Aug. 31, 1965 H. W. MARANO 3,204,070

MOMENTARY SWITCH USING RESILIENT LEAF SPRING ACTUATOR

Filed Aug. 22, 1963

Fig. 1.

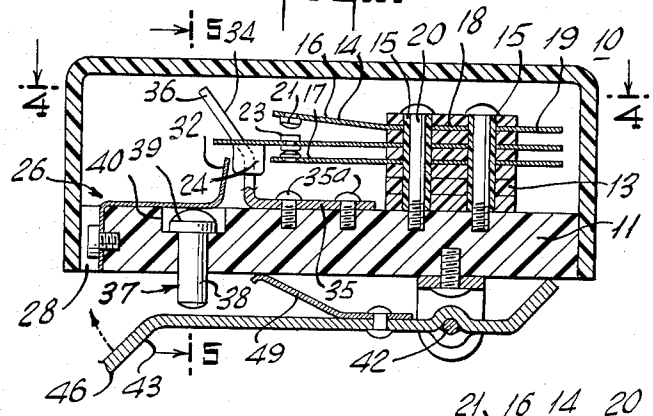


Fig. 5.

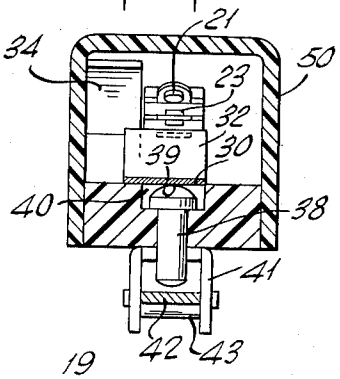


Fig. 2.

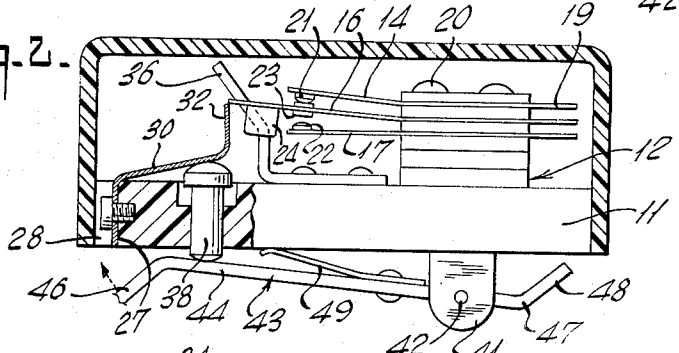


Fig. 3.

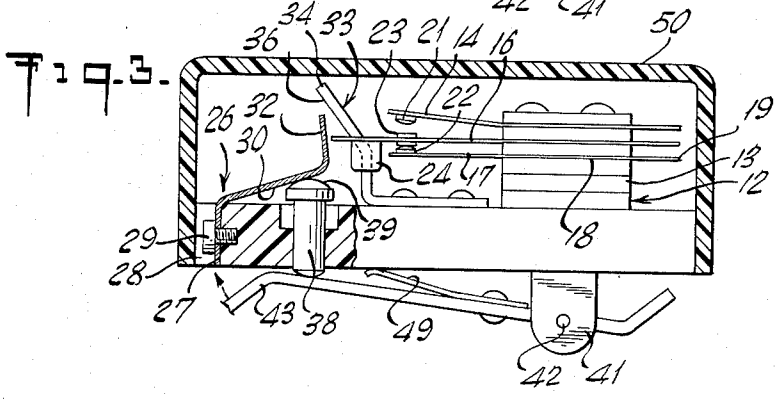
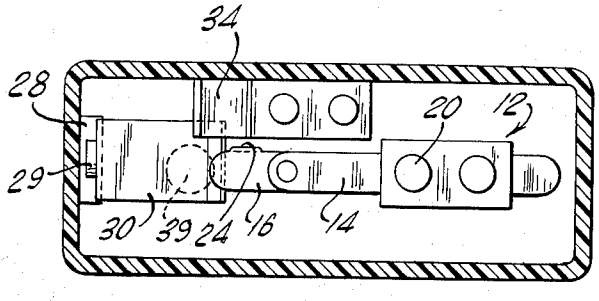


Fig. 4.



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MOMENTARY SWITCH USING RESILIENT LEAF SPRING ACTUATOR

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9 Claims. (Cl. 200—160)

The present invention relates generally to improvements in electric switches and it relates particularly to an improved momentary make or break snap switch.

There are many types of electrical devices or equipment which require the momentary opening or closing of a circuit with the initiation of a condition which may be of extended duration. It has been a common practice to employ electronic circuits or relay systems for effecting such an operation but these expedients possess numerous drawbacks and disadvantages. They are generally complex, bulky and expensive arrangements and are often unreliable and difficult to maintain and to service. While switches of a momentary make or break type have been proposed these have not been generally suitable for use in the operation and automatic cycling of equipment and for high-rate repetitive use and are complex mechanical structures, and otherwise leave much to be desired.

It is, therefore, a principal object of the present invention to provide an improved electric switch.

Another object of the present invention is to provide an electric switch of the momentary make or break type.

Still another object of the present invention is to provide a momentary make or break electric switch capable of high-rate repetitive operation and suitable for use in the cycling control of automatic equipment.

A further object of the present invention is to provide an electric switch of the above nature characterized by its simplicity, ruggedness, compactness, versatility, reliability and low cost.

The above and other objects of the present invention will become apparent from a reading of the following description taken in conjunction with the accompanying drawing, wherein:

FIGURE 1 is a longitudinal vertical sectional view of a switch embodying the present invention, illustrated in normal dormant position;

FIGURE 2 is a view similar to FIGURE 1, the switch being shown in its opposite switch position;

FIGURE 3 is a view similar to FIGURE 2, the switch being shown in its actuated return position;

FIGURE 4 is a sectional view taken along line 4—4 in FIGURE 1; and

FIGURE 5 is a sectional view taken along line 5—5 in FIGURE 1.

In a sense, the present invention contemplates an electric switch comprising a contact element, an elongated resilient switch blade supported at a trailing end thereof and alternatively movable into first and second positions in and out of electrical engagement with said contact element and resiliently biased to said first position, and an actuating member including an arm swingably supported adjacent an end thereof at a point forward of the leading end of said switch blade for movement between an advanced and a retracted position and directed toward said switch blade and terminating at a point transversely spaced from said switch blade in a resiliently supported leg extending toward the free end of said switch blade, said arm being resiliently biased toward said retracted position whereby upon advance of said actuating member said leg is in engagement with and moves said switch blade momentarily to said second position and moves forwardly of and releases said switch blade to return to said first position and upon retraction of said actuating member said leg is urged forwardly to by-pass the leading end of said switch.

According to a preferred form of the present switch, there is provided a base member on which is mounted an upwardly directed support insulator. Upper, lower and intermediate, mutually insulated, vertically spaced resilient switch arms are affixed to and project forwardly from the support insulator and carry registering contact elements, the intermediate arm contact element alternatively engaging the other contact elements, and being normally biased with the intermediate arm into engagement with the lower contact element. The actuating member is located on the base forward of the switch arms and is integrally formed of a resilient material and includes an arm affixed to the base at its trailing end and extending rearwardly and terminating in an integrally formed leg directed upwardly and rearwardly toward the underface of the front end of the intermediate switch arm. A forwardly upwardly inclined cam plate is disposed above the actuating leg, the plane of the cam plate being forward of the leading end of the intermediate switch arm at the level of the leading end thereof when in its raised position and rearward of said leading end when said leading end is in its depressed position. Suitable means are provided for selectively raising the actuating member against the initial biasing thereof.

Referring now to the drawing which illustrates a preferred embodiment of the present invention, reference numeral **10** generally designates the improved switch which comprises a base member **11** formed of a block of insulating material such as any suitable synthetic resin, for example, nylon, polystyrene or the like. Mounted atop base **11** adjacent the rear end thereof is a medially located column support insulator **12** formed of a plurality of stacked rectangular insulator plates **13** provided with longitudinally spaced pairs of vertically aligned openings.

Column insulator **12** supports at its upper section in forwardly directed cantilevered fashion regularly vertically spaced upper, lower and intermediate resilient switch arms **14**, **16** and **17** respectively. Switch arms **14**, **16** and **17** are mutually electrically insulated and each is provided with a trailing section **18** sandwiched between a corresponding pair of insulator plates **13** and having formed therein a pair of spaced openings registering with the corresponding openings in the insulator plates **13**. Trailing section **18** projects rearwardly of the insulator column **13** to define terminal lugs **19** which may be connected to corresponding accessible terminal posts. The switch arms **14**, **16** and **17** and the insulator plates **13** are secured in assembled condition to the base member **11** by a pair of screws **20** provided with insulating sleeves **15** and registering with the openings formed in the plates **13** and switch arms **14**, **16** and **17** and engaging corresponding tapped bores formed in base member **11**.

Intermediate switch arm **16** defines a switch blade which is longer than and thus projects forwardly of the forward ends of upper and lower switch arms **14** and **17**. Depending from a point immediately rearwardly of the leading end of intermediate switch arm **16** is a vertical guide plate **24**. Switch arms **14** and **17** carry adjacent their leading ends downwardly and upwardly directed contact elements **21** and **22** respectively. Intermediate switch arm **16** carries a double-faced contact element **23** in opposing relation to contact elements **21** and **22**. Intermediate and lower switch arms **16** and **17** are resiliently biased toward each other so that contact elements **22** and **23** are normally in engagement and the switch arm

14 is upwardly inclined so that intermediate contact element 23 is normally spaced from upper contact element 21. The upper and lower switch arms 14 and 17 are so disposed that the intermediate switch arm 16 can be moved from its depressed to its raised position to effect disengagement of contact elements 22, 23 and engagement of contact elements 23, 21.

In order to actuate and effect the momentary make or break snap action of switch 10, there is provided an actuating member 26 which comprises a depending front vertical leg 27 registering with a recess 28 formed in the front face of base member 11 and secured to said front face by a screw 29. Extending rearwardly from the upper end of leg 27 and along the top face of the base member 11 is an integrally formed arm 30 which terminates in an upwardly rearwardly inclined leg 32. The upper end or tip of the leg 32 is disposed directly below and directed toward the underface of the free end of intermediate switch arm 16, and is disposed immediately forward of guide plate 24. Actuating member 26 is formed of a resilient material such as spring steel and is swingable about the elbow between the leg 27 and the arm 30 so that the upper tip of the rear leg 32 normally traverses an arcuate path whose lower section is rearward of the lower section of the arcuate path traversed by the leading end of the intermediate switch arm 16 as it swings upwardly and before said contact element 23 engages the upper contact element 21. The upper section of the arcuate path of the tip of leg 32 is disposed forwardly of the upper section of the arcuate path of the forward end of intermediate switch arm 16 following engagement between contact elements 21 and 23 and disengagement between contact elements 22 and 23.

In order to assure disengagement between actuating leg 32 and intermediate switch arm 16, following the raising of the leg 32 and switch arm 16, there is provided a cam member 33 which includes a cam plate 34 having a bottom cam surface 36 which is upwardly and forwardly inclined. Cam plate 34 is mounted on the top face of base member 11 laterally spaced forwardly relative to switch blades 14, 16 and 17 by an integrally formed bracket 35 secured to the base member 11 by suitable screws 35*a*. The plane of cam surface 36 is rearward of the leading end of intermediate switch blade 16 when the latter is in its depressed position and is formed of said leading end when the latter is in its raised position.

Actuating member 26 is operated by means of a plunger 37 having a shank 38 registering with the vertical bore formed in base member 11 in alignment with the rear section of actuating arm 30. Plunger 38 is provided with an upper enlarged head 39 which rests in a well 40 formed in base member 11 beneath actuating arm 30. Depending from and affixed to the rear section of base member 11 is a bracket assembly 41 to which is journalled by means of a pin 42 for swinging about a transverse axis an actuating lever 43. Actuating lever 43 includes a forwardly directed horizontal arm 44, the front end of which immediately underlies plunger 37 and terminates in a downwardly forwardly directed arm 46. In order to limit the counterclockwise movement of lever 43, it is provided with a rearwardly directed arm 47 terminating in an upwardly rearwardly projecting leg 48 which normally bears upon the underface of base 11. A leaf spring 49 has its trailing end affixed to arm 44 and is upwardly inclined toward a leading end thereof bearing on the underface of base member 11 resiliently to urge the actuating lever 43 counterclockwise to a retracted position. The entire switch assembly may be encased in any suitable removable cover member 50 which releasably engages the peripheral wall of base member 11.

Considering now the operation of the improved switch of the present invention, in its normal dormant position switch 10 is in the condition shown in FIGURE 1 of the drawing, with the tip of actuating leg 32 spaced below and in line with the underface of the leading end of intermediate switch arm 16. Upon swinging lever 43 clockwise arm 44 bears against and raises plunger 37 which in turn raises actuating member 26 against the resilient return bias thereof. With the raising of actuating member 26, the upper tip of leg 32 moves into engagement with switch arm 16 thereby to raise switch arm 16 and effect the disengagement of contact elements 22 and 23 and engagement of contact elements 21 and 23. During the upward movement of switch arm 16 and actuating leg 32 their registering ends traverse upwardly diverging arcuate paths. At a point immediately following the engagement of contact elements 21 and 23, the normal position of the tip of leg 32 is forward of the corresponding position of the tip end of blade 16 thus causing the release of switch arm 16 and its return to its initial depressed position in contact with blade 17 and contact 22 thereon. As actuating leg 32 moves upwardly, the tip thereof rides along cam surface 36 which urges the leg tip forwardly to assure its disengagement from the switch arm 16 following the closing of the contacts 21 and 23.

Upon the release of the lever 43 it is urged counterclockwise to its retracted position by spring 49 to permit the return movement of plunger 37 and the lowering of the actuating member 26. As leg 32 moves downwardly it rides along the front end of switch arm 16 being urged forwardly thereby until it passes below the switch arm 16 to its depressed position. Leg 32 then springs to its normal biased position directed toward the underface of the switch arm 16, having been prevented from movement rearwardly thereof by plate 24. During the above cycle, which may be rapidly repeated, the contact elements 22 and 23 are momentarily opened and the contact elements 21 and 23 are momentarily closed.

While there has been described herein and illustrated a preferred embodiment of the present invention, it is apparent that numerous alterations, omissions and additions may be made without departing from the spirit thereof.

What is claimed is:

1. An electric switch comprising a contact element, an elongated resilient switch blade supported at a trailing end thereof and alternatively movable into first and second positions into and out of electrical engagement with said contact element and resiliently biased to said first position, and an actuating member including an arm swingably supported adjacent an end thereof at a fixed point forward of the leading end of said switch blade for movement between an advanced and a retracted position and directed toward said switch blade and terminating at a point transversely spaced from said switch blade in a resiliently supported leg angularly extending from said arm toward the free end of said switch blade, said arm being resiliently biased toward said retracted position whereby upon advance of said actuating member said leg is in engagement with and moves said switch blade momentarily to said second position and moves forwardly of and releases said switch blade to return to said first position and upon retraction of said actuating member said leg is urged forwardly to by-pass said switch leading end.

2. An electric switch comprising a first contact element, a horizontally projecting, cantilevered elongated resilient switch blade affixed at a trailing end thereof and alternatively swingable between first and second positions in and out of electrical engagement with said contact element and resiliently biased to said first position, and an actuating member including a resilient longitudinally extending arm supported adjacent an end thereof at a fixed point forward of the leading end of said switch blade for movement between a raised and a lowered position and directed toward said switch blade and terminating at a point below said switch in a resilient leg angularly projecting upwardly and rearwardly from said

arm toward the underface of the free end of said switch blade, said arm being resiliently biased toward said lowered position whereby upon raising of said actuating member said leg is in engagement with and moves said switch blade momentarily to said second position and moves forwardly of, and releases said switch blade to return to said first position, and upon lowering of said actuating member said leg is urged forwardly to by-pass said switch blade leading end.

3. The switch of claim 2, including cam means for engaging the free end of and urging said leg rearwardly and out of engagement with said blade with the raising of said leg.

4. The switch of claim 2, including a second contact element, said first and second contact elements being disposed adjacent opposite faces of said blade and being alternatively engaged thereby.

5. An electric switch comprising a first contact element, a horizontally projecting, cantilevered elongated resilient switch blade affixed at a trailing end thereof and alternatively swingable between first and second positions in and out of electrical engagement with said contact element and resiliently biased to said first position, and an actuating member including a resilient arm supported adjacent an end thereof at a fixed point forward of the leading end of said switch blade between a raised and a lowered position and directed toward said switch blade and terminating at a point below said switch in a resilient leg angularly projecting from said arm upwardly toward the underface of the free end of said blade, and a cam member having a forwardly upwardly inclined cam surface confronting and positioned to engage the upper end of said actuating leg, the plane of said cam surface being forward of the leading end of said blade at a level of the leading end of said blade when in said second position and rearward of the leading end of said blade at a level of the leading end of said blade when in said first position.

6. An electric switch comprising a base plate, a support insulator mounted on and projecting upwardly from said base plate, vertically spaced resilient upper, lower and intermediate arms supported by and projecting forwardly from said insulator, registering contact elements mounted on said arms, said intermediate arm carried contact element alternatively engaging one of said other contact elements and said intermediate arm being biased toward said lower arm, a resilient actuating member including a resilient arm affixed at a forward end thereof to a fixed point on said base and extending rearwardly and terminating in an angularly related integrally formed upwardly rearwardly projecting resilient leg directed toward the underface of the forward end of said intermediate arm, and means for swinging said actuating member and raising said leg against the resilient bias thereof.

7. The switch of claim 6, wherein said base has a vertical bore formed therein in alignment with the underface of said actuating arm, and including a plunger member registering with said bore.

8. The switch of claim 6, including cam means for engaging and urging the upper end of said leg rearwardly out of engagement with said intermediate arm with the raising of said leg.

9. The switch of claim 8, wherein said cam means includes an upwardly forwardly inclined cam plate registering with and of greater forward inclination than the path of the upper end of said leg and the free end of said intermediate arm.

References Cited by the Examiner

UNITED STATES PATENTS

2,586,056 2/52 Kling et al. ---------- 200—160

BERNARD A. GILHEANY, *Primary Examiner.*

ROBERT K. SCHAEFER, *Examiner.*