

July 14, 1964

A. A. BREVICK ETAL

3,141,075

ELECTRICAL SNAP-ACTION SWITCH

Filed May 1, 1963

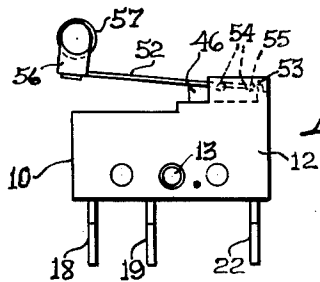


Fig. 1.

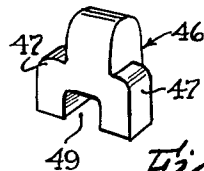


Fig. 8.

Fig. 2.

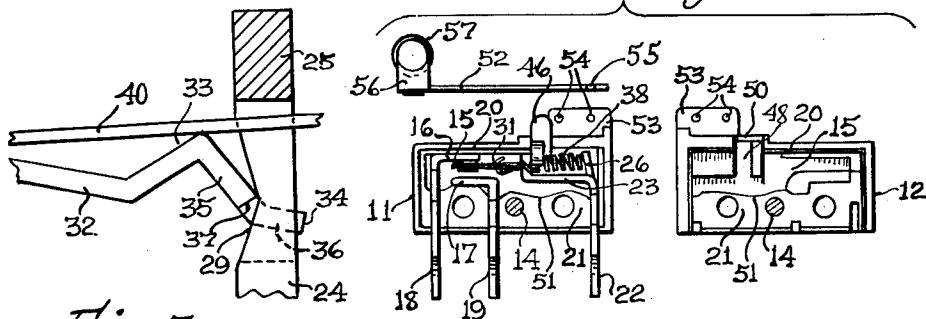


Fig. 7.

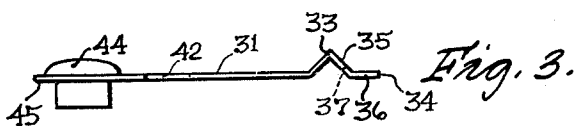


Fig. 3.

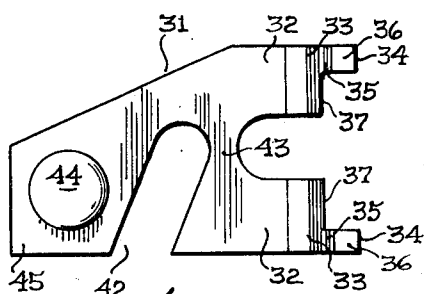


Fig. 4.

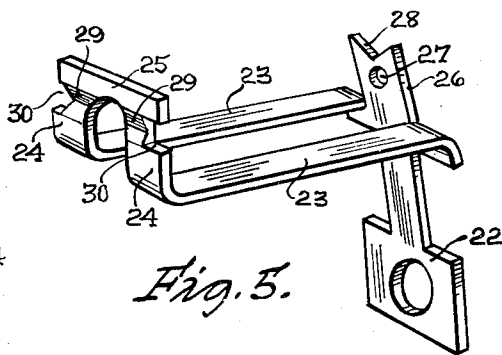


Fig. 5.

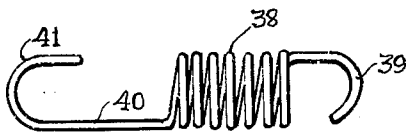


Fig. 6.

INVENTORS.
ARNOLD A. BREVICK &
WALTER L. CHERRY JR.
BY
Shredy & Shredy
THEIR ATTORNEYS.

1

3,141,075

ELECTRICAL SNAP-ACTION SWITCH

Arnold A. Brevick and Walter L. Cherry, Jr., Highland Park, Ill., assignors to Cherry Electrical Products Corp., Highland Park, Ill., a corporation of Illinois

Filed Mar. 1, 1963, Ser. No. 261,998

6 Claims. (Cl. 200-67)

This invention relates to a new and useful improvement in an electrical snap-action switch, and more particularly to a sub-miniature switch utilizing a coil spring over-centering mechanism.

An object of this invention is to provide in a switch of this character an arrangement of parts that are so related to each other and to the switch housing that they require a minimum amount of space without interfering with the switching action.

Another object of this invention is to provide, in a switch of this character, a coil spring over-centering mechanism that requires extremely light operating and switch-contact-releasing forces and provides a maximum amount of overtravel or continued switch actuating movement after the over-centering of the switch contacts without bottoming or damage to the switch mechanism.

A further object of this invention is, in a switch of this character, of a means for connecting an actuating lever in different relations to the switch actuator to vary the force and length of movement required to operate the switch with a snap action.

Yet another object of this invention is an arrangement of parts in a switch of this character which permits the switch housing to be of a minimum thickness while permitting the use of the desired coil spring over-centering construction.

Other objects will appear hereinafter.

The invention consists in the novel combination and arrangement of parts to be hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings showing the preferred form of construction, and in which:

FIG. 1 is a side elevational view of the assembled switch;

FIG. 2 is a side elevational view of the switch showing the housing in opened condition and the relation of each half of the casing with respect to each other and to the internal switch mechanism;

FIG. 3 is a side view of the switch blade;

FIG. 4 is a top plan view of the switch blade of this invention;

FIG. 5 is a perspective view of the combination switch blade pivotal posts and terminal member;

FIG. 6 is a side view of the coil spring as employed in this invention;

FIG. 7 is an enlarged fragmentary side elevational view of the pivotal connection for the movable switch blade of our improved switch; and

FIG. 8 is a perspective view of the switch actuator.

The switch of this invention includes a housing 10 which comprises an inter-locking caved case 11 and cover 12 which are adapted to be joined together by means of a rivet 13 or the like extending through aligned holes 14 formed in each.

Positioned within the cavity 15 of the housing 10, as provided by the caved case 11 and the cover 12, is a horizontally extending first fixed contact 16 and a second horizontally extending fixed contact 17, with each contact having depending leg terminals 18 and 19 respectively extending in spaced parallel relation out of the bottom of the housing 10.

As shown in FIG. 2, the first fixed contact 16 lies in parallel relation with the inner surfaces of the top wall

2

20 of the housing 10 which defines the cavity 15, while the second fixed contact 17 lies in parallel relation with the inner surface of the bottom wall 21 of the housing 10 which defines the cavity 15.

The fixed contacts 16 and 17 are so formed and so positioned as to extend in parallel spaced apart opposite directions with respect to each other and to lie in the same vertical plane adjacent one end of the cavity 15, as seen in FIG. 2.

A third combination terminal and support bracket 22 extends through the bottom wall 21 of the housing 10 in a spaced parallel relation with respect to the terminals 18 and 19. Within the cavity 15 of the housing 10 the bracket portion of the terminal 22 provides a pair of spaced apart horizontally extending supporting bars 23 which terminate into vertically extending pivot posts 24. These pivot posts 24 are joined together by a top member 25 as seen in FIG. 5.

Extending vertically from between the bars 23 and lying in the same general longitudinal plane defined by the terminal bracket 22, is a lug 26. This lug 26 is so constructed as to be slightly angled in the direction of the pivotal posts 24 and to be disposed in the vertical plane extending between such posts 24 as seen in FIG. 5. This lug 26 has formed therein an aperture 27 and has its top edge 28 notched for a purpose hereinafter made apparent.

Each of the pivotal posts 24 has its one surface which faces away from lug 26, notched as at 29. Each of the pivot posts 24 has its outer edge cut out as at 30 through the horizontal plane of the notch 29 as seen in FIG. 5.

A contact-bearing switch blade 31 substantially U-shaped in configuration is formed from an elongated flat blank of material. Each arm 32 of the U-shaped switch blade 31 is V-bent as at 33 out of its normal longitudinal plane. The inner edge portions adjacent the free ends 34 of each of the arms 32 of the U-shaped blade 31, as well as a portion of the reverse leg 35 of the V-bend 33 is notched so as to provide restraining fingers 36.

These restraining fingers 36 extend through the normal longitudinal plane of the blade 31 and will project through the edges notches 30 formed in the pivot posts 24 when the switch blade 31 is pivotally connected thereto. When the blade 31 is pivotally connected to posts 24, the notched edge 37 of each of the reverse legs 35 of each arm 32 will provide a sharp corner which will seat in the vertex of the notch 29 formed in each pivotal post 24, and thus provide a friction-free pivotal connection between the blade 31 and the posts 24.

The switch blade 31 is pivotally connected to the pivot posts 24 through the use of a coil spring 38. This spring 38 is provided at one end with a hook portion 39 while the opposite end is formed to provide an elongated neck 40 which terminates into a hook 41 which extends in a direction opposite to that of the hook portion 39 as shown in FIG. 6. This construction of the coil spring 38 permits the coils thereof to lie intermediate the lug 26 and the pivot posts 24, with the neck 40 extending beneath the cross member 25 and between the pivot posts 24.

The hook portion 39 will sit in the notch 28 and have its free end projected through the aperture 27 formed in the lug 26. The hook 41 will project upwardly through a slot 42 cut diagonally in the switch blade 31 with the neck 40 of the spring extending between the arms 32 of the blade 31 and beneath a bearing portion 43 thereof as shown in FIG. 4.

By this construction of the coil spring 38 we obtain a greater bearing surface between the pivot posts 24 and the notched edges 37 of each of the reversed legs 35 of the arms 32 of the switch blade 31. This larger bearing surface also provides a greater current bearing contact between the pivot posts 24 and the blade 31.

3

The base of the notch 28 formed in the top edge of the stud 26 lies in an elevated plane with respect to the vertex of the notches 29 formed in one face of the pivot posts 24, so that the normal horizontal plane of the coil spring 38, when connected to the switch blade 31 and the lug 26, will be above the horizontal plane of the blade 31, thus tending to overcenter such blade 31 so that the contact 44 carried by the cantilevered end 45 thereof is normally in contact with the first fixed contact 16 as seen in FIG. 2.

Extending through a suitable opening formed in the top wall of the housing 10 is a switch actuator 46. This switch actuator is provided with laterally projecting partial shoulders 47 which are adapted to be slidably contained in guiding grooves 48 formed in the inner faces of the case 11 and cover 12.

The bottom face of the actuator 46 is recessed as at 49. When the actuator 46 is operatively inserted in the housing 10 the coils of the coil spring 38 will sit in the recess 49 formed in the bottom face of the actuator 46 as seen in FIG. 7.

The top of the shoulders 47 of the actuator 46 will engage a lip 50 provided by opposite edges of the case 11 and cover 12 adjacent the opening through which the actuator 46 projects, and thus the complete vertical withdrawal of the actuator 46 from the switch housing 10 will be prevented.

The bottom surfaces of the shoulders 47 to either side of the recess 49 will bottom upon the horizontally extending supporting bars 23 of the supporting bracket 22 when the actuator 46 is caused to be moved normally into the housing 10.

This bottoming of the actuator 46 will prevent damage to the coil spring 38 as well as the switch blade 31. During the actuation of the actuator 46 the coils of the spring 38 are permitted to pass between the supporting arms 23 of the terminal 22 and as the bottom wall 21 which defines the cavity 15 is relieved as at 51, the coil spring 38 will not be damaged by possible engagement therewith when it is caused to be moved downwardly between the arms 23.

This sub-miniature snap-action switch provides a novel arrangement for pivotally mounting an external actuator lever 52. This mounting includes vertically extending ears 53 integrally formed as extensions of the side walls of the case 11 and cover 12 as seen in FIGS. 1 and 2. Each of the ears 53 has formed in confronting faces a series of horizontally aligned detents 54. The actuating lever 52 adjacent one end thereof is provided with laterally extending studs 55, which studs are adapted to be pivotally projected into opposite detents 54 formed in the ears 53. Adjacent the opposite end of the lever 52 there is provided a mounting bracket 56 which rotatably supports a roller element 57.

From the foregoing description of the construction of the mounting for the actuating lever 52, it is readily understandable that such lever 52 may be pivotally connected to the case 11 and cover 12 in either of two positions and thus vary its point of contact with the exposed end of the actuator 46. This selection permits the switch to be assembled in such a manner so that it may be operable through varying degrees of operating forces. When the studs 55 of the lever 52 are positioned in the detents 54 farthest away from the exposed end of the actuator 46 as seen in FIG. 1, the operating force and the distance of travel of the actuating lever 52 is to be considered standard for a switch of this type. If in assembling the switch the studs 55 are inserted in the detents 54 closest to the actuator 46, a high lever ratio of operating force and distance of travel is achieved. The operating force in the latter form of construction is one-third as great as that required in the standard lever ratio, and the distance of travel of the actuating lever 52, in order to cause actuation of the switch, is three times as much as in the standard lever ratio.

4

From the foregoing it is apparent that we have described a sub-miniature snap action switch which permits the use of a coil spring overcentering mechanism which insures a long life for such switch. We have described an inter-locking case and cover which is constructed to permit the attainment of the objects required by this type of switch.

Our improved switch also provides a simple method of pre-determining the required amount of actuating force and distance of travel of the switch actuator through the novel means of pivotally connecting the actuator lever to the switch housing.

While we have illustrated and described the preferred form of construction for carrying our invention into effect, this is capable of variation and modification without departing from the spirit of the invention. We, therefore, do not wish to be limited to the precise details of construction set forth but desire to avail ourselves of such variations and modifications as come within the scope of the appended claims.

Having thus described our invention, what we claim as new and desire to protect by Letters Patent is:

1. A snap-action switch comprising, in combination,
 - (a) a hollow housing having an inter-locking case and cover,
 - (b) an integral terminal and pivot bracket including as a pre-assembled unit a pivotal switch blade and an overcentering mechanism,
 - (c) said bracket having a pair of spaced apart horizontally extending supporting arms,
 - (d) said arms terminating at one end into an elongated terminal having a free end adapted to be projected out of said housing,
 - (e) a lug struck from said bracket from between said arms and extending vertically therefrom in substantially the same longitudinal plane of said terminal,
 - (f) said arms provided at their opposite ends with angularly disposed pivot posts extending in a spaced parallel relation with respect to each other and said lug,
 - (g) said posts having their free ends connected together by a transversely extending cross member,
 - (h) a pivotal switch blade having pivotal connection with one side of said posts along a line extending beneath said cross member and below the free end of said lug,
 - (i) said overcentering mechanism including a coil spring having one end connected to the free end of said lug and its opposite end connected to said blade,
 - (j) said spring having its coils positioned intermediate said lug and said pivot posts and having an elongated neck portion extending between said posts beneath said cross member and under a portion of said blade so that said spring will lie between said arms of said bracket in an elevated horizontal plane with respect to the normal plane of said blade so as to overcenter said blade into a first contact position,
 - (k) a switch actuator movable through said hollow housing in a plane transversely with respect to said spring and engageable with the coils of said spring at a point between said pivot posts and said lug and adapted to move the coils of said spring between said arms into a horizontal plane beneath the point of pivotal connection between said blade and said posts so as to cause said blade to move with a snap-action into a second contact position.

2. A snap action switch as defined by claim 1 wherein said horizontally extending supporting arms are of a length whereby said lug is positioned adjacent one end wall of said housing while said pivotal posts are positioned adjacent the path of said actuator as it moves through said hollow housing, and said inter-locking case and cover each providing guiding recesses extending parallel to said pivot posts for receiving a portion of said actuator so as to guide said actuator as it moves through said housing into engagement with said arms.

5

3. The snap-action switch as defined by claim 1 wherein said cross member connecting the free ends of said pivot posts is engageable by said neck portion of said spring for preventing unlimited pivotal movement of said blade from its normal overcentered position relative to said pivot posts during the assembling of said integral terminal pivot bracket into said hollow housing, and said actuator includes portions extending on either side of the coils of said spring with said portions adapted to bottom on said arms as the coils of said spring are moved therebetween to prevent unlimited movement of said actuator in one direction through said hollow housing.

4. A snap action switch of the structure defined by claim 3 and further characterized by having said horizontally extending supporting arms of a length whereby said lug is positioned adjacent one end wall of said housing while said pivotal posts are positioned adjacent the path of said actuator as it moves through said hollow housing, and said inter-locking case and cover each providing guiding recesses extending parallel to said pivot posts for receiving a portion of said actuator so as to guide said actuator as it moves through said housing into engagement with said arms.

5. In a snap action switch of the type described having a pivotal switch blade and a coil spring over-centering mechanism for pivoting one end of the blade between a first and second switching position within a hollow housing, the combination of

- (a) an integral terminal and pivot bracket for said switch,
- (b) said bracket including spaced apart supporting arms extending in a horizontal plane relative to the pivotal switch blade,
- (c) said arms terminating at one end into a pair of spaced parallel pivot posts extending at right angles to said arms.
- (d) a cross member extending between the free ends of said posts for connecting the same together so as to define a passage therebetween,
- (e) one face of each of said posts provided with a fulcrum line extending beneath and parallel to said cross member and adapted to receive an angle portion of the blade formed intermediate its ends,
- (f) said bracket providing a terminal extending transversely to said supporting arms and adapted to project out of the switch housing,
- (g) an extension provided by said terminal disposed between said arms and extending in spaced vertical relation to said posts and having its free end lying in an elevated plane with respect to the fulcrum line formed in said posts,
- (h) a coil spring connected at one end to the free end of said extension and having an elongated non-coiled

6

end portion extending through the passage defined by said posts and said cross member and connected to the switch blade intermediate its ends,

- (i) said spring lying in an elevated plane extending vertically from and between said arms so as to over-center the switch blade into a first switching position,
- (j) said cross member extending transversely to and engageable with said non-coiled end portion of said spring when said spring is disposed in the passage defined by said posts and said cross member to limit its pivotal movement in a direction away from said arms and to position the switch blade in its first switching position during the assembly of the switch into the hollow housing,
- (k) a switch actuator movable through the hollow housing in a plane transversely with respect to said spring and engageable therewith at a point between said pivot posts and said extension and adapted to move said spring between said arms into a horizontal plane beneath said fulcrum line so as to cause said blade to move with a snap action into a second switching position, and
- (l) means on said actuator disposed to either side of said spring for bottoming on said supporting arms as said spring is moved therebetween to prevent unlimited movement of said actuator in one direction through said hollow housing.

6. A snap action switch as defined by claim 5 wherein said horizontally extending supporting arms are of a length whereby said extension and said terminal are positioned adjacent one end wall of said housing while said pivot posts are positioned adjacent the path of said actuator as it moves through said hollow housing, and said means on said actuator comprising shoulder portions which extend on either side of said spring with said shoulder portions adapted to bottom on said arms when said spring is moved between said arms, and said hollow housing providing guiding recesses therein extending parallelly to said pivot posts for receiving said shoulder portions of said actuator so as to guide said actuator as it moves through said housing into engagement with said arms.

References Cited in the file of this patent

UNITED STATES PATENTS

2,648,234	Lester	Aug. 11, 1953
2,821,587	Cherry	Jan. 28, 1958
3,073,923	Anderson et al.	Jan. 15, 1963
3,098,904	Anderson	July 23, 1963

FOREIGN PATENTS

1,196,660	France	May 25, 1959
-----------	--------	--------------