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PLUNGER OPERATED ELECTRICAL SWITCHES

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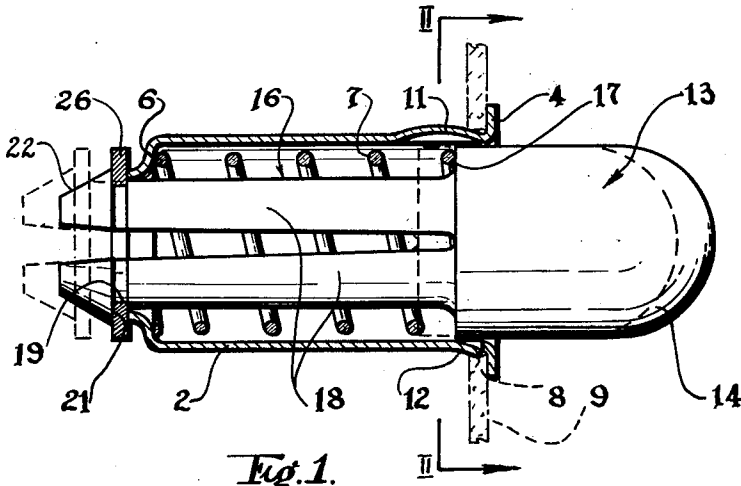


Fig. 1.

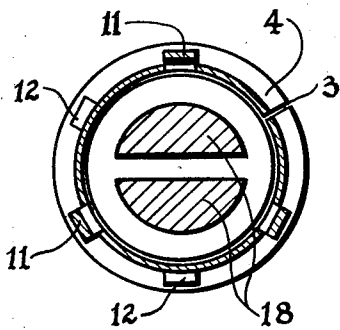


Fig. 2.

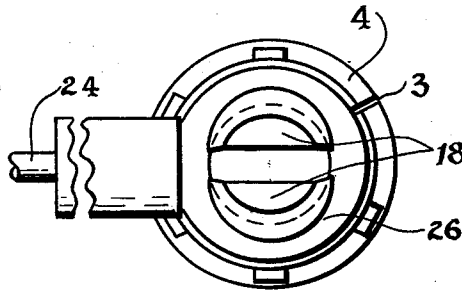


Fig. 3.

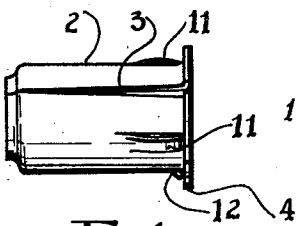


Fig. 4.

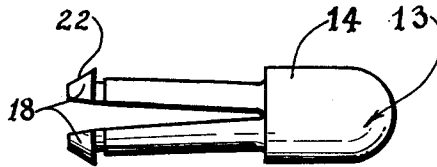


Fig. 5.

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**PLUNGER OPERATED ELECTRICAL SWITCHES**  
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This invention relates to plunger operated electrical switches for use on motor vehicles and for other purposes and which are adapted to be actuated by the door of the vehicle, for example, in such a manner that a low voltage electric lamp included in the switch circuit is automatically switched on when the door is opened.

Switches of the type mentioned are, of course, well known but hitherto they have been constructed of a number of separate parts adapted for closing and opening the electrical circuit and also for the attachment of the associated electrical conductor and the mounting of the switch on the vehicle body or other support.

The primary object of the present invention is to provide an improved plunger operated electrical switch of the kind indicated which is of particularly simple design and construction in that the number of parts employed are reduced to a minimum and their construction is such that they may be quickly and easily assembled by unskilled labour.

Furthermore, the improved switch may be easily fitted into a single mounting hole of a door pillar for example, without the use of special tools, connecting screws, rivets or the like whilst the electrical lead may also be connected to the switch in a most simple manner without the use of screws, nuts or other anchoring means.

According to the present invention, the improved switch includes a tubular body member composed of metal and having means for retaining it in an apertured metal support, a plunger composed of electrically non-conductive material and adapted to form a free sliding fit within said body member, a helical spring located within said body member between opposed shoulders on said body member and the plunger respectively, the inner end portion of said plunger being compressible so as to pass through said body member and spring when the inner end portion of said plunger is compressed and a detachable electrical contact carried by the inner end portion of said plunger and which is adapted to normally engage the inner end portion of said body member under the influence of said spring.

Other advantages and various novel constructional features will be more readily apparent from the following detailed description.

Referring to the drawings which form part of this specification—

FIGURE 1 is a longitudinal section of an improved switch assembly in accordance with the present invention.

FIGURE 2 is a cross section taken on the line II—II and showing a split body member released from its support.

FIGURE 3 is an end view looking at the left hand end of FIGURE 1.

FIGURE 4 is a side elevation of the body member seen in FIGURE 1.

FIGURE 5 is a side elevation of the associated plunger.

In accordance with the present invention the improved switch includes a body member 2 which is made of metal or other electrically conductive material and is of hollow tubular formation. The wall of the body member may be split lengthwise as at 3 so that it may be compressed and subsequently spring back into place when it is fitted in the desired operative position.

The body member is provided at its outer end with a laterally projecting locating flange 4 whilst its opposite

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or inner end is preferably of reduced diameter so as to form a seat 6 for an associated spring 7 hereinafter described.

Retaining means are provided for detachably connecting the body member for example, to the door pillar of a motor vehicle simply by drilling or punching a suitably sized hole 8 in a wall 9 of the pillar and pushing the body member therethrough until the locating flange engages the face of the pillar wall. Such retaining means may consist of a series of circumferentially spaced lobes 11 formed in the wall of the body member for example, by forming spaced cuts therethrough and expressing the metal between such cuts outwardly adjacent to the locating flange.

In addition, one or more earthing tabs 12 may also be cut and expressed outwardly from the wall of the body member in such a manner that the free ends of the tabs are located in closely spaced relationship with the locating flange so as not to pass through the hole in the wall of the door pillar or other mounting member but to form a firm contact with the metal defining the hole after the body member of the switch has been pushed therethrough, as seen more clearly in FIGURE 1 thereby ensuring a satisfactory electrical contact with the motor vehicle body.

Associated with the foregoing is a plunger 13 which is adapted to form a free sliding fit within the body member and is composed of plastic or other electrically non-conductive material. Nylon is particularly suitable for such a plunger as it possesses a desirable resilient property and, in addition, is substantially noiseless in operation.

The plunger has a head portion 14 which is of substantially cylindrical formation and the outer end thereof is preferably of hemi-spherical formation. The plunger also has a tail portion 16 which is of relatively smaller diameter than the head portion so as to form a shoulder 17 which serves as a seat for the adjacent end of the aforesaid spring 7. In addition, the tail portion of the plunger is bifurcated lengthwise so as to form opposed resilient sections 18, the outer ends of which may be yieldingly pressed towards each other to reduce the effective diameter of the tail portion as hereinafter described.

A substantially circumferential groove 19 is formed in the tail portion and spaced inwardly from the free end thereof, the groove being bounded by inner and outer shoulders on the opposed sections of the tail portion. The outer shoulder 21 is of larger diameter than the inner shoulder so as to overhang the adjacent inner end of the tail portion when the tail sections are uncompressed, thereby normally preventing the plunger from being withdrawn from the body member.

In order to facilitate the assembly of the plunger in the body member, the free end of the tail portion is preferably tapered as at 22 lengthwise and inwardly from the outer shoulder to the end of the tail.

The aforesaid spring 7 is preferably of the helical type and of such a length that when it is assembled between the opposed spring seats on the body member and the plunger and the latter is secured in position in the body member, the spring is under compression and is adapted to yieldingly oppose inward movement of the plunger within the body member.

The tail portion 16 is adapted to be detachably connected to an earth return lead of the associated electric lamp circuit and for this purpose a flexible lead 24 is provided with a suitable metal terminal 26. The latter is preferably of annular formation and of such predetermined internal diameter as to form a snug fit within the aforesaid circumferential groove 19 in the plunger tail so that when carried by the plunger it will overhang and engage the inner end of the body portion 2 under the influence of the spring.

It will be appreciated from the foregoing that the im-

proved switch consists of three main parts only namely, the body member 2, the plunger 13 and the associated spring 7. These parts may be quickly and easily assembled simply by inserting the spring in the body portion and pushing the tail of the plunger through the spring until its tapered free end is compressed as it passes through the reduced inner end of the body portion and is freed to spring back to its original diameter. In addition the aforesaid terminal 26 may be easily fitted to the tail portion of the plunger simply by pushing the tapered end of the tail through the hole in the terminal until the latter is accommodated within the circumferential groove 19 in the tail portion.

With the assembled switch installed as aforesaid in a door pillar the plunger 13 is moved against the spring compression by the frame of the associated hinged door when in the closed position thus interrupting the electrical circuit. The lamp in the electrical circuit is therefore switched on only when the door is in the open or partly opened position.

Although the foregoing description refers by way of example to the application of the improved switch to the door of a motor vehicle, it will be appreciated that its use is not limited thereto but that it may be readily employed for a variety of other purposes including, for instance, its use with the door of a refrigerator or with the brake pedal of a motor vehicle.

Various minor alterations, modifications and/or additions may be introduced into the foregoing construction and arrangement of parts without departing from the ambit of the invention as defined by the appended claims.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An improved electrical switch of the kind indicated comprising a tubular body member composed of metal and having means for retaining it in an apertured metal support, a plunger composed of nylon or other electrically non-conductive material axially movable within said body member, a helical spring located within said body member between opposed shoulders on said body member and the plunger respectively, the inner end portion of said plunger being compressible and provided with one or more lateral projections adapted to permit the inner end portion of the plunger to pass through said body member and spring when the inner end portion of said plunger is compressed but to overhang the adjacent inner end portion of said body member when the plunger, spring and body member are assembled, the inner end portion of said plunger being bifurcated lengthwise so as to form opposed resilient sections forming a tail portion which is of relatively smaller diameter than the remaining or head portion of said plunger so as to form one of said shoulders, a substantially circumferential groove being formed in the opposed sections of said tail portion and spaced inwardly from the free end thereof so as to form inner and outer shoulders, the outer shoulder being of larger diameter than the inner shoulder so as to normally overhang the adjacent inner end of said body member, the free end of said tail portion being tapered lengthwise and inwardly from said outer shoulder so as to be capable of passing through an apertured detachable electrical contact carried by the inner end portion of said plunger and which normally engages the inner end portion of said body member under the influence of said spring, said retaining means including a series of circumferentially spaced lobes formed in the wall of said body member which is slit lengthwise and provided at its outer end with a laterally projecting locating flange and one or more earthing tabs expressed outwardly from the wall of said body member in such a manner that the free end of each tab is located in closely spaced relationship with said locating flange.

2. An electrical switch of the kind indicated comprising, a tubular body member formed of metal material and having integral means for retaining it in an apertured

metal support, a plunger formed of electrically non-conductive material axially movable within said body member, a helical spring located within said body member between opposed shoulders on said body member and the plunger respectively, the inner end portion of said plunger having a plurality of lateral projections to permit the inner end portion of the plunger to pass through the body member and spring when the inner end portion of said plunger is compressed but to overhang the adjacent inner end portion of said body member when the plunger, spring and body member are assembled, and a detachable electrical contact carried by the inner end portion of said plunger which normally engages the inner end portion of said body member under the influence of said spring, the inner end of said body member and said detachable electrical contact forming respectively the fixed and movable contacts of said switch.

3. An electrical switch of the kind indicated comprising, a tubular body member formed of metal material and having integral means for retaining it in an apertured metal support, a plunger formed of electrically non-conductive material axially movable within said body member, a helical spring located within said body member between opposed shoulders on said body member and the plunger respectively, the inner end portion of said plunger being bifurcated lengthwise to form opposed resilient sections, the outer end of said sections having lateral projections, said resilient sections having a part circular groove, said resilient sections being radially compressible toward each other so as to pass through said body member and said spring when the inner end portion of said plunger is radially compressed, and a detachable electrical contact positioned within said groove and carried by said plunger, said contact normally engaging the inner end portion of said body member under the influence of said spring, the inner end of said body member and said detachable electrical contact forming respectively the fixed and movable contacts of said switch.

4. An electric switch of the kind indicated comprising, a tubular body member formed of metal material and having integral means for retaining it in an apertured metal support, a plunger formed of electrically non-conductive material axially movable within said body member, a helical spring located within said body member between opposed shoulders on said body member and the plunger respectively, the inner end portion of said plunger being provided with a plurality of lateral projections adapted to permit the inner end portion of the plunger to pass through the body member and spring when the inner end portion of said plunger is compressed but to overhang the adjacent inner end portion of said body member when the plunger, spring and body member are assembled, the inner end portion of said plunger being bifurcated lengthwise so as to form opposite resilient sections, the outer ends of which are provided with said lateral projections, said resilient sections having a part-circular groove, an electrical contact having a portion fitting within said groove which is provided with a hole to pass the inner end portion of said plunger, said part circular groove being spaced inwardly from the inner end of said plunger and being bounded by inner and outer shoulders on said opposed sections, the outer shoulder being of larger diameter than the inner shoulder so as to form said overhanging lateral projections, the inner end of said body member and said detachable electrical contact forming respectively the fixed and movable contacts of said switch.

5. An electric switch comprising, a housing formed of electrically conductive material, a plunger member formed of electrically non-conductive material shiftable axially within said housing, said plunger member being formed at least in part by two separate sections which are radially compressible toward each other, a spring reactive between said plunger and said housing for normally urging said plunger in one direction, and a detach-

able electrical contact having an opening receiving the end of said plunger which is radially compressible, said contact being capable of being attached to or detached from the radially compressible end of said plunger by radially compressing said sections toward each other, said contact engaging the end of said housing when said spring urges said plunger in said one direction and being positioned between said end of said housing and portions of said sections.

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