June 5, 1962 J. LONG ETAL 3,038,053

SWITCH

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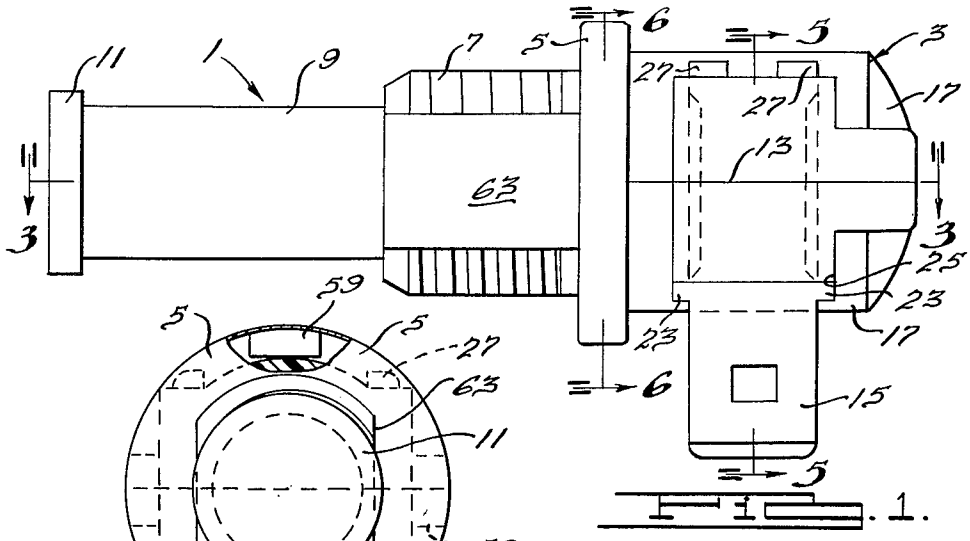


Fig. 1.

Fig. 2.

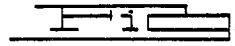


Fig. 3.

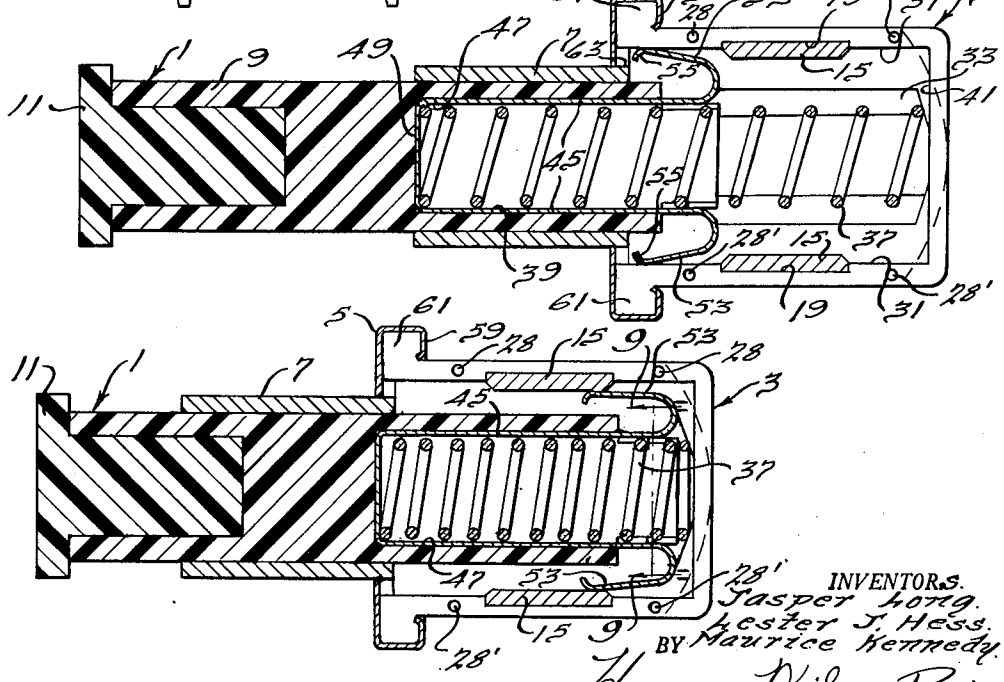


Fig. 4.

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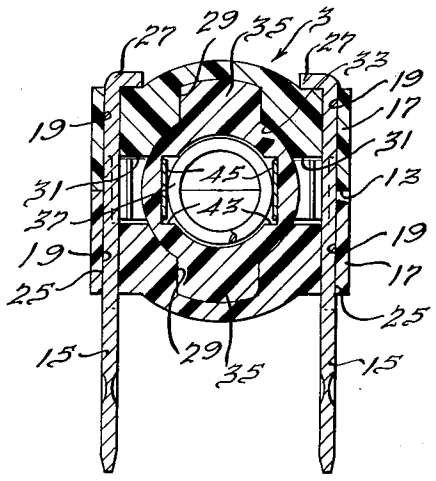


Fig. 5.

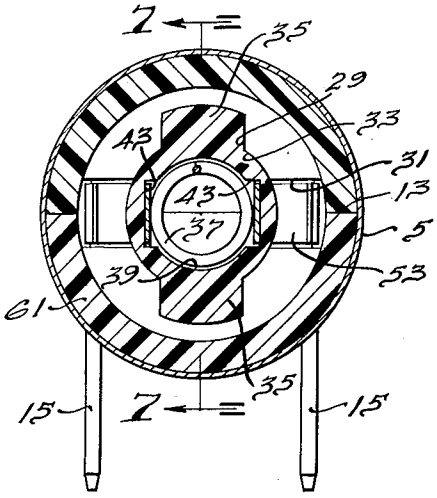
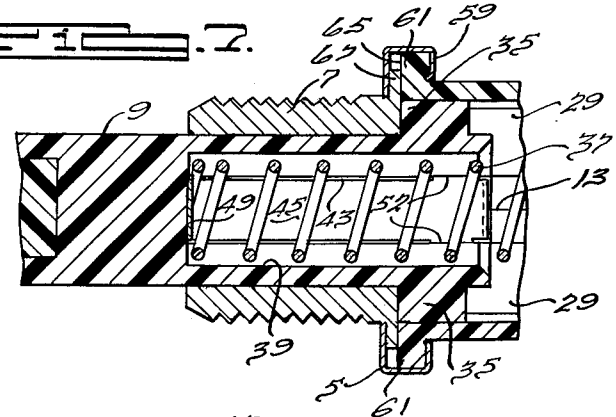


Fig. 6.

Fig. 7.



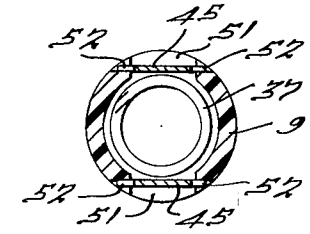


Fig. 9.

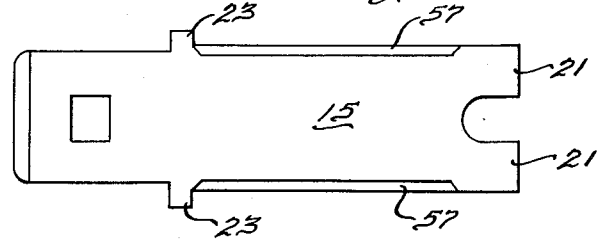


Fig. 8.

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SWITCH

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This invention relates to switches and, in particular, to a plunger-type switch wherein depressions of the plunger will interconnect terminals to make a circuit.

It is the object of this invention to provide a plunger-type switch that is well adapted for automotive use. This means that it must be relatively inexpensive to manufacture but it must perform well and have a long operating life.

The invention accomplishes this and other objects by means of a construction in which non-conductive parts are of a simple, readily manufactured design, such as plastic parts that may be made in simple molds with axially extending core pins. The conductive parts are likewise made of a simple construction and, preferably, the terminal elements are used in such a way as to hold various non-conducting parts together. In addition, the various parts are arranged so that they may be easily assembled together in their proper relative positions.

The invention is illustrated in the accompanying drawings in which:

FIGURE 1 is a side elevation of an improved switch embodying the invention, the particular switch that is illustrated being adapted for use as a back-up switch in an automobile.

FIG. 2 is an end view taken from the left of FIG. 1.

FIG. 3 is a longitudinal section along the lines 3—3 of FIG. 1 showing the switch in the open position.

FIG. 4 is a view similar to FIG. 3 but shows the switch in a closed position.

FIG. 5 is a section taken along the line 5—5 of FIG. 1.

FIG. 6 is a section taken along the line 6—6 of FIG. 1.

FIG. 7 is a section partly broken away, taken along the line 7—7 of FIG. 6.

FIG. 8 is a plan view in detail of the terminal.

FIG. 9 is a section along the line 9—9 of FIG. 4.

Looking generally at the construction of the back-up switch 1 as shown in FIG. 1, it comprises a housing 3 of nylon or other suitable non-conducting moldabe material which is held by a sheet metal bezel 5 to a threaded mounting bushing 7 which will thread into a suitable mounting aperture to support the switch 1 in position. Slidably supported inside of the bushing 7 is a plunger 9, the outer end of which may be reinforced by an insert 11. When the plunger is in the extended position of FIG. 1, the switch is open and when the plunger is pushed to the right toward the side of the mounting bushing 7 the switch will be closed.

As best seen in FIG. 5, the housing 3 consists of two half sections 17 which are symmetrical about, and held together in, the midplane 13 by means of the two blade terminals 15. Each half 17 of the housing 3 has a pair of slots 19 formed in it during the molding operation. The flat blade terminals 15, shown in detail in FIG. 8, are projected through the aligned slots 19 on the two housing halves 17 so that the tabs 21 on the terminal 15 form a leading end. The terminals 15 are inserted in one half 17 of the housing 3 until the transverse shoulders 23 engage the surface 25 on one of the housings, as can be seen in FIGS. 1 and 5. In this position, the tabs 21 will project out of the other housing 17 and can be bent at right angles as shown at 27 to act along with the shoulders 23 to firmly hold the two housing halves 17 together along the plane 13. If desired, spherical detents 28 and

mating depressions 28' may be formed on opposite sides of each of the halves to fit together on opposite halves and hold them against shifting prior to staking of the terminals.

When the two housings 17 are together, they form a more or less cross-shaped axially extending internal cavity or aperture. This aperture has opposite axial portions 29 and opposite axial portions 31. A portion 29 and a portion 31 are spaced 90° from each other and as best seen in FIGS. 5 and 6 the aperture formed in the housing 3 has four circular portions 33 interconnecting the portions 29 and 31.

The plunger 9 is formed with radial shoulders or flanges 35 that fit in and slide in the aperture portions 29 and prevent angular movement of the plunger 9. The flanges 35 also act to limit the outward movement of the plunger as can be seen in FIG. 7. They engage the inner end of the threaded bushing 7 and thus define the ultimate released position that the switch can assume when the plunger 9 is pressed outwardly by the coil spring 37, the latter fitting inside of an aperture or cavity 39 in the plunger 9 and bearing at the other end against the bottom wall 41 of the housing 3.

The cavity 39 inside of the plunger 9 includes opposite groove portions 43 which receive and locate the relatively long legs 45 of the bridge contact member 47. This member is made from an originally flat rectangular strip of electrical conducting material which is bent into a more or less U or hat shape. The central portion joining the two legs 45 fits against the bottom of the recess 39 and is held there by the coil spring 37. The free ends of the bridge contact 47 extend outwardly through notches 51 that are formed in the ends of the plunger 9 and then are reversely bent backwards into contact forming sections 53. The extreme ends of the sections 53 are turned inwardly as seen at 55. Wings 52 on the legs 45 engage the four outside faces of the notches as seen in FIG. 9 and confine the flexing of the member 47 to the rebent ends 53.

The contact ends 53 ride in the aperture portions 31 and it will be noted that the terminal grooves 19 in the housing sections 17 are located so that the terminals project into the aperture sections 31 in the path of movement of the resilient contact sections 53. (See FIGS. 3 and 4). The sides of the terminals 15 within the aperture portions 31 are beveled as seen at 57 to enable the spring sections 53 to more readily ride up over them when the plunger is depressed to put the switch in the closed position of FIG. 4. It will be seen from FIG. 4 that in the depressed position, the two terminals 15 are interconnected through the contact bridge member 47.

In assembling the various parts into the switch 1, the two housing valves 17 are placed together along the plane 13 and the terminals 15 are inserted into the grooves 19 until it is possible to bend the tabs 21 over into flanges 27 to hold the housing sections together. The bushing 7 and bezel 5 are placed over plunger 9. The insert 11 is placed in the end of plunger 9 and the bridge contact 47 is placed within its cavity 39. The coil spring is inserted into the cavity 39 so as to press the bottom 49 of the contact against the bottom of the cavity. The plunger with assembled parts is then inserted in the housing 3 and four tabs 59 on the bezel 5 are bent around and over the radial flange 61 formed on each of the housing sections 17. The bezel will therefore hold the bushing 7 in position, and, as seen in FIG. 7, will act with it to limit the outward movement of the plunger 9. The bezel 5 has a non-circular opening (FIG. 2) to fit the flat sides 63 of the member 7 and, since the ends of the tabs 59 are embedded in the housing 3, will act to prevent rotation of the bushing 7 relative to the parts and facilitate its threading into an aperture in which the switch 1 is to be mounted. Rotation is also prevented by means of flat sided slots 65 in the

ends of the housing halves which receive the flanged head 67 of the bushing 7.

The invention may be embodied in other structures than the one set forth herein.

We claim:

1. In a switch, a housing comprising a pair of housing sections fitting together along a plane to form a cavity, a pair of terminal elements for the switch and supported by the housing and extending at substantially right angles to said plane and forming means for holding the housing sections together, each of said terminals extending through opposite sides of the housing and having shoulders engaging the outer surface of said housing on opposite sides of said plane to hold the sections together along the plane, said terminals being exposed in said cavity but separated from each other, and movable means located in said cavity for selectively interconnecting the terminals.

2. In a switch, a housing comprising a pair of molded plastic parts, said parts being formed each as a half shell adapted to engage the other along a plane of intersection, said parts having apertures therein so that the cavities and all sections thereof are parallel to each other and perpendicular to the half shell diameter, certain of said cavities being aligned when said parts are engaged together, and terminals extending at substantially right angles to said plane and through said last mentioned aligned cavities and having shoulders bearing against both said parts and acting to hold them together.

3. In an electrical switch, a two piece housing having a cavity opening out of one end and closed at the other end, a plunger having a cavity opening out of one end, facing the closed end of the housing cavity, said plunger being arranged to telescope within the housing cavity with the plunger cavity opening into the housing cavity, a U-shaped contact in said plunger cavity having outwardly flared ends projecting transversely out of the end of the plunger, shoulder means formed on said plunger holding said contact in said plunger cavity against angular motion, means slidably supporting said plunger in said housing against angular movement and terminals mounted in said housing and arranged to be contacted by the plunger mounted contact in certain positions of the plunger and housing.

4. The invention set forth in claim 3 including a mounting member for the switch disposed in alignment with the housing cavity, said plunger slidably extending through said mounting member, means fixedly connecting said mounting member to said housing, a spring in said cavities and acting to urge the plunger out of the housing cavity, and means on said plunger for engagement with the mounting member to limit movement of the plunger out of the housing cavity.

5. The invention set forth in claim 4 wherein said terminals extend through opposite sides of the housing at right angles to the direction of plunger movement and hold the two pieces of the housing together.

6. The invention set forth in claim 5 wherein said terminals comprise flat metal members having a portion of their thickness projecting into the housing cavity.

7. In a switch, a housing having terminals, a plunger slidable in the housing, said plunger having an aperture therein opening out of one end, notches formed on opposite sides of said plunger at the opening end of said aperture, a U-shaped contact member in said aperture having legs extending out of said opening, the ends of said legs being rebent and flexible and arranged to interconnect said terminals in a predetermined position of said plunger, and wings on said contact legs adjacent to and inwardly of said rebent ends and engaging the outer edges of said notches on said plunger to confine flexing of said contact to said flexible ends.

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