Jan. 22, 1963 C. J. IACCARINO 3,075,062

TOGGLE SWITCH

Filed Feb. 2, 1960

Fig. 1

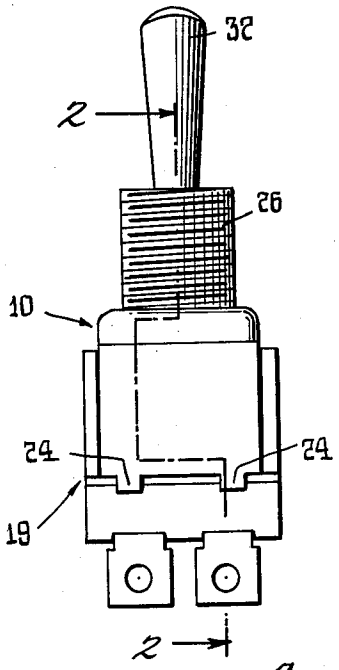


Fig. 2

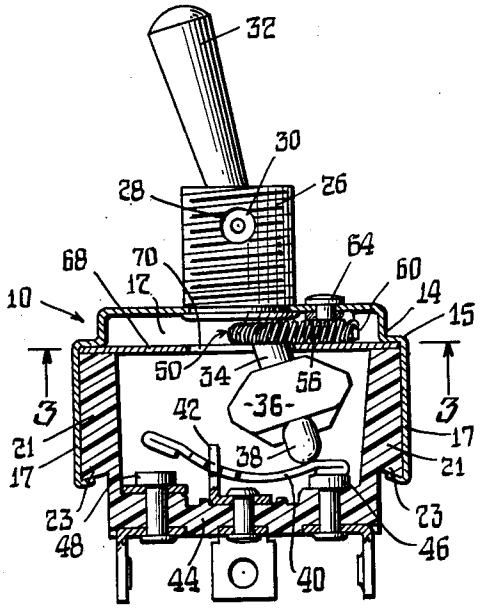


Fig. 4

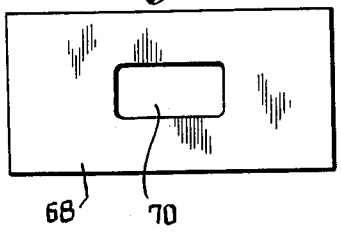
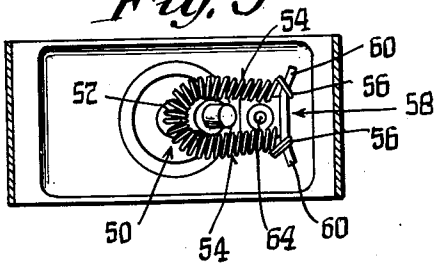


Fig. 3



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TOGGLE SWITCH

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This invention relates to small electric switches, and more particularly to electric toggle switches of the type wherein the pivotal movement of a manually operable lever is utilized to actuate the switch blade for effecting the switching.

The invention is concerned especially with a combination switch and spring means provided for the purpose of biasing the switch operating arm to one end position, whereby the switch may be either of the normally-open type or else the normally-closed type.

In the past various types of biasing or return springs have been utilized to maintain small toggle switches either in their normal open or else normally closed positions. While as a rule these springs have proved to be generally satisfactory from the functional or operating standpoint, they usually involved complicated or unusual shapes or configurations which required special equipment and tooling in order to provide for their fabrication. Moreover, where springs of special shape were utilized, the departure from the conventional helical shape involved special bends, sharp corners and the like which often constituted a source of failure after a period of use. Further, the use of springs having special shapes or configurations at times resulted in more difficult assembly operations, thereby increasing the ultimate cost of the product.

The above disadvantages and drawbacks of prior toggle-switch spring biasing means are overcome by the present invention, and one object of the invention is to provide a novel and improved combination toggle-switch and spring or biasing means therefor, which utilizes without unduly large space requirements a simple, standard form of helical coil spring such as is produced in large volume on conventional spring fabricating equipment.

A further object of the invention is to provide an improved combination toggle switch and spring biasing means in accordance with the foregoing, wherein a relatively long, active length of helical coil spring is available while still requiring but a relatively small space to accommodate the spring, thereby resulting in an extremely compact switch construction.

A still further object of the invention is to provide an improved combination toggle switch and biasing spring means as above set forth, wherein the spring action involves only the normal stretching and angular opening movement of the coil convolutions in a manner such that no portion of the coil spring is unduly stressed or strained in an unusual manner so as to cause an ultimate failure of the spring.

A feature of the invention resides in the provision of a novel combination toggle switch and biasing spring means as outlined, wherein a soft and desirable yet firm and positive spring action is had at all times, making for positive and reliable actuation of the switch parts.

Yet another feature of the invention resides in the provision of an improved combination toggle switch and helical biasing spring means, wherein the assembly of the spring to the switch arm may be easily and quickly effected.

Other objects of the invention are to provide a novel toggle switch and return spring construction which is extremely simple, involves relatively few components which may be readily fabricated and assembled, and which is

economical in construction and reliable throughout an extended period of use.

Other features and advantages will hereinafter appear.

In the drawings accompanying this specification, similar characters of reference indicate corresponding parts wherever possible in the several views, in which:

FIG. 1 is an end elevational view of an improved spring-biased toggle switch as provided by the invention.

FIG. 2 is a vertical sectional view, taken on the line 2—2 of FIG. 1.

FIG. 3 is a transverse sectional view, taken on the line 3—3 of FIG. 2.

FIG. 4 is a plan view of a spring retainer plate as utilized in conjunction with the improved helical coil spring organization.

Referring to FIGS. 1–3, the toggle switch construction shown therein comprises a housing part designated generally by the numeral **10**, said housing part having a generally flat and rectangular dished portion **12** constituting a spring enclosure as will be hereinafter explained. One pair of oppositely disposed edge portions of said spring enclosure have reverse bends **14** and **15** by which there is formed a socket means for a spring retainer plate, as will be shortly described. The housing part **10** has opposite parallel depending wall portions **17** joined to the bends **15** and constituting attachment means for securing a switch case **19** to said part. As seen in FIGS. 1 and 2, the switch case **19** is in the form of a small rectangular open-sided box having end walls **21** provided with external shoulders **23** arranged for engagement with inwardly bent tabs **24** provided on the depending wall portions **17**. By such organization the switch case **19** is rigidly secured to the housing part **10**.

For the purpose of mounting the housing part **10** and switch case **19** on a supporting means such as an apertured wall, there is provided the usual mounting barrel **26** secured at one end in a central aperture of the dished portion **12** of the housing part **10**. The mounting barrel **26** has a pair of transverse bearing apertures **28** accommodating a pivot pin **30**, which latter passes through a switch operating lever **32** disposed within and passing through the barrel **26**.

Within the switch case **19** the switch operating lever **32** has a projecting arm portion **34** on which there is mounted a carrier member **36**, preferably constituted of insulating material, said member having a spring charged plunger **38** engaging a metal switch arm **40** pivotally carried by an angle-shaped bearing bracket **42** secured to the bottom wall **44** of the switch case **19**. The switch arm **40** is arranged for alternate engagement with stationary switch contact points **46** and **48**, and as seen in FIG. 2 the arm **40** is engaged with the stationary contact **46** and disengaged from the stationary contact **48**.

It will be understood, considering FIG. 2, that the switch operating lever **32** may be swung in a clockwise direction from the position shown in the figure to a symmetrically disposed opposite position wherein the plunger **38** will engage the other end of the switch arm **40**, thereby effecting a counterclockwise swinging movement of the switch arm and causing the latter to become disengaged from the stationary contact **46** and engaged with the stationary contact **48**. Thus, the circuit through the contact **46** will be broken whereas the circuit through the contact **48** will be made.

In accordance with the present invention, in conjunction with the toggle switch construction as above set forth there is provided a novel and improved, simplified biasing means which is economical to fabricate and incorporate in the switch construction, requiring relatively little space, and which provides a desirable return spring action and is extremely reliable in its functioning throughout an extended period of use. Considering FIGS. 2 and 3, the

simple biasing spring provided by the invention is in the form of a helical coil which has roughly the shape of the letter U. The said helical coil is designated by the reference numeral 50, and has a middle yoke portion 52 together with a pair of oppositely disposed leg portions 54, the latter terminating in attachment loops or eyes 56 such as are usually provided at the ends of a helical extension coil spring. While the return spring 50 is shown in the shape of the letter U, the spring is not fabricated with this configuration but instead is formed in a straight shape, that is, it has an original, tightly coiled accurate helical configuration with a straight axis, the end convolutions terminating in the attachment loops 56.

As seen in FIGS. 2 and 3, the return spring 50 is wrapped or bent around the projecting arm portion 34 of the switch operating lever 32, and the two ends of the spring 50 are secured to an anchoring means 58 constituted as an angle bracket having a pair of oppositely extending arms 60 which make a large obtuse angle with respect to each other. The two loops 56 of the spring 50 are slipped over the arms 60 of the anchoring bracket 58, with the spring 50 disposed around the projecting arm 54 of the switch operating lever 32, as shown in the figures. In so doing, the spring 50 is stretched to an extent, whereby the adjoining convolutions are spaced apart or from each other a slight distance, except at the middle yoke portion, wherein the inner sides of the convolutions are in engagement with each other whereas the outer sides are more widely spaced apart.

I have found that, contrary to what might be expected, the U-shaped helical coil spring 50 which was originally formed in a straight configuration will be retained in the U-shaped position as shown without any special retainer means being provided on the arms 60 of the anchoring bracket 58, due to the stretch which the spring experiences, in conjunction with the snug fit provided between the loops 56 and the arms 60. The said fit need not be especially tight, but is of the type known as a "sliding fit." However, the loops or eyes 56 are originally not bent at right angles to the remainder of the coil convolutions but instead make an acute angle with respect to such convolutions, whereby the eyes will frictionally seize, by virtue of their angular disposition, the arms 60 of the anchoring bracket 58. By such organization, the end portions of the spring 50 are retained on the anchoring bracket, and such retention is further facilitated by giving the anchoring arms a slight angular disposition whereby they make the large obtuse angle with respect to each other as shown in FIG. 3. The anchoring bracket 58 may be secured to the housing part 10 in any suitable manner, as by the rivet 64 shown.

It will be understood that the action of the return spring 50 is to normally yieldably hold the switch operating lever 32 in the angular position illustrated in FIGS. 2 and 3. However, when the lever 32 is subjected to an actuating force tending to swing it in a clockwise direction, the spring 50 will permit such swinging movement of the lever, this resulting in an extension of the spring and a spreading apart of the convolutions thereof.

In connection with such action it will be noted that even though the U-shaped spring 50 occupies but little space, it has an appreciable active or effective length and a relatively large number of convolutions, whereby there is obtained a soft spring action, which prevents permanent distortion of the spring, and permits the operating lever 32 to be readily actuated in a clockwise direction as viewed in FIG. 2.

The return spring 50 will be normally retained in the operative position shown in FIGS. 2 and 3. However, further in accordance with the invention, there is provided a slotted retainer plate 68 having a flat rectangular configuration and a rectangular central opening 70 as seen in FIG. 4, the said retainer plate being disposed within the housing part 10 and against the underside of the return spring 50. The projecing arm 34 of the switch operating lever 32 is passed through the rectangular slot 70 of the plate 68, and the opposite edge portions of the plate rest on the edges of the walls 21 of the switch case 19. The retainer plate 68 is clamped against the said edge portions of the switch case by the adjoining peripheral portions of the spring enclosure portion of the housing part 10, as clearly seen in FIG. 2. The reverse bends 14, 15 of the housing part constitute a socket means for the slotted retainer plate, as shown, whereby the latter is securely held in its operative position against displacement. In this connection the presence of the projecting arm 34 of the switch lever 32 within the slot 70 of the retainer plate will prevent any lateral movement of the said plate at any time. It will be readily seen from an inspection of FIG. 2 that the novel U-shaped coil spring 50 is thus fully enclosed, being contained within the spring enclosure portion 12 of the housing part 10 and being covered by the slotted retainer plate 68 which obstructs and prevents movement of the spring 50 laterally, that is, it prevents any downward movement of the spring as seen in FIG. 2.

It will be seen that the spring means 50 as provided herein may be initially of the conventional helical coil type having end loops such as are commonly provided on such springs, and that the said spring means may be readily fabricated on conventional spring forming equipment. Moreover, the return spring has a relatively long length compared with the space it occupies, and may be easily and quickly assembled to the switch construction. The stresses to which the spring are subjected are those normally expected in a helical coil spring, and since no unusual stresses or strains are encountered the spring is not likely to fail even throughout an extended period of use. The spring has a relatively soft action, resulting in a desirable "operating feel" being imparted to the switch.

Variations and modifications may be made within the scope of the claims, and portions of the improvements may be used without others.

I claim:

1. In a toggle switch construction, a housing part having a mounting barrel attached to it; a switch-operating lever pivotally carried in said mounting barrel and extending through the same, said lever having blade-operating means comprising an arm projecting from one end of the barrel; a stretched helical extension coil spring disposed at the said one end of the barrel and bent roughly into the form of a U, said spring being located within the said housing part and being wrapped around the projecting arm with the middle, yoke portion of the spring engaged with the arm; means anchoring the ends of the coil spring to the said housing part at one side of the projecting arm, thereby to apply a bias to the arm in the direction of the said anchoring means; and guide means engaged with and confining portions of the spring intermediate the ends thereof against lateral movements axially of the said projecting arm.

2. In a toggle switch construction, a housing part having a mounting barrel attached to it; a switch-operating lever pivotally carried in said mounting barrel and extending through the same, said lever having blade-operating means comprising an arm projecting from one end of the barrel; a stretched helical extension coil spring disposed at the said one end of the barrel and bent roughly into the form of a U, said spring being wrapped around the projecting arm with the middle, yoke portion of the spring engaged with the arm; means anchoring the ends of the coil spring to the said housing part at one side of the projecting arm, thereby to apply a bias to the arm in the direction of the said anchoring means; and a slotted retainer plate carried by the housing part, through which the projecting arm passes, said plate extending past and being engageable with one side of the spring to block the latter and limit movement thereof in a direction away from the projecting arm.

3. The invention as defined in claim 2, in which the

housing part has a socket means carrying and positioning the retainer plate.

4. The invention as defined in claim 3 in which there is a switch case, in which the housing part has attachment means by which it is secured to the case, said case having a wall portion abutting the slotted plate to retain the same in the socket means.

5. In a toggle switch construction, a housing part having a mounting barrel attached to it; a switch-operating lever pivotally carried in said mounting barrel and extending through the same, said lever having blade-operating means comprising an arm projecting from one end of the barrel; a stretched helical extension coil spring disposed at the said one end of the barrel and bent roughly into the form of a U, said spring being wrapped around the projecting arm with the middle, yoke portion of the spring engaged with the arm; and means anchoring the

ends of the coil spring to the said housing part at one side of the projecting arm, thereby to apply a bias to the arm in the direction of the said anchoring means, said anchoring means comprising a bracket secured to the housing part and having a pair of arms to which the ends of the spring are secured.

6. The invention as defined in claim 5 in which the arms of the bracket extend in opposite directions and are bent to make a large obtuse angle with respect to each other, said arms passing through end portions of the spring and the angular disposition of the arms facilitating retention of the spring thereon.

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