United States Patent [19]

Bechtiger

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[45] **July 17, 1973**

[54] **DELAYED SNAP ACTION MICROSWITCH**

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[21] Appl. No.: **218,274**

[52] **U.S. Cl.** ..... **200/67 H,** 200/67 B, 200/67 PK

[51] **Int. Cl.** **H01h 13/28**

[58] **Field of Search** ..... 200/33 R, 67 PK, 200/67 H, 41, 153 T, 67 B

[56] **References Cited**

UNITED STATES PATENTS

3,094,602 6/1963 Frachon ..... 200/153 T

2,148,790 2/1939 Wagner et al. 200/41

Primary Examiner—David Smith, Jr.

Attorney—Imirie & Smiley

[57] **ABSTRACT**

A microswitch having a snap action, wherein depression of an operating button to a predetermined joint first tensions an operating spring, then when moved beyond the point releases an operating lever which starts a delay mechanism, and finally causes a rapid action of the contacts of the switch.

4 Claims, 4 Drawing Figures

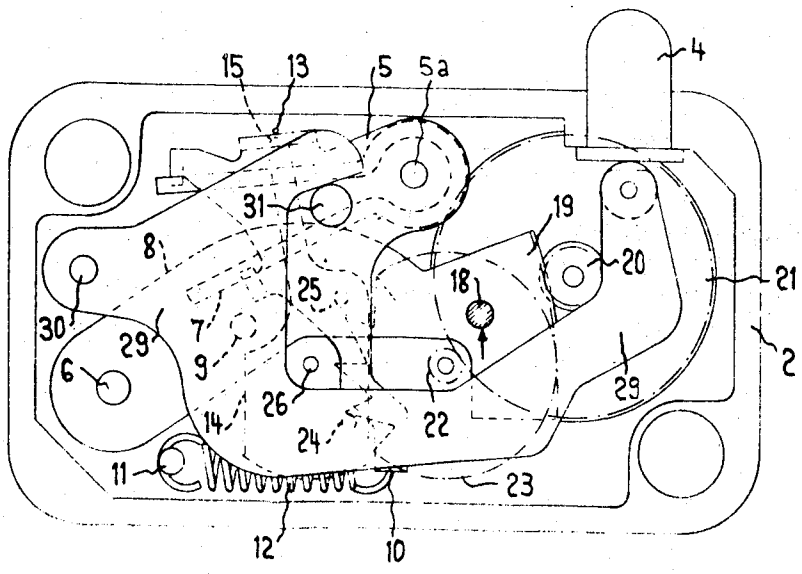


FIG. 1

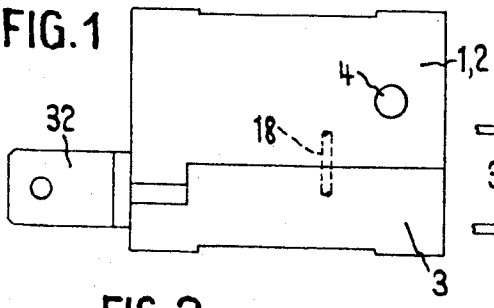


FIG. 4

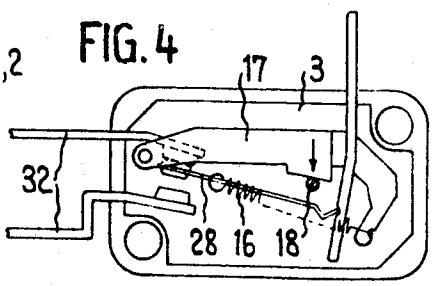


FIG. 2

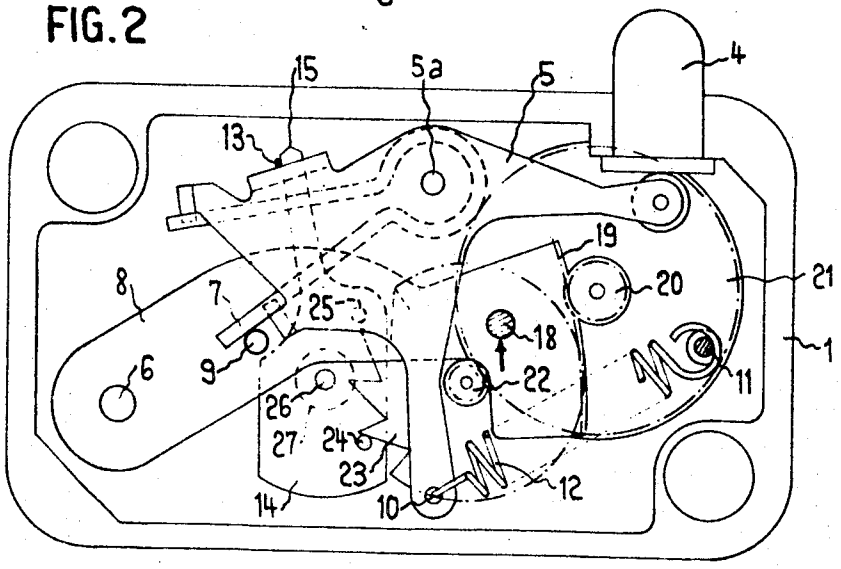
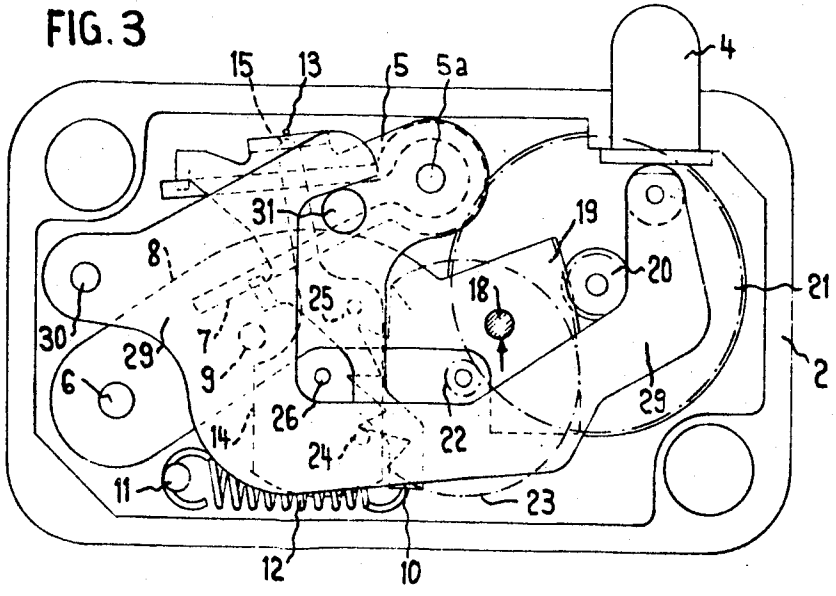


FIG. 3



DELAYED SNAP ACTION MICROSWITCH

The present invention relates to a delayed snap action microswitch having a contact lever which snaps over from a rest position through a dead centre position into a second switch position. There is a pretensioned actuating member for the switch lever constantly acting in the same direction, the release point for the said actuating member being defined by the position of an operating button during depression thereof. The switching action takes place after a delay derived from an escapement.

According to the present invention there is provided a microswitch having a contact lever which under the action of a spring is able to snap over from a rest position through a dead centre position into a second switch position, including an actuating member pretensioned by a constantly acting force, for the switch lever and acting independently of the switch position, the release of said actuating member being determined by the position of a depressible actuating button, and an escapement delaying the said switching action after release of the actuating member.

Reference is now made to the accompanying drawings in which:

FIG. 1 shows a schematic overall view of the microswitch with its principal elements;

FIG. 2 shows the mechanism of the said microswitch;

FIG. 3 shows a modified mechanism of the microswitch, and

FIG. 4 shows the interior of the switch compartment.

The switch has a normal position shown in FIG. 2 i.e. the operating button 4 actuatable from the outside, is fully protruded from a housing 1. If this button 4 is gradually depressed by a force acting thereon, a lever 5 mounted at 5*a* is rotated clockwise (in FIG. 2) and hence a spring 7 mounted on the lever 5 is disengaged from a pin 9 secured to a lever 8. At the same time the spring 12 hooked at 10 to the lever 5, and at 11 to the housing 1, is extended. By the same rotation of the lever 5 a spring pin 13 secured thereto is pressed in a direction towards the tip 15 of an armature 14. The force exerted by the switch spring 16 (FIG. 4) via a connecting lever 17 in the direction of the arrow on a pin 18 (FIG. 1, 2 and 4) fixed to lever 8, produces a torque in said lever about pivot 6, in an anti-clockwise direction in FIG. 2. This torque, after removal of the spring 7 from pin 9, acts via a toothed segment 19 of the lever 8 on a first pinion 20 of a freewheel gear 21, and via the latter on a second pinion 22 fixed to a toothed wheel 23. The teeth of this wheel act via pins 24 and 25 on the armature 14, thus forming an inertia escapement. Since however the armature 14 is prevented by the spring pin 13 from rocking about its axis 26, the escapement gear train cannot run. If however the button 4 is further depressed, then the spring pin 13 reaches the tip 15 of the armature 14, releasing the latter. At this instant the lever 8 commences to rotate in an anti-clockwise direction in FIG. 2, due to the force acting via the connecting lever 17 (FIG. 4) and the pin 18 (FIG. 1, 2 and 4) this rotation oscillating the armature 14 via the pins 24 and 25. It should be noted that the oscillating rate is determined by the rating of the switch spring 16 (FIG. 4) and the mass of the oscillating parts. This mass may be varied by attachment of rings 27 to the shaft 26, so that the time interval between the instant of release of the armature 14 by the

spring pin 13 and the snapping over of the switch lever 28 (FIG. 4) as determined by the position of the communicating lever 28 (FIG. 4) can be accurately predetermined or adjusted.

It is evident that the speed of depression of the button 4 has no influence on the delay action of the switch provided the button remains depressed for a time at least as long as the time interval between release of the armature and the snapping over the switch lever 28. It is thus to be observed that the possibility of reduced contact pressure caused by slow depression of the button of a conventional microswitch is avoided.

It is possible by means of the said additional rings 27 to use the microswitch of the invention as a precise delay switch.

If the button 4 is released during the time interval required for the complete action of the escapement, then spring pin 13 blocks the armature 14 before the switch lever 28 (FIG. 4) snaps over into the second switch position, so that the electric switching state remains unchanged at the terminals 32 (FIG. 1) of the microswitch.

If button 4 remains depressed for a sufficient length of time such that the whole switching operation action occurs and the microswitch changes over, then the switch remains in the changed-over position until the button 4 is released, whereupon the latter is returned to its original position (as shown in FIG. 2) due to the force stored in the spring 12. This same force which acts via the lever 5 on the button 4, also causes the spring 7 via the pin 9 to return the lever 8, and the lever 8 via pin 18 returns the connecting lever 28 into its original position. Since the freewheel gear 21 includes a freewheel clutch which permits the pinion 20 to rotate freely in an anti-clockwork direction, the following gear train is not rotated therewith; this permits an unobstructed return of all the said parts. This reverse movement is controlled by the button as in conventional microswitches.

FIG. 3 shows an alternative embodiment which carries out a switching movement only during the return movement of the button 4. This is effected in that the lever 5 is not actuated directly by the button 4 but by an additional lever 29 pivoted at 30, and a pin 31 inserted in the lever to effect return of the button 4.

The action of the switching operation is the same as in the first embodiment. The main difference is that the spring 12 of the embodiment of FIG. 3 in order to compensate the torque of the lever 5 exerts on the latter a force acting in the opposite direction to that described in FIG. 2.

This second embodiment has the same advantages as those described in connection with the first embodiment.

I claim:

1. A micro-switch comprising a casing, a snap action switch lever in said casing, a connecting member rockingly mounted in said casing and engageable by said switch lever, a switch spring connected between said switch lever and said connecting member, an actuating member operable from the outside of said casing, a spring-loaded rocking member mounted in said casing and operable by said actuating member, a trigger on said rocking member, a second rocking member mounted in said casing and normally restrained against movement by said spring-loaded rocking member, said second rocking member carrying a follower operable

by said connecting member, an escapement wheel pivoted in said casing, means operable by said second rocking member to drive said escapement wheel, an escapement armature rockingly mounted in said casing and cooperative with said escapement wheel, said armature comprising a tip engaged with and normally restrained by said trigger, movement of said spring-loaded rocking member through operation of said actuating member disengaging said second rocking member and freeing said armature tip from said trigger to enable operation of said escapement wheel by movement of said second rocking member by said switch spring.

2. A micro-switch as claimed in claim **1**, comprising a support on said second rocking member, a spring mounted on said spring-loaded rocking member and normally engaging by its one end said support before said actuating member is operated, and released from

said support on the beginning of a movement of said actuating member.

3. A micro-switch as claimed in claim **1**, wherein said means comprises a free wheel gearing including a toothed segment on said second rocking member, a free wheel gear, a first pinion coaxially fixed to said free wheel gear and in mesh with said toothed segment, and a second pinion fixed coaxially to said escapement wheel.

4. In a micro-switch as claimed in claim **1**, a support on said spring-loaded rocking member, and an intermediate member rockingly mounted in said casing to be directly operable by said actuating member and to bear against said support to swing said spring-loaded rocking member on said actuating member being operated.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,746,808 Dated July 17, 1973

Inventor(s) Charles G. Bechtiger

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

IN THE HEADING INSERT:

Claims priority, Application Switzerland, Feb. 12, 1971
#2115/71

IN THE CLAIMS:

Claim 1, line 3, (Column 2, line 58) change "and engageable by" to -- adjacent --.

Signed and sealed this 16th day of April 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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