June 23, 1953 J. J. GEEL 2,643,307

ELECTRIC SWITCH ACTUATOR

Filed Aug. 16, 1951 2 Sheets-Sheet 1

Fig. 1

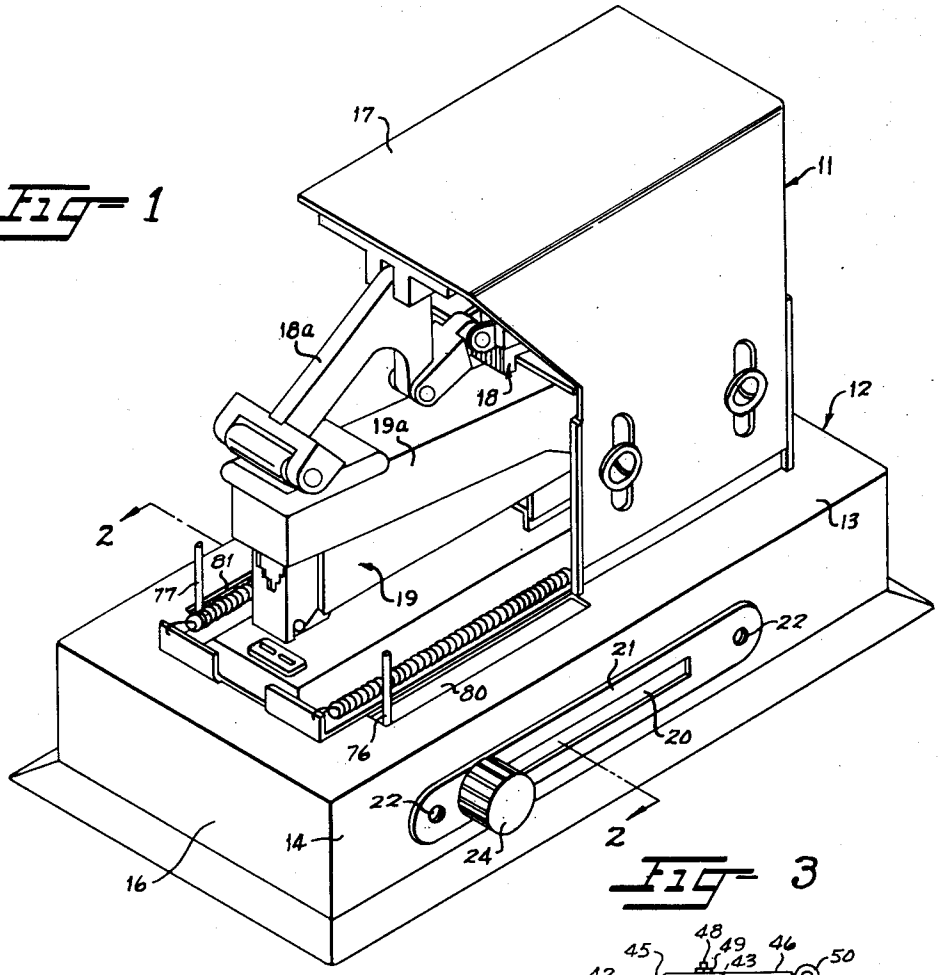


Fig. 3

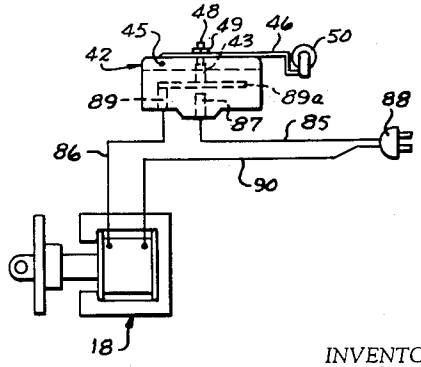
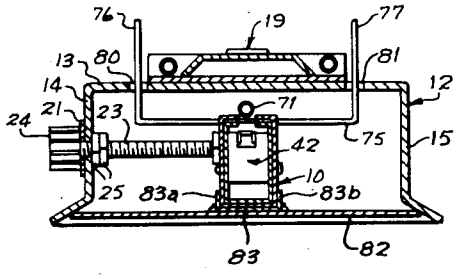


Fig. 2



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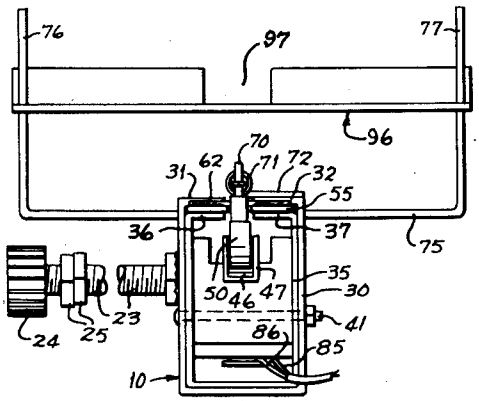

Fig- 6

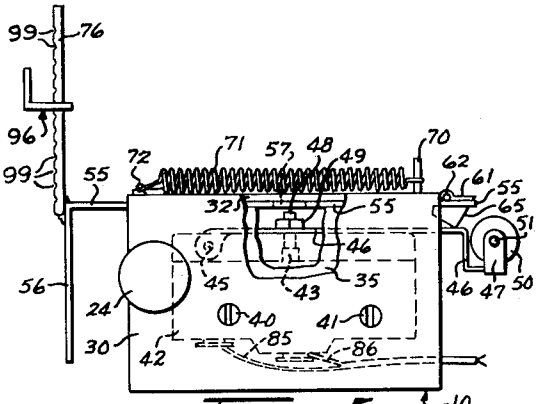

Fig- 5

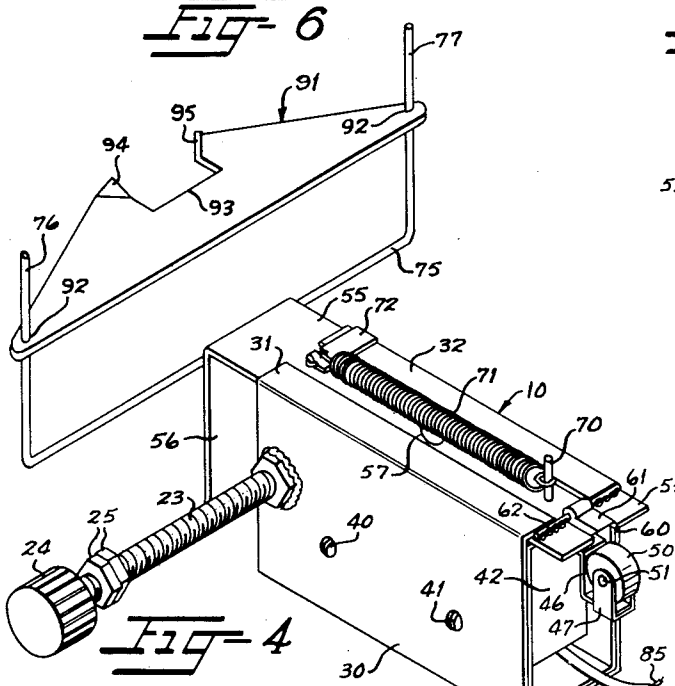

Fig- 4

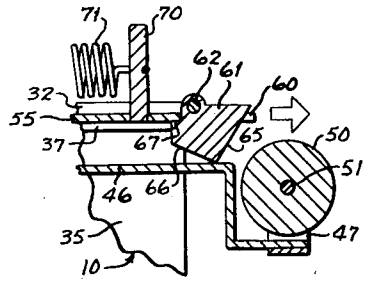

Fig- 7

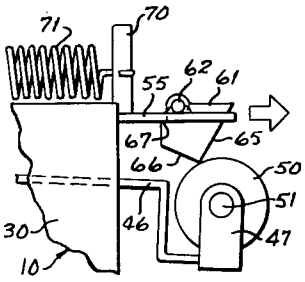

Fig- 8

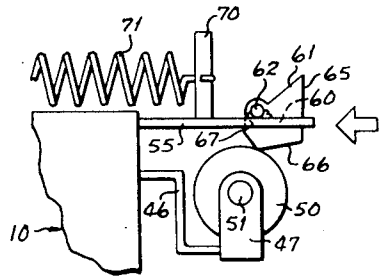

Fig- 9

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Patented June 23, 1953 2,643,307

UNITED STATES PATENT OFFICE

2,643,307

ELECTRIC SWITCH ACTUATOR

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Application August 16, 1951, Serial No. 242,147

5 Claims. (Cl. 200—52)

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This invention relates to electric switches and more particularly to an improved mechanism for actuating the same. While not limited thereto, this electric switch actuator is particularly adapted to operate electrically operable staplers and the like, such as is shown in my pending patent application, Serial No. 189,535, filed October 11, 1950, and entitled Electrically Operable Stapler Actuator.

The stapler shown in my co-pending application is actuated by means of a bell crank and a solenoid for moving the stapler to drive a staple through material and the solenoid is actuated by a manually operable switch. In using a stapler of this type, material to be stapled is placed beneath the stapler head and the manual switch is actuated to drive the staple through the material and while this actuator is a marked improvement over hand operated staplers, a considerable amount of time and motion is used in positioning the material to be stapled and then actuating the manual switch and when the stapler is used extensively this time and motion becomes an important factor from a cost standpoint. It is, therefore, the primary object of this invention to provide a switch actuator particularly adapted to be used with a stapler and actuator therefor whereby the positioning of material to be stapled will engage means on the switch actuator to automatically actuate the switch of the stapler actuator to cause a staple to be driven through the material.

It is to be understood that the improved switch actuator may readily be used for many purposes and while the same is particularly adapted for use with an electrically operable stapler and is illustrated in combination with such a stapler, it is another object of this invention to provide a switch actuator for actuating a sensitive switch upon material engaging the switch actuator.

It is another object of this invention to provide a switch actuator in combination with a sensitive switch and having slidable means associated with said switch and adapted to engage means on the switch for opening or closing the same and said slidable means being provided with contact elements adapted to be engaged by material whereby upon material engaging the contact means on the slidable means, the latter will move relative to the switch to engage the means thereon for opening or closing the same. This invention may readily be used to adapt a sensitive switch to a limit switch for various purposes.

More specifically, it is an object of this invention to provide in a sensitive switch having a

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plunger for opening or closing the same and also having a pivoted lever arm extending over said plunger and the lever arm having a roller on the free end thereof, novel means for engaging said roller to depress the lever arm to move said plunger to open or close the switch comprising a housing associated with said switch, a slidable member slidably mounted in said housing in superposed relation to the lever arm of said switch, said slidable member having a cam or dog pivotally mounted therein and adapted to engage the roller on said lever arm for depressing the same and contact means on said slidable member adapted to be contacted by material to be processed for moving said slidable member to a position where the cam or dog carried thereby will engage the roller on the lever arm to depress the same to actuate said switch.

It is another object of this invention to provide a switch actuator of the type described wherein the cam or dog carried by the slidable member is so constructed as to depress the roller on the lever arm when the slidable member is moved in one direction and to ride over the roller on the lever arm when the slidable member is moved in the other direction.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

Figure 1 is an isometric view of the novel switch actuator and illustrating a stapler device with which the switch actuator may be associated;

Figure 2 is a vertical sectional view of the switch actuator and stapler at a reduced scale, taken substantially along the line 2—2 in Figure 1;

Figure 3 is a schematic wiring diagram showing the electric circuit associated with this invention;

Figure 4 is an isometric view of the switch actuator per se and illustrating one form of contact means therefor;

Figure 5 is an elevation of the switch actuator looking at the left-hand side of Figure 4 and showing another form of contact means;

Figure 6 is an end view of the invention looking at the right-hand end of Figure 5;

Figure 7 is an enlarged view of the upper right-hand portion of Figure 5 with parts in section and showing the cam in the position maintained prior to operation of the switch actuator;

Figure 8 is an elevational view similar to Figure 7 but showing the cam depressing the roller upon the slidable member being partially moved;

Figure 9 is a view similar to Figure 8 but show-

ing the cam in the position assumed after the lever arm has been depressed but prior to riding back over the roller.

Referring more specifically to the drawings, the numeral 10 broadly designates the switch actuator which is shown in Figures 1 and 2 in association with an electrically operable staple actuator 11 having a base portion 12 which may be of any suitable construction such as stamped metal and is provided with a top 13, side walls 14 and 15 and end walls 16, only one of which is shown in the drawings.

The electrically operable stapler actuator is illustrated to show one type of device with which the switch actuator may be used, it being understood that the invention is not limited to use with the stapler actuator illustrated. The particular stapler actuator shown is of the type disclosed in my co-pending patent application, Electrically Operable Stapler Actuator, Serial No. 189,535, filed October 11, 1950, and includes a housing 17 which carries a solenoid 18 and a bell crank 18a for actuating an arm 19a of a stapler 19 suitably positioned on the base portion 12.

The side wall 14, of the base 12, has an opening 20 therein around which a plate 21 is fixedly mounted in any suitable manner, such as by screws 22, and in which a threaded shaft 23 is mounted for sliding movement. The threaded shaft 23 has a knob 24 threadably mounted on the outer end thereof, and threadably mounted thereon immediately adjacent the side wall 14 are a pair of lock nuts 25, the purpose of which will be later described.

The inner end of the threaded shaft 23 is fixedly mounted, in any suitable manner, such as welding, on a U-shaped bracket or housing 30 having its upper edges turned inwardly toward each other to form portions 31 and 32. The U-shaped bracket 30 fits around another U-shaped bracket or inner housing 35, opposed sides of which are turned inwardly at their upper edges to form turned-in portions 36 and 37 (Figure 6), the purpose of which will be later described.

The U-shaped bracket 30 and the U-shaped bracket 35 are held in fixed relation to each other by bolts 40 and 41 and these brackets 30 and 35 form a housing for a sensitive electric switch 42 such as a "Microswitch." The switch 42 is held in adjustable fixed relation inside the U-shaped member 35 by the bolts 40 and 41. The switch 42 may be of the type disclosed in Patent No. 1,960,020 to P. K. McGall. The switch 42 has pivotally mounted thereon, as at 45, an operating lever 46 which extends to the right in Figures 4 and 5 or rearwardly of the staple actuator 11 and is bent downwardly and rearwardly again and on the outermost end of which is fixedly mounted in any suitable manner a U-shaped roller bracket 47 in which a roller 50 is rotatably mounted as at 51.

Threadably mounted in the operating lever 46 between the pivot point 45 and the roller 50, is a set screw 48 having a lock nut 49 threadably mounted thereon which is in vertical alinement with a plunger 43 which is a conventional part of the sensitive switch 42. The set screw 48 allows minute adjustment of the opening and closing time of the switch 42 in relation to the vertical movement of the roller 50. Movement of the plunger 43 serves to make or break an electrical circuit in a well known manner. In the switch illustrated, the plunger serves to complete an electrical circuit upon being depressed but it is to be understood that the switch actuator may also be used with a plunger which breaks a circuit when depressed.

By referring to Figures 4 and 7, it will be observed that the turned-in portions 31 and 32 of the U-shaped bracket 30 and the turned-in portions 36 and 37 of the U-shaped bracket 35 are spaced from each other to form a guide for sliding means such as a plate member 55. The forward or left-hand end of the sliding member 55 in Figure 5, is turned down to form a downwardly extending portion 56 which acts as a stop to limit rearward movement of the sliding member 55 relative to the switch 42. The rear end of the sliding member 55 is provided with a notch 60 therein in which a switch actuator member in the form of a cam or dog 61 is eccentrically pivotally mounted on a transversely extending shaft 62. The shaft 62 is fixedly mounted on the rear end of the sliding member 55 in any suitable manner, such as by welding. The shaft 62 is in the same plane as the portions 31 and 32 of the housing 30 and acts as a stop to limit forward movement of the sliding member 55 as this shaft 62 comes into contact with the inturned portions 31 and 32 of the U-shaped bracket 30 (Figures 4 and 7). The cam 61 is provided with cam surfaces 65, 66 and a lip 67, the purposes of which will be later described. The sliding member 55 is provided with a hole 57 (Figure 4) which is provided to give access to the set screw 48 for adjustment thereof.

Fixedly mounted in any suitable manner as by a pressed fit in the sliding member 55 is a spring perch 70 around which one end of a tension spring 71 is mounted, the forward end of the tension spring 71 being mounted on a spring perch 72 fixedly mounted to the inturned portion 32 of the U-shaped bracket 30 in any suitable manner as by welding.

It is thus seen that the spring 71 will normally urge the sliding member 55 to a forward position, or the position shown in Figure 4, that is, with the shaft 62 acting as a stop and resting against the inturned portions 31 and 32 of the U-shaped member 30 and with the cam 61 in the position shown in Figures 5 and 7.

If desired, the downturned portion 56 of the sliding member 55 may be utilized as a contact element to be contacted by material to be processed for actuating the switch. However, in many instances, such as in using the switch actuator with a stapler of the type described, it is necessary or desirable to provide an additional contact element or elements. To this end, there is illustrated a contact element in the form of a U-shaped slide actuator 75 which is fixedly secured, as by welding, to the front end of the sliding member 55 or to the portion 56 thereof. The U-shaped slide actuator 75 has upturned portions 76 and 77 thereon which are adapted to extend through elongated slots 80 and 81 in the top portion 13 of the base 12 and have free movement, forwardly and rearwardly in said slots.

The base 12 is provided with a removable bottom 82 on which is fixedly mounted in any suitable manner, such as welding, a U-shaped channel member 83 (Figure 2) having upturned side portions 83a and 83b in which the bottom of the U-shaped bracket 30 is slidably mounted. In operation, the switch actuator 10 may be placed in any position along the U-shaped channel 83 by loosening the knob 24 on the outer end of the threaded shaft 23 and moving the switch actuator 10 along the channel member 83 along with the U-shaped bracket 75 and then tightening the

knob 24 against the plate 21 to hold the switch actuator in the desired position to thus position the contact element 75 in the desired position. The nuts 25, having previously been tightened against the inner surface of wall 14, serve as a backing for the relatively thin material from which wall 14 is made. Thus, the displacement between the leading edge of the material to be stapled and the point at which the staple is driven into said material may be varied as desired.

After the switch actuator 10 has been placed in the desired position so that the staple will be driven through the material at the desired distance away from the edge thereof, the material to be stapled is then moved between the jaws of the stapler and into engagement with the upturned portions 76 and 77 of the U-shaped bracket 75. Continued movement of the material against the upturned portions 76 and 77 will cause the sliding plate 55 to be moved rearwardly against the tension of the tension spring 70. Due to the fact that the lip portion 67 of the cam 61 engages the lower edge of the sliding plate 55, the cam 61 will be positioned as shown in Figures 7 and 8 and, as the cam surfaces 65 and 66 successively engage the roller 50, the roller 50 along with the actuator lever 46 is forced downwardly or clockwise around the pivot point 45 to bring the set screw 48 into engagement with the plunger 43 to actuate and close the switch 42.

The switch 42 is provided with suitable wires 85 and 86. The wire 85 leads from a contact 87 to a plug 88 (Figure 3). The wire 86 leads from a contact 89 within the switch 42 to one side of the solenoid 18. The contact 89 has mounted thereon one end of a contact bar 89a which momentarily completes the electric circuit from the contact 87 as the plunger 43 is depressed by the set screw 48. A wire 90 leads from the solenoid 18 to the plug 88 to complete the circuit between the switch 42 and the solenoid 18. The plug 88 may be connected to any suitable source of electrical energy.

It will thus be observed that the stapler 19 is actuated almost simultaneously upon depression of the roller 50 in the manner described to thus drive a staple through the material to be processed.

As the stapled material is withdrawn from beneath the stapler 19, the tension spring 71 will move the sliding member 55 forwardly along with the contact member 75 and the cam surface 66 of the cam 61 will engage the roller 50 and cause the cam 61 to pivot and ride over the roller 50 without depressing the same, as is clearly shown in Figure 9, to thus position the sliding member 55 and the cam 61 in substantially the position shown in Figure 7 to again be operated in the manner described.

In using the switch actuator with an electric stapler of the type described, it is frequently desirable to staple material such as paper at the corner thereof and to accomplish this result, the contact member 75 may be suitably modified as by means of an auxiliary bracket 91 (Figure 4) which has a pair of bores 92 therein which are slidably penetrated by the upturned portions 76 and 77 of the member 75. The bracket 91 is provided with a forwardly facing opening 93 positioned substantially in the center portion thereof and the forward edges of the bracket defining the opening 93 are turned up to form portions 94 and 95 against which the corners of material to be stapled are placed. It is thus seen that

the corners of material, by using the auxiliary bracket 91, may be used to actuate the switch to thus automatically position a staple at approximately a forty-five degree angle in the corner of the material.

When the material to be stapled is not wide enough to contact the upturned portions 76 and 77 of the member 75, an L-shaped auxiliary bracket 96 may be provided. The L-shaped auxiliary bracket 96 fits on the upturned portions 76 and 77 in the same manner as the bracket 91, previously described, and has an opening 97 in the vertical flange thereof which is provided to allow the staple driving arm of the stapler to be moved downwardly sufficiently to allow the staple to be driven through the material. It is thus seen that as narrow material is pressed against the vertical flange of the L-shaped bracket 96, the contact member 75 will be moved rearwardly in the manner previously described, to actuate the switch 42 for stapling the material.

The upturned portions 76 and 77 are provided with a plurality of notches 99 therein (Figure 5) which provide a rough surface on which the edge of the paper or material to be stapled may be placed to prevent slippage, as the material is pressed against the upturned portions 76 and 77 of the member 75.

It is thus seen that I have provided novel and efficient means for actuating a sensitive switch, which means are particularly useful in combination with electrically operable staplers.

In the drawings and specification there has been set forth a preferred embodiment of the invention and although specific terms are employed they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. An actuator for a sensitive switch having a plunger for opening or closing the same and also having a pivoted lever arm extending over said plunger and said lever arm having a roller on the free end thereof, said actuator comprising means for engaging said roller to depress the lever arm to move said plunger to open or close the switch including a housing partially enclosing said switch and having a slot therein positioned over said lever, a slidable member slidably mounted between the slotted portion of the housing and said switch in superposed relation to the lever arm of said switch, said slidable member having a cam pivotally mounted adjacent one end thereof and adapted to engage the roller on said lever arm for depressing the same, U-shaped contact means fixed on the end of said slidable member remote from said cam and adapted to be contacted by material being processed for moving said slidable member to a position where the cam carried thereby will engage the roller on the lever arm to depress the same to actuate the switch, and spring means normally urging said slidable member and cam away from said roller.

2. An actuator for a sensitive switch having a plunger for opening or closing the same and also having a pivoted lever arm extending in superposed relation to said plunger and said lever arm having a roller on the free end thereof, said actuator comprising means for engaging said roller to depress the lever arm to move said plunger to open or close the switch including a housing partially enclosing said switch, said housing having one wall thereof disposed in spaced relation to the lever arm of said switch

and said wall being slotted above said lever arm, a slidable planar member slidably mounted between said slotted wall of said housing in superposed relation to the lever arm of said switch, said slidable member having a cam pivotally mounted on one end thereof and adapted to engage the roller on said lever arm for depressing the same, U-shaped contact means on the end of said slidable member remote from said cam and adapted to be contacted by material being processed for moving said slidable member to a position where the cam carried thereby will engage the roller on the lever arm to depress the same to actuate the switch, a pin fixed on said slidable member and extending upwardly through said slot, and a spring connected at one end to said pin and at its other end to said housing for normally urging said slidable member in a direction opposite to that in which it is moved by material being processed.

3. An actuator for a sensitive switch having a plunger for opening or closing the same and also having a pivoted lever arm extending in superposed relation to said plunger and said lever arm having a roller on the free end thereof, said actuator comprising means for engaging said roller to depress the lever arm to move said plunger to open or close the switch including a housing partially enclosing and fixed to said switch, a slidable member slidably mounted between one wall of said housing and said switch in superposed relation to the lever arm of said switch, said slidable member having a cam pivotally mounted thereon and adapted to engage the roller on said lever arm for depressing the same, contact means on said slidable member adapted to be contacted by material being processed for moving said slidable member to a position where the cam carried thereby will engage the roller on the lever arm to depress the same to actuate the switch, and said cam carried by the slidable member being so constructed so as to depress the roller on the lever arm when the slidable member is moved in one direction and to ride over the roller on the lever arm when the slidable member is moved in the other direction, a spring means connected to said housing and to said slidable member for normally urging said slidable member in a direction opposite to the direction in which it is moved by said material, and an adjustment bolt fixed to one wall of the housing and extending therefrom for adjustably mounting said housing and said switch in a device to be controlled by said switch.

4. An actuator for a sensitive switch having a plunger for opening and closing the same and having a pivoted lever extending in superposed relation to said plunger and said lever having

a roller on the free end thereof, said actuator comprising a housing enclosing said switch, a trackway in the upper portion of said housing, an L-shaped member slidably mounted in the trackway in said housing in superposed relation to the lever of said switch, one arm of said L-shaped member being adapted to engage said switch to limit the movement thereof in one direction and the other arm of said L-shaped member having a slot in the free end thereof, a pin spanning said slot, a cam pivotally mounted on said pin and depending in said slot, said cam being irregular in shape whereby upon movement thereof in one direction it will engage and depress said roller to actuate said switch and upon movement thereof in the other direction the cam will ride over said roller without actuating said switch.

5. An actuator for a sensitive switch having a plunger for opening and closing the same and having a pivoted lever extending in superposed relation to said plunger and said lever having a roller on the free end thereof, said actuator comprising a housing enclosing said switch, a trackway in the upper portion of said housing, an L-shaped member slidably mounted in the trackway in said housing in superposed relation to the lever of said switch, one arm of said L-shaped member being adapted to engage said switch to limit the movement thereof in one direction and the other arm of said L-shaped member having a slot in the free end thereof, a pin spanning said slot, a cam pivotally mounted on said pin and depending in said slot, said cam being irregular in shape whereby upon movement thereof in one direction it will engage and depress said roller to actuate said switch and upon movement thereof in the other direction the cam will ride over said roller without actuating said switch, and spring means normally urging said L-shaped member in a direction opposite to the direction in which it moves to actuate said switch.

JOHN J. GEEL.

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