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PLUNGER TYPE SWITCH

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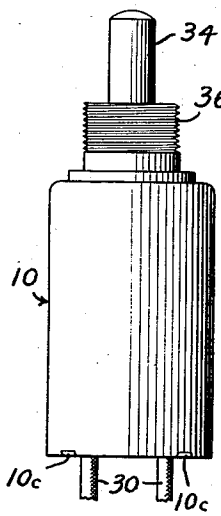


Fig. 1.

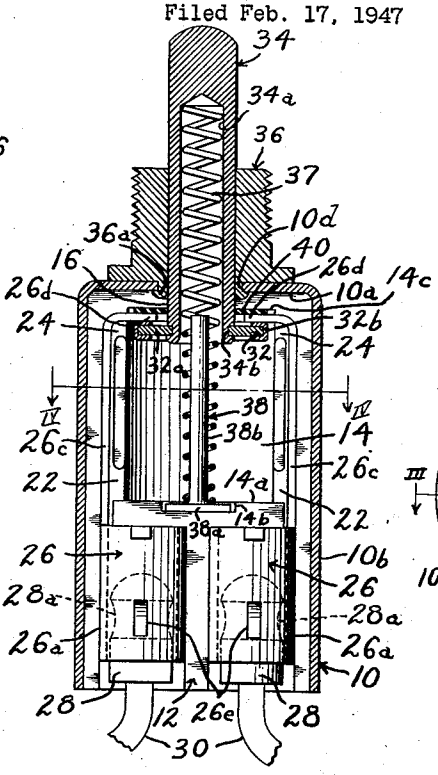


Fig. 3.

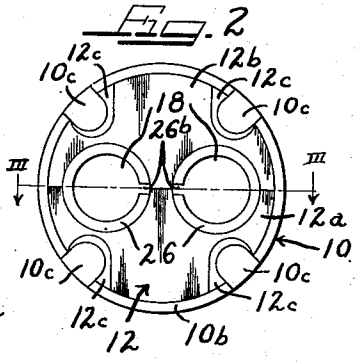


Fig. 2.

Fig. 5.

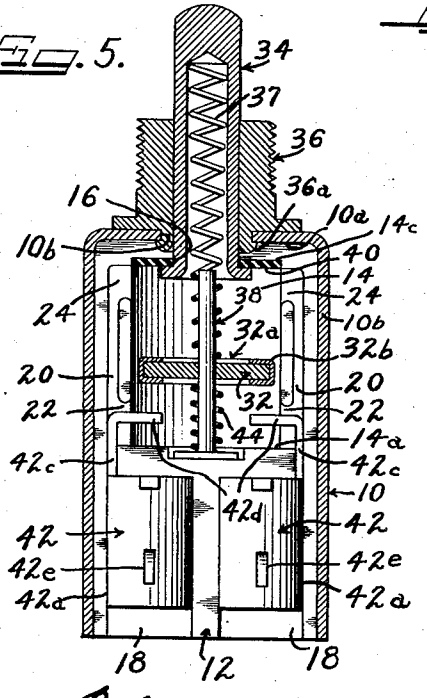
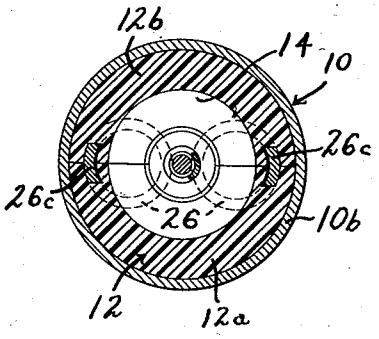


Fig. 4.



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PLUNGER TYPE SWITCH

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3 Claims. (Cl. 200—159)

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This invention relates to an electric switch and particularly to a plunger type switch characterized by the sturdiness of its construction, reliability of operation and outstanding ease of manufacture and assembly of its components.

A large number of switch constructions have heretofore been proposed wherein the movement of a plunger member effects the opening or closing of an electric circuit through the contact elements of the switch. Such plunger type switches may be either of the normally open construction, wherein the circuit through the switch is normally open but closed by manipulation of the plunger, or of the normally closed construction wherein manipulation of the plunger effects the opening of the switch contacts.

A feature of this invention is the provision of an extremely simple and readily manufacturable plunger type switch construction which may be conveniently assembled as either a normally open or a normally closed switch and which utilizes substantially identical components for either type of switch.

A further feature of this invention is the provision of a plunger type switch construction wherein the switch terminals include hollow members specially constructed to receive and releasably retain wire end terminal members inserted therein in good conducting relation. By this construction, the problem of securing proper electrical connection of the switch in a particular wiring system is completely eliminated, particularly in the utilization of the switch in automotive wiring systems. Furthermore, in the switch construction embodying this invention, the wire end terminal members are completely enclosed within the insulating body of the switch and hence there is no possibility of such terminal members being inadvertently shorted by accidental contact of the switch with an adjacent conducting member.

Accordingly, it is an object of this invention to provide an improved electric switch of the plunger operated type.

Another object of this invention is to provide an improved plunger type electric switch characterized by outstanding ease of manufacture and assembly of its components.

A further object of this invention is to provide an improved plunger switch construction wherein substantially identical components may be utilized to effect an assembly of the switch as either a normally open construction or a normally closed construction.

A particular object of this invention is to provide an improved plunger switch construction

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particularly adaptable for use in wiring systems employing terminal members on the wire ends to effect electrical connection of the switch unit in the system. A switch constructed in accordance with this invention will releasably retain such wire end terminal members in good electrical connection with the contact elements of the switch and furthermore, will eliminate the possibility of accidental shorting connections occurring across the terminal members.

The specific nature of this invention as well as other objects and advantages thereof will become apparent to those skilled in the art from the following detailed description of the annexed sheet of drawings which, by way of preferred example only, illustrate two specific embodiments of the invention.

On the drawings:

Figure 1 is a side elevational view of a switch unit embodying this invention;

Figure 2 is an end elevational view of the switch in Figure 1;

Figure 3 is a longitudinal sectional view taken along the plane III—III of Figure 2, and illustrating the interior switch construction for a normally closed type of plunger switch;

Figure 4 is a transverse sectional view taken on the plane IV—IV of Figure 3;

Figure 5 is a view similar to Figure 3, but showing the interior switch construction for a normally open type of plunger switch.

As shown on the drawings:

Referring to Figures 1 through 4, a switch element embodying this invention is shown assembled within a cup-shaped casing 10 which may be metallic or plastic as desired, and which has a centrally apertured bottom portion 10*a* and cylindrical wall portions 10*b*. Within casing 10, an insulating block unit 12 is snugly mounted. Block unit 12 has a generally cylindrical exterior suitably dimensioned to permit such unit to be snugly inserted in the casing 10 through the large open end thereof. Block unit 12 is preferably molded from any one of several well known electrical insulating materials and is most conveniently formed as assembly of two identical half portions 12*a* and 12*b*, respectively, which are joinable along a diametral plane as best shown in Fig. 2.

The insulating block unit 12 may be conveniently retained within casing 10 by the provision of a plurality of integral tabs 10*c* on the open end of the casing 10 which are bent inwardly after the insertion of insulating block 12. Suitable recesses 12*c* are provided in the adjacent end face of insulating block 12 to receive the in-

wardly projecting portions of the tabs 10c, and hence maintain the end face of the switch unit of substantially flush construction.

The half portions 12a and 12b of the insulating block 12, when assembled, define a large cylindrical cavity 14 which is substantially coaxial with the axis of the block unit 12 and which has a reduced diameter opening 16 communicating with the inserted end face of the block unit 12. Opening 16 thus communicates with the central aperture 10b provided in the base portion 10a of the casing 10.

In the other axial end of the block unit 12 there are defined a plurality of recesses 18 which open in the adjacent end face of the insulating block 12. In the illustrated construction, two such recesses 18 are provided and such recesses may conveniently be of cylindrical construction. The recesses 18 are respectively in communication with the cavity 14 by the provision of passages 20 extending longitudinally from the end of each of the recesses 18 generally parallel to the axis of the insulating block unit and communicating with cavity 14 through two axially spaced, generally radial passages 22 and 24 respectively.

A metallic terminal member 26 is mounted in each of the recesses 18. Such terminal members comprise generally cylindrical body portions 26a which are longitudinally split as indicated at 26b (Figure 2) and are preferably normally expanded to a slightly greater diameter than that of the recesses 26 so that a slight resilient compression of such split body portion is required to effect the assembly thereof in recesses 26. This arrangement insures that the terminal members 26 will be snugly retained within the recesses 18.

Each of the terminal members 26 is provided with an integral axially extending arm 26c which, when the terminal member is assembled into block unit 12, lies snugly in the respective longitudinally extending passage 20. The end of such arm portion 26c is bent generally radially inwardly as indicated at 26d, and projects through the radial passage 24 into the interior of cavity 14. Since each of the terminal members 26 is identical, the end portions 26d are thus arranged within cavity 14 in spaced opposed relationship.

The recess defined by the hollow portion 26a of the terminal members 26 is suitably dimensioned so as to permit the snug insertion therein of a conventional terminal member 28 which is secured in customary manner to the bare ends of an insulated wire 30. To resiliently retain the terminal members 28 in an inserted position, the walls of hollow portion 26a are deformed inwardly at one or more points to provide an inwardly projecting spring tongue 26e. Tongues 26e therefore snap into engagement with an annular groove 28a which is conventionally provided on the wire end of the terminal members 28. It will be noted that in their inserted position, the metallic portions of the wire end terminals 28 are completely enclosed within the insulating body 12. Hence, all possibility of such end terminal members being accidentally shorted by a conducting member adjacent to the switch is substantially eliminated.

To effect a selective electrical connection of the end portions 26d of the terminal members 26, a disk-like conducting member 32 is provided which is movable within the cavity 14 by an operating plunger 34. Operating plunger 34 may be conveniently journaled for sliding movement by the provision of an annular mounting bushing 36 on casing 10, which has an axially projecting flange portion 36a extending through the aperture 10d in the base of casing 10, and then deformed outwardly to effect a rigid securement of the bushing 36 to the casing 10.

Plunger 34 is a rod-like member slidably journaled in the bore of mounting bushing 36 and extending into cavity 14 through the small opening 16 in the insulating block 12. Operating rod 34 is preferably provided with an axial recess 34a which opens in the inserted end face of the rod.

The conducting ring 32 which effects the switching action comprises a disk-like annular piece 32a of suitable electrically insulated material which is secured in an annular groove 34b provided on the inserted end of operating rod 34 by the simple expedient of peening over such end. Around the periphery of disk base 32a an annular conducting rim 32b is mounted. Rim 32b is preferably substantially U-shape in cross section and is permanently assembled on disk base 32a by a bending operation. The end face of conducting rim 32b will, therefore, effect an electrical connection between end portions 26d of the terminal members 26 when the operating rod 34 is moved outwardly to its extreme position with respect to the cavity 14.

A spring 37 is provided which is insertable in the recess 34a of operating rod 34 and operates between operating rod 34 and end wall 14a of the cavity 14. Preferably, a spring guide member 38 is provided having an enlarged head portion 38a seated in a suitable recess 14b in wall 14a of the cavity 14, and a stem portion 38b insertable within the spring 37 and hence, also, within the recess 34a of operating rod 34. Therefore, when operating rod 34 is pushed inwardly against the bias of spring 37, the spring guide 38 cooperates with rod 34 in telescopic relation.

From the foregoing description it is believed that the operation of the plunger type switch disclosed in Figures 1 through 4 is completely obvious. Such switch normally effects electrical connection between terminal members 26 by virtue of the conducting ring element 32 being held tightly in engagement with the terminal end portions 26d, under the outward bias exerted by the spring 37. When the operating rod or plunger 34 is moved inwardly with respect to the cavity 14, the electrical connection between the terminal members 26 is broken.

To prevent the possibility of the spring induced outward movement of plunger 34 exerting a battering action upon the end wall 14c of cavity 14, a resilient washer 40 is mounted adjacent wall 14c and effectively absorbs the impact shocks produced by outward movement of the plunger 34.

Referring now to Figure 5, there is shown a plunger type switch of a normally open construction in which substantially identical elements are employed as in the normally closed modifications of Figures 1 through 4. A casing 10, insulating block unit 12, mounting bushing 36, operating plunger 34, conducting ring 32, and spring guide 38 are identical to similarly identified elements of the modification of Figures 1 to 4. The terminal elements 42 which are employed in the modification of Figure 5 have identically shaped hollow cylindrical body portions 42a. The arm portions 42c, however, are of shorter length than the arm portions 26c of the terminals 26 and the inturned ends 42d of such arms 42c project into the interior of cavity 14 through radial passages 22. The conducting ring unit 32 is not

rigidly secured to operating plunger 34 but is operatively connected to the plunger 34 by virtue of being positioned on spring guide 38 between main spring 37 and an auxiliary spring 44. Main spring 37 is somewhat heavier than auxiliary spring 44, and the characteristics of such springs are selected so that, in normal position, the conducting ring 32 is floatingly positioned in the cavity 14 in a position outwardly from, and out of contact with, the end portions 42*d* of the terminals 42. Inward movements of operating plunger 34, however, will effect an inward movement of conducting ring 32 to engage the metallic rim portion 32*b* with the contact ends 42*d* of the terminal members 42. It is therefore apparent that the switch unit shown in Figure 5 will operate as a normally open type plunger switch.

Both types of switch units herein described are of identical exterior configuration, and hence may be readily substituted in any particular electrical circuit where space requirements are limited. Furthermore, the provision of threads on the exterior of the mounting bushing 36 permits the switch unit to be conveniently mounted on a panel, wall or similar surface.

It is also apparent that all of the major components of a switch construction embodying this invention may be economically manufactured by high production, low cost operations, such as molding and stamping, and a minimum of machining is required. Furthermore, the fact that substantially identical components are employed to assemble two distinct types of switches obviously effects an additional substantial saving in manufacturing costs.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

We claim as our invention:

1. A plunger type switch comprising a generally cylindrical insulating body having an interior cavity formed therein and extending therealong for a portion of the length thereof and opening to one face of said body, and a plurality of parallel axially extending recesses opening to the opposite face of said body and communicating with said cavity through an interior wall of said body, a metallic terminal member having a hollow cylindrical body portion disposed in each of said recesses, said terminal members each having an axially extending arm portion extending through said interior wall of said body into said cavity, the intermediate portions of said arm portions being entirely encased by said insulating body and extending along said body inwardly of the wall of said cavity and having inwardly extending terminal end portions extending within said cavity and forming contacts for the switch, a plunger axially reciprocable in said cavity, a conducting disk disposed in said cavity operably connected with said plunger and movable to and from engaging connection with said terminal end portions of said axially extending arm portions, and resilient means urging said plunger to outward position with respect to said cavity.

2. A plunger type switch comprising an insulating body having an interior cavity having an inner end wall and extending along said body from said end wall and opening to one end face of said body, a plurality of recesses in said body on the opposite side of said inner end wall from said cavity and opening to the opposite end face of said body from said cavity, metallic terminal members having body portions disposed in said recesses, and integral contact arms extending from said recesses through said inner end wall of said insulating body into and along said cavity and having terminal end portions extending radially within said cavity, said wall completely encasing the intermediate portions of said arm portions, an operating rod axially reciprocable in said cavity and having an end portion projecting out through said opening of said cavity, a rod-like guide member disposed in said cavity in coaxial alignment with said operating rod, a contact disk on said guide member having a conducting rim portion engageable with said terminal end portions of said arms to complete a circuit thereacross, a plunger carried by said operating rod for reciprocating said contact disk on said guide member, and resilient means urging said plunger away from said disk.

3. A plunger type switch comprising a generally cylindrical insulating body formed of two identical half portions joinable on a diametral plane, a casing surrounding said body and securing said half portions in assembled relation with respect to each other, said insulating body having an inner wall defining an interior cavity opening in one face of the body and terminating in an end wall interiorly of the body, and a plurality of parallel spaced axially extending recesses separated from said cavity by said end wall and opening to the opposite end face of said body, registering axially extending slots formed in the abutting faces of said half portions and forming passageways from said recesses to said cavity, metallic terminal members having hollow cylindrical body portions disposed in said recesses and having integral axially extending arm portions extending through said passageways formed by said registering slots and along said cavity, said hollow body portions detachably receiving wire end terminals inserted therein, said arm portions each having radially inwardly extending end contact portions disposed in said cavity in spaced opposed relationship, a plunger axially reciprocable in said cavity, a conducting disk disposed in said cavity and operably connected to said plunger and movable thereby into bridging relation across said end portions, and resilient means urging said plunger outwardly with respect to said cavity.

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