

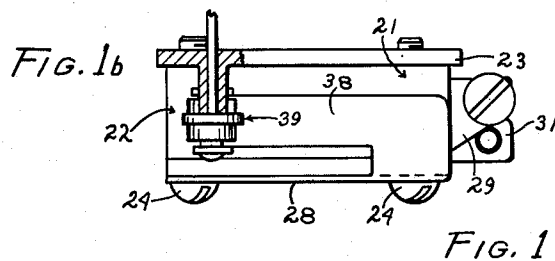
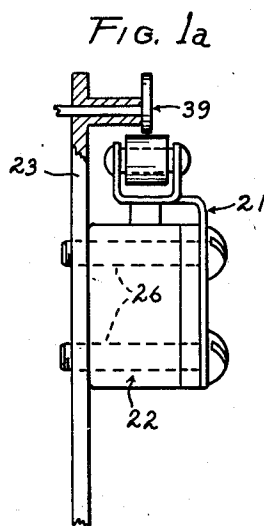
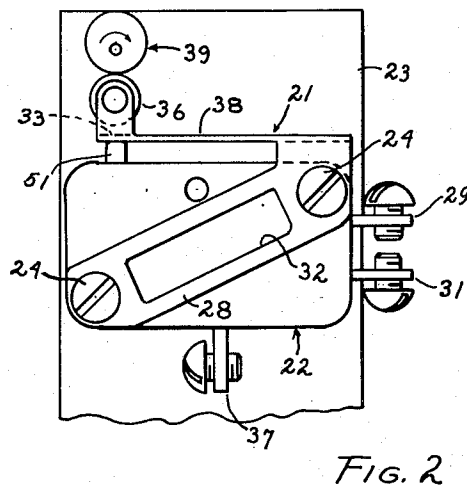
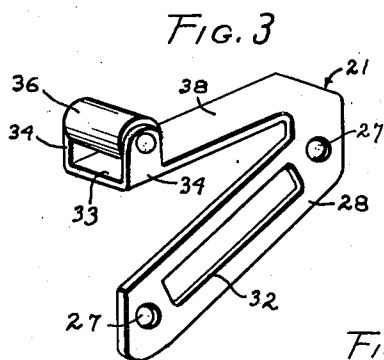
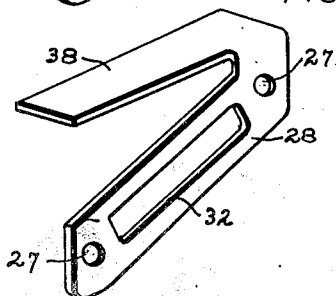
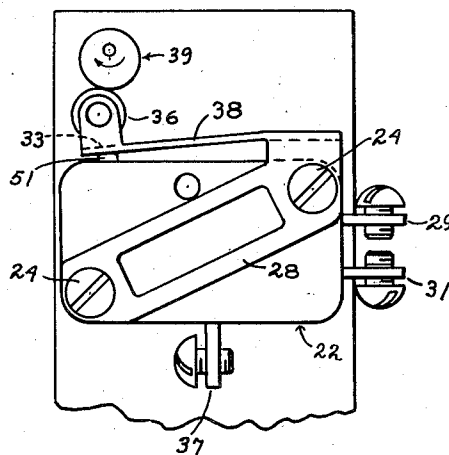
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SWITCH ACTUATOR

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## UNITED STATES PATENT OFFICE

2,612,368

## SWITCH ACTUATOR

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10 Claims.

(Ch. 267--1)

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This invention relates to electrical switches and has specific reference to an improved actuator therefor.

Compact precision switches, for example those of the type disclosed in McGall Patent 1,960,020, function best when the operating force is applied to the plunger with as little side thrust as possible. This means that when the plunger is operated by a rotating cam, or by a cam reciprocating transversely to the plunger, an intermediate member must be interposed between the cam and the plunger to direct the force applied to the plunger substantially parallel to the axis thereof and to eliminate the side thrust which would otherwise cause part of the force applied to the plunger to be lost by frictional engagement with the switch housing. Such an intermediate member is called a switch actuator.

Objects of this invention include the provision of an improved actuator that is simple, inexpensive, and readily attached to a unitary electric precision switch of the type disclosed in the above-mentioned McGall patent. A preferred embodiment will be formed from a single piece of flat leaf spring material, or resilient fiber or plastic material, and will have a mounting portion screwed or bolted to one side of the switch, and a flexible portion adapted to be pressed against the operating plunger by the cam or other operating means.

Other objects and advantages will be apparent from the description, and from the drawings, in which—

Figure 1 is a side view of a supporting plate with a unitary electrical switch having an actuator mounted thereon illustrating one embodiment of my invention;

Figs. 1a and 1b are end and top views respectively of Figure 1;

Fig. 2 is a view similar to Figure 1, but showing the operating cam turned 180 degrees to depress the flexible actuator portion and the switch operating plunger to abnormal positions which are opposite to their normal positions shown in Figure 1;

Fig. 3 is a perspective view of the actuator shown on the previous figures, and

Fig. 4 is another modification of the actuator.

Referring now more particularly to the drawings, the actuator 21 and the switch 22 are fastened to a supporting plate 23 by common mounting screws or bolts 24 which extend through mounting holes 25 in the switch and through the mounting holes 27 in the actuator and are threadably engaged with the supporting plate 23.

For purposes of illustration, my improved actuator is shown applied to the self-returning precision type unitary switch disclosed in Oscar H. Kaminsky copending application for a snap acting device, Serial No. 645,876, filed February 6, 1946, issued as Patent No. 2,486,033, October 29, 1949, to which reference may be had for the details of its construction and operation. Briefly, its operation is such that the vertically reciprocable operating plunger 51 is urged to the outward or normal position shown in Figure 1 at which position the terminals 29 and 37 will be connected within the switch; and when the plunger 51 is in the depressed or abnormal position shown in Fig. 2, terminals 31 and 37 will be connected.

The actuator, generally designated above as 21, may be readily formed from a single piece of sheet spring material such as brass or steel; or from any formable, resilient fiber material; or it may be molded or pressed from plastics molding powders or laminated plastic materials such as those known in the trade as synthetic resin molding powders, or synthetic resin laminated sheets. I wish to emphasize that my actuator may be made of a wide variety of resilient, flexible materials, although it is recognized that in some cases electrically conducting brass or copper may be preferred while in other cases electrically insulating materials such as the fiber or plastics materials above-mentioned will be preferred.

In describing the construction of the actuator, it may be regarded as comprising two parts: (a) the mounting portion 28, and (b) the flexible or cantilever portion 38. A hole, or holes, 27 are provided in the mounting portion and are registerable with the mounting hole or holes 26 formed in the switch 22; obviously where the switch has only one mounting hole, the mounting portion 28 of the actuator need have only one mounting hole 27 but usually it will be preferable to have at least two of these mounting holes, or equivalent means, to prevent the actuator from rotating when operated. The mounting portion 28 may or may not be slotted, as shown at 32, either to reduce weight or to improve its appearance. In the embodiment shown, although obviously not always necessarily so, the flexible or actuating portion 38 will have been molded, bent, or otherwise formed at substantially right angles to a plane containing the mounting portion 28 so that its freely movable end portion 33 will be resiliently movable in a path substantially parallel to the reciprocable axis of the plunger 51. The flexible end portion

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33 may, if desired for a particular installation, be provided with the integral upstanding ears 34 engaging the freely rotatable roller 36. Such a roller will be provided where it is desired to reduce the friction between the actuator and the operating member (herein shown as an eccentrically mounted cam, generally designated 39). In other adaptations, where a certain amount of friction is permissible and it is desired to make the actuator as inexpensively as possible, the roller may be omitted in which case the actuator will take the form shown in Fig. 4. The portion of the member 38 integrally connected to the mounting or side portion 28 and the mounting portion 28 together in effect define a mounting bracket for the free end portion 33.

In describing the operation of the actuator switch combination illustrated, assume that the parts are each in the position shown in Figure 1. This is the normal or undepressed position, at which the eccentric cam 39 is rotated out of contact with the roller 36. In this particular case the cam 39 comprises the operating means referred to above and it may be rotated manually or in response to temperature rise in a certain piece of equipment or it may be automatically rotated in response to any preferred condition calling for a change in switching positions. This particular form of operating means is not an essential part of my invention herein disclosed and may take any desired form. In Fig. 2 the parts are shown in their depressed or abnormal positions which they will assume when the operating cam 39 is rotated 180° with respect to its position in Figure 1. When the cam 39 is further rotated another 180° to resume its Figure 1 position, the actuator cantilever portion 38 will follow it upward to its Figure 1 position under the influence of bending stresses stored up in it; and, since the switch is of the self-returning type, in which the plunger 51 is constantly urged to its Figure 1 position, the plunger will follow the actuator cantilever portion 38 when the latter moves upward.

While I have thus described two specific embodiments of my invention, I am aware that numerous alterations and changes may be made therein without materially departing from the spirit of the invention and the scope of the appended claims.

I claim:

1. For use with a plunger operated switch having a top surface through which the plunger projects and a side surface having diagonally spaced mounting holes formed thereon, an actuator comprising an elongated resilient member adapted to rest in spaced relation with the top surface of the switch when disposed in operative position with respect to the switch, said member having a free end shaped to engage the plunger and an opposite end spaced from the free end when disposed in said position, and a mounting portion integrally interconnected at a side edge of the resilient member with the mounting portion depending from the resilient member inclined at an angle with respect thereto, said mounting portion being shaped to overlie said side surface of said switch and being formed with holes positioned to be in register with said diagonally positioned mounting holes when said elongated member is in the aforesaid position.

2. An actuator for use with a plunger operated switch of the type having a top surface through which the plunger projects and a side surface having diagonally spaced mounting holes formed

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thereon, said actuator comprising a single piece of resilient material having a mounting portion adapted to be in side by side relation with said side surface of the switch and being formed with holes positioned to be in register with said mounting holes, and an elongated actuating portion inclined at an angle to said mounting portion and extending thereabove to overlie the top surface of the switch, said actuating portion having a mounting end integrally connected at a side edge with said mounting portion to be supported thereby and having a free end adapted to engage said plunger to depress the latter upon application of force to said actuating portion.

3. An actuator comprising a mounting portion having spaced mounting apertures thereon, and an elongated actuating portion inclined at an angle to said mounting portion, said actuating portion at one end being connected at a side edge to said mounting portion and having its opposite end free to move between opposed positions.

4. An actuator comprising an elongated resilient member having an end free to move, and a mounting portion for the elongated resilient member interconnected therewith in spaced relation from the free end thereof, said mounting portion extending from a side edge of the elongated resilient member in angularly disposed relationship with respect thereto.

5. An actuator comprising an elongated flexible resilient member having one end free to move, and a mounting portion for the elongated resilient member interconnected therewith in spaced relation from the free end thereof, said mounting portion depending from the elongated resilient member to extend downwardly therefrom and in a direction toward the free end thereof.

6. An actuator comprising an elongated flexible resilient member having one end free to move, and a mounting portion for the elongated resilient member interconnected therewith in spaced relation from the free end thereof, said mounting portion depending from the elongated resilient member at a side edge thereof to extend downwardly therefrom and in a direction toward the free end thereof.

7. An actuator comprising an elongated straight flexible resilient member having one end free to move, and a mounting portion for the elongated resilient member interconnected with the other end thereof at a side edge thereof, said mounting portion being formed of flat material extending in a plane perpendicular to the plane of the elongated resilient member and depending therefrom diagonally in a direction toward the free end thereof.

8. An actuator formed from a single sheet of material comprising an elongated straight flexible resilient member having one end free to move, and a mounting portion for the elongated flexible member integral with the other end thereof, said mounting portion extending in a plane perpendicular to the plane of the elongated flexible member and depending from a side edge thereof to extend therebelow and terminate in a portion disposed toward the free end of the elongated flexible member in spaced relation therefrom.

9. An actuator formed from a single sheet of material comprising an elongated straight flexible resilient leaf spring member having one end free to move, and a mounting portion for the leaf spring member interconnected with the other end thereof, said mounting portion being

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formed of flat material extending in a plane perpendicular to the plane of the leaf spring member and depending from a side edge thereof to extend diagonally therebelow and terminate in a portion disposed toward the free end thereof, said depending mounting portion being formed with a pair of spaced mounting holes disposed respectively below the free and mounted ends of the leaf spring member.

10. An actuator for a plunger operated switch having a first surface through which the plunger projects and a second surface at an angle with respect to the first surface and spaced laterally of said plunger, said actuator comprising a bracket shaped to be attached to said switch and having a first portion shaped to be rigidly attached to the second surface, said actuator also including a second portion rigidly attached to the first portion and inclined at an angle with respect to the first portion and shaped to overlie said first surface on the switch, said second portion including a resilient cantilevered portion shaped to overlie said first surface on the switch

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and extending beyond the attachment of said second portion to said first portion and having its free end remote from said attachment shaped to be engageable with said plunger, and a roller mounted on said free end of the resilient portion on the side thereof away from the plunger for transmitting force from an external source to the resilient portion to actuate the plunger.

STAFFORD G. RANSOME.

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