Dec. 27, 1955 W. A. LAUDER 2,728,826

SNAP ACTION SWITCH

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Fig. 1

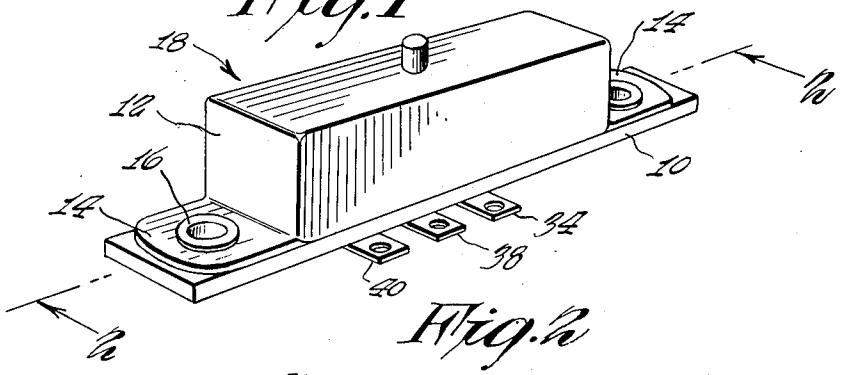


Fig. 2

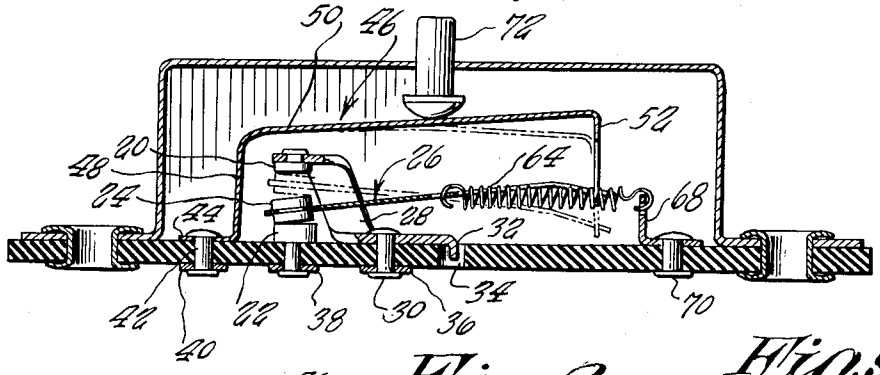


Fig. 3

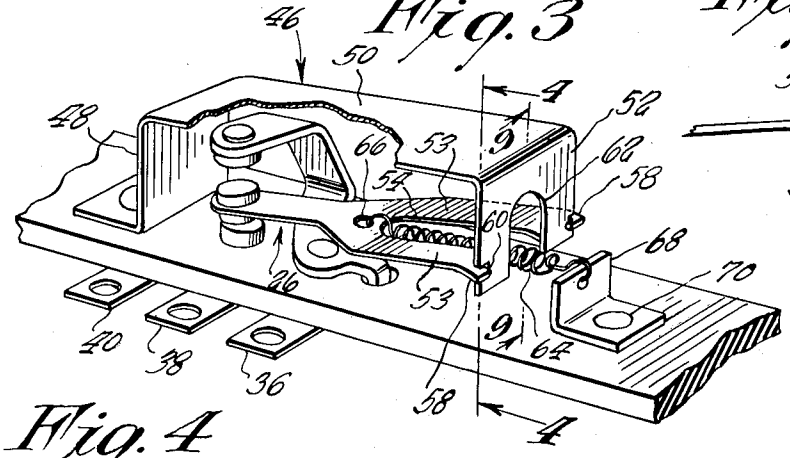


Fig. 9

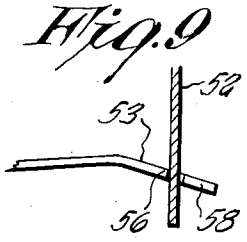
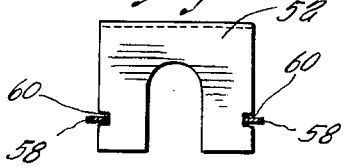


Fig. 4



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Fig. 5

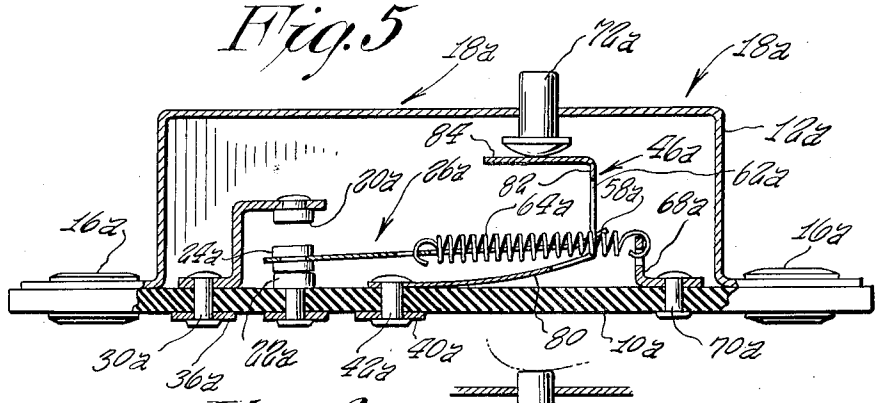


Fig. 6

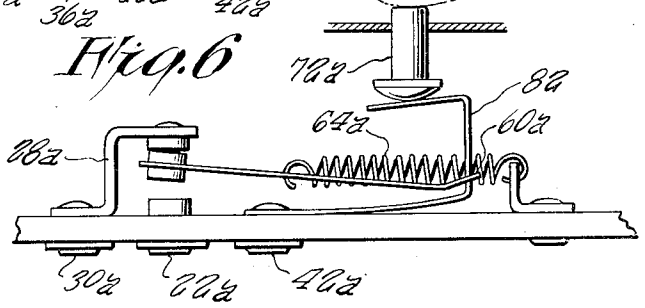


Fig. 7

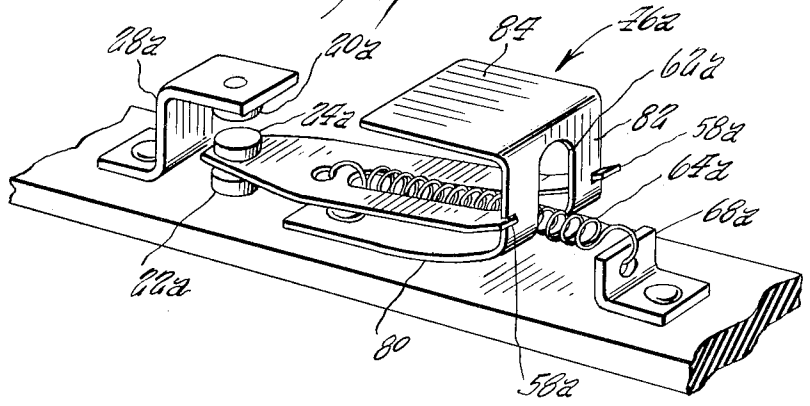
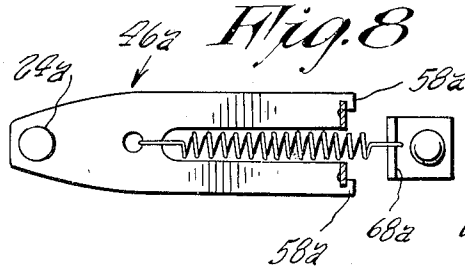


Fig. 8



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SNAP ACTION SWITCH

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Application February 9, 1952, Serial No. 270,783

3 Claims. (Cl. 200—67)

This invention relates to electrical switches of the snap action type, adapted for rapidly making and breaking electrical circuits. More particularly, the invention has to do with precision snap action switches of small and compact construction, requiring a relatively light force to effect operation, yet capable of handling heavy electrical loads in an efficient and practical manner.

Switches of the kind referred to have heretofore commonly included toggle mechanism in which the contact carrying, snap-over member itself embodies one or more leaf spring elements. It is difficult to produce snap-over members of the kind referred to with a desired degree of precision and uniformity.

It is an object of the present invention to overcome these drawbacks by providing a structure in which the snap-over member is a substantially rigid arm acted upon by a simple tension spring of the kind that is elongated by tension, such, for example, as a wire spring composed of coils or other convolutions.

It is accordingly a feature of the invention that the switch is made to comprise the combination with a base and upper and lower spaced stationary abutments carried by the base, at least one of which is a conductive contact, of a movable contact carrying arm having one of its ends disposed between the stationary abutments, a fulcrum member connected to the base and having a fulcrum forming portion for the second end of the movable contact carrying arm, and a tension spring connected at one end to an intermediate point on the movable contact carrying arm and extended from such point of connection in an outward direction away from the stationary abutments, with the outer end of the tension spring anchored to the base, the fulcrum member being operable to carry the fulcrum of the movable contact carrying arm back and forth across the line of pull of the tension spring.

Other objects and advantages will hereinafter appear.

In the drawing forming part of this specification:

Figure 1 is a perspective view of one form of switch embodying features of the invention;

Figure 2 is a view in sectional elevation taken along the line 2—2 of Figure 1, looking in the direction of the arrows;

Figure 3 is a perspective view of the switch of Figure 1, partly broken away, and with the cover removed;

Figure 4 is a detail sectional view showing the fulcrum spring and portions of the movable contact carrying arm, the section being taken upon the line 4—4 of Figure 3, looking in the direction of the arrows;

Figure 5 is a view in side elevation, partly broken away, showing another illustrative form of switch with the parts in their normal positions.

Figure 6 is a fragmentary view in side elevation showing the switch of Figure 5 with the parts actuated to shift the movable contact carrying arm;

Figure 7 is a fragmentary perspective view of the switch illustrated in Figure 5 with the parts in the Figure 5 position;

Figure 8 is a detail horizontal sectional view showing only the movable contact carrying arm and immediately associated operating parts; and

Figure 9 is a fragmentary detail view taken upon the line 9—9 of Figure 3, looking in the direction of the arrows, but upon a larger scale than Figure 3.

The illustrative switch of Figures 1 to 4 comprises a base 10 of insulating material and a cover 12 of insulating material. The cover ends include out-turned ears 14 which are secured to the base by eyelets 16, so that the base and cover jointly form a closed housing or casing 18.

The base 10 has secured upon it upper and lower spaced stationary abutments 20 and 22 between which a contact 24, carried by a substantially rigid arm 26, is movable. As shown, the abutments 20 and 22 are both conductive contacts, although it will be understood that either of them could be made non-conductive or merely left unconnected if desired.

The upper abutment 20 is secured to a stationary conductive bracket 28, the bracket being affixed to the base by means of a conductive rivet 30. A finger 32 formed on the bracket 28 fits into a bore 34 formed in the base and holds the bracket against turning. The rivet 30 conductively engages a terminal bar 36 and clamps the bar against the outer face of the base 10. The abutment or contact 22 is itself a rivet which conductively engages a terminal bar 38 and clamps the bar against the outer face of the base 10. A third terminal bar 40 is engaged by a conductive rivet 42 and clamped by the rivet against the outer face of the base 10.

The rivet 42 is also passed through a horizontal ear 44 of a conductive leaf spring 46 to clamp one end of the spring in fixed position against the base 10. The leaf spring 46 comprises an upstanding segment 48, an actuating segment 50 which overlies the abutments 20 and 22 and the arm 26, and a downturned fulcrum segment 52 which forms a fulcrum for the arm 26.

The arm 26 is forked at its end remote from the stationary abutments 20 and 22, being made to include the two branches 53 which are divided from one another by a deep slot 54. Each branch 53 is bent downward near its fulcrumed end to present a rocking edge 56 for engagement with the fulcrum segment 52. Each branch 53 includes a finger 58 which extends beyond the edge 56 and is received loosely in a notch 60 of the fulcrum segment to retain the fulcrumed end of the contact carrying arm 26 in its proper location. The fulcrum segment 52 is formed with a deep notch or slot 62 in line with the slot 54 of the arm 26.

A tension coil spring 64 is connected at one end to the arm 26 at an intermediate point of the arm, the spring end being hooked through a hole 66 formed in the arm. The spring 64 extends outward along the slot 54, and through the slot 62, and is connected under tension at its outer end to a raised anchoring bracket 68 which is secured in fixed position upon the base 10 by suitable means such as a rivet 70. The spring 64 draws the arm 26 toward the fulcrum segment 52, causing it to bear firmly against the latter at all times.

An actuating plunger 72 is slidingly mounted in the top of the cover 12 to bear against the actuating segment 50 of the spring 46. The parts are illustrated in full lines in Figure 2, and also in Figure 3, in the positions which they normally occupy when no pressure is applied to the plunger 72. The spring 46 maintains the plunger in a raised position, and it also maintains the fulcrum of the arm 26 above the line of pull of the spring 64. As a consequence, the spring applies a counterclockwise moment to the arm 26, causing the contact 24 to bear against the lower fixed abutment or contact 22.

When the plunger 72 is depressed, the fulcrum seg-

ment 52 is forced downward, causing the fulcrum of the arm 26 to be moved downward across the line of pull of spring 64. This causes the spring 64 to apply a clockwise moment to the arm 26 with the result that the arm 26 is snapped clockwise about its fulcrum to carry the contact 24 upward into engagement with the upper stationary abutment or contact 20. The positions of the parts under these conditions is illustrated in dot-and-dash lines in Figure 2.

When the plunger is released, the fulcrum of the arm 26 is moved upward across the line of pull of spring 64, causing the arm 26 to be snapped counterclockwise into engagement with the lower abutment or contact 22.

The circuit functions are self evident, the upper contact being used for a normally open circuit and the lower for a normally closed circuit.

The switch of Figures 5 to 8 is similar in its principle of construction and operation to the switch which has been already described. A base 10*a* and a cover 12*a* are united by eyelets 16*a* to form a housing or casing 18*a* as before. A contact member 24*a* mounted on a carrier arm 26*a* is movable between upper and lower abutments or contracts 20*a* and 22*a*. A tension spring 64*a* has one end connected to an intermediate point on the arm 26*a* and extends outward along a slot formed in the arm. The outer end of the spring 64*a* is connected to a raised anchoring bracket 68*a* which is affixed to the base 10*a* by a rivet 70*a*. An actuating plunger 72*a* is slidingly mounted in the top of the cover 12*a* as before.

A fulcrum and switch actuating leaf spring 46*a* is secured at one end to the base 10*a* by means of a conductive rivet 42*a*, which rivet also engages a terminal bar 40*a* and clamps it to the outer face of the base 10*a*. The spring 64*a* includes a lower segment 80 which extends outward away from the stationary abutments 20*a* and 22*a* beneath the arm 26*a*, but sufficiently spaced from the base 10*a* to permit a desired freedom for operative movement. The spring 64*a* also includes an upwardly extending fulcrum segment 82 formed with a slot 62*a* through which the spring 64*a* passes freely, and with notches 69*a* for receiving fingers 58*a* of the arm 26*a*. The details of connection and cooperation of the arm 26*a* and the segment 82 are desirably the same as those already described with reference to the arm 26 and the segment 52 of Figures 2 and 4. No further description of them will therefore be given.

The spring 46*a* terminates in an inturned actuating segment 84 which is engaged by the plunger 72*a*. The normal position of the parts, maintained by the resiliency of the spring 46*a*, is illustrated in Figures 5 and 7. The plunger 72*a* is normally supported in an elevated position by the spring 46*a*, and the fulcrum of the arm 26*a* is supported above the line of pull of the spring 64*a*, causing the contact 24*a* to be pressed down against the stationary abutment or contact 22*a*.

When the plunger 72*a* is depressed, the parts assume the positions illustrated in Figure 6. The fulcrum of the arm 26*a* is thrust downward across the line of pull of the spring 64*a* and this causes the arm 26*a* to be snapped in a clockwise direction and to carry the contact 24*a* up into engagement with the contact 20*a*.

When the plunger is released the spring resumes its original position, as shown in Figures 5 and 7. As the fulcrum of the arm 26*a* is carried upward across the line of pull of the spring 64*a* the contact 24*a* is snapped down into engagement with the lower abutment of the contact 22*a*.

I have described what I believe to be the best embodiments of my invention. I do not wish, however, to be confined to the embodiments shown, but what I desire to cover by letters patent is set forth in the appended claims.

I claim:

1. A snap switch comprising a base, spaced upper and lower stationary abutment members carried by the base, at least one of which is a conductive contact, a substantially flat movable contact arm having one of its ends disposed between the stationary abutments and its other end forked, a switch actuating fulcrum member in the form of a leaf spring, affixed to said base, said spring having a vertically movable fulcrum segment, said fulcrum segment being forked, the forked elements of the fulcrum member having notches extending therethrough, the forked ends of said contact arm being curved out of the plane of said arm and each having an edge pivotally abutting the fulcrum member along one side of one of the forked elements of said fulcrum segment adjacent one of said notches, each of the forked ends of said contact arm having a finger projecting beyond its said edge through the adjacent notch, segment, spring having an actuating segment, and a tension coil spring connected at one end to an intermediate point on the movable contact arm and extending outward from said point between the branches of the forked end of said arm and between the forked portions of said fulcrum member and having its opposite end connected to a fixed point on said base, the fulcrum member being movable to carry the point of pivotal engagement between said contact arm and said fulcrum segment laterally across the longitudinal axis of said spring, said spring being tensioned to maintain a pivotal engagement between said contact arm and said fulcrum segment, said fulcrum member having an actuating segment engageable to move the fulcrum member.

2. A snap switch comprising a base, spaced upper and lower stationary abtument members attached to the base, at least one of which is a conductive contact, a leaf spring clamped to said base, said leaf spring having an upstanding segment extending substantially vertically above said base, an actuating segment connected to said upstanding segment, and a second vertical fulcrum segment extending substantially vertically downward from said actuating segment toward said base, said fulcrum segment being forked to form two branches divided from one another by a slot, a substantially rigid arm having a contact adjacent one end thereof with the opposite end of said arm being forked to form two branches divided from one another by a deep slot, with each of said branches having means forming edges, each of said edges having a rocking engagement with one of the first-mentioned branches along one side thereof, and with the contact on said arm positioned intermediate said abutment members, means forming fingers on said branches of said arm, said fingers extending through the first-mentioned branches adjacent the points of rocking engagement of said fulcrum segment with said arm, a tension coil spring connected at one end to said arm at an intermediate point on said arm, the opposite end of said spring being connected to said base to maintain said spring in tension, with said spring extending through both of said slots, said leaf spring being movable to move the point of rocking engagement between said arm and said fulcrum segment laterally across the longitudinal axis of said coil spring by exerting pressure on said actuating segment.

3. A snap switch comprising a base, spaced upper and lower stationary abutment members attached to said base, at least one of said abutment members being a conductive contact, a leaf spring clamped to said base, said spring having an upstanding segment extending substantially vertically from said base, and an actuating segment connected to said upstanding segment, said upstanding segment being forked to form two branches divided from one another by a slot, a substantially rigid arm having a contact adjacent one end thereof with the opposite end of said arm being forked to form two branches divided from one another by a deep slot, with each of said branches having means forming edges, each of said edges having a rocking engagement with one of the first-mentioned branches along one side thereof, and with the contact on said arm positioned intermediate said abutment members, means forming fingers on said branches of said

arm, said fingers extending through the first-mentioned branches adjacent the points of rocking engagement of said fulcrum segment with said arm, a tension coil spring connected at one end to said arm at an intermediate point on said arm, the opposite end of said spring being connected to said base to maintain said spring in tension, with said spring extending through both of said slots, said leaf spring being movable to move the point of rocking engagement between said arm and said fulcrum segment laterally across the longitudinal axis of said coil spring by exerting pressure on said actuating segment.

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