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SNAP SWITCH

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1 Claim. (Cl. 200—76)

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This invention relates to electrical switches and more particularly to momentary contact switches used to limit the travel of some electrically operated device, and impart periodic or continuous motion to a motor.

The primary object of this invention is to provide a two-position switch which includes an adjustable leaf spring for making and breaking contact therein.

Another object is to provide a leaf spring for a momentary contact switch which includes thereon contacts which impart a wiping action to their mating contacts under the action of the spring when making or breaking the contacts.

A further object is to provide a leaf spring including corrugations at its outer edges to permit rapid adjustment of the tension therein with standard tools.

A still further object is to provide a plunger, for operating the leaf spring, which is threaded to receive an external coil spring to prevent overtravel of the plunger with resultant damage to the switch.

Yet another object is to provide a two-position switch which is easily converted from a momentary contact switch to a positive acting switch.

These and other objects will be apparent from a perusal of the following specification and drawing, in which:

Figure 1 represents a top plan view of the assembled switch.

Figure 2 represents a sectional elevational view of the switch taken along the lines 2—2 of Figure 1.

Figure 3 represents an end view of the switch shown in Figure 1.

Figure 4 is a detail plan view of the leaf spring of this invention.

Figure 5 is a detail elevational view of the spring of Figure 4.

Figure 6 is a detail elevational view of the plunger of this invention.

Figure 7 represents a modified plunger for use in installations where momentary contact is not desired.

Figure 8 represents a modified plunger for use in this switch where an external spring is not required.

Referring now more particularly to the characters of reference on the drawing, numeral 1 represents the two-section housing of nonconducting material which encloses the operating mechanism of this switch. The two separating sections 1a and 1b of this housing are held together by through bolts 2 and nuts 3 which fit

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into their respective recesses 4 in the outer surface of the housing. The matching surfaces of these sections come together snugly in a plane represented by the line 5 in Figures 1 and 3. Adjacent this line at the top and bottom of the housing indentures 6 are formed to receive removable terminals 7 and 7a for connecting electric leads to this switch. Terminals 7 at the top of the housing are connected to leads when it is desired to provide a "normally off" switch and bottom terminals 7a are connected when it is desired to provide a "normally on" switch as will be subsequently explained. Sections 1a and 1b, comprised of relatively thin walls 8, combine to form an enclosed recess 9 in which the switch mechanism operates.

Plunger 10 (also of insulating material) extends centrally through opening 11 of upper boss 12 at the top of housing 1 and into a recess 13 of a lower boss 14 at the bottom of the housing. Plunger 10 includes a threaded section 15 which receives coil spring 16 which surrounds the upper neck 17 of the plunger and acts as a buffer to prevent damage to the switch or plunger due to overtravel of the actuating mechanism which trips this limit switch. The lower end 18 of the plunger is drilled as at recess 19 to receive a smaller coil spring 20 to normally maintain the plunger in a raised position. A square section 21 is formed on the plunger near its lower end, and a central section 22 just above it extends upward to groove 23 which, together with groove 24 in boss 12, forms a means for seating sealing boot 25 which is present to prevent dirt or grease from entering the interior of the switch. Square section 21 is slotted as at 27 on two opposite sides to receive the free ends 28 of arms 29 on leaf spring 30.

Plunger 50 is one modification of plunger 10 wherein a rubber tip 55, including an indentation 56, is secured to the top portion of neck 17a by means of a cementing material 57. When this plunger is installed in housing 1 the spring 20 is not used and the switch then becomes a positive acting, two-position switch which is pushed down to engage contacts 34 and 42, and pulled up to engage contacts 35 and 43. Plunger 60 represents another modification wherein the neck and threaded section are removed and a knob 65 is above groove 23b. This plunger 60 may be employed for momentary contact in a manually controlled or other circuit where there is no danger of damage to the plunger or switch. It will be observed that the plunger 10 easily

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could be converted to either of the modified types 50 or 60 with a minimum of effort.

Leaf spring 30 may be stamped in one operation from a single strip of metal and includes cantilever type arms 29 which extend inwardly from either side but terminate short of the center. Outer strips 31 connect the end sections 32 and are corrugated by a special die. Silver contacts 34 and 35 are attached to end sections 32 on opposite sides. Contacts 34 are welded to the top side of the leaf spring 30 in a longitudinal direction and contacts 35 are welded to the underside of the spring in a transverse direction.

Terminals 7 and 7a include a central threaded section 40 to receive terminal screws 41 and 41a. The upper terminals 7 have a transverse contact 42 at the underside thereof to engage upper longitudinal contacts 54 when the switch has been thrown. The lower terminals 7a include longitudinal contacts 43 which normally engage transverse contacts 35 of spring 30.

When assembled for operation, as represented in Figure 2, arms 29 engage slots 27 of plunger 10. It is to be noted that the distance between the slots 27 of the plunger 10 is wider than the space between the ends 28 of arms 29 in the plane of the leaf spring 30. This feature causes the arms 29 to be placed in compression and the outer strips 31 to be placed in tension and insures a positive over center snap in each direction of movement of the leaf spring. The spring 20 engages recess 19 and forces the plunger 10 upwardly until the top side of square section 21 strikes the underside of boss 12. This action causes arms 29, being under compression, to exert a downward force and firmly engage contacts 35 with contacts 43. When plunger 10 is forced downwardly by an external pressure on spring 16 sufficient to overcome the upward pressure of spring 20, arms 29 pass below the plane of leaf spring 30 and the leaf spring is tripped and arms 29 then point upwardly from grooves 27 and apply an upward pressure and force contacts 34 into engagement with contacts 42. Since the matching contacts are positioned crosswise to each other, and since corrugated strips 31 expand lengthwise during the tripping action which takes place when arms 29 are moved, there results a wiping action between the contacts which prevents the accumulation of carbon thereon.

When electrical leads (not shown) are connected to the lower terminals 7a, spring 20 and leaf spring 30 cooperate to cause the contacts 35 and 43 to be engaged when the plunger is in its normal position. However, when spring 16 and plunger 10 are depressed sufficiently to snap the leaf spring and cause contacts 34 and 42 to be engaged, the switch is in its "momentarily off" position. As long as sufficient pressure is applied to the plunger to depress spring 20 the contacts 42 and 34 will remain engaged, and since there are no leads connected to terminal 7, the switch will not transmit any current. When the external pressure is released, spring 20 will return the plunger 10 to its "normally on" position. If electrical leads are connected to the upper terminals 7 by means of terminal screws 41, there will be no current transfer until the plunger 10 has been depressed and contacts 34 and 42 are momentarily engaged. When this connection is employed, the switch will be in its "normally off" condition.

Spring 16 may be as long as desired, and it will be observed that an electrically actuated

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mechanism will be able to strike the spring 16 and compress it sufficiently to cause plunger 10 to move down and trip leaf spring 30 without ever touching plunger 10 directly, and of course, when the leaf spring 30 has separated contacts 35 and 43, the electric power to the actuated mechanism will be interrupted and no further travel on its part may take place.

In the modified embodiment employing plunger 50, leads may be connected to either terminals 7 or 7a since the switch will operate equally well in either direction when used as a positive acting switch. In another embodiment embodying the plunger 60, the switch may operate as "normally on" or "normally off" and the plunger must be held down manually for the intended operation as spring 20 will return it to its extended position when released. A sealing boot or bellows 25 is employed with each plunger to prevent entry of foreign matter around the plunger.

Adjustment of the leaf spring of this switch may be accomplished readily and accurately by employing a pair of pliers to compress the two sides 46 of a single corrugation hump such as 45 of corrugated strip 31. By compressing a hump on each strip 31 the distance between end sections 32 will be shortened, and also the arms or stiff legs 29 will have their ends 28 moved closer together. When the arms 29 are installed on plunger 10, as they will be when ends 28 are placed in grooves 27, the tension in strip 31 will be greater than before and therefore the pressure required to push plunger 10 down will be increased. On the other hand, if the two sides 46 are separated the tension of strips 31 will be less when assembled and it will require less pressure to depress plunger 10. The use of contacts in transverse relation will permit considerable adjustment of spring 30 and even will allow for misalignment of the contacts.

From the foregoing description it will be readily seen that there has been produced such a device as substantially fulfills the objects of the invention as set forth herein.

While the specification sets forth in detail the present and preferred construction of this mechanism, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention as defined by the appended claim.

Having thus described the invention, the following is claimed as new and useful and upon which Letters Patent are desired:

A snap action switch comprising: an elongated hollow housing; an upper boss on said housing having a central opening therethrough; a lower boss on the housing having a recess therein; an actuating member slidably mounted in said opening and said recess; said housing being divided longitudinally along a plane passing through the axis of said actuating member and into two substantially complementary sections; means extending transversely through said housing sections and tightly securing said housing sections together; a resilient diaphragm connecting said actuating member and said housing to form an airtight seal therebetween; a leaf spring in said housing comprising resiliently extensible outer strips, said outer strips being substantially sinusoidal in cross-section throughout the major portion of their length, opposed inner arms and end sections connecting said strips and arms; said actuating member having a portion disposed between the inner ends of said arms; said portion

having slots for receiving said inner ends for pivotal support thereof and being wider between said inner ends than the space between said ends in the plane of the spring, whereby said inner arms are placed in compression and said outer strips are placed in tension; movable contacts on said end sections; said housing sections having complementary recesses formed in the adjacent faces thereof and on either side of said actuating member and substantially in alignment with said movable contacts; fixed contacts mounted in said recesses; said movable contacts and said fixed contacts disengaging with a wiping action upon over-center movement of said leaf spring; each of said contacts having a long dimension in one direction and a relatively short dimension in a dimension 90° from said one dimension, each of said contacts carried by said end sections being disposed to contact its associated housing contact with its long dimension normal to the long dimension of said associated contact; said actuating member having a recess therein; and a coil spring mounted within the recess in said lower boss and within the recess in said actuating member for biasing said actuating member to non-actuating position.

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