April 17, 1951 G. LONG 2,549,616

SWITCH OPERATING MECHANISM

Filed Sept. 23, 1948

FIG. 1

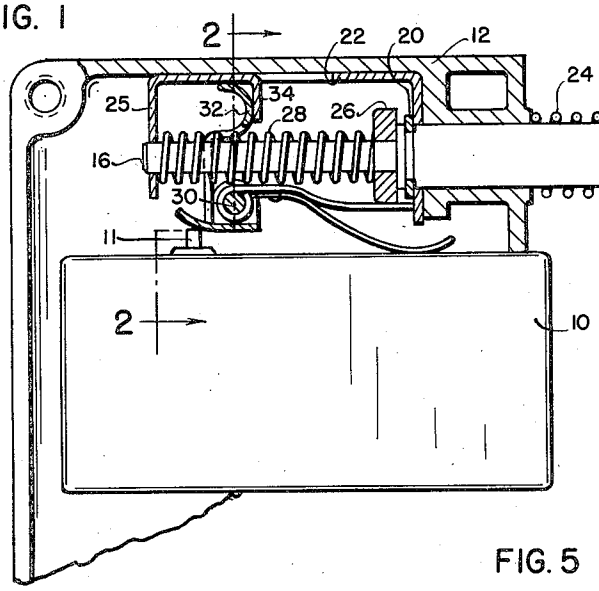


FIG. 2

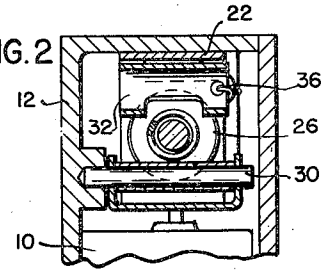


FIG. 5

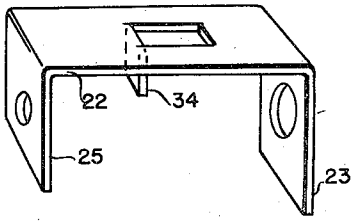


FIG. 3

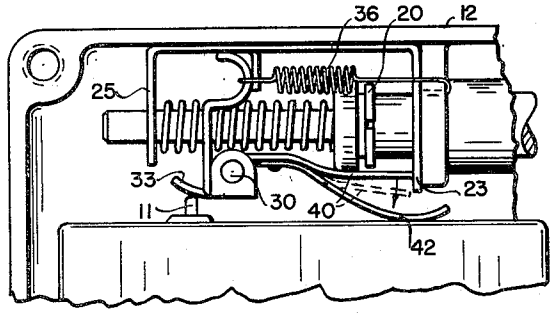


FIG. 6

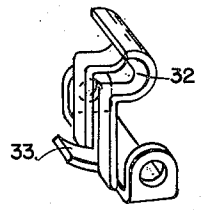


FIG. 4

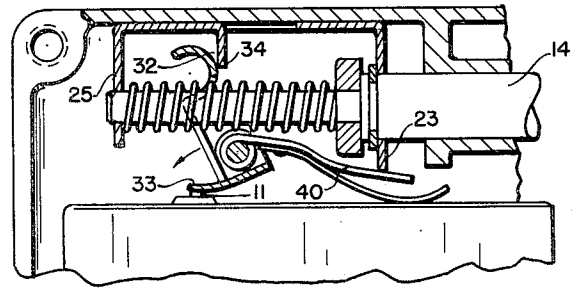
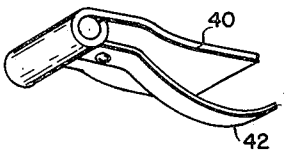


FIG. 7



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SWITCH OPERATING MECHANISM

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Application September 23, 1948, Serial No. 50,831

13 Claims. (Cl. 74—100)

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This invention relates to improvements in mechanism for operating control switches, particularly precision switches, for reciprocating elements, or the like.

An object is to provide a simple operating mechanism to cause reciprocating motion of a moving part to operate a switch, particularly an electrical precision switch, of the type requiring small movements for on and off operation.

Another object is to provide a switch operating mechanism for return switches for use with mechanism requiring controlled reciprocating motion, as planer tables, extrusion plungers, and the like.

Another object is to provide a mechanism which will allow overtravel of the reciprocating element without damaging the switch mechanism.

Another object is to provide a mechanism which will permit small movements of the reciprocating element without operating the switch, thereby eliminating objectionable "hunting" of the operating mechanism.

Another object is to provide a switch operating mechanism which is inexpensive to build, will allow a positive and certain selection of the location of the point of linear travel of the reciprocating element at which the switch will be actuated.

These and other objects which will hereinafter appear are accomplished by this invention which is fully described in the following specification and shown in the accompanying drawings in which

Figure 1 is a partial side elevation partly in section showing the switch and switch operating mechanism;

Fig. 2 is a section taken through 2—2 of Fig. 1;

Fig. 3 is a side elevation of the switch operating mechanism at an intermediate point before the switch is depressed;

Fig. 4 is a side sectional elevation similar to Fig. 1 but showing the switch depressed;

Fig. 5 is a perspective view of the U-shaped member;

Fig. 6 is a perspective view of the bell crank; and

Fig. 7 is a perspective view of the latch and leaf spring assembly.

An embodiment of the invention shown comprises an electrical switch 10 having a spring loaded actuating pin 11. The embodiment described preferably employs a precision snap acting switch requiring small movements of the plunger for actuation but will be understood to be readily adaptable to other types of electrical

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switches. The precision switch and switch operating mechanism are enclosed in a suitable case 12. A control member in the form of a plunger 14 is slidably mounted in the case and is movable by an adjustable screw or the like 13 which is threaded into a reciprocating member 15. The plunger has on its inner end a reduced portion 16. The plunger has an annular groove in which is located a snap ring 20, the latter normally bearing on the inside of a switch actuating member 22 in the form of a saddle, one end of which is slidably mounted on the plunger 14 while the other is slidably mounted on the reduced portion 16, the saddle being guided by the case 12. The plunger 14 and the saddle 22 are normally urged to the right (in Fig. 1) by means of a compression spring 24 which surrounds the plunger 14 and bears at one end on the case 12 and at the other on a pin or the like 27 which extends through the plunger.

While a reciprocating type plunger 14 is employed, it is to be understood that an oscillating plunger could readily be substituted.

Mounted on the reduced portion 16 is a cam release means 26 and a compression spring 28 surrounds the reduced portion and bears on the inner end 25 of the saddle 22 and on the cam 26.

A pivot pin 30 is secured to the case 12 and carries a bell crank lever 32, the upper end of which is curved to engage an ear 34 cut from the central portion of the saddle 22. Thus in Fig. 4, as the saddle is moved to the left, the bell crank is rocked in a counterclockwise direction about the pivot pin 30, depressing the actuating pin 11 of the precision switch, thus operating the latter.

The mechanism by which this movement of the bell crank takes place will now be described. The bell crank lever is normally urged to the right, as shown in Fig. 3, by means of a tension return spring 36 which connects the bell crank lever with a part of the case. A latch 40 is pivotally mounted on the pin 30 and has a leaf spring 42 or the like secured thereto, as shown in Fig. 7, and which normally holds it in contact with the cam 26 in which position, as shown in Figs. 1 and 3, it engages the outer end 23 of the saddle 22, thereby normally retaining the saddle in the position shown in these figures. The cam 26 bearing upon the sloping latch 40 presses this latch down from the full line position of Fig. 3 to the dotted line position, as the plunger 14 moves from the position of Fig. 1 through the position of Fig. 3 to the position of Fig. 4. During this time the cam is slowly moving the latch

40 down so that in the dotted line position of Fig. 3 it becomes released from the bottom of the end 23 at which time the spring 28 acting upon the opposite end 25 of the saddle suddenly snaps the saddle from the position shown in Fig. 3 to that of Fig. 4. As it does so, the ear 34 carries the bell crank lever 32 from its position, as shown in Fig. 3, to that as shown in Fig. 4, at which time the finger 33 of the bell crank lever has depressed the operating pin 11 of the precision switch.

This precision switch is operably connected to an electric motor or the like (not shown), which in turn drives a machine element to be controlled. Operation of the switch may start or stop the motor, depending upon the requirements of the particular machine. The switch may be of the spring loaded, double throw type so that it may be wired in the desired manner and so that depressing the plunger will move the switch to one position and releasing it will move it to the other position. In this case, the machine is so designed as to require that the motor be turned on by movement of member 15 and plunger 14 to the left, as described above. The motor drives the machine through the desired cycle and thus moves member 15 back to the right.

This movement of member 15 to the right releases plunger 14. The spring 24 returns the plunger to the position shown in Fig. 1, and the other operating parts of the mechanism likewise resume the position shown in that figure. Withdrawal of cam 26 and slide 22 permits the spring 42 to raise the latch 40 into engagement with end 23 of the slide. This latching engagement is automatic and instantaneous, the moment the slide reaches its extreme right hand position. Thus the pin 11 of the switch returns to its normal position and the motor is turned off. Furthermore, the latch prevents re-operation of slide 22 and switch pin 11, in case plunger 14 is moved slightly to the left by rebound of the machine element.

The machine element is usually stopped at the end of its cycle with a buffer. A heavy reciprocating element as planer table or extrusion plunger will bounce and move the member 15 to the left. The present mechanism will assimilate the bounce motion and not again close the switch. Without means to assimilate the return movement the electric motor will again be started to return the reciprocating table or plunger against the buffer, which is the objectionable "hunting." In some cases series of bounces will occur which is obviously undesirable.

It will therefore be noted that small movements of the operating rod 14 due to uncontrolled actions of the reciprocating member 15 will not operate the precision switch to cause objectionable "hunting" but only a full signal movement of the operating rod will trip the switch.

Thus it will be seen that I have provided a very simple and efficient means for quickly operating an electrical switch and one which can be easily adjusted to cause the switch to be operated with very great accuracy. It will also be observed that this apparatus is inexpensive to build, that it is rugged in construction and not likely to get out of order.

While I have shown and described but a few embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, may be made which do not depart from the spirit and scope of my invention as disclosed in the appended claims.

I claim as my invention:

1. In a mechanism for operating an electrical switch having an actuating pin which has a normal position, a case enclosing the switch, a plunger reciprocable in said case, a saddle slidable on the plunger, a latch pivotally mounted adjacent the switch, a spring normally holding the latch in engagement with said saddle to prevent movement of the saddle, a spring normally holding the plunger and saddle in retracted positions, a spring acting on the saddle to oppose the first spring, a bell crank lever pivotally mounted adjacent the switch and movable by the saddle to depress the actuating pin, and a cam carried by the plunger which slides up on the latch as the plunger moves inwardly to disengage the latch from the saddle to permit the saddle to move the bell crank lever to depress the actuating pin.

2. In a mechanism for operating an electrical switch having an actuating pin which has a normal position, a case enclosing the switch, a plunger reciprocable in said case, a saddle slidable on the plunger and normally abutting the inner wall of said case in retracted position, a latch pivotally mounted adjacent the switch and normally engaging the saddle holding it in said abutting relation, a spring normally holding the latch in engagement with said saddle to prevent movement of the saddle, a spring normally holding the plunger and saddle in retracted positions, a spring acting on the saddle to oppose the first spring, a bell crank lever pivotally mounted adjacent the switch and movable by the saddle to depress the actuating pin, the latch and bell crank lever being pivoted about the same axis, and a cam carried by the plunger which slides up on the latch as the plunger moves inwardly to disengage the latch form the saddle to permit the saddle to move the bell crank lever to depress the actuating pin.

3. A switch operating mechanism comprising a movable switch-actuating member having means operating the switch on movement of the member to one position, tensioning means urging the member to that position, releasable latch means preventing movement of the member to that position, a control member movable in response to a condition to be controlled, and release means operatively associated with the control member to release the latch means and operate the switch on predetermined movement of the control member.

4. A switch operating mechanism comprising in combination with a switch actuating member operating the switch on movement to one position, a return control member acting to return the switch actuating member from said position, spring means urging the switch actuating member toward said position, a resilient latch urged to engagement with the switch actuating member, and a cam operable by control member to disengage the latch permitting movement of actuating member to said position.

5. A switch operating mechanism comprising in combination a switch operating member, a control rod having an annular collar abutting the operating member in the secured position, a compression spring acting between the operating member and control rod urging abutment of the collar, a spring latch pivoted at a fixed point and normally urged to engagement with the saddle holding it in the secured position, a cam actuated by the push rod to disengage the latch, and a pivotal bell crank actuated by the saddle mov-

ing to released position to operate the switch means.

6. A switch operating mechanism comprising in combination a push rod, a U-shaped member, an annular lock ring carried by the push rod to engagement against the inside of the U-shaped member, a compression spring acting between the U-shaped member and lock ring, a spring latch urged to engagement and restraining the U-shaped member, a cam carried by the push rod to disengage the latch, and a pivotal bell crank engaging the carrier at one end and the switch to be actuated at the other end.

7. A switch operating mechanism comprising in combination an actuating rod provided with an annular ring, a U-shaped member slidably mounted thereon, a compression spring acting between the U-shaped member and locking ring to urge the abutment of said ring and member, a bell crank engageable with the U-member at one end and with the switch to be actuated at the other end and mounted at a fixed pivotal point, a latch pivoted at the same pivotal point, a spring latch engaging to hold the U-shaped member, and a cam carried by the actuating rod to disengage the latch.

8. A switch engaging mechanism comprising a hollow casing, a plunger rod journaled therein, a U-shaped saddle freely journaled to the plunger rod, a snap ring secured to the plunger rod abutting the inside of the saddle, a coil compression spring carried by the plunger rod and acting between the saddle and snap ring, a switch means supported within the case, a fixed pivot pin supported by the case, a bell crank pivotally mounted on said pin and engageable with the saddle at one end to actuate the switch at the other end, a return spring attached to the bell crank and case, a latch pivoted on said pin normally resisting the saddle, a leaf spring secured to the latch and urging the latch to engagement, and a cam carried on the plunger rod disengaging the latch with plunger rod movement.

9. A switch operating mechanism comprising a movable switch-actuating member having means operating the switch on movement of the member to one position, tensioning means urging the member to that position, releasable latch means preventing movement of the member to that position, a control member movable in response to a condition to be controlled, release means operatively associated with the control member to release the latch means and operate the switch on predetermined movement of the control member in one direction, and cooperating means on the control member and actuating member withdrawing the latter from said one position upon movement of the control member in the opposite direction, the latch automatically re-engaging the actuating member and preventing reoperation of the switch by less than said predetermined movement of the control member in said one direction.

10. A switch operating mechanism comprising a switch actuating member movable between a first inactive position and a second switch operating position, tensioning means urging the member to its second position, latch means holding the member in its first position, a control member movable in response to a condition to be controlled, the control member releasing the latch on predetermined movement of the control member in one direction and means moving the actuating member from its second to its first position on movement of the control member in another direction, the latch means automatically re-engaging the actuating member to hold it in said first position.

11. In a mechanism for operating an electrical switch having an actuating pin, a mounting member for the switch, a plunger reciprocable in said mounting and having a shoulder thereon, a saddle slidable on the plunger and normally abutting the mounting, a latch pivotally mounted adjacent the switch and normally engaging the saddle holding it against said mounting, a spring normally holding the latch in engagement with said saddle to prevent movement of the saddle, a spring acting between the plunger and saddle to urge said plunger shoulder against the saddle, means operatively connected between the saddle and actuating pin and movable by the saddle to depress and release the actuating pin, and a cam carried by the plunger which slides up on the latch as the plunger moves inwardly to disengage the latch from the saddle to permit the saddle to move the bell crank lever to depress the actuating pin.

12. In a mechanism for operating an electrical switch having an actuating pin, a plunger having a shoulder thereon and being reciprocable longitudinally along a path and normally in retracted position at one end of the path, a saddle slidable on the plunger and abutting the shoulder, a latch normally engaging the saddle and holding it in said retracted position, a spring normally holding the latch in engagement with said saddle to prevent movement thereof, a spring adapted to act between the saddle and shoulder to urge said shoulder to abutting relationship with the saddle, a cam carried by the plunger which slides up on the latch as the plunger moves from the retracted position to disengage the latch from the saddle, and means operatively connected between the saddle and switch actuating pin to operate the pin on movement of the saddle from the retracted position.

13. In a mechanism for operating an electrical switch having an actuating pin, a plunger having a shoulder thereon and being reciprocable longitudinally along a path and normally in retracted position at one end of the path, a saddle slidable on the plunger and abutting the shoulder, a latch comprising a flat elongated member pivotally mounted adjacent the plunger and in endwise abutment with the saddle and holding it in said retracted position, said flat member being at an angle to the plunger axis, a spring urging the abutting end of said flat member into engagement with the saddle to prevent movement thereof, a cam carried by the plunger which slides up on the latch as the plunger moves from the retracted position to disengage the latch from the saddle, and means operatively connected between the saddle and switch actuating pin to operate the pin on movement of the saddle from the retracted position.

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