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SWITCH

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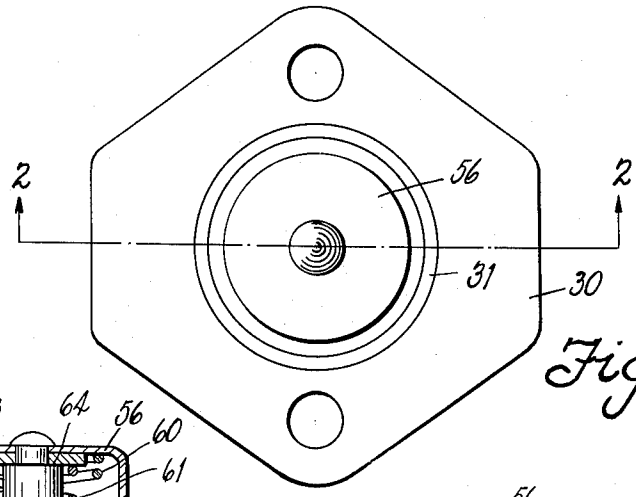


Fig. 1

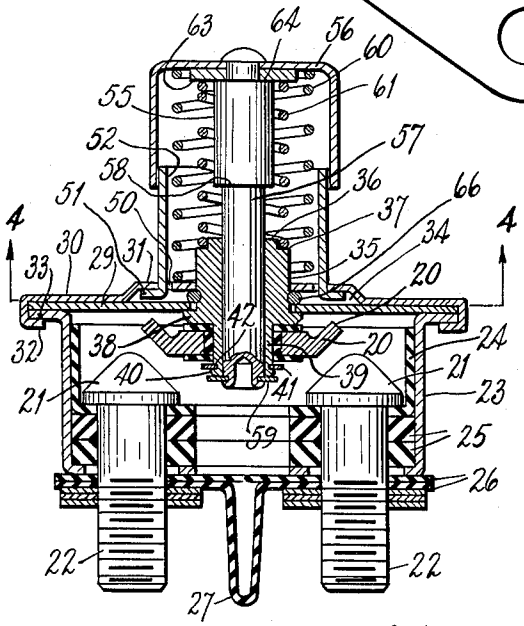


Fig. 2

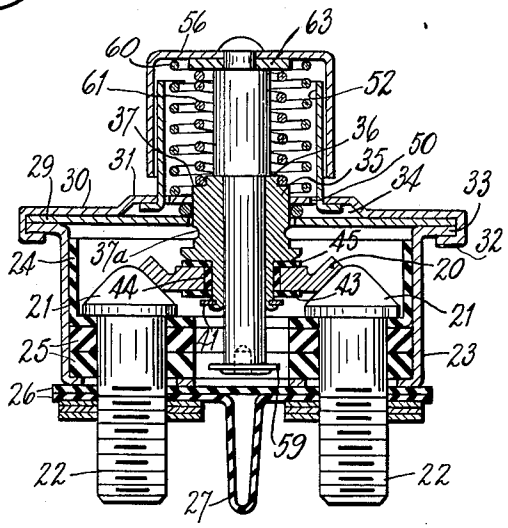


Fig. 3

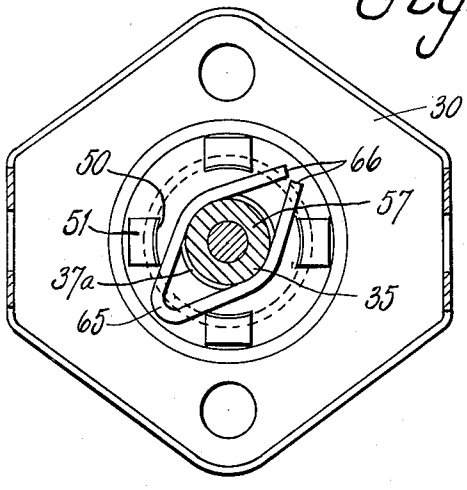


Fig. 4

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SWITCH

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2 Claims. (Cl. 200—77)

This invention relates to improvements in electric switches, and is particularly concerned with a switch for providing a snap closing and separation of contacts.

An object of the present invention is to provide a switch which embodies means for obtaining a snap action for the movable contact into a circuit closing position and which is adapted to exert good contact pressure on the fixed contacts.

Another object of the invention is to provide a full pressure contact while the switch is closed and which is maintained up to the instant the switch is opened.

Another object of the present invention is to provide a push button switch which in its normal condition resists operation of the actuator with comparatively great force but which when fully operated requires very little pressure to maintain it operated.

Another object of the invention is to provide delayed opening of the switch so accidental separation of the contacts, with only slight movement of the push button, is prevented.

Another object of the invention is to provide a switch of the push button type which is self-restoring and which is yieldingly and firmly held in its inoperative position. By the arrangement the actuating force is increased and the chance of false operation through accidental contact with the actuator is avoided.

Further objects and advantages of the present invention will be apparent from the following description reference being had to the accompanying drawings wherein preferred embodiment of the present invention is clearly shown.

In the drawings:

Fig. 1 is a top plan view of the switch embodying the present invention.

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1 and showing the switch in its inoperative position.

Fig. 3 is a similar view to Fig. 2 but illustrating the switch in its operative position.

Fig. 4 is a sectional view on line 4—4 of Fig. 2.

Referring to the drawing, the switch embodying the present invention comprises a movable contact 20 separated from fixed contacts 21 provided by headed ends of terminal screws 22. The terminal screws pass through a metal casing or housing 23 and are insulated therefrom by a lining member 24, members 25, and a non-conducting strip 26. The strip is folded to form a partition 27 between the screws 22. The partition assists in preventing accidental short circuits of the terminal screws 22.

The casing 23 is closed by a closure including a metal plate 29 and a metal cover 30 having a central raised portion 31. The cover 30 is provided with prongs or tangs 32 which are bent over a flange 33 provided by the casing 23 to hold the plate and cover in position. The raised portion 31 and the plate 29 form a chamber 34. The plate 29 and the raised portion 31 have aligned openings for receiving a bushing or contact carrier 35 which has a close slidable fit within the opening in the

raised portion 31. The carrier 35 has an upstanding portion 36 which forms a shoulder or spring seat 37. The carrier 35 is formed with a perimetrical groove 37*a*, a collar or stop flange 38, a lower reduced portion 39. The movable contact 20 is insulatingly supported on the carrier 35 and is attached thereto by expanding the lower end of the carrier 35 at 40 to clamp a metal washer 41 against a shoulder 42 of the carrier 35. In the normal position of the contact 20, washer 41 is spaced from a washer 43 which together with a bushing 44 and a washer 45 insulate the contact 20 from the carrier 35. The reduced portion 39 is slightly longer than the combined thickness of the parts 43, 44 and 45 and the contact 20 has a central hole slightly larger in diameter than bushing 44 to provide sufficient play between the contact 20 and the carrier 35 so that when the carrier is moved downwardly the contact 20 may shift slightly by rocking endwise with respect to the carrier when the contact 20 engages contact 21. By this arrangement a good electrical contact is assured without accurate alignment of the rod, carrier and the contacts 21.

The cover 31 is provided with a plurality of spaced slots 50 for receiving spaced tangs 51 at its lower end of a tube 52. These tangs are bent over against the underside of the raised portion 32 to secure the tube 52 to the raised portion 31 of cover 30.

An actuator or plunger rod 55 extends through the bushing or carrier 35 and carires at its upper end a cup-shaped head or cap 56 which is arranged to receive the upper end of the tube 52. It will be noted that the rod 55 is reduced at 57 to provide a shoulder 58. The reduced portion 57 has a sliding fit within the bushing 35 and has over-travel relative thereto. A metal washer 59 is secured upon the lower end of plunger rod 55, as by riveting over the end of the rod 55 and said washer serves to maintain the carrier on rod 55 and the washer 59 also prevents withdrawal of the plunger from the carrier 35.

A spring 60 is interposed between the raised portion 31 and the cap 56 and serves to maintain contact 20 out of engagement with the stationary contacts 21 as viewed in Fig. 2. The upward movement of the actuator is limited by the stop flange 38 of the carrier 35 abutting the plate 29.

Since it is desired to have a switch that will produce a snap closing of the contacts, the carrier 35 should be yieldingly held in its extended position until manually moved by the actuator. This is accomplished by having overtravel from the actuator relative to the carrier for a predetermined movement and having the carrier 35 yieldingly retained by a spring 61 interposed between the spring seat 37 and a washer 63 clamped between a shoulder 64 and the cap 56. The spring 61 is held under compression by a C-shaped spring 65 located within the chamber 34 whereby the carrier is continuously biased toward the stationary contacts 21. The spring 65 is preferably designed to provide an elongated C-shaped spring formed of a length of tough, spring metal such, for example, as music wire, spring bronze or other similar material. However other designs of yielding means could be used to hold yieldingly the carrier in its extended position until actuated by the actuator. The spring 65 has its arms 66 bowed, see Fig. 4, and tensioned toward each other. The arms straddle the carrier 33 and normally fit in a perimetrical groove 37*a* under tension to grip the carrier 35 so as to hold the movable contact 20 out of engagement with the stationary contact 21.

By the above described arrangement and construction of the switch it will be noted that when the operator desires to close the switch the actuator is depressed. Upon depression of the actuator both springs 60 and 61 are highly compressed, but the carrier 35 is held

stationary by the spring **65** until the shoulder **58** of actuator engages the upper end of carrier. When that happens further compression of the spring **61** cannot occur. Upon continued movement of the actuator the shoulder **58** will move the carrier **35** with the rod causing the arms **66** to cam out of the groove **37***a*. Since the spring **61** was highly compressed it will expand with an exceedingly strong force to move the carrier relative to the actuator portion **57** with a snap action causing the contact **20** to engage contacts **21**, Fig. 3. The distance that the movable contact moves is considerably less than the distance the actuator has moved before the shoulder **58** engages the carrier, therefore the contact **20** will be held in engagement with contacts **21** by the spring **61** still under heavy spring pressure between the washer **63** and the carrier. The actuator may still have over-travel relative to the carrier until the cap engages the top of the tube **52**. It is apparent that when the actuator is so moved the spring **61** will be compressed and this compressed force will be transmitted to the bushing or carrier **35** causing increased pressure between contacts **20** and **21**. When the force upon the cap is released the compressed spring **60** will operate to restore the actuator to its extended or inoperative position as shown in Fig. 2. On the upward movement of the actuator, due to the expansion of the spring **60**, the contact **20** remains in engagement with contacts **21** until the washer **59** engages the lower end of the carrier **35** which actuates the carrier **35** upward until the stop flange **38** engages the plate **29**. When that happens the arms **66**, which tend to return to their normal state, will snap into the groove **37***a* to hold yieldingly the carrier in its extended position. The force by which the spring **60** urges the actuator towards its extended or inoperative position of the switch will cause the contact **20** to move away from contacts **21** quickly and clean to prevent arcing and burning of the contacts.

From the foregoing it is apparent that the structure disclosed herein provides a novel switch arrangement employing a switch having its operating member biased to an inoperative position and having its movable contact biased toward the operative position together with bias means for holding the movable contact in an inoperative position, and means for releasing the hold on the movable contact when the actuator is moved toward the operative position of the switch which causes the movable contact to move with a snap action and held so as to provide a full pressure contact.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In a switch, the combination with a casing supporting a plurality of stationary contacts, a plate and a cover for the casing; a movable contact; a movable carrier slidably supported by the plate and cover and carrying the movable contact; an external annular groove formed in the carrier; a plunger rod slidably mounted in the carrier; a spring positioned between the cover and the plunger rod for maintaining the rod and carrier in a normal position to hold the movable contact out of engagement with the stationary contacts; a second spring positioned between the carrier and the rod for transmitting motion to the carrier to close the contacts; a detent spring disposed between the plate and cover cooperating with the groove for holding the movable contact out of engagement with the stationary contacts when the switch is inoperative but which can be overcome by movement of the plunger in a direction for contact closing; and means associated with the plunger for transmitting motion to the carrier from the rod after the rod has moved a certain distance to compress the first and second mentioned springs free of the third spring whereby the second spring is operative to move the movable contact with a snap action into engagement with the stationary contacts.

2. An electric switch comprising in combination, a housing; stationary contact supported by the housing; a movable contact; a plate and a cover supported by the housing; a carrier slidably mounted in the cover and supporting the movable contact; a perimetrical groove formed in the carrier; an actuator slidably mounted in the carrier; a compression spring disposed between the actuator and the cover; a second compression spring disposed between the actuator and carrier; a C-shaped spring disposed between the cover and plate and having portions received by the groove of the carrier for holding the movable contact out of engagement with the stationary contacts when the switch is inoperative; a shoulder provided by the actuator for engaging one end of the carrier when motion is transmitted to the actuator toward switch closing position to move the carrier to force the portions of the C-shaped spring out of the groove to permit the second mentioned spring to move the carrier and the movable contact with a snap action into engagement with the stationary contacts; means associated with the actuator for engaging the other end of the carrier to separate the contacts upon release of the transmitting force; and stop means provided by the sleeve cooperating with the plate for limiting the return movement of the actuator.

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