May 10, 1949. M. W. EATON 2,469,686

GAUGING SWITCH

Filed May 6, 1946

FIG. 1

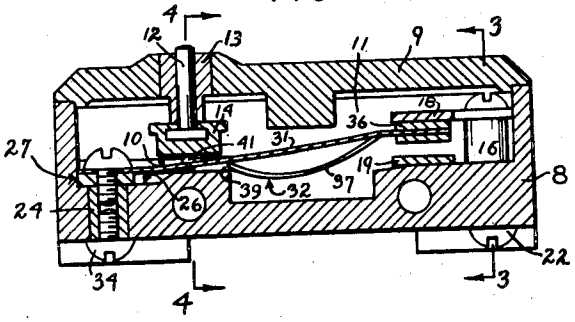


FIG. 3

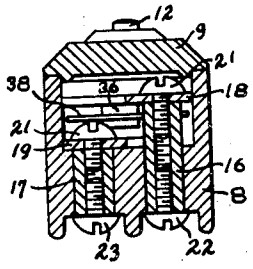


FIG. 2

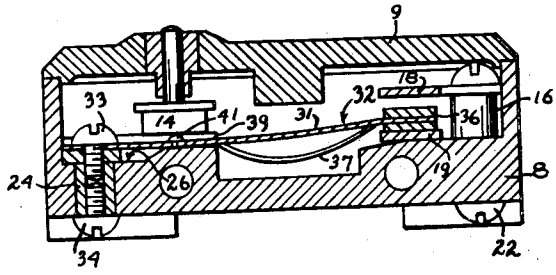


FIG. 4

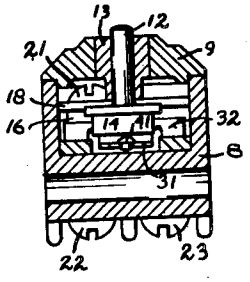


FIG. 5

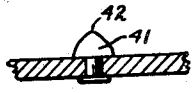


FIG. 6

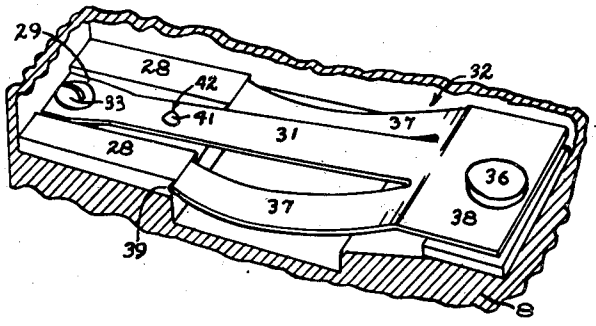


FIG. 7



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GAUGING SWITCH

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5 Claims. (Cl. 200—67)

1

This invention relates to electric snap switches of the small, compact precision type shown in the McGall Patent 1,960,020, issued May 22, 1934, and is more particularly concerned with an improved connection between the operating plunger and the snap spring within the switch housing for greater precision of operation. In referring to the switch of this invention as a "precision switch," it must be understood to mean one which operates in response to very slight movement of the operating plunger and one which is intended to operate consistently at the same position of its plunger.

An important use of this type of switch is in connection with automatic close tolerance gauging equipment wherein the switch may be incorporated in a dimension measuring jig through which parts are moving from a machining or manufacturing operation and in which the switch is suitably connected in an electric circuit to automatically reject or indicate any parts not conforming to the proper dimension.

These switches are usually characterized by a reciprocable operating plunger extending through the housing wall and contacting a sensitive portion of a snap acting leaf spring. The exact portion of the spring which is engaged by the plunger is important in determining the plunger movement required to actuate the switch. That is, as the position of engagement on the spring is changed, more or less movement of the operating plunger will be required to operate the switch. Consequently, when such a switch is to be used for automatic gauging purposes extreme care has had to be taken in manufacturing to minimize the clearance between the plunger and its bushing so it will engage the spring at substantially the same place each time.

An important object of this invention is the provision of a relatively inexpensive precision switch in which the operating characteristics of the switch are substantially reproduced within precision limits on successive operations of the switch.

An important feature of this invention lies in the provision of a pointed projection affixed to the spring in alignment with and engageable by the plunger. The position of engagement will, therefore, always be defined by the top of the projection and will vary only very slightly.

Other objects and advantages of this invention will be apparent from the following description in connection with the accompanying drawing, in which—

Figure 1 is a longitudinal sectional view of a self-returning snap acting switch illustrating one form of the present invention and showing the parts in their normal or plunger-non-depressed positions;

Fig. 2 is a view similar to Figure 1 showing the parts in their abnormal or plunger-depressed positions;

Fig. 3 is a transverse sectional view of Figure 1 taken along the line 3—3;

Fig. 4 is a transverse sectional view of Figure 1 taken along the line 4—4;

Fig. 5 is an enlarged view of the riveted spring projection shown in the previous figures;

Fig. 6 is a partially sectioned perspective view of the switch shown in the previous figures, and

Fig. 7 is a view similar to Fig. 5 showing a modified form of the invention.

2

The invention as herein shown is embodied in a molded plastic housing having a body 8 and a cover 9 seated over the body in interfitting relationship to provide an enclosed switch chamber 11 effectively enclosed against extraneous solid material, such as dust, which might interfere with the operation of the switch mechanism. Carried in the cover is an actuating plunger 12 reciprocably mounted within the molded-in bushing 13. The actuating pin 12 carries a plunger head 14 preferably of insulating material having a flat inward surface 10 adapted to engage and operate the switch spring, as will be described. Fitting into the opposite end of the housing 8 are molded-in terminal bushings 16 and 17 having upper and lower contacts 18 and 19 mounted thereon by screws 21 and having terminal screws 22 and 23 mounted flush with the bottom outside surface of the housing to receive suitable conductor connectors (not shown).

A terminal bushing 24 is molded into the body at the plunger end of the switch, the upper end of the bushing being flush with a shoulder 26 of the body. Seated on the upper end of the bushing 24 and against the shoulder 26 is a U-shaped anchor plate indicated generally by the numeral 27, having spaced legs 28 extending toward the center of the body, as will be apparent from Fig. 6. Positioned on top of the anchor plate 27 is an end 29 of a tension member 31 of a spring system generally designated 32, to be presently described more fully, which with the anchor 27 is mounted on the bushing 24 by a screw 33. A terminal screw 34 at the outside end of the bushing 24 provides a third conductor connector. Electrical connection thus may be had, through the spring 32 and movable contact 36, between terminal screws 34 and 22 (Figure 1) or 34 and 23 (Fig. 2). The tension member 31 forms part of the main snap spring system designated 32, such as that disclosed in McGall Patent 1,960,020, mounted in cantilever fashion; this spring being formed of suitable metal such, for example, as beryllium copper, and having in addition to the tension member 31, a pair of spaced compression members 37 of somewhat lesser length than the tension member, the compression members and

the tension member being interconnected at the free end of the spring, as shown at 38. The opposite ends of the compression members 37 are pivotally supported in notches 39 formed in the ends of the anchor legs 28, as described in the McGall patent.

In the ordinary McGall type switch, the inner end surface 10 of the plunger 12 is rounded and engages the tension member at a "sensitive" portion near its cantilevered end as shown. Any change of engagement position of the plunger 12 and the tension member along the longitudinal axis of the tension member, such as by rotation of the plunger, even though it be in the order of only a few thousandths of an inch, changes the plunger movement required to operate the switch; consequently, the pin 12 had to be very closely guided within the bushing 13 and in some cases this even had to be a lapped fit. The present invention employing the rivet 41 in the Figure 1 modification and the raised projection 41a in the Fig. 7 modification provides a far more precise construction for positively fixing this engagement point with repsect to the tension member.

It will be seen that with this construction when the plunger 12 is depressed so as to force its surface 10 down upon the tip or end 42 of the projection 41 (or 41a as in the Fig. 7 modification) and move the tension member 31 through the axis of maximum stress of the spring system, the free or contact-carrying end 38 of this main spring system will snap from the position shown in Figure 1 to the position shown in Fig. 2. When the plunger is released, the bias which is built into the spring system to make it self-returning causes the spring to snap back to the Figure 1 position.

While two particular forms of the present invention have been shown it will be apparent that minor changes therein will readily suggest themselves to others skilled in the art without departing from the spirit and scope of the invention.

Having thus described the invention, what is claimed as new is:

1. The combination in a switch of the precision type of a snap action leaf spring, a housing therefor and an operating plunger comprising a metallic pin reciprocably mounted on said housing and a head of insulating material mounted at one end thereof within the housing in substantially concentric relation thereto, said head having a substantially flat surface at right angles to the axis of said metallic pin on the side thereof opposite said pin, said spring having a pointed rigid projection terminating in a single point intermediate the edges thereof fixed thereon and substantially axially aligned with said metallic pin and engageable with the flat surface of said insulating head for deflection of said spring under pressure applied to said pin.

2. In a snap switch requiring precision duplication of operating characteristics on repeated operations of the switch, the combination of, a contact movable between opposed positions, a resilient member supporting said contact and having a tension portion and a compression portion mounted to form a snap spring system for moving said contact between the opposed positions with a snap action, said tension portion having a dome-like projection thereon terminating in a single point spaced from the plane of the tension member, and a plunger in alignment with said projection and having a flattened end engageable with said point of the projection for actuating said spring system, said flattened end shaped and positioned with respect to the projection so that for successive depressions of the plunger the operating characteristics of the snap spring system are repeated in a predetermined manner.

3. In a snap switch the combination of, spaced compression members interconnected at one end to form an end free to move between preselected positions, means for mounting the compression members at the opposite end, a tension member intermediate said compression members and having an end integrally connected with said free end, said tension member having a pointed projection thereon terminating in a single point intermediate the edges and spaced out of the plane of the tension member, means for mounting the opposite end of said tension member adjacent said mounting means for the compression member, said tension and compression members forming a snap spring system for moving said free end between preselected positions with a snap action, a reciprocably mounted plunger in axial alignment with said projection and having a flattened end engageable with the point thereof to actuate said snap spring system whereby the point at which the snap spring system actuates is predetermined within precision limits for successive operations of the snap switch.

4. In a snap switch the combination of, spaced compression members, a tension member intermediate said compression members, said tension and compression members interconnected at one end to form an end free to move between preselected positions, means for mounting the opposite ends of said tension and compression members to form a snap spring system, pointed means intermediate the edges and rigid with said tension member and terminating in a single point spaced out of the plane thereof, and a plunger reciprocably mounted adjacent said tension member to actuate said system and having a flattened end engageable with said point of the pointed means to maintain the actuating point of said snap spring system at a predetermined position upon successive actuations of said snap spring system.

5. In a snap switch the combination of, a spring member comprising a free end movable between spaced positions and a first and second stressed portion mounted to form a snap spring system for moving said free end between the spaced positions with a snap action, a plunger reciprocable axially to actuate said system upon application of force to said plunger and having a flattened end spaced adjacent one of said stressed portions, and pointed means rigid with and intermediate the edges of the stressed portion and terminating in a single point adjacent said flattened end and engageable by the latter for positioning said applied force to effect actuation of the snap spring system at a predetermined point upon successive actuations of the snap spring system.

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