July 30, 1940. E. P. BARLOW ET AL 2,209,378

SWITCH

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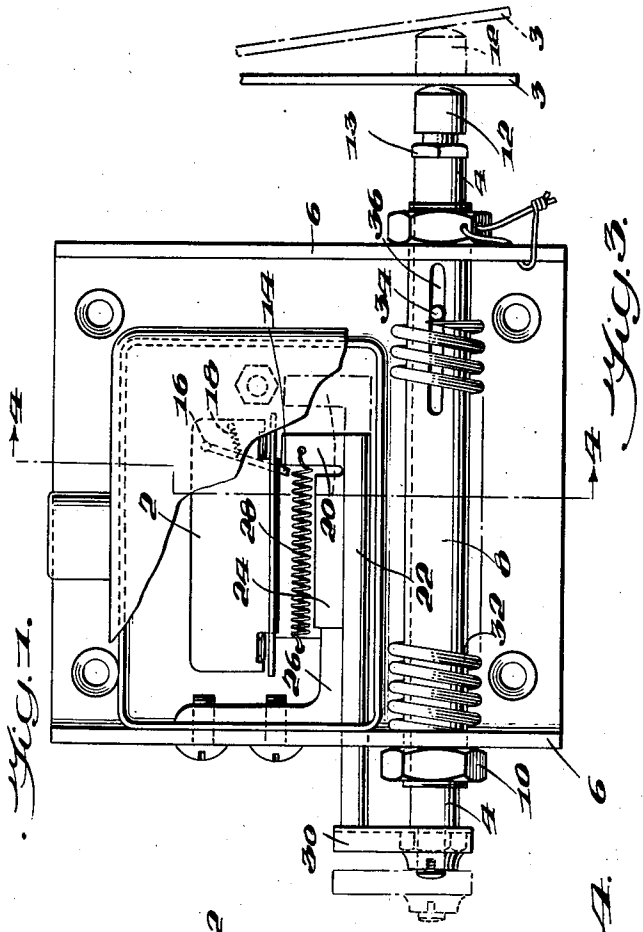


Fig. 1.

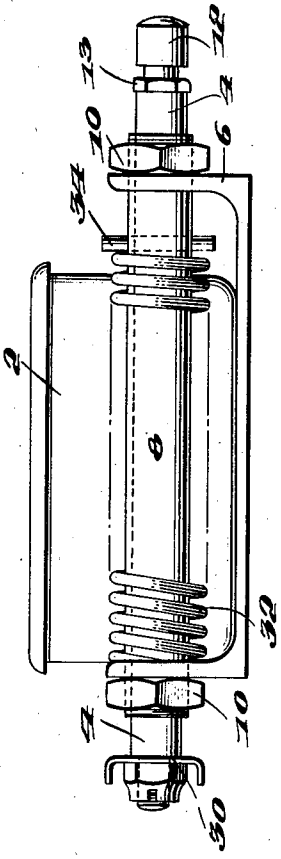


Fig. 3.

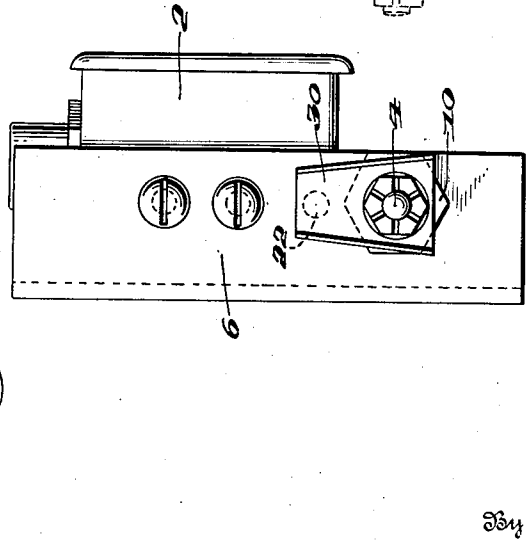


Fig. 2.

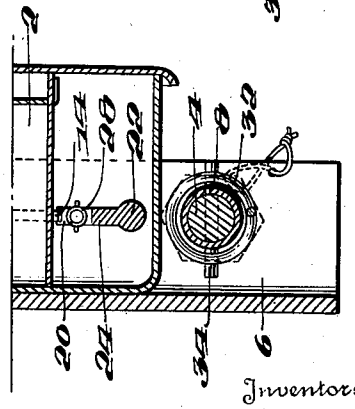


Fig. 4.

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SWITCH

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4 Claims. (Cl. 200—47)

The invention relates to switches and particularly to the prevention of damage due to overtravel in automatically operated switches.

In many types of devices in which an electric motor or other electrical device is utilized to move some member, it is necessary to stop this member when it reaches a certain point. This is often accomplished by providing some sort of electrical switch together with mechanism operated by the member when it reaches the desired stopping point to operate the switch, so as for example to break the circuit to the motor and thus prevent further movement of the member.

Any motor when it is running has a certain amount of kinetic energy. Therefore, when the motor circuit is broken, there is a tendency for the member moved thereby to move slightly farther. This slight additional movement is likely to damage the switch through exerting the momentum of the motor thereon.

Some types of construction have been used in an attempt to overcome this difficulty. Such structures have utilized some sort of resilient connection between the member and the switch. As the resiliency of any part varies with use, these constructions do not always operate the switch when the moving member reaches the desired position, but are likely to operate either before or after such time. This disadvantage is especially harmful where the member being moved must occupy a certain position with respect to other parts. For example, if the member is to be held in the switch-operating position by locking mechanism, it must be accurately positioned with respect thereto. For this purpose it is important that the switch shall be operated at the proper time. If it is not, movement of the member beyond its proper stopping position will exert an increasingly large force on the resilient connection and therethrough to the switch, and may damage the switch.

The primary object of the present invention is to provide a mechanism for connecting a switch to a part which is moved thereby, which will avoid damage to the switch when the member moves to the position in which it is to be stopped, even though the member may travel slightly beyond the position in which it operates the switch.

Another object of the invention is to provide mechanism which will be certain to operate the switch when the controlled part reaches a predetermined position, and not before or after such time.

A further object of the invention is to provide a mechanism of this type which is simple and easy to operate, and which does not transfer motion through any resilient connection. The invention involves the provision of a free lost-motion connection between the member to be operated and a switch-operating member, this switch-operating member being resiliently urged to maintain its switch-operating position. An important feature of the invention is that there is no relative motion between the member to be operated and this switch operating member, until the member moves beyond its switch-operating position.

The invention is applicable as stated above to many purposes. One possible utility would be in the control of the retraction of auxiliary floats on flying boats. When such floats are retracted into recesses in the wing of a boat, this is usually accomplished by an electric motor which through a threaded arrangement lifts the floats into the proper positions. The present invention is applicable to such an arrangement, in which case the switch may be arranged in the motor circuit or in any other manner so that its opening breaks the circuit to the motor and thus stops the movement of the float.

Further objects and advantages of the invention will appear more fully from the following description, particularly when taken in conjunction with the accompanying drawing which forms a part thereof.

In the drawing:

Fig. 1 shows in side elevation a switch-operating mechanism embodying my invention;

Fig. 2 is an end view thereof;

Fig. 3 is a bottom plan view;

Fig. 4 is a cross section substantially on the line 4—4 of Fig. 1.

It is assumed that the mechanism is to be used for operating a switch 2, which is arranged in the controlling circuit of a motor which for example imparts movement to a member 3, a part of an auxiliary, such as a float. Arranged in the path of movement of the member to be controlled is a rod 4 which is slidable through openings in opposite legs or side walls 6 of a framework, sliding therein through a sleeve 8 which is held in position in the framework by nuts 10 on opposite ends thereof. The head 12 of rod 4, which is adjustably threaded in the rod and secured in position by lock nut 13, is arranged in the path of the member 3 to be moved, so that as the member moves towards the position in which it is to be stopped the rod 4 is pushed toward the left of Fig. 1.

The switch, which may be of any desired type,

includes any suitable operating device, as for example a lever 14 which might be pivoted at 16. This lever might be urged to the right in Fig. 1, or counterclockwise, by a suitable tension spring 18. In its righthand position, it is assumed for purposes of illustration that the switch will be closed, although the invention is obviously applicable to any other condition of the switch.

The switch handle 14 extends outside of the switch 2, and directly in the path of a projection 20 of a rod 22 which is slidable in the frame 6 parallel to the movement of the rod 4. Rod 22 also carries a stop member 24 which is engageable upon movement to the left with an angle lug 26 fixed on the frame 6. A coil tension spring 28 connected at one end to a fixed part of the frame and at the other end to the lug 20 continuously urges the rod 22 to the left, or to a position in which in the form shown it opens the switch.

Rod 22 extends into the path of a lug 30 which is mounted on the lefthand end of the rod 4. Thus as rod 4 moves to the right lug 30 engages rod 22 and pushes it toward the right. Rod 4 is normally urged toward the right by a coil compression spring 32 surrounding the sleeve 8, and operating on a pin 34 which is fixed in rod 4 and extends through longitudinal slots 36 of sleeve 8 into the path of the coil spring 32.

The operation of this mechanism is as follows:

Under normal conditions, assuming for example that the member to be moved is not in the position in which the switch operating mechanism is to be effective, the coil spring 32 which is stronger than the coil spring 28 pushes rod 4 to the right and thereby pushes rod 22 to the right. This moves the head 20 of rod 22 and head 12 of rod 4 to the broken line positions shown in Fig. 1. Lever 14 then swings counterclockwise under the action of spring 18, and the switch is closed.

Assuming now that the electric motor is started and the member to be moved thereby moves. When the member engages the rod 4 it pushes it toward the left. As the rod 4 is moved toward the left, it permits rod 22 to move towards the left under the action of spring 28. When rod 22 reaches the position shown in solid lines in Fig. 1, it has engaged the end of lever 14 and moved it to the position shown, in which position it breaks the circuit through the switch. This stops the supply of current to the motor, but the motor because of its momentum is likely to move the member further, and thus push the rod 4 and member 30 to the broken line position shown in Fig. 1. During this further movement, the rod 22 remains substantially stationary, because its stop 24 has engaged the fixed stop 26. Thus no further force is exerted on the switch lever 14, even though the member to be operated has moved a considerable distance beyond switch opening position.

Upon motion in the other direction, the switch is permitted to close again when the device moves back to or beyond the solid line position shown in Fig. 1, and thus is set for a second operation.

While we have by way of example described the mechanism as applied to a switch which controls a motor operating or moving a movable member, it is obvious that the device is of broad utility to operate a switch for any purpose when a movable member reaches a given position.

While we have described herein one embodiment of our invention, we wish it to be understood that we do not intend to limit ourselves thereby except within the scope of the appended claims.

We claim:

1. Switch-operating mechanism comprising a frame, a movable element slidable in said frame, spring means urging said element in one direction, a second element slidable in said frame parallel to said first element having switch-operating means and engageable by said first element and movable thereby upon movement of said first element in one direction, spring means of less strength than said first spring means urging said second movable element in the opposite direction, said second movable element having a free lost motion connection with said first movable element whereby said first movable element may move in the opposite direction from that in which it is urged by said first spring means without moving said second movable element.

2. In combination with a switch, a slidable rod having switch-operating means thereon, a spring connected to said rod and urging it to move in one direction towards switch-operating position, stop means to limit the movement of said rod in such direction, a second slidable rod having means thereon located in the path of said first slidable rod and engageable with the end thereof, said means being arranged to move said first slidable rod against the action of said spring, and spring means urging said second slidable rod in the opposite direction from the direction in which said first slidable rod is urged by said first spring.

3. In combination with a switch, a slidable rod having switch-operating means thereon, a spring connected to said rod and urging it to move in one direction towards switch-operating position, stop means to limit the movement of said rod in such direction, a second slidable rod having means thereon located in the path of said first slidable rod and engageable with the end thereof, said means being arranged to move said first slidable rod against the action of said spring, a sleeve through which said second slidable rod extends, said sleeve having a slot therein, a pin secured in said second slidable rod and passing through said slot, and a coil spring around said sleeve engageable with said pin, said coil spring urging said second slidable rod in the opposite direction from the direction in which said first slidable rod is urged by said first spring.

4. In combination a frame having side walls, a switch carried by said frame, a rod slidable in said frame and having a switch-operating position, cooperating stop means carried by said frame and rod for limiting movement of said rod in one direction, a spring connected to said frame and to said rod urging said rod in such direction, such rod upon movement in such direction operating said switch, a sleeve mounted between said side walls, a second rod slidable in said sleeve, said rod having on the outside of said frame a projecting member located in the path of said first rod and engageable therewith to move said first rod against the action of said spring, said sleeve having a longitudinal slot therein, a pin secured in said sleeve and slidable in said slot, and a coil spring of greater strength than said first spring mounted around said sleeve, said coil spring engaging against one side of said frame at one end and against said pin at the other end, said coil spring acting in opposition to said first spring.

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