one end in which the ball contact is adapted to seat. The lower end of springs rests on the inner face of the closure 61 and urges the ball 70 against the contact portions 51. The diameters of the ball 70 and the spring 71 are less than the cross dimension of the cylindrical walls of the recess but greater than the space between the extremities of the contact portions 51. By this arrangement the ball 70 and spring 71 can move laterally so to assure good contact engagement between the ball 71 and contact portions 51. When the base 61 is assembled with the body the space between the contact portions 51 is greater than the width of the grooves 25 so as to permit the lugs 42 of plunger to pass therebetween the contact portion 51 without any interference. It will also be noted, see Figs. 3 and 4 that the lugs do not touch the underside of the end wall 22. This is due to the face that the ball 70 makes contact with the contact portions 51 before the plunger is moved to its full outward position by the spring 71. It is pointed out that the arc of seat 43 is slightly greater than the ball 70. By this arrangement the ball can move relative to the seat in case the ball 70 engages one contact 51 before the other. Thus the ball can shift to one side until both contact portions 51 are engaged by the ball 70.

The closure 61 is secured in place in the enlarged portion of the recess by forcing same past the projections 38. The closure has a peripheral flange 75 which is complementary to the contour of the mouth of the recess formed by the thin walls 36 and 37. The thickness of the flange 75 is substantially the same as the space between the shoulder 39 and the ledge 33. When the closure is forced into position the flange 75 will first engage the tapered portions of the projections 38 causing all of the thin walls to flex sufficiently to allow the flange to snap in position between the ledge 33 and shoulders 39. When this happens the thin walls will tend to return to their normal state and cause the shoulders 39 to overlie the flange. Thus the closure is held firmly in place and against accidental displacement. Further the intermediate portions of the members 50 are firmly held between the upper face of closure 61 and the shoulders 32 of the body 20.

The body 20 can be suitably mounted to a support in any suitable manner. One way for mounting the body to a support, not shown, is by the use of a U-shaped clip member 80. This clip is first attached to the support. The clip comprises a yoke 81 having opening through which an eyelet, not shown, is inserted. This eyelet passes through an opening in the support and then spun over to hold firmly the clip in position on the support. Portions of the yoke 81



are struck inwardly along its side edges to provide resilient fingers 82. The arms 83 of the clip are cut out intermediate their sides to provide an opening 84 and a cross bar 85. The lower ends are angles outwardly to provide for easy assembly of the body within the clip.

When the body is inserted between the arms 83 they will spread apart. The openings 84 in the arms of sufficient width to straddle with a close fit straight sides of exterior lugs 86 formed integral with the body. As the switch assembly is pushed between the arms and toward the yoke the plunger 40 will pass through the eyelet which acts as a bearing sleeve for the plunger. When the switch assembly is pushed toward the yoke a certain distance the top or end wall 22 will engage and place the fingers 82 under tension. When the cross bars 85 are beyond the lugs 86 the arms tend to return to their normal state and position the cross bars under the lugs and the resilient fingers urge the switch assembly away from the yoke until the cross bars come in abutting relation with the lugs.

Among the advantages of the present construction of the body and other switch parts described are that the plunger 40, ball 71, and spring 72 are arranged in tandem relation, and the ball and contact cannot touch the intermediate portions of the member 50 and the ease and quickness with which the part can be assembled without the use of screws, bolts or the like. The closure can be also detached, as required, by simply flexing the walls.

It will be clear without detailed explanation that the spring 70 which has one end resting on the closure and having the other end which forms the seat for the ball or movable contact will exert a force on the ball so as to have good electrical contact with the contact portions 51, and also hold the plunger in its outward position as shown in Figs. 2 and 3. When the plunger 40 is depressed inwardly against the tension of spring, the bridging relation between the ball 70 and contact portions 51 will be interrupted.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. An electric switch comprising, a helical-coil spring, a movable contact, and a plunger in tandem relation, the movable contact being between the spring and the plunger; removable relative fixed contacts into engagement with which the movable contact is urged by the spring; and a housing comprising two members only, namely a body and a removable cover of molded plastic for closing the housing also for supporting the fixed contacts, said body being shaped to provide grooves for locating the fixed contacts for engagement by the movable contact when the closure is associated with the body, means for guiding the movable contact into engagement with the fixed contacts independently of the plunger and for retaining the spring in position to urge the movable contact into engagement with the fixed contacts, and means for guiding the plunger in straight line movement into engagement with the movable contact to separate it from the fixed contacts.

2. An electric switch comprising, a helical-coil spring, a movable ball contact, and a plunger in tandem relation the ball contact engaging the spring and the plunger; removable relatively

fixed contacts extending into the path of the ball contact into engagement with which the ball contact is urged by the spring; a housing comprising two members only, namely, a body and a detachable closure of molded plastic for closing the body and for supporting the fixed contacts, said body shaped for locating the fixed contacts for engagement by the ball contact, the means for guiding the ball contact into engagement with the fixed contacts independently of the plunger and for retaining the spring in position to urge the ball into engagement with the fixed contacts and to provide for lateral shifting of the ball and spring, and the means for guiding the plunger into engagement with the ball to separate it from the fixed contacts.

3. An electric switch comprising an operating member having side extensions, a body having a cross-shaped recess extending from one end thereof and terminating short of the other end to provide an end wall for the body, said end wall having a central hole which receives the member, said recess being symmetrical with respect to the axis of the central hole and being defined by cylindrical walls interrupted by two pairs of diametrically opposite grooves, one pair receiving side extensions of the member to guide the same, each groove of the other pair being defined by two spaced, parallel walls extending to a third wall, each of said side walls providing a third groove at the junction of said side wall with the third wall, each of said third grooves extending from the open end of the body and terminating short of the end wall of the body, terminals each having a wider part received in the third mentioned grooves and a narrower, fixed contact part received by a second mentioned groove and projecting toward the center of the body, a movable contact guided by the cylindrical surface of the recess for engagement with the fixed contact parts, a spring for urging the movable contact toward the fixed contact parts, and a closure secured to the open end of the body for retaining the springs and the terminals,

4. An electric switch comprising an operating member having lateral extensions, a one-piece molded insulating body having a cross-shaped recess therein and opening to one end thereof and terminating short of the other end to provide an end wall for the body, said end wall having a central hole which receives the operating member, said recess being symmetrical with respect to the axis of the central hole and being defined by cylindrical walls interrupted by two pairs of diametrical grooves, one pair of grooves receiving the lateral extensions of the operating member to guide the same, each groove of the other pair being defined by two spaced, parallel walls extending to a third wall, each of said walls providing a third groove at the juncture of said side walls with the third wall, each of said third grooves extending from the open end of the body and terminating short of the end wall of the body; a pair of terminal members, each having a wider portion freely insertable into the third mentioned grooves, said conducting member having a narrower fixed contact portion at one end received by a second mentioned groove and projecting toward the center of the body and, having a narrower fixed terminal portion at the other end; a movable contact guided by the cylindrical surfaces of the recess for engagement with the contact portions; a spring for urging the movable contact toward the contact portions; and a closure secured to the open end of the body for retaining the spring and terminal in position, said closure having openings formed therein to provide clearance for said narrow terminal portions.



5. In a switch the combination with a body of insulating material having a recess extending from one end and terminating short of the other end to provide an end wall provided with an opening, said recess being enlarged at its open end to provide a shoulder and resilient thin walls surrounding the shoulder, said thin walls having spaced inwardly extending projections spaced from the shoulder, said recess being interrupted by two pairs of oppositely disposed grooves extending from the shoulder and terminating short of the end wall, of a plunger having a shank extending through the opening of the end wall and having side extensions adjacent its lower end projecting into one pair of grooves to be guided thereby; a pair of elongated terminals received by the other pair of grooves, each having a contact element extending into the recess; a movable bridging member; a coiled spring for urging the bridging member against the contact elements; and a removable closure for closing the recess, said closure being snapped into position between the projections and shoulder to compress the spring and for retaining the plunger, spring, and terminals in assembled positions within the housing, said plunger being operated to move the bridging member from the contact elements against the urging force of the spring.

6. In a switch the combination with a one-piece body of insulating material having a recess extending from one end and terminating short of the other end to provide an end wall provided with an opening, said recess being enlarged at its open end to provide a shoulder surrounded by resilient walls, said walls being provided with inwardly extending projections spaced from the shoulder, said walls of the recess being interrupted by a pair of diametrically opposite grooves extending from the shoulder and terminating short of the end wall to provide abutments; a removable terminal located in each of said grooves, each terminal having a contact element extending toward the center of the recess; a removable non-conducting actuator slidably supported in the opening; a bridging member of sufficient size for engaging the contact elements; a spring for urging the bridging member into contact engagement with said elements; and a removable closure of insulating material adapted to be forced past the lugs and into engagement with the shoulder, said closure compressing the spring and holding the terminals against respective abutment and thereby retain the plunger, the spring, and the terminals in assembled positions with the body, said plunger engaging the bridging member and being operated to move the bridging member from the contact elements.

ROBERT C. WOOFTER.


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