Oct. 8, 1963 W. S. FLEMING 3,106,622

CONVERTIBLE MOMENTARY SWITCH

Filed March 6, 1961

Fig. 1

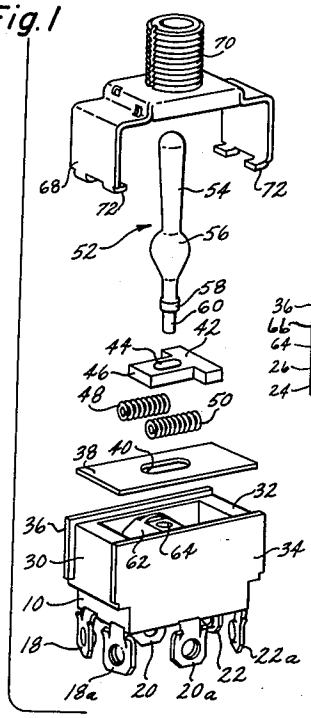


Fig. 4

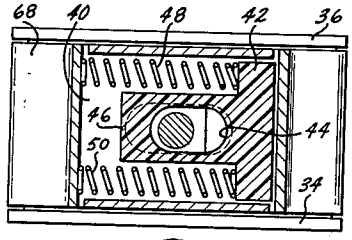


Fig. 5

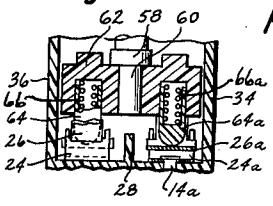


Fig. 3

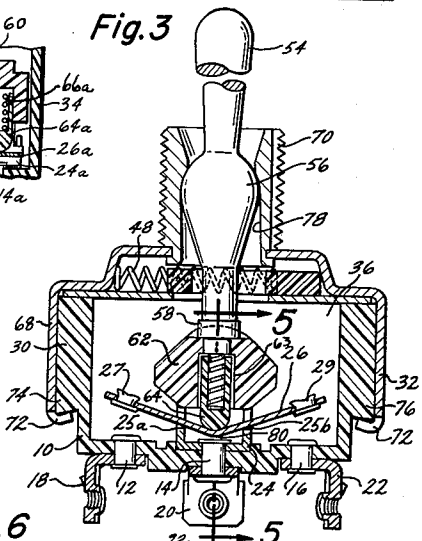


Fig. 2

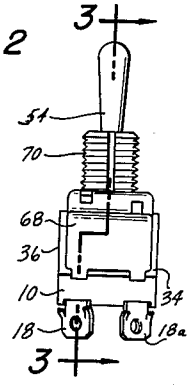


Fig. 4a

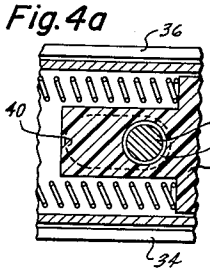


Fig. 6

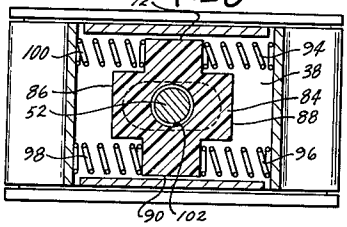


Fig. 8

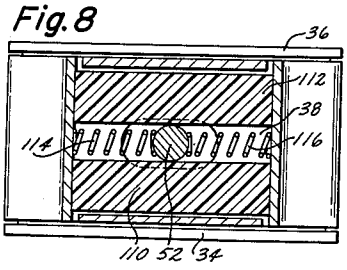
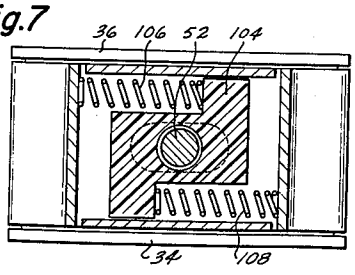


Fig. 7



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CONVERTIBLE MOMENTARY SWITCH

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This invention relates generally to an electric switch and more particularly to a switch having momentary switch action.

The principal object of this invention is to provide an improved switch having momentary switch action in at least one contact operating direction.

Another object is to provide an improved double-throw switch which is easily convertible from momentary action in one operating direction to momentary operation in the other direction or to momentary switch action in both operating directions.

A further object is to provide such a switch which is easily convertible to momentary switch action in one throw position and a locking switch action in the other throw position.

A further object of this invention is to provide a switch which is easily convertible to either a momentary or lock action in its OFF position.

An additional object of this invention is the provision of an improved toggle switch that is easily convertible to various modes of momentary operation while being durable, reliable, economical to construct and easy to operate.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application which will be indicated in the appended claims.

In the drawings:

FIG. 1 is an exploded view of a preferred embodiment of a toggle switch incorporating this invention;

FIG. 2 is a side view of the assembled switch shown in FIG. 1;

FIG. 3 is a cross-sectional view taken along lines 3—3 of FIG. 2;

FIG. 4 is a cross-sectional plan view of the switch shown in FIG. 3;

FIG. 4*a* is a fragmentary view similar to FIG. 4 but showing a modification thereof;

FIG. 5 is a combined cutaway view and cross-sectional view of the contact arms and lower end of the toggle lever of the switch shown in FIG. 3; and

FIGS. 6, 7 and 8 show alternate embodiments of the spring and sliding plate arrangement shown in FIG. 4.

The following description of a preferred form of a switch embodying this invention will be made with reference to FIGS. 1, 2, 3, 4 and 5 wherein a toggle switch is illustrated. A switch assembly shown in the exploded view in FIG. 1 includes an insulating base 10 having mounted in the bottom wall thereof two sets of three contacts each. These two sets of contacts are identical and therefore, FIG. 3 shows only one set consisting of the contacts 12, 14 and 16 which have fixed thereto terminal lugs 18, 20 and 22, respectively. However, it is to be understood, as best indicated in FIGS. 1, 2 and 5, that the second set of contacts and their corresponding terminal lugs are identical to the first and are identifiable by the same reference numerals with a subscript *a*, such as terminal lub 18*a* shown in FIGS. 1 and 2.

Also mounted on the bottom wall of base 10 is a generally U-shaped metallic contact arm support 24 upon which a metallic contact arm 26 is supported for generally pivotal movement about edge 25*a* or edge 25*b* as a fulcrum. Fixed to opposite ends of arm 26 are contact buttons 27 and 29. Support 24 is also fixed to contact 14 and makes an electrical connection therewith. An identical support 24*a* is mounted in like manner on base 10, is electrically connected to contact 14*a* and supports a second contact arm 26*a* for generally pivotal movement thereon. Base 10 has an integral vertical flange 28 which extends longitudinally thereof between the base end walls 30 and 32 and separates supports 24 and 24*a*. Side walls 34 and 36 complete the enclosure of the lower part of the toggle switch assembly and extend slightly upwardly beyond end walls 30 and 32.

Seated on the tops of end walls 30 and 32 is a cover plate 38 having formed therein an elongated aperture 40. Disposed on top of cover plate 38 is a removable T-shaped sliding plate 42 having formed therein an elongated aperture 44 of slightly smaller dimensions than aperture 40. Disposed on either side of the center leg 46 of plate 42 are a pair of coil springs 48 and 50.

The switch operator or contact actuator is a toggle lever designated generally by the reference numeral 52 and has an operating handle 54, an enlarged bulbous portion 56 which serves as a fulcrum for lever 52, a circular flange 58 and a lower extension 60. As shown best in FIG. 3, toggle lever 52 is assembled by passing the lower end thereof through the aligned elongated openings 44 and 40 in sliding plate 42 and cover plate 38, respectively.

The lower end 60 of toggle lever 52 is received in a central vertical bore 63 formed in the rocker 62 with flange 58 acting as a stop against which the top of rocker 62 abuts. Two actuator elements 64 and 64*a* are received in corresponding vertical bores formed in either side of rocker 62 and are biased outwardly thereof by coil springs 65 and 66*a* which are disposed in corresponding vertical bores formed within the elements 64 and 64*a*. A cover bracket 68 incorporating a stem 70 is then placed over the toggle handle 54 and end walls 30 and 32 of base 10 to complete the switch assembly. Cover bracket 68 is provided with clamping fingers 72 which engage the shoulder portions 74 and 76 of end walls 30 and 32, respectively, thereby clamping the entire assembly together. Stem 70 is provided with conically shaped inner wall 78 which acts as a pivot for the bulbous portion 56 and also serves to preclude upward movement of lever 52.

In operation the normal OFF position of the switch occurs when the toggle lever 52 is in its vertical position as shown in FIGS. 3 and 4. Since the contact arm operating portion of the switch is symmetrical, the description which follows will deal with only the contact arm 26 and associated elements with the understanding that the operation of contact arm 26*a* is identical. Cover bracket 68 acts as an abutment or a stop for lateral movement of slider plate 42 to the right and also serves as a stop for the lefthand end of springs 48 and 50. With this arrangement, springs 48 and 50 resiliently oppose movement of slider plate 42 to the left. In the normal OFF position apertures 40 and 44 are so aligned that toggle lever 52 is not in engagement with either cover plate 38 or slider 42.

The toggle switch shown in FIGS. 1, 2, 3, 4 and 5 is designed to have a stable or locked OFF position and one stable or locked contact-making or throw position. However, the other throw position is in the nature of a momentary action, meaning that the contact arms will be in engagement with the fixed contacts in the base only so long as force is applied to toggle lever 52. As soon as the force is removed, the action of the compressed springs 48 and 50 will return the lever to its vertical OFF position.

Let us now consider the case in which force is ap-

plied to handle 54 in order to pivot toggle lever 52 in a counterclockwise direction as seen in FIG. 3. Consequently, spring-loaded element 64 is moved along contact arm 26 to the right to force downwardly the right-hand side of contact arm 26 carrying the contact button 29 about edge 25*b* of support 24. A locking engagement is made between contact 29 and contact 16 by virtue of the movement of toggle lever 52 and spring-biased element 64 "over center" from point 80 to a point outwardly of pivot fulcrum 25*b*. In moving to this locked position lever 52 moves freely within the apertures 40 and 44 until it is in its extreme clockwise position where wall 78 of stem 70 acts as a stop. In other words, springs 48 and 50 and slider plate 42 present no opposition to the movement of the togle lever in this direction, and contacts 29 and 16 are therefore held in an engaged or ON position. In this ON position of the switch, an electrical circuit is completed between contacts 16 and 14 through contact arm 26.

If a force is now applied to lever handle 54 to rotate toggle lever 52 in a clockwise direction to its vertical position, the lever will snap to its upright position wherein the nose of element 64 rests at point 80, the bottom point of V-shaped contact arm 26, and will remain in that stable position until further force is applied to handle 54. When the lever 52 is vertical, the switch is OFF since contact arm 26 is not electrically connected to either contact 12 or 16. If the toggle lever is turned further in a clockwise direction, it will be noted that the portion of lever 52 between the flange 58 and enlarged portion 56 now engages the lefthand inner periphery of aperture 44 so that slider 42 is moved to the left to compress springs 48 and 50. Therefore, when lever 52 is moved to its extreme clockwise position, the lower end of the lever tends to be forced back to the right under the action of springs 48 and 50, thereby resulting in what may be called momentary making of contacts 27 and 12. When the force is removed from lever handle 54, lever 52 will snap back to its vertical or OFF position under the action of springs 50 and 48. Therefore, it can be seen that the switch shown in FIGS. 1, 2, 3, 4 and 5 has a stable OFF position, a maintained or locked ON position and a momentary ON position.

As a variation of the switch shown in FIGS. 3 and 4, a circular hole 44*a* having substantially the same diameter as toggle lever 52 may be formed in slider 42 in place of the elongated hole 44 (see FIG. 4*a*). This hole is positioned near the righthand end of slider plate 42 so that springs 48 and 50 normally bias lever 52 to its extrememost counterclockwise position. In other words, the normal position of such a modified switch would be a locked or maintained ON position. With such an arrangement both the OFF and other throw or ON positions are momentary positions since any clockwise movement of lever 52 from its normal position places it immediately in engagement with the inner periphery of the circular opening in the slider so that the lever is placed under the spring action of springs 48 and 50 which tend to return the lever to its extreme counterclockwise or ON position.

FIGS. 6, 7 and 8 show various configurations of slideable plates which may be substituted for slideable plate 42 in order to provide the toggle switch with a momentary contact in both throw or ON positions. For example, in FIG. 6 a slider plate 84 is placed on the cover plate 38. The plate has lateral projections 86 and 88 and transverse projections 90 and 92. Instead of two coil springs, four coil springs 94, 96, 98 and 100 are disposed on cover plate 38 with springs 94 and 96 acting in one direction on slider 84 and springs 98 and 100 acting in the opposite direction on slider 84. A circular aperture 102, rather than an elongated aperture is formed in slider 84 so that movement of toggle lever 52 in either direction is resiliently opposed by one pair of the four springs. Therefore, it can be seen that while

the OFF or vertical position of lever 52 is stable, movement of lever 52 to either of its ON positions is opposed by the resilient action of the springs so that only a momentary contact is made in either ON position.

In FIG. 7 the slider plate 104 has a Z-shaped configuration. Spring 106 opposes movement of slider 104 to the left while spring 108 opposes movement of slider 104 to the right. Once again, it can be easily seen that while the OFF position of lever 52 is stable, the two ON positions are of the momentary action type.

In FIG. 8 the slider plate actually takes the form of two separate portions 110 and 112 disposed on cover plate 38 on either side of the lever 52. A pair of springs 114 and 116 are disposed in the channel defined by the two plate portions 110 and 112. Once again, it can be easily seen that the springs act to maintain lever 52 in a stable vertical or OFF position while movement of toggle 52 in either the counterclockwise or clockwise direction is opposed by the action of one of the springs 114 or 116 so that both ON or contact-making positions of the switch are of the momentary action type.

It is to be remembered that even though much of the foregoing description of the operation of the switches refers only to the interaction of toggle lever 52 and contact arm 26 that the same description may be applied to the interaction of the toggle 52 and contact arm 26*a*.

From the foregoing description of the structure and operation of a preferred embodiment of this invention, it is apparent that a toggle switch has been provided which not only has at least one momentary ON or contact-making position but which may also be easily converted by utilizing various configurations of the slider plate to a toggle switch having two momentary ON positions or such other mode of operation that is desired. In addition, it is clear that the described structure is economical and reliable in operation.

As will be apparent to persons skilled in the art, various modifications and adaptations of the structure above described will become readily apparent without departure from the spirit and scope of the invention, the scope of which is defined in the appended claims.

I claim:

1. A switch comprising a casing including a base, a fixed contact mounted on said base, a contact arm movably mounted on said base for engagement with said fixed contact, a lever pivotally mounted in said casing above said contact arm, a lower extension on said lever normally engaging said contact arm to effect movement thereof, a slideable plate carried by said casing and having therein an aperture through which said lower extension passes, and spring means carried by said casing for resiliently opposing movement of said slideable plate in at least one direction whereby movement of said lower extension in said one direction causes it to engage the inner periphery of said aperture and move said plate in said one direction, thereby moving said contact arm relative to said fixed contact.

2. The switch as defined in claim 1 wherein said slideable plate is substantially rectangular and said aperture extends to the opposite ends of said plate to form effectively two parallel, separate plate portions defining a channel therebetween, said spring means comprising a pair of springs disposed in said channel, each of said springs having one end thereof in engagement with said lower extension and the other end thereof in engagement with said casing so that movement of said lower extension in each lateral direction is resiliently opposed by one of said springs.

3. The switch as defined in claim 1 wherein said aperture is elongated so that movement of said lower extension in the other direction is unopposed by said slideable plate and said spring means.

4. The switch as defined in claim 3 wherein said slideable plate is T-shaped and has an elongated leg and a transversely extending crossarm, and said spring means

includes two springs disposed on either side of said leg and in engagement with said crossarm to urge said plate in said one direction.

5. The switch as defined in claim 1 wherein the lateral dimension of said lower extension is substantially identical to the lateral dimension of said aperture at the point at which said extension passes through said aperture, said spring means also opposing movement of said slideable plate in said other direction so that movement of said extension in either direction is resiliently opposed by said spring means.

6. The switch as defined in claim 5 wherein said spring means includes four laterally extending springs and said slideable plate has a portion extending transversely thereof, two of said springs being disposed to exert lateral, opposing forces on opposite sides of one transverse end of said portion and the other two of said springs acting in a similar manner on the other transverse end of said portion.

7. The switch as defined in claim 5 wherein said plate has a laterally extending portion with offset portions extending from either end thereof in opposite transverse directions, and said spring means comprises two laterally disposed springs each engaging a corresponding offset portion so that movement of said plate in each lateral direction is resiliently opposed by one of said springs.

8. A toggle switch comprising a casing including a base, fixed contacts mounted on said base, a contact arm pivotally mounted on said base, a toggle lever pivotally mounted in said casing above said contact arm, said lever being laterally movable in two directions, a spring-biased lower extension of said lever normally engaging one end of said contact arm, a laterally slideable plate carried by said casing and having therein an aperture through which said lower extension passes, said slideable plate being T-shaped and having a laterally extending leg and a transversely extending crossarm, a pair of coil springs carried by said casing and disposed on either side of said leg in engagement with opposite transverse ends of said crossarm to urge said plate in said one direction, the inner periphery of said aperture normally resiliently engaging said lower extension so that in the normal position thereof it rotates said contact arm to place said one end of said contact arm into engagement with a corresponding one of said fixed contacts under the locking action of said toggle lever and said spring-biased lower extension, whereby movement of said extension in said other direction is resiliently opposed by said springs so that momentary contact is made between the other end of said contact arm and another corresponding one of said fixed contact.

9. A double-throw toggle switch comprising a casing including a base having secured thereto three longitudinally spaced, aligned pairs of fixed contacts, a pair of V-shaped contact arms each having fixed on each end thereof a contact button, each arm being supported at spaced points on a corresponding one of the central pair of said fixed contacts, a toggle lever mounted in said casing above said base, the lower end of said toggle lever normally resiliently engaging said contact arms at the point of the V intermediate the spaced support points, a cover plate mounted in said casing above said switch arms and having a longitudinally extending, elongated opening therein through which said lever passes, a substantially T-shaped slideable plate disposed on said cover plate and having a longitudinally extending leg and a transversely extending crossarm, a pair of springs disposed on said cover plate on either side of said leg, each spring having one end engaging said casing and the other end engaging said crossarm thereby biasing said slidable plate in one direction, whereby movement of said toggle lever in said one direction causes the lower end thereof to move longitudinally within the slot in said cover plate and in said slideable plate to rotate said contact arms about one of the spaced support points so that the contact buttons on one end thereof engage their corresponding end pair of fixed contacts, and movement of said toggle lever in the other direction causes the lower end thereof to move said slideable plate against the force of said pair of springs and rotate said contacts arms about the other of the spaced support points so that the contact buttons on the other end thereof make contact with their corresponding end pair of fixed contacts.

10. The switch as set forth in claim 1 wherein a cover plate is fixedly mounted on said switch housing above said contact arm, said cover plate being apertured to receive said lever, and said spring means and said slideable plate are supported on said cover plate.

11. A switch comprising a casing including a base, a fixed contact mounted on said base, a movable contact mounted on said casing for engagement with said fixed contact, a movable contact actuator mounted on said casing to effect movement of said movable contact toward and away from said fixed contact, a slideable plate carried by said casing and engageable with said actuator for movement therewith, said plate being independent of said movable contact and spaced therefrom throughout its range of movement with said contact actuator, and spring means carried by said casing for resiliently opposing movement of said slideable plate in at least one direction of movement.

12. A switch comprising a casing including a base, a fixed contact mounted on said base, a movable contact mounted on said casing for engagement with said fixed contact, a movable contact actuator mounted on said casing to effect movement of said movable contact toward and away from said fixed contact, a slideable plate carried by said casing and engageable with said actuator for movement therewith, said plate being T-shaped and having an elongated leg and transversely extending crossarm, a spring disposed on each side of said leg and in engagement with said crossarm to urge said plate in one direction of movement, each said spring being supported by said casing.

13. A switch comprising a casing including a base, a fixed contact mounted on said base, a movable contact mounted on said casing for engagement with said fixed contact, a movable contact actuator mounted on said casing to effect movement of said movable contact toward and away from said fixed contact, a slideable plate carried by said casing and engageable with said actuator for movement therewith, said plate having a laterally extending portion with offset portions extending from either end thereof in opposite transverse directions and two laterally disposed springs each engaging a corresponding offset portion whereby movement of said plate in each lateral direction is resiliently opposed by one of said springs, each said spring being supported by said housing.

14. A switch comprising a casing including a base, a fixed contact mounted on said base, a movable contact mounted on said casing for engagement with said fixed contact, a movable contact actuator mounted on said casing to effect movement of said movable contact toward and away from said fixed contact, a mover plate supported on said switch housing above the contacts, a slideable plate supported on said cover plate and engageable with said actuator for movement therewith and spring means supported by said plate for resiliently opposing movement of said slideable plate in at least one direction of movement.

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