Dec. 8, 1942. M. W. EATON 2,304,400

SNAP SWITCH

Filed Aug. 3, 1940

Fig. 1

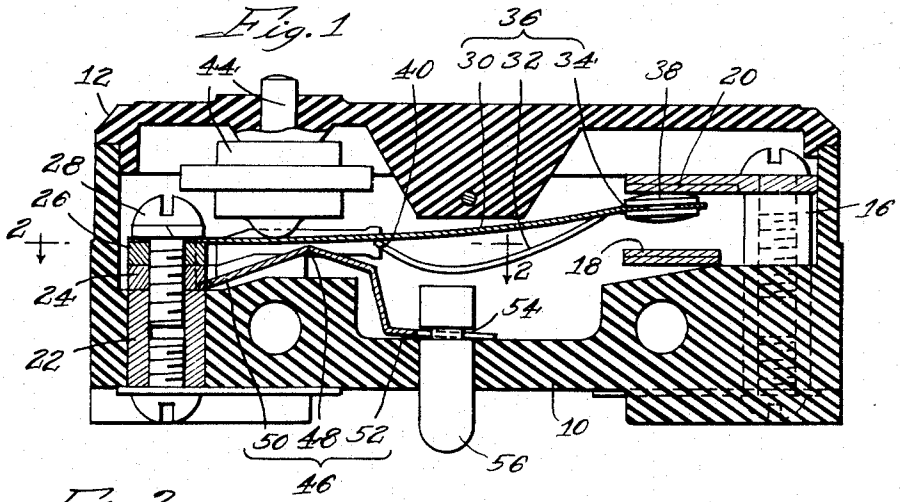


Fig. 2

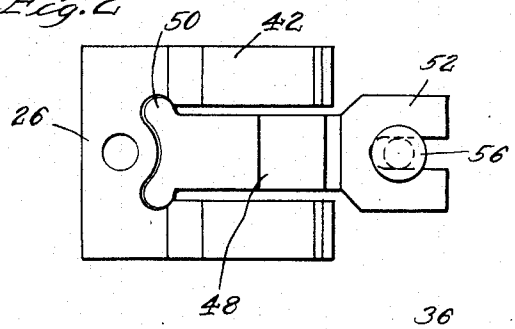
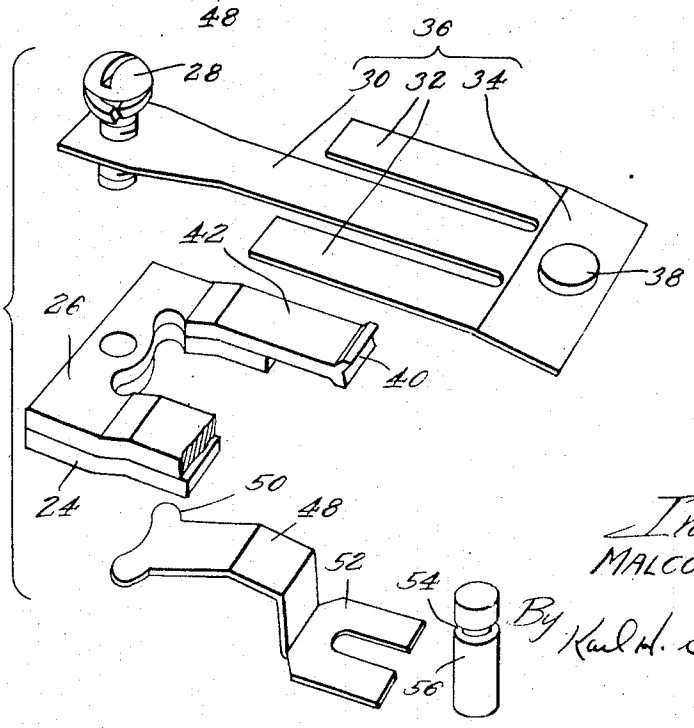


Fig. 3



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SNAP SWITCH

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3 Claims. (Cl. 200—67)

The present invention relates to snap acting electric switches.

My invention constitutes an improvement upon the snap switch of U. S. Patent 1,960,020 to P. K. McGall, May 22, 1934.

The McGall snap switch is of the self returning type. Thus, although its snap acting spring has two stable positions between which it snaps it is capable of lying normally in only one of those positions. When an actuating force is applied to the switch, the snap spring snaps out of its normal position into its other position, but returns automaticaly to its first or normal position when the actuating force is released. The McGall switch possesses a desirable combination of operating precision, large control capacity, and small operating effort, which has won its adoption in a large number of electrical control applications. However, in many of these applications it has been desirable that the switch should not exhibit a self returning action but rather after actuation in one direction should require a second distinct actuation for effecting its return operation. Furthermore, it is desirable that the switch, although requiring separate actuations for operation in two directions, should nevertheless retain its original precision, sensitivity and high control capacity.

It is an object of the present invention to provide a switch of the McGall type without a self-returning action, but yet with the full precision, sensitivity and control capacity of the McGall switch. Another object is the provision of means for effecting a return actuation of such a switch with a snap action for utilizing its inherent precision, sensitivity and high control capacity in so doing. These and other objects and advantages will become apparent in the following description of a specific embodiment of my invention which serves by way of example to illustrate the manner in which the invention may be carried into practice. However, the invention is not to be limited to the particular details of any embodiment or example. In the drawing:

Fig. 1 is a longitudinal section of a complete snap switch embodying my present invention;

Fig. 2 is a partial plan view of the internal construction of the switch in Fig. 1, constituting a section along the line 2—2 of Fig. 1; and

Fig. 3 is an exploded pictorial view showing certain of the parts of the switch of Fig. 1 and their orientations with respect to each other.

As shown in Fig. 1 the switch includes an insulating housing 10, and an insulating cover 12 for said housing. Two separate threaded metal bushings of different lengths located along side of each other and embedded in the bottom of the insulating housing 10 (of which only bushing 16 appears in the sectional view of Fig. 1) support stationary contacts 18 and 20. The details of this particular part of the switch construction are shown in U. S. Patent 2,172,673 issued September 12, 1939 to M. W. Eaton.

At the other end of the housing, a threaded metal bushing 22 embedded in the bottom of the housing 10 supports a spacer 24 and a spring anchor 26. A single screw, 28 mounts the parts 24 and 26 and clamps also the end of a tension member 30 of a toggle spring 36. As best shown in Fig. 3 this toggle spring is cut and formed from a single piece of thin leaf spring material and includes the central tension member 30 and two compression side members 32 connected together at the movable end 34 of the toggle, which end supports electric contact 38. As is shown in Fig. 1 the side legs 32 are bowed in compression in the assembled switch. The ends of these side legs or thin leaf compression springs 32 are pivotally supported in notches 40 in the ends of the legs 42 or the U-shaped spring anchor 26.

The tension member 30 of the toggle spring, being fastened under the screw 28 at the center of the base of the U-shaped anchor 26, extends out over the space between the legs 42 of that anchor, where it may be deflected up and down for causing the toggle spring 36 to snap back and forth between the two stationary contacts 18 and 20. The portion of tension spring 30 that lies over this space between the two legs 42 of the spring anchor constitutes a sensitive area of the spring which may be moved through a slight distance to cause a much larger snap motion of the movable end 34 carrying the contact 38. A rigid actuating plunger 44 is supported by the cover 12 and arranged to slide up and down therein in alignment with the sensitive area of tension spring 30. Accordingly, an actuating force may be applied to this rigid plunger 44 to move the sensitive area down a slight distance for causing the movable end 34 of the toggle 36 to snap down, carrying movable contact 38 down into engagement with stationary contact 18. The operation of the switch in response to actuation by the plunger 44 is sensitive and precise and induces a good snap action to provide high load handling capacity for the switch. In snapping down to carry contact 38 from its upper position in engagement with upper stationary contact 20 down to its lower position in engagement with lower stationary contact 18, the toggle moves a suffi-

cient distance that it goes "over center" and so tends to remain in its new position.

A formed spring strip or lever **46** has an arch **48**, positioned in the space between the legs of the U-shaped spacer **24** and spring anchor **26** with the peak of its arch lying just under the sensitive area of the tension spring **30**. One end **50** of this spring fulcrums in the curve of the U of this spacer and spring anchor. The other end **52** is forked to fit a circumferential notch **54** in actuating plunger **56** that slides up and down in a hole in the bottom of the housing **10**. The plunger **56** may be moved upward to raise the peak of the arch **48** against the bottom surface of tension spring **30** at its sensitive area for in turn causing the toggle spring **36** to snap back to its upper position. The spring **46** is resilient first to limit the forces that may be transmitted by it to the spring **30** for limiting the stresses in the spring **30**, and second to insure that actuation of the plunger **56** cannot interfere with, nor supersede, the control of the switch exercised by the rigid actuating plunger **44**. This feature is particularly advantageous when the switch is employed as a safety limit. For such use the controlled apparatus actuates the rigid plunger **44** to effect the safety or limit stop and the plunger **56** serves as the "reset" for restoring the controlled apparatus to operation.

The present invention provides a new and improved construction for adapting the McGall type of switch with its inherent precision, sensitivity and high control capacity for non-self-sustained, or "double" actuation, and thereby gives the switch a separate reset action of high precision and sensitivity with the full control capacity of the switch.

It will be apparent to those skilled in the art that the invention is capable of numerous modifications and variations within the scope of the following claims.

I claim:

1. In a device of the class described, the combination with a switch housing having a cavity therein and a ledge at one end of said cavity, a U-shaped support on this ledge with the legs of the U extending toward the center of the housing, a snap-spring mounted on said U-shaped support, said spring having a sensitive area spaced slightly above the surface of the ledge in the space between the legs of the U, and actuating means for pressing down on said sensitive area for actuating said spring, of, an arched lever extending into the shallow space between said ledge and snap spring, having one end fulcrumed on the surface of the ledge in the curve of the U, and having the peak of the arch under said sensitive area of the spring, and means for lifting the other end of the lever to lift said peak against said sensitive area for actuating said snap-spring.

2. The combination with an elongated switch housing having a well and a ledge-like supporting surface alongside thereof, and a thin leaf snap spring having a sensitive area adapted to be pressed for snapping said spring, of, means for supporting said spring over said supporting surface and over said well, with said sensitive area spaced slightly above said supporting surface, an arched, resilient, thin-leaf lever, extending into the shallow space between said spring and supporting surface, said lever having one end resting on said surface to provide a fulcrum, having the peak of said arch under said sensitive area, and having its other end in said well, and a movable actuating member in said well for lifting said other end of said arched lever for in turn causing said lever to press up against the sensitive area of said spring.

3. In combination in a device of the class described, a supporting surface, a thin-leaf snap-spring having a sensitive area such that a small motion of said sensitive area causes a snap motion of said spring, means for supporting said spring above said surface with said sensitive area spaced slightly therefrom, a thin-leaf lever extending into the shallow space between said spring and said supporting surface for prying up against the lower face of said sensitive area of the spring, first actuating means for actuating said lever to pry up against said lower face of said sensitive area for causing a snap action of said spring, and second actuating means, independent of both said lever and said first actuating means, for applying an actuating force down against the top face of said sensitive area of said spring for causing a snap motion of said spring.

MALCOLM W. EATON.