

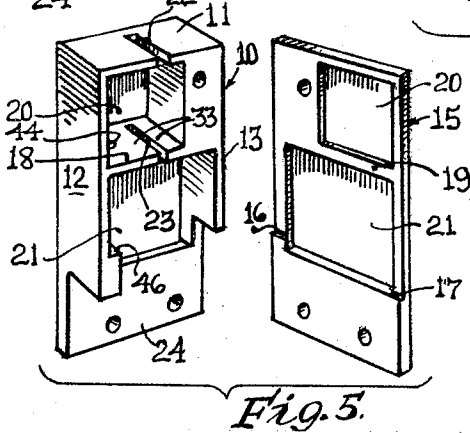
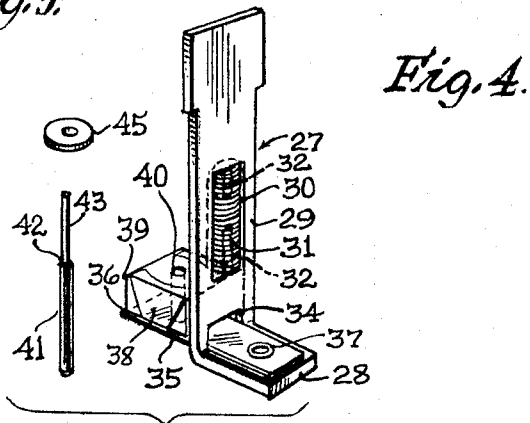
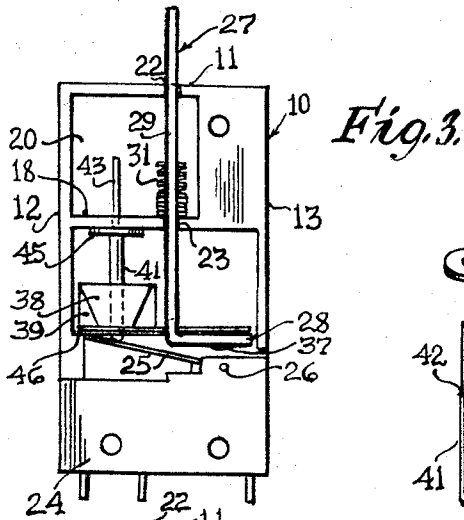
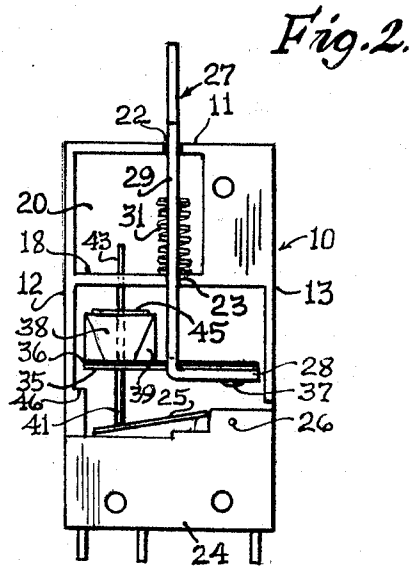
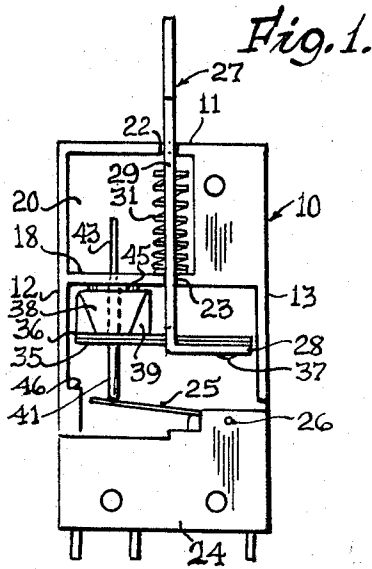
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MAGNETIC PULSE SWITCH ACTUATOR

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MAGNETIC PULSE SWITCH ACTUATOR

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8 Claims

ABSTRACT OF THE DISCLOSURE

A housing for an actuator for a snap-action switch including a movable actuating lever carrying a magnet which retains for movement therewith an actuator pin operatable upon a spring-biased pivotal switch actuator which has a limited travel in comparison to the distance of travel of the magnet carrying actuating lever whereby the actuator pin is forcibly separated from the magnetic field of the magnet and independently returned to its original or unactuating position by the spring-biased switch actuator after pivoting the same through its limited distance of travel effecting a momentary pulsation of the snap-action switch associated therewith.

Summary of the invention

The object of the invention is to provide a snap-action switch with an external actuator by which the switch is momentarily actuated or pulsed independently of the continued movement or position of the external actuator. To accomplish this object there is provided on the external actuator a magnet which creates a magnetic field between the external switch actuator and an independent movable actuating pin with the pin in fact effecting the actuation of a pivotal switch actuator through its pretravel and with the pin being separated from the magnetic field and returned to its original position after the switch has been actuated and the external switch actuator moved a predetermined distance (overtravel) which is greater than the pretravel necessary for the pivoting of the switch actuator to momentarily actuate or pulse its snap action switch.

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 a form of construction in which:

FIG. 1 is a side elevational view of the switch actuator and housing therefor with the side cover removed and showing the components in their original or unactuated positions.

FIG. 2 is a side elevational view similar to FIG. 1 but showing the components in their first or switch actuating position.

FIG. 3 is a view similar to FIGS. 1 and 2 but showing the components of the actuator in an inoperative position.

FIG. 4 is a perspective view of the parts of the switch actuator in an unassembled relation, and

FIG. 5 is a perspective view of the actuator housing and cover in an open position.

The device of the invention includes a hollow housing 10 having a top wall 11 and partial side walls 12 and 13 terminating short of the bottom edge of the back wall 14 as seen in FIG. 5. A removable cover 15 is associated with the housing 10 and cooperates therewith by providing side wall shoulders 16 and 17 which engage a portion of the bottom edge of the partial side walls 12 and 13 so as to provide a partially side walled and opened bottom hollow closure for a snap-action switch and switch actuator.

The hollow housing 10 as well as the inner wall surface of the cover 15 are by walls 18 and 19 divided into separate compartments 20 and 21. The wall 18 as well as the top wall 11 of the housing 10 has formed therein aligned slots 22 and 23 with the slot 22 providing open communication between the compartments 20 and 21 and with slot 23 providing open communication with the compartment 20 through the top wall 11 of the housing 10.

Positioned between the back wall 14 of the housing 10 and the lowermost portion of the cover 15 and beneath the ends of the partial side walls 12 and 13 is a snap-action switch casing 24.

The snap-action switch as associated with the switch actuator and housing which comprises the subject matter of this invention may be of the construction and have the operation of the snap-action switch shown and described in United States Letters Patent 3,141,075 dated July 14, 1964.

The snap-action switch of the type described in the above mentioned patent provides an internal coil spring which will bias an external pivotal switch actuator 25 about a pin 26 provided by the casing 24 of such switch. Such pivotal switch actuator has a limited pretravel, which is the distance of movement from its rest position to its point of operating the switch. The switch actuator 25 has its free end projecting into the compartment 21 as seen in FIGS. 1, 2 and 3.

The switch actuating lever 27 as disclosed herein is formed from a substantially flat piece of material and is generally L-shaped, so as to provide a base leg 28. The elongated body portion 29 of the lever 27 is adopted to be inserted into the slots 22 and 23 so as to position the base leg 28 in the lower compartment 21. The body portion 29 of the lever 27 is provided with a cutout 30 in which is positioned a coil spring 31. To retain the coil spring 31 within the cutout 30 there are provided by the body portion 29 spaced apart longitudinally aligned retaining studs 32 which project inwardly of the coils of the spring 31 as clearly shown in FIG. 4. When the lever 27 is mounted into the housing 10 the lower end of the coil spring 31 will rest upon the wall surfaces 33 which define the longitudinal edges of the slot 22 formed in the wall 18.

The lever 27 at the junction of its body portion 29 with the laterally extending base leg 28 is provided with an opening 34. Mounted on the upper face of the base leg 28 and extending through the opening 34 and beyond the longitudinal axis of the body portion 29 of the lever 27 is a supporting plate 35. Mounted upon the supporting plate 35 is a nonmagnetic magnet-supporting member 36. Both the supporting plate 35 and the magnet-supporting member 36 have their one end fixedly connected to the base leg 28 by means of a rivet 37 or the like.

The free end of the magnet-carrying member 36 is provided with enlarged wings 38 which are wrapped about the opposite sides of a permanent magnet 39 so as to connect the same to the member 36. The supporting plate 35 as well as the magnet-carrying member 36 and the magnet 39 itself has formed therethrough an aligned passage 40 which extends parallel to the body portion 29 of the lever 27. Positioned within the passage 40 is an elongated actuating pin 41. The pin 41 has a portion of its length reduced in circumference so as to provide a shoulder 42. The passage 40 is of a size to receive the pin 41 which pin is of such a length that its reduced end 43 projects through an opening 44 formed in the wall 18 and into compartment 20 as shown in FIGS. 1, 2, and 3.

Between the top surface of the magnet 39 and the underside of the wall 18 and upon the reduced end 43 of the pin 41 is a magnetically attracted washer 45. The washer freely sits upon the shoulder 42 formed on the pin 41

and by being disposed between such shoulder 42 and the wall 18 prevents the pin 41 from passing upwardly out of the passage 40 formed in the magnet 39 as well as in the supporting plate 35, and magnet carrying member 36, and into the compartment 20. The washer 45 will also move the pin 41 in a downward direction when it is caused to so move with the magnet 39 as the actuating lever 27 is depressed into and through the housing 10 as seen in FIGS. 2 and 3.

The operation of the actuating lever as hereinbefore described is as follows:

When all of the parts are assembled as described they will be in the positions shown in FIG. 1. The pivotal switch actuator 25 is biased by its internal spring (not shown herein but fully described in United States Patent 3,141,075) into the elevated position where its free end supports the pin 41 such that the washer 45 seated upon the shoulder 42 thereof is between the wall 18 and magnet 39. The actuating lever 27 through the expansion of the spring 31 carried thereby is also in an elevated position with respect to the switch casing 24.

As force is applied to the exposed end of the lever 27 it will move downwardly in one direction and be guided by slots 22 and 23, against the spring 31. The magnet 39 as carried by the carrying member 36 and supporting plate 35 attached to the base leg 28 of the lever 27 will move in a like direction through compartment 21. The magnet will exert sufficient magnet force upon the washer 45 so that it will bear against the shoulder 42 of the pin 41 and cause the same to move in one direction against and overcome the spring biasing pressure on the switch actuator 25, causing it to pivot downward into the position shown in FIG. 2 where the switch is actuated.

The forced pivoting of the switch actuator 24 by the pin 41 will cause its free end to engage the top wall of the switch casing 24 thus arresting any further movement of it as well as pin 41 in the downward direction.

As the actuating lever 27 continues its overtravel movement it will cause the magnet 39 to be moved away from the washer 45, which is stopped in any further downward movement by the shoulder 42 of the now arrested pin 41 until the spring bias of the switch actuator 25 overcomes the magnetic force of the magnet 39, permitting the pin 41 to be moved thereby in an opposite or upward direction through the magnet 39 until the washer 45 again engages the under surface of the wall 18 as shown in FIG. 3.

Further downward movement of the actuating lever 27 is prevented when the free end of the supporting plate 35 engages the stop shoulder 46 formed on the inner surface of the side wall 12.

When the external moving force is removed from the free exposed end 47 of the actuating lever 27 the now compressed spring 31 will expand to return the actuating lever 27 to its original position as seen in FIG. 1 where once again the washer 45 as carried by the pin will be magnetically attached to the magnet 39.

The magnet-carrying end of the magnet-carrying member 36 will yieldably bend about its connection to the base leg 28 of the lever 27, if the same is struck with a greater external force, causing it to move downwardly through the housing 10 at a speed greater than the magnetic attraction to the washer 45; thus allowing time for the magnet to maintain its magnetic force regardless of acceleration.

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

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

1. A hollow housing for a switch actuating lever and a snap action switch which provides a spring biased pivotal actuator having a limited pivotal travel, and which is adapted to be momentarily pivotally moved by the actuating lever so as to actuate the switch with a snap action wherein the improvement comprises:

(a) an elongated lever movable axially through the housing in the direction of the spring biased pivotal actuator with the lever having a distance of travel greater than that of the pivotal actuator,

(b) actuating means supported by the pivotal actuator and extending longitudinally in a spaced parallel relation to said lever and releasably connected thereto for movement therewith in one direction,

(c) means for pivotally connecting the spring biased actuator to the switch with a portion thereof in the path of travel of said actuating means,

(d) means carried by said lever to one side thereof and transversely to the longitudinal length of said actuating means and through which said actuating means extends for releasably connecting said actuating means to said lever for movement therewith in one direction to pivot the pivotal actuator so as to momentarily actuate the switch,

(e) said actuating means being disconnected from said lever and said means for releasably connecting it to said lever by the spring biased pivotal switch actuator after the switch actuator has been pivoted through its limited pivotal travel and during continued movement of said lever and said connecting means in one direction,

(f) means in the path of movement of said lever for arresting its movement in one direction after said actuating means has been disconnected therefrom and moved in an opposite direction by the spring biased pivotal actuator, and

(g) means operative upon said lever for moving it and said connecting means carried thereby in said opposite direction independently of said actuating means to connect said actuating means thereto for movement therewith in one direction.

2. A hollow housing for a switch actuating lever as defined by claim 1 wherein said actuating means comprises an elongated pin extending substantially vertical with respect to the pivotal switch actuator and in spaced parallel relation to one side of and beyond one end of said switch actuating lever.

3. A hollow housing for a switch actuating lever as defined by claim 1 wherein said means carried by said lever for releasably connecting said actuating means thereto comprises a magnet having a magnetic field which exerts sufficient force upon said actuating means that the same is moved in one direction with said lever and overcomes the spring bias of the pivotal actuator of said switch so as to move the same through its limited pivotal travel.

4. A hollow housing for a switch actuator as defined by claim 2 wherein said means carried by said lever for releasably connecting said pin thereto for movement therewith in one direction comprises a magnet which magnetically attracts and holds a means carried by said pin so that said means and said pin is releasably connected to said lever.

5. A hollow housing for a switch actuating lever as defined by claim 1 wherein said means that arrests the movement of said lever in one direction comprises stop shoulders provided by said housing in the path of travel of a part of said lever with said shoulder spaced from said part of said lever a distance sufficient to permit continued movement of said lever after said actuating means has been disconnected therefrom by the spring-biased pivotal switch actuator.

6. A hollow housing for a switch actuating lever as defined by claim 5 wherein said means carried by said lever for releasably connecting said pin thereto for movement

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therewith in one direction comprises a magnet which magnetically attracts and holds a means carried by said pin so that said means and said pin is releasably connected to said lever.

7. A hollow housing for a switch actuating lever as defined by claim 1 wherein said means for moving said lever and said connecting means carried thereby in an opposite direction comprises a coil spring normally yieldably restraining movement of said lever in one direction through said housing.

8. A hollow housing for a switch actuating lever as defined by claim 6 wherein said means for moving said lever and said connecting means carried thereby in an opposite direction comprises a coil spring normally yieldably restraining movement of said lever in one direction through said housing.

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