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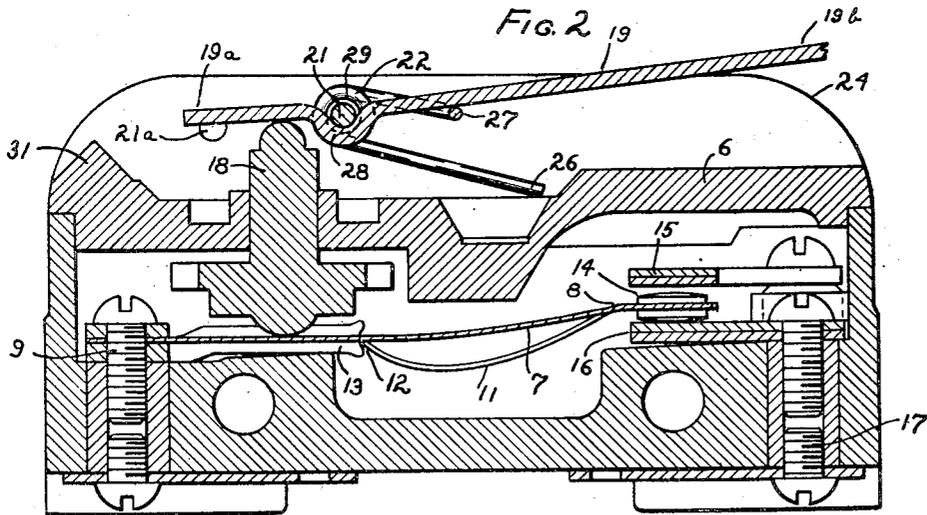
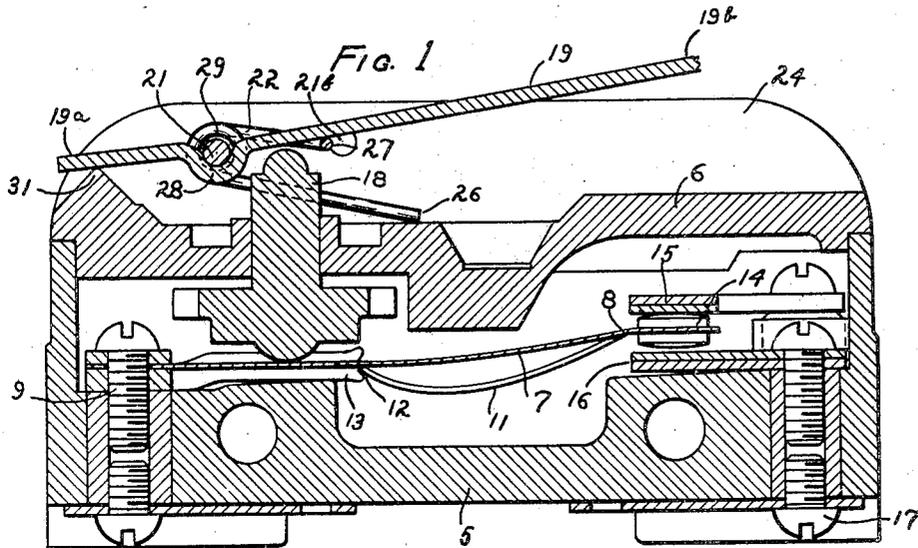
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SWITCH OPERATING MECHANISM

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SWITCH OPERATING MECHANISM

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This invention relates to switches, more specifically to leaf spring snap switches, and is particularly concerned with improvements in the operating mechanism for such switches.

One type of switch of this general character which has received popular favor embodies an operating device in the form of a leaf spring fixedly mounted upon the cover of the switch casing and disposed in operative relation to the switch operating plunger. It has been found, however, that long continued operations produced fatigue of the metal of the spring, which resulted in change of its shape and in the point at which the switch would be actuated under pressure. The reliability of such a switch, particularly as to its time or point of operation, was accordingly impaired.

One of the purposes of my present invention is the elimination of the leaf spring actuator and the utilization in lieu thereof of a pivoted rigid lever which will not be subject to deformation or variation in its timing during prolonged usage.

The various locations in which switches of this character are required to be mounted has heretofore necessitated different mountings for the leaf spring actuator. These different mountings required correspondingly different tops for the switch casing, thereby increasing the cost of manufacture and necessitating the stocking of a number of different species of the switch.

Another purpose of my invention is to provide an operating mechanism of simple construction and consisting of but few parts, which, however, are capable of being assembled in a number of different ways so as to produce a normally on or normally off switch, as desired, and to position the actuating lever in different locations to meet the requirements of various installations.

Still another object of my invention is to provide an operating mechanism which can be quickly assembled and easily disassembled, but which, when assembled, will have the various elements so interlocked that they will be retained in position without the employment of extraneous means or devices for fastening or holding the parts in place.

Other purposes and inherent advantages of my invention will be readily appreciated as the same becomes better understood by reference to the following description when considered in connection with the accompanying drawings.

Referring to the drawings,

Fig. 1 is a longitudinal sectional view of a snap switch equipped with my invention;

Fig. 2 is a similar view showing a different assembly of the elements of the operating mechanism;

Fig. 3 is a similar view showing still another manner of assembly of the elements of the operating mechanism; and

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Fig. 4 is a plan view of the form of the invention shown in Fig. 2.

Referring to the drawings more in detail, it will be observed that the casing in which the switch proper is mounted comprises the bottom portion 5 and a top portion 6, together forming an enclosure or housing for the switch mechanism. This mechanism may be of any preferred snap switch construction, for instance, the general type disclosed in Patent No. 1,960,020, issued May 22, 1934.

Since my invention is not concerned with the details of the switch mechanism proper, it will suffice for the present disclosure to state that the housing or casing is customarily formed of suitable plastic insulating material providing a base upon which the leaf spring 7 of the contact arm 8 is mounted by means of a screw or screws 9. The contact arm 8 also includes one or more spring strips 11 pivotally abutting at 12 against an abutment element 13 anchored to the base 5 of the casing. A double-faced contact button or element 14 carried at or near the end of the contact arm is adapted to engage and establish electrical contact with the contact stops or elements 15 and 16, either or both of which may be employed to complete an electric circuit from the contact arm through the binding post or posts 17. The contact arm is normally biased to establish contact with the upper element 15, and is adapted to be depressed into contact with the lower element 16 by a plunger 18 engaging the upper face of the contact arm near its anchorage 9 and projecting upwardly through the top wall of the switch casing into position to be actuated by mechanism constituting the subject matter of my present invention.

The switch structure thus far described may be conventional or of any preferred design, and may be actuated by any mechanism adapted to depress the plunger 18 so as to thereby depress the switch arm 8.

The mechanism for actuating the plunger 18 and with which my present invention is concerned, comprises a rigid lever 19, a fulcrum pin 21 and a coiled spring 22, all mounted above the top wall of the switch casing upon suitable supporting means extending upwardly therefrom. The supporting means may be of any preferred construction, such as upstanding ears mounted on the casing top, but, as illustrated, it consists of a pair of upstanding walls designated 24, respectively (Fig. 4), formed integrally with and disposed in spaced apart relation upon the casing top 6.

The fulcrum pin or pintle 21 is mounted in and extends between the supporting walls 24, and the spring 22 is mounted on the pintle by having the pintle extend through the coils of the spring, as shown. The ends 25 and 26 of the spring engage

the upper face of the top 6 near the walls 24, respectively, while the central loop 27 connecting the coils extends beneath and yieldably engages the lower face of the lever 19. This lever is provided near one end with a transversely extending socket or bearing 28 formed by bending the metal of the lever into a curved form adapted to snugly fit the curvature of the pintle 21 which provides the fulcrum for the lever and provides a short arm 19a and a long arm 19b. The central portion of the pintle for a distance slightly greater than the width of the lever 19 is made of smaller diameter than the end portions thereof, to thereby provide shoulders 29 at each side of the lever which prevent lateral movement of the lever relatively to the pintle and also prevent displacement of the pintle from the openings in the supporting walls in which it is seated, so long as the lever is engaged with the reduced portion of the pintle. It will be readily apparent that, since relative movement between the pintle and lever transversely of the lever is prevented by the shoulders, and since bodily movement of the lever and pintle longitudinally of the pintle is prevented by the surrounding convolutions of the spring 22, the whole assembly of pintle, lever and spring is held together and in operative position by the cooperative action of the spring, the shoulder and pintle and the socketed lever.

The lever may be mounted on the switch casing in a number of different ways to meet the requirements of various installations, without the necessity of specially designed and mounted constructions heretofore considered essential. For instance, in the disclosure of Fig. 1, the pintle 21 is carried in openings 21a (Figs. 2 and 3) of the walls 24, and the switch is of a type which, when the parts are in normal position, will maintain contact between the switch arm 8 and the upper contact element 15. The plunger 18 is accordingly in the elevated position shown in this figure and the lever 19 is biased upon its pintle in a counterclockwise direction, the extent of such bias movement being limited by a stop or abutment 31, in this instance formed integrally with the top wall 6 of the casing. Downward pressure exerted upon the long arm of lever 19 will, in the form shown in Fig. 1, depress the plunger 18 to thereby operate the switch.

In Fig. 2 the fulcrum pintle 21 is illustrated as mounted upon the opposite side of the plunger 18 from that shown in Fig. 1 in openings 21b (Fig. 1) of the walls 24. The lever 19 is thereby converted from a lever of the second order to a lever of the first order, and as the result the plunger 18 is normally depressed by the action of spring 22 so that the contact arm establishes contact with the lower element 16 instead of the upper element 15. Downward pressure exerted upon the long arm of the lever in this instance will release the plunger 18, permitting automatic return of the contact arm 8 in the upper position into contact with element 15.

In the form shown in Fig. 3, the position of the lever 19 is reversed from that of Fig. 2, so that the long arm thereof extends to the left, instead of to the right. This assembly also normally holds the plunger in depressed position with the contact arm 8 maintaining contact with the lower element 16. To operate the switch in this instance, the lever is required to be moved on its fulcrum in a clockwise direction viewing Fig. 3 by the exertion of pressure upon the lower face of the lever instead of upon the upper face, as in the elements previously described. This permits

of substantial overtravel of the lever 19, since the lever can be rotated until the short end strikes the top of the case.

It will also be apparent that the lever 19 may be reversed from the position of Fig. 1 so that the long arm thereof extends to the left from the pintle so that the switch is operated by movement of the lever in a clockwise direction.

Thus it will be seen that provision is made for shifting the pintle from one side of the plunger to the other to change the normal position of the switch contacts and for changing the position of the operating lever on the pintle to accommodate the switch to different directions of movement of the operating face and to provide overtravel of the lever where this is desirable.

It should be apparent from the foregoing that my invention overcomes the disadvantages inherent in the spring operating arms heretofore employed, by utilizing a rigid operating lever which insures against any variation in the point of operation of the switch. It should further be appreciated that by the utilization of a standard lever, pintle and spring, a variety of assemblies may be made capable of meeting various requirements and conditions of installation and use. Furthermore, the assembly is maintained against displacement of any of its parts by the cooperative action of the transversely socketed lever, the shoulder pintle and the embracing spring, and yet is readily demountable without the use of tools to change the operating arrangement, and this is accomplished without the use of screws, bolts, nuts and the like which tend to loosen under vibration as in aircraft, tanks, and numerous industrial applications.

The structural details illustrated and described may obviously be varied within substantial limits without departing from the scope of my invention as defined in the following claims.

I claim:

1. A mechanism for operating a plunger actuated switch, comprising a pair of supporting elements disposed in spaced apart relation on a switch casing and on opposite sides of the switch actuating plunger, a pintle supported by and extending between said elements in proximity to said plunger, said pintle having an intermediate portion of reduced diameter providing inwardly facing opposed shoulders at the ends thereof, a rigid operating lever shaped to provide an open-sided bearing adapted to be pressed against said intermediate portion of the pintle, and a coil spring surrounding the pintle between the sides of the lever and the supporting elements, said spring being engaged with the switch casing and with said lever, said pintle, lever and spring being cooperatively associated so as to prevent disassembly of the parts during normal operation.

2. An operating mechanism for a plunger actuated switch, comprising supports disposed upon opposite sides of the switch plunger, a pintle mounted between said supports to one side of the plunger provided with spaced apart annular shoulders having portions outside said shoulders mounted in said supports, a rigid lever fulcrumed on the pintle, said lever having a bearing portion adapted to be engaged with said pintle by movement of the lever transversely of the pintle, and a coiled spring mounted on the pintle so as to maintain the lever in fulcrumed position on the pintle.

3. In a switch operating mechanism for plunger actuated snap switches, the combination of a fulcrumed pintle mounted in proximity and to

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one side of the switch plunger, said pintle being provided with a pair of spaced apart annular shoulders, a rigid lever fulcrumed on the pintle between said shoulders, said lever having opposed portions engageable with said shoulders to limit movement of said pintle transverse to the axis of said lever, a coiled spring consisting of coils mounted on the pintle at each side of the lever, said spring having a loop connecting said coils and engaged with the lever to maintain said lever normally pressed resiliently against said pintle, the free ends of the spring being engaged with the switch casing, whereby the pintle, lever and spring are maintained in assembled relation by the tension of the spring.

4. A snap switch comprising a snap switch mechanism having an actuating plunger, a casing for enclosing the same, a cover of moulded plastic for said casing having upstanding walls integral therewith disposed along opposed side edges of the cover and an opening intermediate the walls to support said plunger for sliding movement, a pintle extending between said walls having an intermediate portion of reduced diameter and shoulders at the ends thereof supported by said walls, a rigid operating lever having an open sided bearing fulcrumed on the intermediate portion of said pintle between the walls, a coiled spring mounted on said pintle engaging the switch casing and the lever to bias the lever in a selected direction and to prevent disengagement of the lever from the pintle, and stop means on the cover to limit the rotation of the lever.

5. A mechanism for operating a plunger actuated switch, comprising supporting elements arranged in spaced apart fixed relation relative to the switch, a pintle extending between and supported by said elements at one side of the plunger, a rigid operating lever having an open-sided bearing intermediate its ends fulcrumed on said pintle between said supporting elements providing a long arm on one side of said pintle for actuating the lever and a short arm on the other side thereof for selective engagement with the plunger depending upon the position of the lever on the pintle, said pintle having an annular groove formed thereon for receiving said lever so as to positively position the lever, and a coiled spring mounted on said pintle and engaged with the switch casing and with said lever so as to bias said lever in a selected direction and to wedge said bearing into engagement with said pintle whereby said operating lever is readily removable for reversing its position by pressing said open-sided bearing transversely away from said pintle.

6. In an operating mechanism for a plunger operated switch, comprising a support disposed at one side of the plunger, a pintle mounted on said support and extending adjacent another side of said plunger to form a fulcrum, a lever having a recessed portion engageable with said pintle, said pintle having an annular groove intermediate the ends thereof for receiving the recessed portion of the lever to prevent relative displacement of the lever longitudinally of the pintle, and a coiled spring mounted on the pintle to maintain the lever in fulcrumed position on the pintle.

7. A mechanism for operating a plunger operated switch comprising, upstanding walls integrally attached to said switch on opposite sides of said plunger, a pintle supported by said walls adjacent one side of said plunger, a rigid operat-

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ing lever having an open faced bearing fulcrumed on said pintle between said walls and having a first portion and a second portion extending in opposite directions from said pintle, said portions being of such length that either said first or second portion is engageable with said plunger for actuating the latter when the lever is transposed end for end on the pintle, means acting between said lever and said pintle for preventing relative displacement of the lever longitudinally of the pintle, and a coiled spring mounted on said pintle having an end abutting the lever and an end engageable with the switch, said spring being biased to hold said lever in an assembled relation with the pintle and to urge said lever in one direction about said pintle.

8. A mechanism for operating a plunger operated switch comprising, a support affixed to the switch adjacent one side of the plunger, said support having a first opening spaced from said plunger in one direction along a longitudinal axis of the support and a second opening spaced from said plunger in the opposite direction along a longitudinal axis of the support, a pintle shaped to be received in either of said openings to form a fulcrum on either side of the plunger at spaced positions along the longitudinal axis of the switch, a rigid lever for engaging said plunger having a bearing intermediate its ends shaped to receive the pintle, means acting between the lever and the pintle for positively maintaining the lever and the pintle in a predetermined relation, and a spring mounted on the pintle to bias the lever in a predetermined direction.

9. A mechanism for operating a plunger operated switch comprising, a support affixed to said switch adjacent one side of said plunger, said support having a first pivotal supporting opening disposed adjacent one side of said plunger and a second pivotal supporting opening disposed on the opposite side of said plunger a substantially equal distance, said openings being disposed at spaced positions along a longitudinal axis of the support, a pintle shaped to be received in either of said openings to form a fulcrum, a rigid lever for engaging said plunger comprising a first end portion adapted for engagement to operate the plunger, a second end portion and an open-sided bearing intermediate said portions shaped to receive the pintle, the length of each of said end portions being greater than the distance from the pintle to the plunger, and a spring mounted on the pintle having an end engageable with the lever on the side thereof away from the open-sided bearing and having an end engageable with said switch, said spring being biased to urge the lever into engagement with the pintle and to urge the lever in one direction about the pintle.

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