May 17, 1966 R. W. FRASER 3,251,971

ADJUSTABLE DOOR SWITCH

Filed April 6, 1964

Fig. 1.

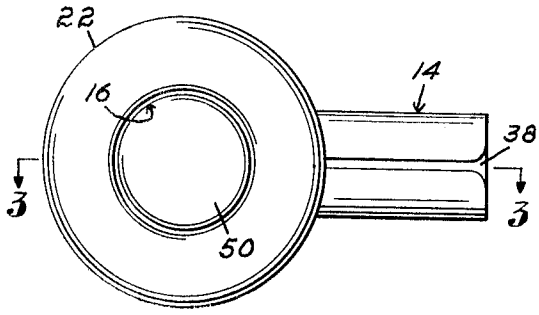


Fig. 2.

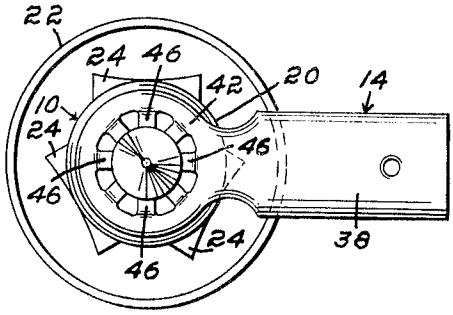


Fig. 3.

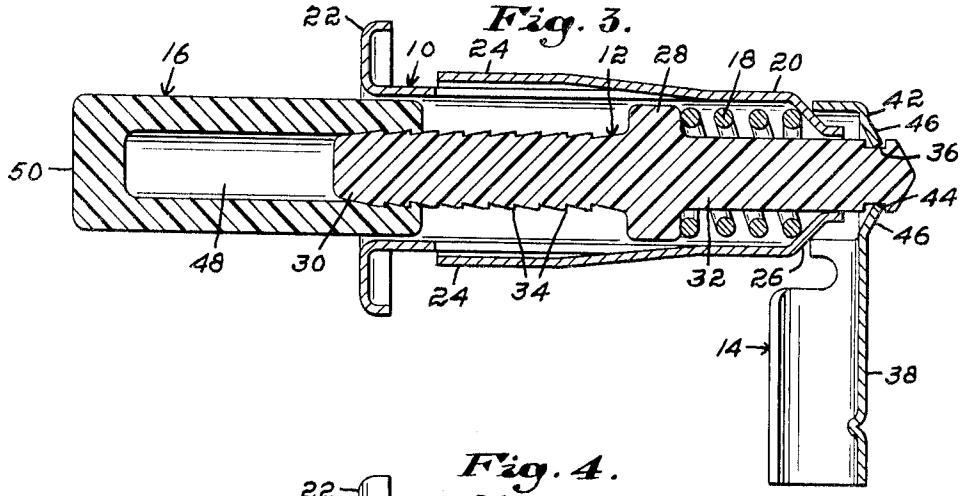


Fig. 4.

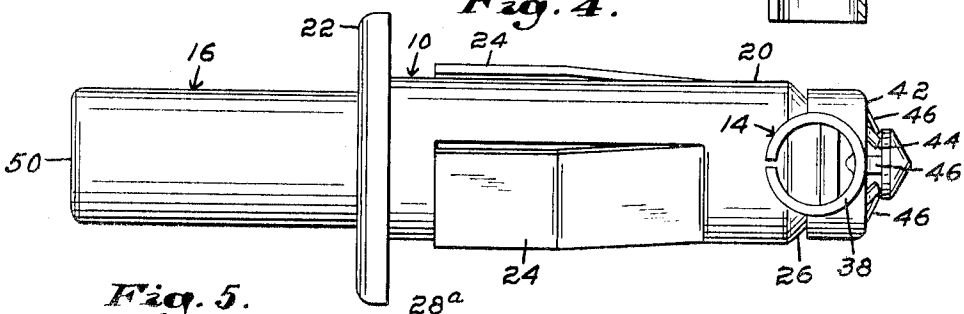
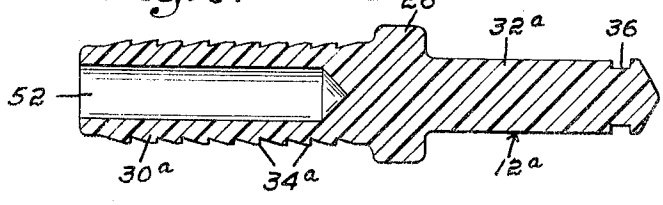


Fig. 5.



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ADJUSTABLE DOOR SWITCH

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This invention relates generally to switches and more specifically to switches having an adjustment feature for taking up variations in the supporting structures.

Frequently there is a comparatively great variation in distances between doors and jambs in articles of manufacture, such as refrigerators or motor vehicles. If a switch is mounted on either of the two mentioned elements there will, utilizing most presently known switches, be a malfunction if the distance between them is too great. Although the problem could be solved by making a very long switch, this is inefficient because of increased cost. The long switch is also inefficient because the plunger is likely to break after repeated operation and because there is a limit to the space available in most of the devices.

Through the use of the switch design disclosed hereinafter the take-up feature will prevent most of the disadvantages mentioned.

An object of the present invention is to provide an adaptor for a switch having means of adjusting a plunger associated with it for variations in the distance between a supporting structure and another.

A further object of the present invention is to provide an adjustable engagement between a tubular plunger and a series of teeth formed on an adaptor.

Other objects of the invention will, in part, be obvious and will, in part, appear hereinafter.

In the drawings:

FIG. 1 is a top plan view of the switch;

FIG. 2 is a bottom plan view of the switch;

FIG. 3 is a section taken on line 3—3 of FIG. 1;

FIG. 4 is a side elevation of the switch shown in FIG. 1; and

FIG. 5 is a section of a variation of the adaptor shown in FIG. 3.

There is shown in the drawing a switch comprising a metallic casing **10**, an adaptor **12** formed of a plastic material, a contact assembly **14**, a tubular plunger **16** open at one end and a helical compression spring **18**.

The switch casing **10** includes a body portion **20** generally tubular in configuration and open at both ends. An anular flange **22** is formed adjacent one open end of the casing **10** as shown in FIGS. 3 and 4. The annular flange **22** may be provided by a separate cap which is engaged to the body of the casing if desired. The flange **22** is in integral right angle relation with the body portion **20**. The body portion **20** has a series of rectangular spring members **24** sheared from the body portion **20** and separated therefrom on three sides. The free terminal end of each spring member **24** is directed toward the flange **22**, and each of the spring members **24** is spaced from the other. The spring members **24** are spaced in an annular configuration around the axis of the body portion and each has a slight knuckle formed between its terminal end and its connection with the body portion **20**, as shown in FIGS. 3 and 4. The open end of the casing **10**, remote from the flange **22**, is constricted to provide a smaller diameter than the other opening. This constriction is provided by an angular circumferential shoulder **26** which is directed toward the axis of the casing **10**, as shown in FIG. 3.

The adaptor **12** is formed of an insulating material, such as nylon and has the general configuration of a solid rod divided by a separator **28** which extends in annular integral relation to the body portion of the adaptor **12** between the terminal ends thereof. The separator **28** divides the adaptor **12** into an upper portion **30** and a lower portion **32**. The upper portion **30** is provided with a series of circumferential annular teeth **34** which are spaced from each other axially in a steplike relationship. The lower portion **32** has its free terminal end in the form of an arrowhead and has a circumferential groove **36** spaced from the tip of the terminal end as shown in FIG. 3.

The contact assembly **14** comprises a tubular, receptacle portion **38**, open at both ends, and a cup-shaped contact portion having a base portion **42** extended to integrally engage the bottom of the receptacle portion **38** as shown in FIG. 3. An aperture **44** is formed in the base portion **42** and is defined by a series of rectangular teeth. Each of the teeth **46** is spaced from the others. The upstanding wall (not numbered) which extends from the base portion **42** does not describe a complete circle but rather a circle which is interrupted at its connection with the receptacle portion.

The switch is assembled by first placing the spring **18** into circumscribing relation with the lower portion **32** of the adaptor **12**. The spring **18** and the adaptor **12** are then passed into the casing **10** from the open end adjacent the flange **22** until one end of the spring **18** abuts a portion of the inner surface of the shoulder **26** of the casing **10** and the other end of the spring **18** abuts the surface of the separator **28** of the adaptor **12** as shown in FIG. 3. The groove **36** of the adaptor **12** is passed through and lies beyond the constricted end of the casing **10**. The terminal end of the upper portion **30** can now be held and axial pressure applied to push the arrowhead of the adaptor between the teeth **46** of the contact assembly **14** until the teeth **46** engage against the inner wall of the groove **36** as shown in FIG. 3. The circle described by the free ends of the teeth **46** is of less diameter than the circle described by the outer edge of the walls forming the groove **36** but of only slightly less diameter than the root of the groove **36**. The upper edge of the contact portion abuts the outer surface of the shoulder **26**, when the adaptor is in a rest position. The crests of the teeth **34** of the adaptor **12** define a diameter slightly greater than the internal diameter of the core **48** of the plunger **16**. The external diameter of the plunger **16** is less than that of the opening of the casing **10** adjacent the flange **22**. Initial assembly of the plunger **16** with the adaptor **12** is accomplished by pressing the plunger **16** onto the adaptor **12** so that a few of the teeth **34** of the adaptor **12** engage the internal wall of the core **48** of the plunger **16** as shown in FIG. 3. A comparatively large distance remains, at this stage, between the inner surface of the cap portion **50**, which closes one end of the plunger **16** and the free end of the upper portion **30** of the adaptor **12**.

The switch assembly is engaged in an apertured support, such as the door jamb (not shown) of a refrigerator or automobile, by passing the body portion **20** of the casing **10** into an aperture formed in the door jamb until the flange **22** rests against the outer surface of the jamb and the spring members **24** engage either the wall of the aperture or the under surface adjacent the aperture.

Adjustment of the switch is accomplished by slamming the door against the plunger **16**. The door will force the plunger **16** and the adaptor **12** against the spring **18** thus disengaging the contact assembly **14** and the shoulder **26**. This disengagement will continue until the spring is sufficiently compressed to apply a resisting force which would then cause the plunger **16** to pass over the teeth **34**. This movement of the plunger in relation to the adaptor will continue until the door no longer exerts a strong compressing force. This adjustment will take

place over a wide range of distances which may exist between the jamb and the door. Of course, when pressure is removed from the plunger **16**, such as occurs when the door is opened, the spring **18** will, through the adaptor **12**, pull the contact assembly **14** into engagement with the shoulder **26** thereby making electrical contact and actuating the electrical circuit involved.

In FIG. 5 of the drawing there is shown a variation of the adaptor disclosed in FIGS. 1 through 4 and is, in most respects, similar to the original adaptor **12** except that the upper portion **30***a* has a core **52** formed therein. The advantage of having a core **52** formed in the upper portion **30***a* is that it allows an inward flexing of the upper portion when it is engaged with the plunger.

While there has been illustrated and described one preferred embodiment of the invention, it should be understood that the invention is best defined by the following claims.

I claim:

1. A switch comprising a switch casing, an adaptor mounted in said casing, said adaptor having two terminal ends and having a shoulder element extending therefrom between said terminal ends, dividing said adaptor into an upper portion and a lower portion, said upper portion having a series of teeth extending therefrom, a plunger, having a portion thereof, in movable engaged relation with said upper portion and a compression spring circumscribing a portion of said lower portion and being sandwiched between said shoulder element and a portion of said switch body and a contact means capable of being actuated by said adaptor.

2. A switch comprising a switch casing and adaptor associated with said casing, said adaptor having a shoulder element extending therefrom dividing said adaptor into an upper portion and a lower portion, said upper portion having a series of teeth extending therefrom, a plunger, having a portion thereof, in movable engaged relation with said upper portion, and spring means sandwiched between said shoulder element and a portion of said switch body and a contact means capable of being actuated by said adaptor.

3. A switch comprising a tubular switch casing having a restricted opening at one end provided by an internal shoulder, an adaptor mounted within said switch casing, said adaptor formed of an insulating material and having an annular flange means extending therefrom dividing said adaptor into an upper portion and lower portion, said upper portion having a series of teeth extending therefrom, a plunger having a portion thereof in movable engaged relation with said upper portion and a compression spring circumsbribing a portion of said lower portion being sandwiched between said flange and said internal shoulder, and a contact means capable of actuation by said adaptor.

4. A switch as set forth in claim **3** wherein said adaptor is engaged with said contact means outside the area defined by said housing.

5. A switch as set forth in claim **4** wherein said plunger is in the form of a tube closed at one end providing a core and said teeth of said upper portion are engaged against the wall of said core.

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