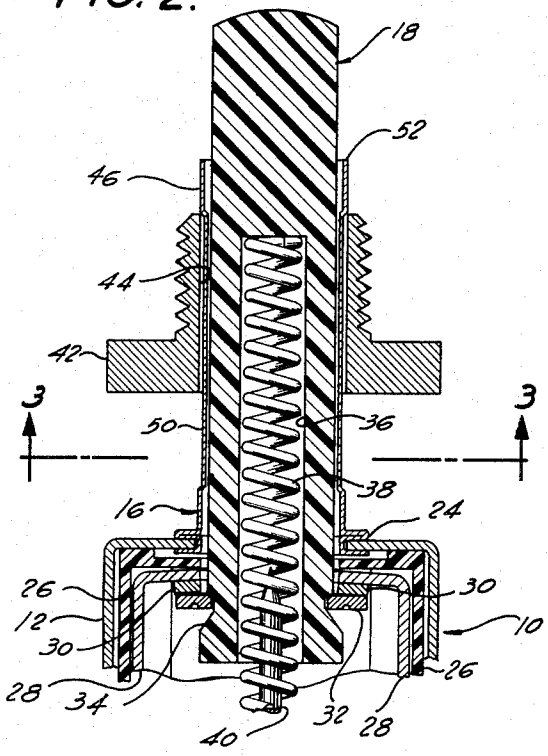
June 22, 1965 C. A. WOODCOCK 3,190,982

ADJUSTABLE PLUNGER SWITCH

Filed Jan. 23, 1962

FIG. 2.



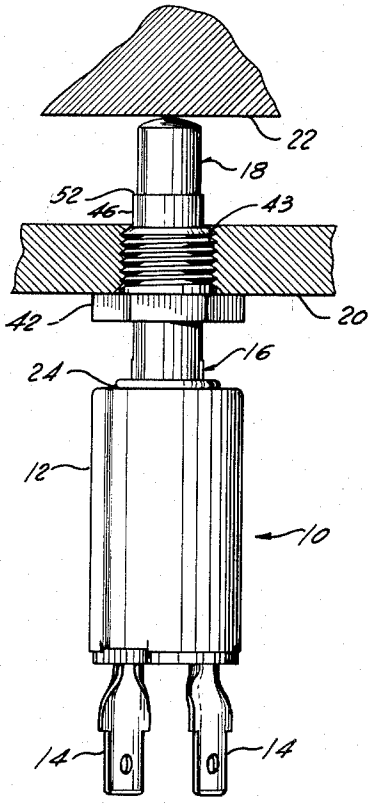


FIG. 1.

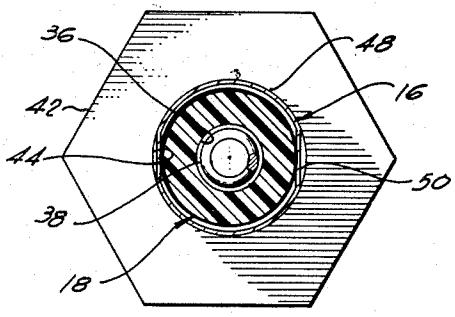


FIG. 3.

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ADJUSTABLE PLUNGER SWITCH

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2 Claims. (Cl. 200—61.81)

This invention relates to a plunger-type switch, and in particular, to an improved mounting therefor operable to adjust automatically the opening and closing setting of the switch upon initial use thereof.

A plunger-type switch generally includes electrical contacts that are opened and closed by axial movement of a plunger within the switch casing. The casing is secured to one structure to support the switch; while a second structure moving relative to the supporting structure moves the plunger to actuate the switch. The position of the switch relative to the advance of the actuating structure determines the opening and closing setting of the switch.

An example of such a switch arrangement is that commonly used with a door structure, where the switch plunger is actuated by the door during opening and closing thereof. Because the switch is used in many sizes and types of door structures, and in fact because even identical door structures have slightly different tolerances, the position of each switch relative to the advance of its actuating door generally must be individually adjusted. Not only is existing adjustment structure complicated and expensive to fabricate, but the adjustment time in man hours is also costly.

Accordingly, an object of this invention is to provide a plunger switch with an improved mounting operable to adjust the effective opening or closing setting of the switch automatically upon initial use thereof.

Another object of this invention is to provide an improved plunger switch mounting which can be economically formed of conventional stock by simple fabrication thereto.

These and other objects will be more fully appreciated after a complete disclosure of the subject invention given in the following specification, the drawing forming a part thereof, wherein:

FIG. 1 is a plan view of a plunger switch in a mounted position and incorporating a specific embodiment of the subject invention;

FIG. 2 is a longitudinal section view of the plunger switch shown in FIG. 1; and

FIG. 3 is a section view as seen generally from lines 3—3 of FIG. 2.

Referring now to FIG. 1 of the drawing, a plunger switch **10** includes a casing **12**, a pair of terminals **14**, a mounting tube **16** projecting from the casing **12** in the opposite direction of terminals **14**, and a plunger **18** slidable within the tube **16** and casing **12**. The switch **10** is secured in its operative arrangement to a frame member **20** which, for example, can be a door post of an automotive vehicle. Member **22**, which can be the door of the vehicle, is movable toward and away from frame **20** to abut plunger **18** of the switch **10** for actuation thereof.

Referring now to FIG. 2, the casing **12** and tube **16** of the switch **10** are continuous cylinders interconnected as by crimping at **24**. The casing **12** receives insulating members **26**, formed for instance from a plastic material, which hold separate the electrical conductive members **28** forming the inner ends of terminals **14**, shown in FIG. 1. The conducting members **28** have spaced stationary contacts **30** which are separated from one another electrically.

An annular conducting member **32** is received within

recess **34** at the inner end of plunger **18** and defines the moving contact of the switch. Moving contact **32** engages contacts **30** in the switch closed position to complete a circuit across terminals **14** and is spaced from the contacts **30** to break the circuit in the switch open position. Plunger **18** is hollowed out at bore **36** which houses therein compression spring **38** guided on nail **40** supported by and insulated electrically from the casing **12** by means (not shown) common in the art. The compression spring **38** urges the plunger **18** and moving contact **32** against the stationary contacts **30** to maintain the switch **10** in the closed position.

Referring now to the improved mounting for switch **10**, it will be noted that tube **16** is of continuous construction around its entire periphery. The tube **16** thus can be of commercially available tubular construction having uniform wall thickness and of cylindrical shape. A bushing nut **42** is received in threaded opening **43** in the frame member **20** and presents a bore **44** of uniform cross-section along its length.

The interior diameter of bore **44** and exterior diameter of tube **16** are chosen appropriately to provide a generally snug but freely movable fit. The intermediate portion of the tube **16** spaced from end portion **46** is flattened out or swaged, as shown in the drawing, by simple impact or pressure means. The swaging thus causes the previously circular cross-section tube **16** to become out of round and present opposing portions **48** of greater dimension and opposing portions **50** of lesser dimension than the unswaged tube. The high sides **48** of the swaged tube thus cannot clear the periphery of bore **44**, so that upon insertion of end portion **46** therein tube **16** and nut **42** become frictionally interlocked.

When mounting the plunger switch **10** operatively, the nut **42** is threaded into opening **43** in the frame **20**. The end portion **46** of tube **16** is inserted into the bore **44** and the entire casing **12** and tube **16** biased against the frictional resistance of the swaged portion **48** and nut **42** until the casing abuts the rearward side of the nut. Thus the plunger **18** is projecting from the frame **20** toward the actuating member **22** by its maximum amount.

Upon actuation of member **22** toward the frame **20**, the plunger **18** will be biased against spring **38** to separate the moving contact **32** from contacts **30** and actuate the switch. However, the switch initially may be positioned improperly, so that the advancing member **22** could depress plunger **18** completely and abut the end **52** of the tube **16**. The assembly is designed so that tube **16** within nut **42** creates sufficient friction force to oppose without movement thereof, the force of spring **38** but which is insufficient to oppose the force of advancing member **22**. Upon member **22** abutting tube end **52** the entire switch **10** will move relative to nut **42** to the position corresponding to the furthest advance of member **22** toward the frame **20**. Thus, the frictional fit between the swaged tube **16** and nut **42** will automatically adjust the proper opening or closing setting of the switch as required.

While the embodiment shown has separate tube **16** secured to the casing **12**, it would be entirely possible to swage the casing **12** and thus completely eliminate the tube. The important feature of the improved mounting is that the swaged member is a simple structure having a continuous wall without axial splits or separations along its length. The member which fits within the receiving bore before swaging is swaged to create a greater cross-dimension than the bore for establishing friction fit therebetween. The swaged member with its continuous wall structure is of sturdy construction capable of maintaining tight friction fit even after repeated use of the switch.

While a single embodiment has been shown it will be obvious to those skilled in the art that various modifications may be made therein without departing from the in-

ventive concept. It is, therefore, desired that the invention not be limited by the embodiment shown but by the appended claims.

What is claimed is:

1. A plunger switch adapted for frictional retention in and axial adjustment through a cylindrical bore through a suitable support member, said switch comprising a casing which includes a tube having a free open end, a plunger guided for axial movement through said tube with one end of the plunger extending into said casing, spring means normally resiliently projecting said plunger axially toward and through the free end of said tube to a predetermined operational position, switch contacts carried by said plunger and casing for actuation responsive to axial movement of the plunger, said plunger being movable inwardly completely through said free end, whereby axial pressure on the plunger in excess of that required to thus move it inwardly completely through said free end may be exerted on said free end of the tube to adjust the axial position of said tube within the said bore, said tube having a medial first portion spaced axially from said free open end and normally of greater external diameter in one diametral plane than said through bore to provide a frictional but axially adjustable fit of the tube within the bore, and of smaller internal diameter than said bore in a diametral plane transverse to said one diametral plane for guiding engagement with said plunger, a second portion extending from said free open end to said first portion being of cylindrical configuration and proportioned for free axial reception and movement in said bore to function as a pilot for guiding said first portion into the bore during assembly of said plunger switch.

2. A plunger switch as defined in claim 1 in which said tube includes a third portion remote from said free end, said third portion being of the same uniform diameter as said second portion and internally dimentioned for free axial reception of said plunger, said third portion merging with said second portion to guide the plunger into said second portion during assembly of the switch.

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