April 23, 1968 F. J. WEREMEY 3,379,851

PUSHBUTTON USING THREE STAGE UNITARY SPRING AS A CONTACTOR MEANS

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Fig. 1.

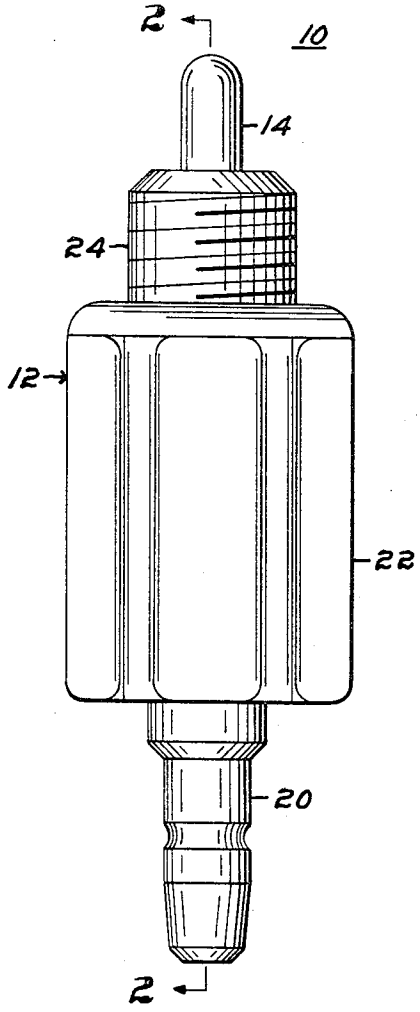


Fig. 2.

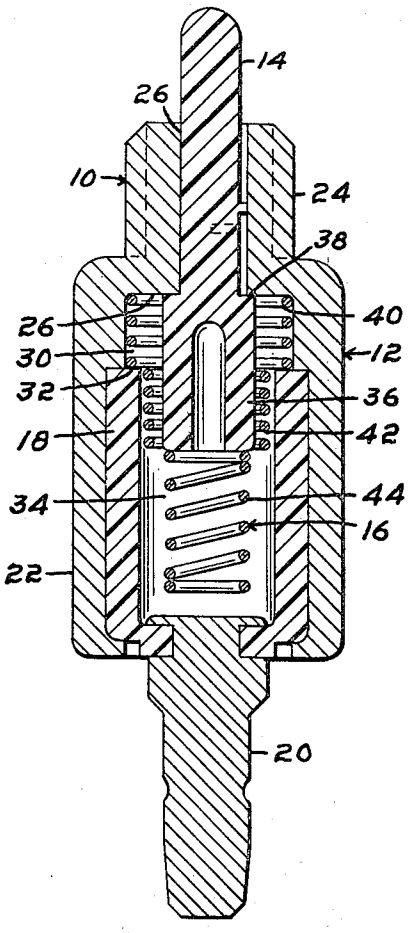
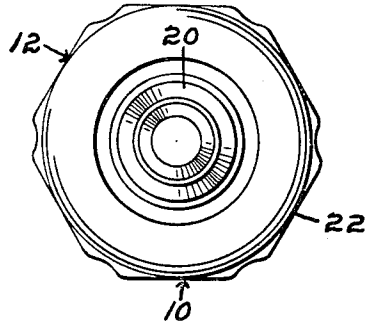


Fig. 3.



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PUSHBUTTON USING THREE STAGE UNITARY SPRING AS A CONTACTOR MEANS

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ABSTRACT OF THE DISCLOSURE

A pushbutton switch is disclosed to provide switching means wherein a unitary stepped spring is utilized as a contact and also to mechanically return the plunger to the normally open position.

This invention relates generally to switches and more specifically to a switch utilizing a stepped-spring.

An object of the present invention is to provide a simple inexpensive construction of a normally open switch.

Another object of the present invention is to utilize a stepped-spring as a contact as well as providing means of mechanically returning the plunger to a rest position.

The prior art indicates that mechanical switches of the normally open type utilize separate contact means and use the spring member only for mechanical purposes. This required not only separate contact means but structure to hold the contact means in engagement with the spring member. In the present invention the use of a stepped-spring provides an element which can be utilized as an electric contact portion in a switch which, for example, is connected directly to ground.

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

In the drawing:

FIG. 1 is a side elevation of the switch;

FIG. 2 is a section taken on line 2—2 of FIG. 1; and

FIG. 3 is a bottom plan view of the switch shown in FIG. 2.

In the drawing, there is shown a switch **10** comprising a housing **12** formed of an electrically conductive material such as steel, a plunger **14**, a stepped compression spring **16**, an insulating retainer member **18** and a terminal **20**.

The housing **12** includes a body portion **22** generally tubular in configuration, open at first and second ends. A tubular extension **24** having an axial core **26** formed at the first end of the body portion **22**. The axis of the core **26** is aligned as a continuation of the cavity of the body portion **22**. The cavity formed in the upper portion of the body portion **22** is of greater diameter than the core **26** thereby providing an internal circumferential shoulder **28**. This upper portion may conveniently be referred to as the upper chamber **30** of the body portion **22**. An internal circumferential step **32** forms a second internal shoulder in the body portion **22** in close proximity to the upper chamber **30** and spaced from the shoulder **28**. The remaining portion of the body portion **22** has a cavity of larger diameter than the upper chamber **30** to provide a lower chamber **34**.

The plunger **14** comprises a cylindrical upper portion rounded at one terminal end and having a spring engagement portion **36** extending from the other end, of larger external diameter than the cylindrical upper portion, providing a plunger shoulder **38**. An axial core may be formed in the spring engagement portion **36** extending from its free terminal end.

The unitary stepped-spring **16** is helical in configuration and has three portions, an upper increment **40** which defines an external diameter, approximately equal to the diameter of the chamber **30**, an intermediate increment **42**

of smaller diameter than the upper increment **40** and a lower increment **44** of smaller diameter than the intermediate increment **42**.

The insulating retainer **18** is formed of an insulating material and comprises a tubular component open at both ends. The insulating retainer **18** has an external diameter approximately equal to the diameter of the lower chamber **34** and has an internal diameter slightly greater than the external diameter of the increment **42** of the spring **16**.

To assemble the switch **10** the plunger **14** is passed into the housing **12** until the plunger's shoulder **38** butts against the internal shoulder **28** of the upper chamber **30**. A portion of the plunger will extend up through the tubular extension **24** and beyond the tubular extension **24** as shown in FIG. 1. The stepped-spring **16** is now dropped into the housing with the upper increment **40** abutting against the internal shoulder **28** and circumscribing a portion of the spring engagement portion **36**. The intermediate increment **42** circumscribes the spring engagement portion **36** of the plunger **14** and is spaced slightly therefrom and the lower increment **44** abuts against the free end of the spring engagement portion **36** and extends well down into the lower chamber **34** for a predetermined distance. The terminal **20** is formed of a conductive material.

The terminal **20** is inserted into the insulating retainer **18** which is upset to secure it thereto. Then, the subassembly consisting of the terminal **20** and the retainer member **18** is dropped into the housing **12** and pressed against the internal step **32** thereby compressing the upper portion **40** of the spring **16** between the upper surface of the retainer member **18** and the shoulder **28**. While maintaining this pressure the lower portion of the housing **12** is curled circumferentially around the lower stepped portion of the insulating retainer **18** thereby securing it and completing the assembly. The major portion of the terminal **20** extends beyond the area defined by the housing **12** as shown in FIG. 2. The terminal **20** is spaced from the spring **16**.

The operation of the assembled switch is rather simple, if axial pressure is now applied to the plunger, the intermediate increment **42** of the spring will be extended or stretched while the lower increment **44** will be moved toward the terminal **20**. Once the lower increment **44** engages against the terminal **20** it will be placed under compression which will continue up to the limits of a provided overcarry. If the plunger should now be released the compressed lower increment **44** would drive the plunger away from the terminal **20** and the extended intermediate increment **44** would compress to its original configuration thereby returning the switch to its normally open position.

If desired, the plunger **14** may include a protuberance which extends at right angles from its external wall and this protuberance may slide within an axial groove formed in the tubular extension **24** for predetermined distance and then by rotating the plunger **14** in either a clockwise or counterclockwise direction it may slip into a second channel formed at right angles to the first channel thereby stopping the plunger so that the axial force may be removed and yet the engagement between the lower increment **44** and the terminal **20** be maintained until the plunger is rotated in another direction to place it within the axial groove and thereby on release allow the expanded forces of the intermediate increment **42** to return it to its original configuration thereby returning the switch to its normally open position.

With reference to the foregoing description it is to be understood that what has been disclosed herein represents only a single embodiment of the invention and is to be construed as illustrative rather than restrictive in nature and that the invention is best described by the following claim.

What is claimed is:

1. A switch comprising a housing, said housing being opened at both ends, and having an axial cavity formed therethrough, a plunger fitted within said housing, having a lower terminal end being axially movable in relation to said housing, a spring lying within said axial cavity, having an upper increment circumscribing a portion of said plunger and butted against an upper shoulder and said housing having a lower internal circumferential step, an intermediate increment having a smaller external diameter than said upper increment and circumscribing a portion of said plunger and a lower increment of smaller diameter than the intermediate increment and being in engaged relationship to said lower terminal end of said plunger and having a free terminal end spaced from all elements of said housing, an insulating retainer member having a portion thereof within said axial cavity, having an upper edge butting said upper increment and having a lower edge engaging a terminal, and the length of said spring increment being such that the pressure of said plunger will place the lower increment under compression and the intermediate increment under tension.

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