

Aug. 23, 1966

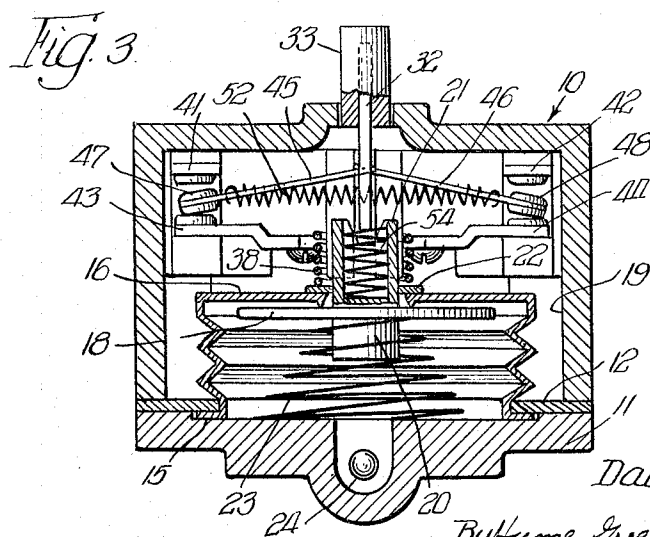
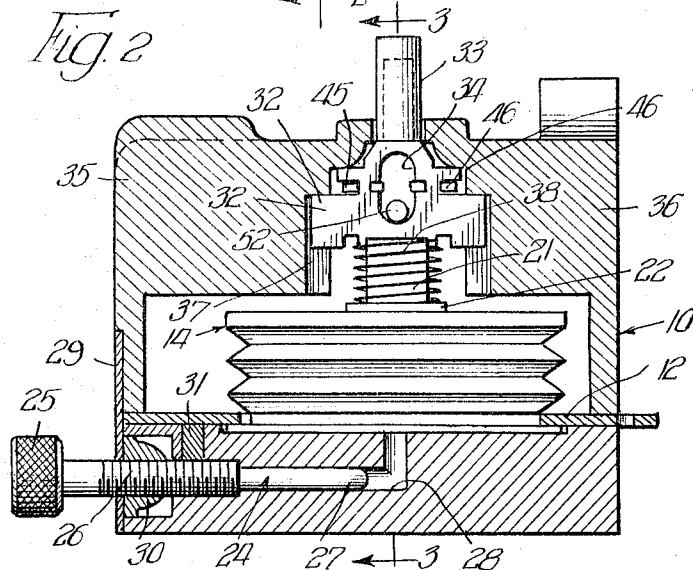
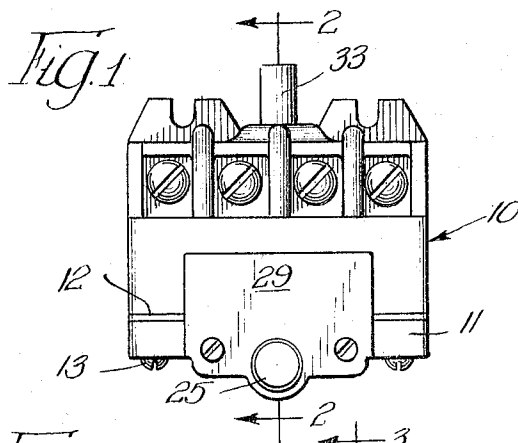
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3,268,675

ACTUATOR FOR BELLOWS TYPE TIME DELAY SWITCH

Filed Oct. 19, 1964

2 Sheets-Sheet 1



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Fig. 4

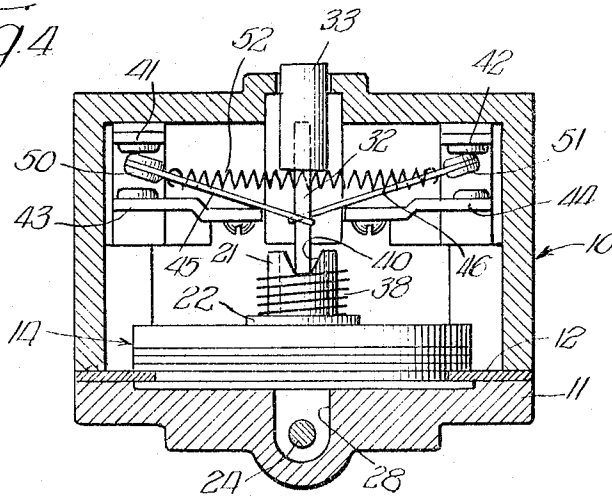


Fig. 5

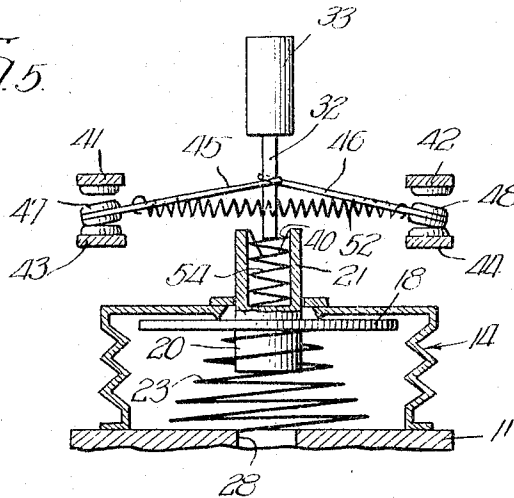
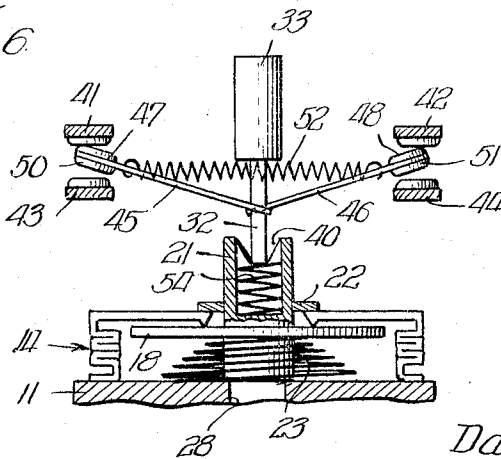


Fig. 6



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ACTUATOR FOR BELLOWS TYPE TIME DELAY SWITCH

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5 Claims. (Cl. 200—34)

The invention relates to electric switch devices and has reference more particularly to time delay switch mechanism having switch blades which form part of a toggle arrangement and wherein accurate timing can be obtained for all switch operations.

In the application Serial No. 389,020 filed by Marquis and McGary on August 12, 1964 and entitled "Time Delay Electric Switch," the pivoted switch blades of the electric device are connected by an overcenter spring in a manner whereby the pivoted blades which carry the movable contacts of the switch form elements of a toggle arrangement. The said toggle arrangement is spring urged into a position connecting certain contacts and disconnecting other contacts. Upon actuation of the toggle arrangement by the operator, the switch blades are moved in a direction to reverse the connection and disconnection of the contacts. A bellows member is employed for timing the period during which the contacts remain in their actuated position.

The bellows type of time delay electric switch and other timers of similar construction have one shortcoming. When the toggle arrangement is actuated to collapse the bellows, the time interval may vary depending on the extent of actuation of the actuator and thus the extent to which the bellows is collapsed. The variations in the time interval is due to the fact that the bellows is not exhausted of a uniform volume of air for each actuation.

Accordingly the present invention has for its major objective the provision of improved means in a bellows type of time delay electric switch whereby the bellows will always be exhausted of a uniform volume of air when the same is collapsed provided the bellows is collapsed far enough to actuate the toggle arrangement.

Another object of the invention is to provide a time delay electric switch employing a bellows member and an actuator for the bellows which is depressed for collapsing the bellows and for actuating the blades of the toggle arrangement and wherein a novel spring and stop combination is interposed between the switch actuator and the bellows member for exhausting a constant volume of air for each actuation of the toggle arrangement.

A further object resides in the provision of a timer of the bellows type which will incorporate an overtravel spring strong enough to resist compression until the bellows is collapsed to a predetermined extent such as results in the toggle arrangement being actuated. Further movement of the actuator is not applied to the bellows but is taken up by compression of the overtravel spring.

With these and various other objects in view the invention may consist of certain novel features of construction and operation as will be more fully described and particularly pointed out in the specification, drawings and claims appended thereto.

In the drawings which illustrate an embodiment of the device and wherein like reference characters are used to designate like parts—

FIGURE 1 is an end elevational view of a time delay switch embodying the features of the present invention;

FIGURE 2 is a vertical sectional view of the time delay switch of FIGURE 1 taken approximately through the center of the unit on line 2—2 of FIGURE 1;

FIGURE 3 is a transverse sectional view taken approximately on line 3—3 of FIGURE 2, the same showing the

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switch blades in normal position with the bellows member inflated;

FIGURE 4 is a transverse sectional view similar to FIGURE 3 but showing the switch blades in an actuated position with the bellows member deflated;

FIGURE 5 is a simplified view of the actuator, toggle arrangement, and bellows the same having been selected for illustrating the action of the overtravel spring and associated parts which are shown in normal position, and

FIGURE 6 is a simplified view similar to FIGURE 5 but showing the switch blades in actuated position with the bellows fully collapsed and the overtravel spring compressed.

The housing of the time delay switch selected for illustrating the invention is formed of two parts, the numeral 10 indicating the top part of the housing, and the numeral 11 the base or bottom part. A metal plate 12 is interposed between the top and bottom parts and the securing screws 13 fixedly but releasably hold the several elements in assembled relation. It will be observed from FIGURE 3 that the housing part 10 is cored to form an enlarged recess 19 for receiving the bellows 14.

The plate 12 functions as a holddown member for the bellows 14 which is retained in sealing contact with the bottom part 11 of the housing, for which purpose the plate overlies the base flange 15 of the bellows. The bellows is preferably formed of rubber, neoprene or similar flexible material, and the top wall 16 of the bellows is in contact with a disk 18 formed of hard material such as metal, plastic, or the like, and the said disk which is positioned within the bellows has coil spring retaining studs on respective sides. The numeral 20 indicates the bottom downward extending stud and the numeral 21 indicates the larger upwardly extending top stud. A collar 22 has encircling relation with the stud 21 and said collar forms a valve for the bellows releasing air from the bellows when the disk 18 is depressed. However, the valve is normally held closed by the bellows coil spring 23 located between the bottom part 11 of the housing and the disk 18, and having encircling relation with the depending stud 20.

The action of the bellows coil spring 23 is to force the bellows into an expanded position. When the bellows is depressed into a deflated position, the coil spring is compressed and thus its tendency is to expand the bellows. However, in order to obtain the desired time delay and the actuation of the switch contacts, a control valve 24 is provided as best shown in FIGURE 2. The control valve includes a knurled head 25, a threaded section 26 and a long tapering end 27. The threaded section and the tapering end are received within a bore 28 formed in the base part 11, the bore ending upwardly to communicate with the interior of the bellows. The nut 30 of squared or hexagonal shape is non-rotatably held within a recess of similar shape in the bottom part of the housing, and between the threaded section 26 and the plate 12 a length of filtering material 31 is located. The nut 30 provides for longitudinal movement of the control valve when the valve is rotated, and the air admitted to the bellows is filtered by passing through the filtering material. A name plate 29 is secured to the housing part 10, and said name plate retains the nut 30 within its recess.

The actuator 32 for the bellows 14 is best shown in FIGURE 2, the same consisting of a relatively thin member of metal or the like, having an extension 33 which is adapted to be depressed by the operator for moving the actuator 32 in a downward direction and thus collapsing and deflating the bellows. The body portion of the actuator 32 is notched along its base edge and the actuator is provided with an oblong opening 34 centrally

located as regards the actuator. The said element is mounted within the housing part 10 in a manner permitting vertical sliding movement, for which purpose the housing part 10 includes wall sections 35 and 36, both of which are slotted at 37 for receiving the vertical edges of the actuator 32. The extension 33 projects through a central opening in the top wall of the housing part 10 and the actuator is yieldingly biased in an upward direction by the coil spring 38 so as to cause the extension 33 to project above the housing whereby it is visible and readily available for actuation by the operator. The coil spring 38 has encircling relation with the stud 21 and the end convolution at the top of the coil spring seats within the notches formed in the base edge of the actuator 32.

The actuator 32 and the stud 21 are operatively connected since the actuator is aligned with and the same is adapted to enter the top open notch 40 formed in the stud 21. The coil spring 38 is thus confined between the collar 22 and the base edge of the actuator 32. The arrangement of the parts is such that when the operator depresses the extension 33, the actuator 32 is likewise depressed and through stud 21 the bellows will be depressed into a deflated condition. This movement of the actuator will compress the bellows coil spring 23, and thus it will be understood that the action of this coil spring is in a direction upward to expand the bellows. However, the coil spring 38 remains compressed to the same extent at all times. Its action is against the collar 22 which, as previously described, functions as a valve and thus the collar is assisted in its valving function by the said coil spring 38. When the bellows is depressed the air within the same will escape, but as the bellows expands the tension exerted by the coil spring 38 on the collar 22 together with the disk 18 effectively prevents air from entering the bellows. Thus the entering air must come from the passage 38, the same being controlled by the valve 24.

The depression of the actuator 32 to collapse the bellows 14, and the subsequent time delay before the parts return to initial position, is employed for actuating switch mechanism of the toggle type. The stationary terminals for the electric switch controlled by the toggle arrangement are indicated by the numerals 41 and 42, the same comprising the top terminals and by the terminals 43 and 44, the same comprising the bottom terminals. FIGURE 3 shows the bottom terminals as being fixedly secured by screws to a wall of part 10 of the housing, and it will be observed that each terminal member includes an end portion having silver contacts fixed thereto. The contacts on the top terminals are directed downwardly, whereas the contacts on the bottom terminals are directed upwardly.

The switch blades 45 and 46 are pivotally carried by the actuator 32 and silver contacts are fixed to the opposite end of each switch blade, both top and bottom. The top contacts 47 and 48 are adapted to coact with the stationary top terminals 41 and 42, whereas the bottom contacts 50 and 51 are adapted to coact with the stationary bottom terminals 43 and 44. The blade 45 is notched to provide outside prongs with the blade 46 being similarly notched to provide inside prongs. By means of these outside and inside prongs the blades are pivotally mounted on and carried by the actuator 32. Thus the blades are pivotally mounted on the actuator and the toggle arrangement is completed by the overcenter spring 52. The said spring yieldingly connects the opposed switch blades and in so doing extends through the opening 34 in the actuator.

In the construction of the time delay electric switch as herein described, the coil spring 38 is relatively weak, whereas the bellows coil spring 23 is relatively strong. The bellows spring must be strong enough to expand the bellows after the same has been deflated and this requires

a lifting of the disk 18 including the studs 20 and 21 integral therewith and also a lifting of the actuator 32. With the bellows fully expanded as shown in FIGURES 2 and 3, the extension 33 of the actuator will project some distance above the part 10 of the housing. As a result of this elevated position of the actuator the pivot ends of the switch blades are located above the overcenter spring and thus the said blades and the silver contacts fixed thereto have moved down into contact with the bottom terminals 43 and 44 to electrically connect the circuit for said terminals. When the operator desires to disconnect this circuit and to connect the electric circuit for the top terminals 41 and 42, he depresses the extension 33. Accordingly the actuator 32 is depressed as is also the bellows 14 which deflates the bellows. This position of the parts is shown in FIGURE 4 wherein it will be seen that the pivot ends of the switch blades in passing through dead center and beyond, has caused a snap action of the blades into an up position. Thus the electrical connection of the bottom terminals is broken and an electrical connection is made joining the top terminals 41 and 42.

The switch blades will remain in the up position of FIGURE 6 for a period of time depending on the adjusted position of the control valve 24. Air will gradually leak into the bellows from the passage 28 to expand the bellows under the expanding force exerted by the coil spring 23. The pivot ends of the switch blades 45 and 46 will again be caused to pass through and continue beyond dead center, only this time in an upward direction. The toggle action is such as to return the blades to their initial down position, FIGURE 5 thereby again connecting the bottom terminals 43 and 44.

The time interval measured by the bellows member may vary depending on the extent to which the bellows is collapsed, provided, of course, that the bellows is collapsed far enough to actuate the toggle arrangement. In order to guarantee uniform collapsing of the bellows each time the toggle arrangement is actuated, the invention employs an overtravel spring 54 having location in the cored top end of the stud 21. The overtravel spring is thus confined between the base end of the actuator 32 and the bottom of the cored passage 40 in stud 21. Only limited compression of the spring is possible since the base end of the actuator is received in the notch 40 formed in the stud 21.

The operation of the parts with the overtravel spring 54 in place is as follows: When the extension 33 is depressed, the movement is transmitted to the stud 21 through the overtravel spring. One characteristic of this spring is the fact that the spring is strong enough so that it is not compressed when the bellows is collapsed to its fullest extent as determined by contact of stud 20 with the bottom part of the base 11 of the housing. This complete collapsing of the bellows will exhaust a constant volume of air. Thus up to this point the movement of the extension 33 has not been sufficient to compress the overtravel spring 54 or to actuate the toggle arrangement.

However, further movement of 33 will now compress the overtravel spring 54, and the actuator 32 will eventually contact the bottom of notch 40. This action is sufficient in magnitude to trip the toggle arrangement and thus the switch blades are given snap action into an up position as shown in FIGURE 6. There is about one-sixteenth to one-eighth of an inch of overtravel available in the notch 40. Such a spring and stop arrangement will always give a constant air volume and thus accurate timing is obtained irregardless of how far 33 is depressed, providing that 33 is depressed far enough to operate the switch.

The invention is not to be limited to or by details of construction of the particular embodiment thereof illustrated by the drawings, as various other forms of the device will, of course, be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

What is claimed is:

1. In actuating mechanism for an electric switch of the toggle type, the combination with an actuator, of a bellows which is deflated when the actuator is depressed, toggle mechanism including a pair of switch blades pivotally carried by the actuator and extending in opposite directions, a pair of spaced stationary terminals located in coacting relation with the free end of each switch blade, one terminal of each pair being located above and the other terminal of each pair being located below a switch blade, an overtravel spring interposed between the actuator and the bellows, said spring being strong enough to resist compression when the actuator is depressed to collapse the bellows to a predetermined extent, and said spring being weak enough so that it is compressed upon continued movement of the actuator to cause an actuation of the toggle mechanism, whereby the bellows is collapsed to said predetermined extent each time the toggle mechanism is actuated by the operator in depressing the actuator to deflate the bellows.

2. Actuating mechanism for an electric switch as defined by claim 1, wherein the pre-determined extent to which the bellows is collapsed is controlled by a stop member located within the bellows and having movement with the top wall of the bellows.

3. In actuating mechanism for an electric switch of the toggle type, the combination with an actuator, of a bellows which is deflated when the actuator is depressed, toggle mechanism including a pair of switch blades pivotally carried by the actuator and extending in opposite directions, a terminal member above and below the free end of each switch blade and with which the switch blades coact as the toggle mechanism is actuated, a stud projecting from respective sides of the top wall of the bellows, one stud being located within the bellows and having depending relation with the top wall, the other stud projecting outwardly from the top wall, an overtravel spring carried by the said other stud and being interposed between the same and the actuator, said spring being strong enough to resist compression when the actuator is depressed to collapse the bellows to an extent determined by contact of the depending stud with a stop, and said

spring being weak enough so that it is compressed upon continued movement of the actuator into contact with the said other stud to cause an actuation of the toggle mechanism, whereby the bellows is collapsed to said predetermined extent each time the toggle mechanism is actuated by the operator in depressing the actuator to deflate the bellows.

4. Actuating mechanism for an electric switch as defined by claim 3, additionally including a coil spring within the bellows and which is compressed when the bellows is deflated, whereby the said coil spring exerts a force in a direction to inflate the bellows.

5. Actuating mechanism for an electric switch as defined by claim 3, additionally including an overcenter spring having a connection adjacent its ends with the switch blades respectively, and also including a coil spring within the bellows and which is compressed when the bellows is deflated, whereby the said coil spring exerts a force in a direction to inflate the bellows.

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