

April 3, 1951

P. A. LUND
SWITCH ACTUATOR

2,547,765

Filed Nov. 5, 1948

2 Sheets-Sheet 1

Fig. 1

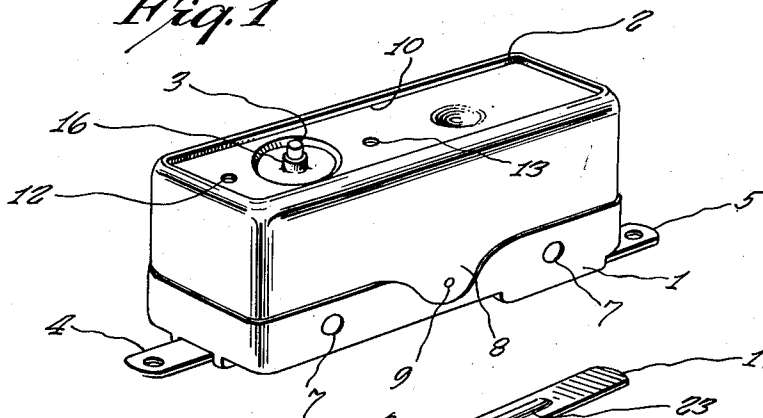


Fig. 2

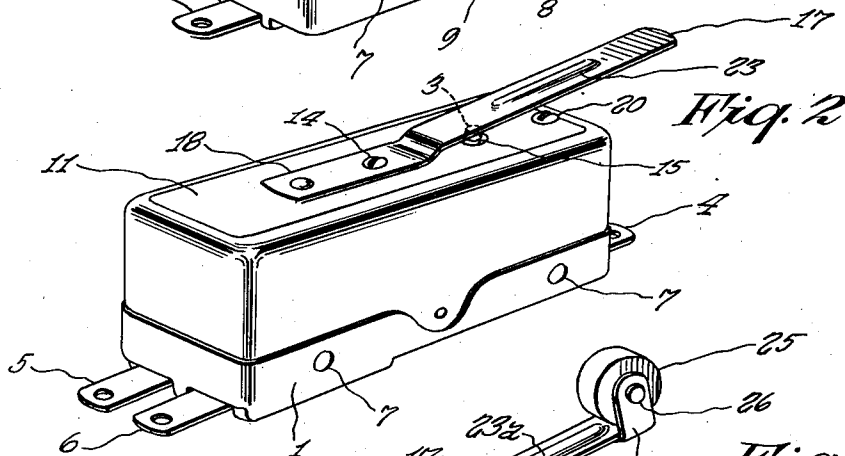


Fig. 3

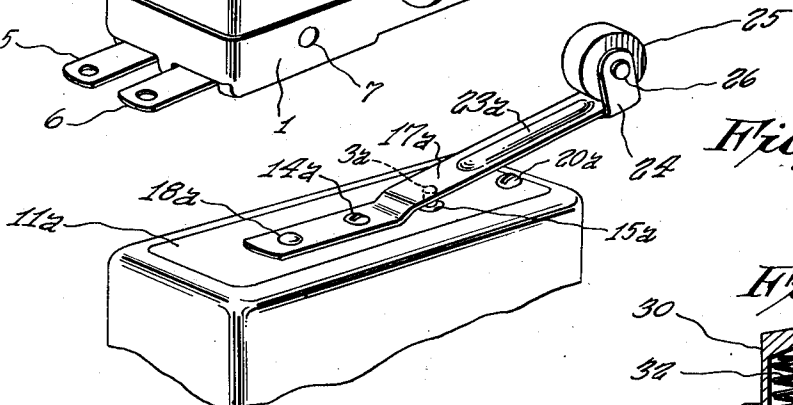


Fig. 4a

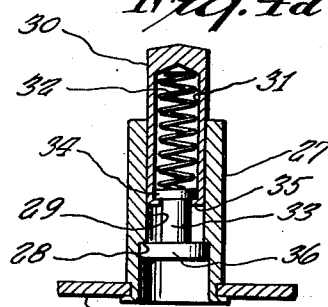
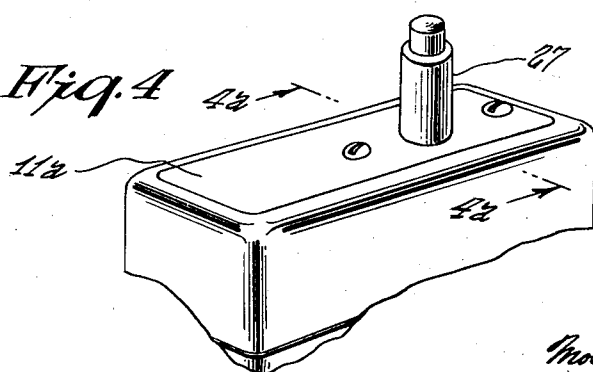


Fig. 4



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Fig. 5

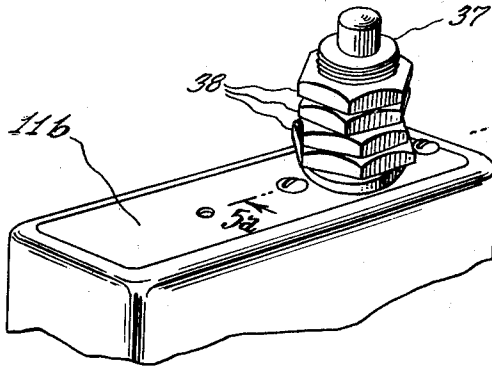


Fig. 5a

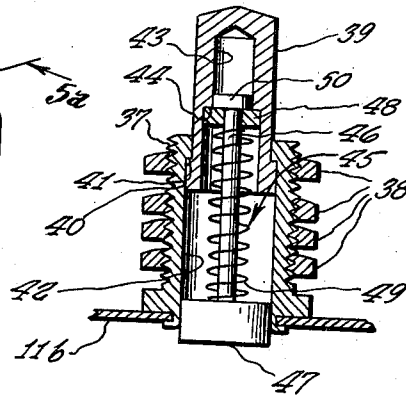


Fig. 6

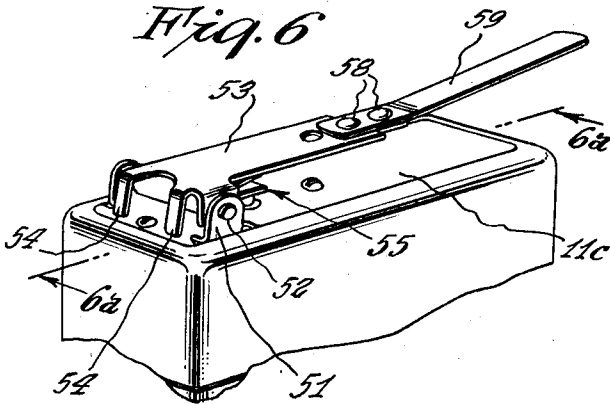


Fig. 6a

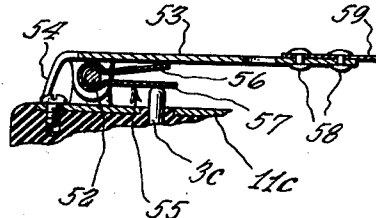


Fig. 7

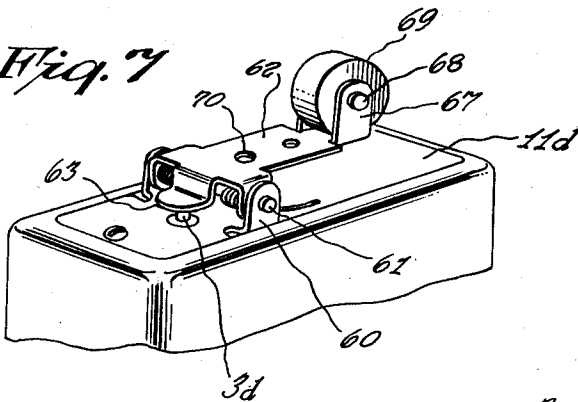
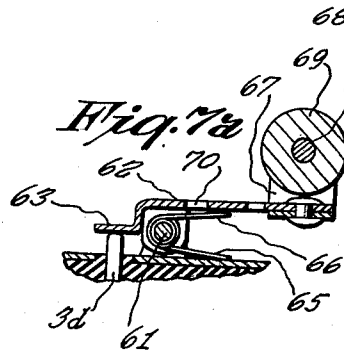


Fig. 7a



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SWITCH ACTUATOR

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Application November 5, 1948, Serial No. 58,587

1 Claim. (Cl. 200-172)

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This invention relates to switches and switch actuators. It is a primary object of the invention to provide for the convenient and economical combining of various actuators with a standard switch so as to meet different requirements as to pre-travel, over-travel, and actuating force.

It is a feature of the illustrative embodiments of the invention that a switch casing through which a switch actuating plunger projects is formed to be attached to and to interfit with any one of a number of similar adapter plates which form parts of different actuators. Other objects and advantages will hereinafter appear.

In the drawing forming part of this specification

Fig. 1 is a perspective view of the exterior of a switch with which any one of the several actuators illustrated is adapted to be combined;

Fig. 2 is a view similar to Fig. 1 but reversed end for end, showing a first form of actuator applied to the switch of Fig. 1;

Fig. 3 is a fragmentary perspective view of a switch having a second form of actuator applied to it;

Fig. 4 is a view similar to Fig. 3 showing a third form of actuator;

Fig. 4a is a vertical, sectional view showing details of the structure of Fig. 4;

Fig. 5 is a view similar to Fig. 3 showing a fourth form of actuator;

Fig. 5a is a vertical, sectional view showing details of the structure of Fig. 5;

Fig. 6 is a view similar to Fig. 3 showing a fifth form of actuator;

Fig. 6a is a fragmentary, vertical sectional view showing a portion of the structure of Fig. 6;

Fig. 7 is a view similar to Fig. 3 showing a sixth form of actuator; and

Fig. 7a is a fragmentary, vertical sectional view showing a portion of the structure of Fig. 7.

The switch illustrated may be in all substantial respects identical with the switch disclosed and claimed in a pending application of Peter J. McLaren and Cyril O. Benson, Serial No. 718,832, filed December 27, 1946, now Patent No. 2,521,015, September 5, 1950, for Snap Over Toggle Switch. Reference may be had to said pending application for a full, detailed disclosure of the switch. The switch comprises lower and upper casing members 1 and 2 within which a snap over toggle switch mechanism is mounted. The switch mechanism is arranged to be actuated by a plunger 3.

The lower casing member 1 is provided with contact tongues 4, 5 and 6. The contact tongue

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4 is invariably connected, directly or indirectly, to one terminal of a voltage source, while the tongues 5 and 6 are alternatively, selectively connected to the opposite terminal of the voltage source. The movable switch contact moves up in response to a downward thrust of pin 3, and moves down as the pin returns to the up position. The tongue 5 is connected to a conductor which extends above the movable switch member within the casing to engage said member in the down or actuated position of the plunger 3, while the tongue 6 is connected to a lower contact which extends below the movable switch member to engage it when the plunger 3 is in the up or normal position. The more common practice is to connect the tongue 5 in circuit and leave the tongue 6 unconnected, so that the up position of the plunger 3 will be an open circuit position, and the down position will be a closed circuit position. In some instances, however, the tongue 6 may be connected and the tongue 5 left unconnected, so as to make the upper contact an active one and the lower contact an idle one.

The lower casing member 1 is formed with openings 7 through which mounting screws (not shown) may be passed for securing the casing to a supporting structure. The upper casing section 2 has ears 8 which fit into recesses formed in the side margins of the lower casing section 1. A pin 9, passed through the ears 8 and through the central body portion of the lower casing section 1, serves to secure the casing sections in fixed relation to one another.

The casing sections 1 and 2 are desirably molded of an insulating, phenolic condensation product such as Bakelite. The upper casing section 2 has formed in its upper face a recess 10, shown as generally rectangular to receive and firmly locate a metallic adapter plate 11. The upper casing member 2 is formed with two drilled openings 12 and 13 in which case hardened self-tapping screws 14 are adapted to be threaded for securing the adapter plate to the casing. The adapter plate is formed with an opening 15, which receives and fits upon a boss 16 that surrounds the plunger 3.

A spring arm 17 is rotatably connected to the plate 11 by a single rivet 18. When the plate 11 is first placed upon the switch casing the arm 17 is swung to one side, so as to uncover the hole 12 of the casing and a corresponding hole of the plate 11. The plate 11 is then attached to the casing member 2 by means of a screw 20 passed through the plate 11 and threaded into the opening 12.

The spring arm 17 has an opening formed in it which is adapted to be aligned with the opening 13 of the casing and with a corresponding opening of the plate 11. When the screw 20 has been applied the spring arm 17 is swung back into position to have the screw 14 passed through the arm 17 and through the plate 11 and threaded into the opening 13 of the casing member 2. The spring arm 17 is desirably formed with a reinforcing rib 23. The spring arm 17 constitutes a convenient actuator for the plunger 3 of a simple and direct acting type.

In Fig. 3 disclosure is made of an actuator which is in most respects the same as the actuator of Fig. 2. Corresponding reference numerals have been applied to corresponding parts with the subscript *a* added in each instance, and no detailed description will, therefore, be given, but the description will be confined to the parts which differ from the disclosure of Fig. 2. The arm 17*a* is formed at its outer end with upturned ears 24, in which a roller 25 is rotatably supported through the medium of a bearing pin 26. The arm 17*a* overlies the plunger pin 3 for actuating it, and coacts with the plunger pin in the same manner in which arm 17 coacts with the plunger pin when the actuator of Fig. 2 is employed.

The actuator of Fig. 4 employs an adapter plate 11*a* which is in all respects the same as the adapter plate 11 of Fig. 2 save that it has a hollow post 27 secured to it by upsetting. The plate 11*a* is fitted and secured to the switch casing in the manner already described. The post 27 is formed with a downwardly facing, internal shoulder 28 at its lower end, the upper portion 29 of the bore which extends through the hollow post being of reduced diameter.

A plunger pin 30 is slidably mounted in the bore 29. The pin 30 is formed with an internal recess 31 in which a compression coil spring 32 is mounted to bear against the inner end of a plunger 33. The plunger 33 is formed with an upper flange 34 which lies behind an inturned flange 35 at the lower end of the recess 31. The plunger 33 is formed at its lower end with a head 36 which is of a larger diameter within the bore portion 29 of the post 27.

The head 36 bears against the actuator pin 3 so that the thrusting downward of the pin 30 causes the pin 3 to be actuated. The spring 32 permits a considerable over-travel of the actuator. The spring 32 may be made fairly stiff so as to resist over-travel of the actuator. Such over-travel is limited by engagement of the lower end of the pin 30 with the upper face of the head 36. Separation of the unit formed by the pin 30 and the plunger 33 from the adapter plate is prevented by engagement of the upper face of the head 36 with the shoulder 28 of the post 27.

The form of actuator shown in Fig. 5 employs an actuator plate 11*b* which is like the adapter plate 11 with the exception that an externally threaded post 37 is secured to the adapter plate 11*b* by upsetting. The plate 11*b* is fitted and secured to the switch casing in the manner already described. The post, together with a series of nuts 38 threaded upon it, is adapted to constitute the supporting means for securing both the actuator and the switch itself to a supporting panel. The post 37 is passed forwardly through an opening in the panel and is clamped in place by the first one of the nuts 38 that is applied. The other nuts are then screwed firmly into place to serve as lock nuts.

A hollow pin 39 operates within the post 37,

the pin being formed near the lower end with a shouldered flange 40 which engages an internal shoulder 41 in the post 37 near the upper end thereof. The flange 40 and the shoulder 41 prevent escape of the pin 39 from the bore of the post. The pin 39 is formed with a comparatively large bore 42 at its lower end and a smaller bore 43 in its upper end, there being a downwardly facing shoulder 44 provided at the junction of the two bores. A spring and plunger unit 45 is arranged to complement the actuating pin 39. This unit comprises a pin 46 having a head 47 secured upon its lower end, and having a washer 48 slidably mounted upon its upper end. A compression coil spring 49 tends at all times to force the washer away from the head 47. The upper end of the pin 46 is spread or upset as illustrated at 50 to prevent separation of the washer 48 from the pin 46. The pin 46 is of small enough diameter to enter the reduced bore 43 of the pin 39, but the washer 48 is adapted to be engaged and thrust downward by the shoulder 44 of the pin 39. Thrusting downward of the pin 39 causes the head 47 to actuate the switch pin 3. The head 47 is therefore arrested by the switch pin 3 at the end of the switch pin stroke, but the spring 49 permits the washer 48 and the pin 39 to travel downward for a considerable distance after the switch pin has been arrested.

In Fig. 6 an actuator is shown in which an adapter plate 11*c* is of the same construction as the adapter plate 11 of Fig. 2 except for the fact that the adapter plate 11*c* is formed with ears 51. The plate 11*c* is fitted and secured to the switch casing in the manner already described. The ears 51 carry a hinge pin 52, upon which an actuating lever 53 is mounted. The lever 53 is formed with downturned tail pieces 54, which are adapted to engage the adapter plate 11*c* for limiting movement of the actuating end of the lever 53 away from the switch casing. A leaf spring 55 is wrapped around the hinge pin 52 to form upper and lower arms 56 and 57. The upper arm 56 normally bears against the lower face of the lever 53 while the lower arm 57 normally bears against the switch pin 3, holding the lever away from the pin. Depression of the lever 53 causes the actuating force to be transmitted through the leaf spring 55 to the hinge pin. The spring 55 may be made light enough to yield before the switch pin 3 is actuated, or it may be made heavy enough to actuate the switch pin first and to yield afterward, according to the mode of operation desired in any given instance.

The lever 53 is a rigid member, but it has secured to it, by rivets 58, a flexible, resilient extension arm 59. While this extension arm has considerable elasticity, it can be readily bent by the fingers beyond its elastic limit, and it can, therefore, be deformed into any desired shape.

In Fig. 7 an adapter plate 11*d* is employed which is, in general, like the adapter plate 11 of Fig. 2. The adapter plate 11*d* differs however in the fact that it has upstanding ears 60 formed upon it. The plate 11*d* is fitted and secured to the switch casing in the manner already described. The ears 60 support a hinge pin 61, upon which an actuating lever 62 is pivotally mounted.

The lever 62 is formed with a tail portion 63 which over-lies the switch pin 3 for actuating the pin. A wire-spring 64 is wrapped around the hinge pin 61 and has its lower ends 65 extended toward the right to rest upon the adapter plate 11*d*. The middle portion of the spring 64 is

formed as a loop 66 which also extends towards the right to bear against the lower face of the lever 62 for urging the lever in a counter-clockwise direction. The spring 64 is made strong enough to overcome the resistance of the switch pin 3, so that the switch pin is normally forced to a depressed position by the lever. The lever 62 is provided at its righthand end with upstanding ears 67 which, through a hinge pin 68, support an actuating roller 69. When the roller 69 is engaged by a cam or any other suitable actuating member, the lever 62 is rocked clockwise, permitting the switch pin to rise. In this type of construction the terminal tongue 6 will most commonly be engaged in circuit so as to cause the lower fixed contact of the switch to be the active one. The lever 62 has an opening 70 formed in it, so that a slender screw driver can be passed through for applying an attaching screw 71.

I have described what I believe to be the best embodiments of my invention. I do not wish, however, to be confined to the embodiments shown, but what I desire to cover by Letters Patent is set forth in the appended claim.

I claim:

The combination with a switch comprising an

operating plunger pin and a casing beyond one face of which the plunger pin projects, said casing having a non-circular depressed area surrounding the plunger pin and attaching bores formed in said area, of an adapter plate fitted in the depressed area of the casing and having openings which register with the attaching bores, fasteners attaching the adapter plate to the casing, and actuating mechanism for the switch operating plunger pin carried by the adapter plate.

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