Aug. 13, 1935. A. C. GAYNOR 2,011,311

ELECTRIC SWITCH

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Fig. 1.

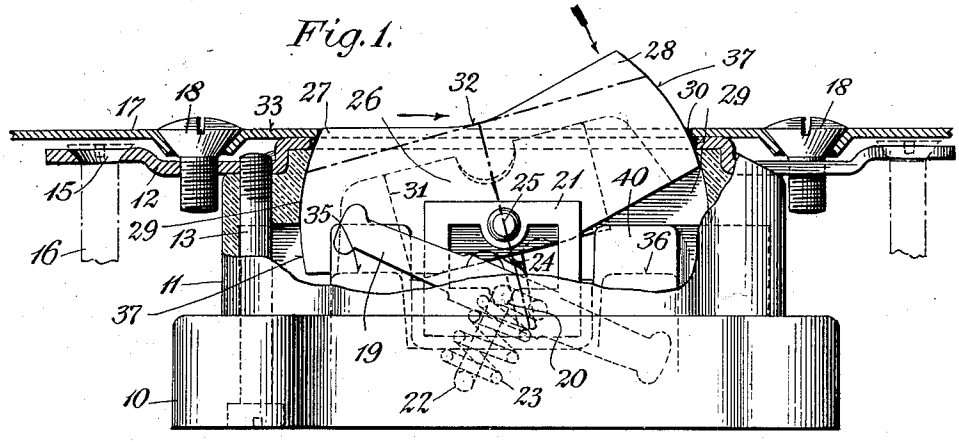


Fig. 2.

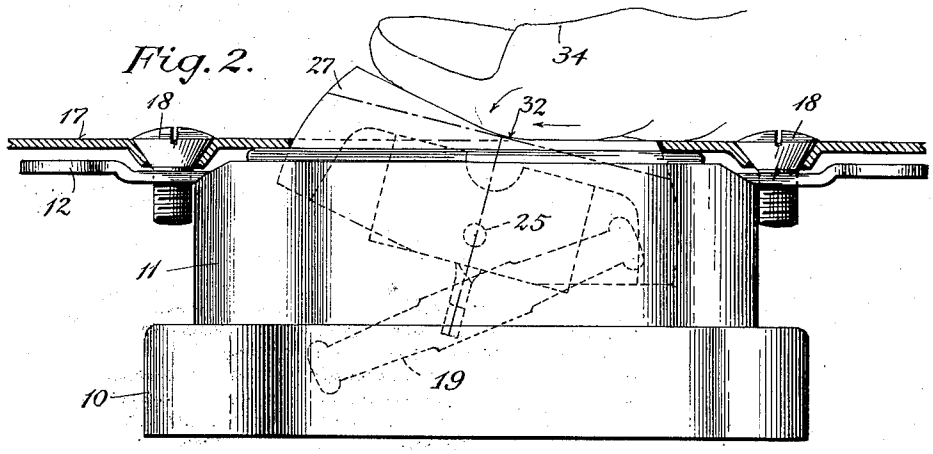
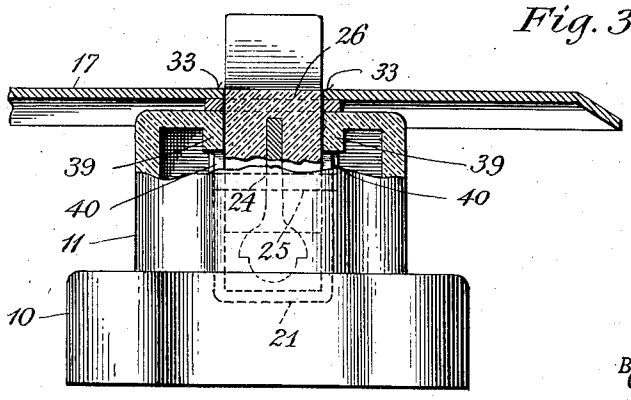


Fig. 3.



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ELECTRIC SWITCH

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10 Claims. (Cl. 200—172)

This invention relates to electric switches, and more particularly to the manually operable means thereof.

An object of the present invention is to provide an operating means for switches which may be operated by a rocking movement of a finger of the operator's hand or by a straight thrust or push or by a wiping movement of the operator's finger, so that no matter how the operating means happens to be engaged by the operator's finger, the switch may be easily and readily operated.

Heretofore, there have been provided for snap or quick break switches, in addition to the ordinary rotary knob type, push-button and straight lever switches, the former being solely operable by a thrust of the operator's finger on the one of the two cylindrical buttons which protrudes from the cover plate or casing more or farther than the other. In the straight lever type switch, the switch is operable by grasping an arm of the lever which protrudes through a cover plate or casing and moving the lever from one side to the other. The straight lever type of switch could also be operated by a wiping movement of the operator's finger.

The device of the present invention, in its preferred form illustrated herein, is so made as to be operable by a straight push or thrust as is the push-button type switch, or by a wiping movement like the straight lever type switch. In addition to these two usual ways of operating switches, the operating means of the present invention may be operated in a novel manner—namely, by placing the thumb or one of the fingers on the operating means intermediate its ends and teetering it from one position of rest to another by a rocking movement of the thumb or finger.

Another feature of the present invention is the provision of an operating means which, because of its shape, mounting and position, need not extend far beyond the surface of a cover plate or casing for operation. Therefore, it is less likely to be broken or damaged by being forcibly struck on its side by some other object.

A further feature of this invention is the provision of an operating means which is so shaped and mounted as to at all times substantially fill or close an opening in a cover plate or casing through which it extends for operation.

And a further feature of this invention is the provision of an operating means which is so shaped, mounted and arranged that in its movement to operated position it may be positively stopped and supported by means located directly beneath and in line with the point of application and direction of the force operating it. In this way, all strain on the operating mechanism is avoided.

These objects and advantages, and others hereinafter referred to, are obtained by providing the operating means in the form of a lever approximately T-shaped having its fulcrum located in the stem of the T, and on the cross-piece or bar of the T which protrudes through an opening in a casing or cover plate, surfaces adapted to be alternately operated by the user to cause the lever to teeter from one position of rest to another.

In the accompanying drawing—

Figure 1 is a side view, partly in section, of a quick break or snap switch, having embodied therein an operating means or a finger-piece made in accordance with the present invention, the finger-piece being shown in one of its two positions of rest.

Fig. 2 is a side elevation of the switch shown in Fig. 1, showing the finger-piece in its other position of rest.

Fig. 3 is an end view of the switch shown in Figs. 1 and 2, part of the casing and finger-piece being shown in section.

The switch shown in the accompanying drawing, for the purpose of illustration, is of the flush wall type. It comprises a base 10 and a casing 11 of insulating material and a metal strap 12, all of which are secured together by means of bolts 13 screw-threaded at 14 in the strap 12. The strap is provided with screw holes 15 for receiving screws 16 by means of which the switch is secured to a joist in the wall or to an outlet box, and this is done before the cover plate 17 is secured in place on the switch structure by screws 18 threaded in the metal strap 12.

The operating mechanism is of the toggle type and comprises a blade 19 mounted on a pivot 20 in a supporting frame 21 to be rocked up and down about the pivot 20 to close and open a circuit. The blade 19 is carried by a yoke 22 which supports at its lower end a coil spring 23 whose function is to hold the blade 19 in either of its two positions of rest until the finger-piece has been operated sufficiently and then to quickly snap the blade 19 to the other position of rest. This is done by causing an arm 24, pivoted in a supporting frame 21, to engage and control the coil spring 23. For instance, considering the parts in the positions shown in Fig. 1, when the arm 24 is moved to the left as viewed, it moves the upper end of the spring toward the left. This

causes the spring to be compressed, and it is not until the arm 24 and the end of the spring 23 pass a line extending from the pivot 20 to the point where the lower end of the spring rests on the yoke 22, that the spring can react and cause its lower end to be moved to the right, thus carrying the yoke 22 to the right and swinging the blade counter-clockwise.

As stated above, heretofore there have been provided two kinds of devices for operating snap or quick break switches, such as is exemplified in the switch illustrated and above described—namely, the push-button and straight lever devices. The former kind is operable by a thrust on the button next to be operated, and in some uses for this reason is more convenient than the straight lever kind. In other uses, the straight lever type is more convenient, because it may be operated by a wiping movement or flip of the operator's finger. It cannot be operated by a thrust or push perpendicular to the cover plate 17 or casing 11 like a push-button, and, clearly, a push-button cannot be operated by a wiping or camming movement. However, the finger-piece of the present invention has combined in a single structure the features of both these common types of devices. Moreover, in addition, the present invention provides a finger-piece which may be operated by a rocking movement of the thumb or finger of the operator's hand.

These advantageous features are accomplished, according to the present invention, by proving operating means for the switch in the form of an approximately T-shaped first-class lever 26 having, in addition to the blade controlling arm 24 which forms the stem of the T and which is mounted on the pivot 25, a cross-piece or bar having ends or arms 27 and 28 located at the same side of the lever's fulcrum (pivot 25), and adapted to protrude through an opening 29 in the casing 11 and an opening 30 in the cover plate 17 for operative engagement by the user. The operating or digitally engageable top surfaces of the arms 27 and 28 are adapted alternately to receive force or pressure applied by the user so as to cause the bar to teeter alternately from one position of rest to another and cause the blade 19 to be moved correspondingly.

The cross-piece or bar of the lever 26 is preferably formed of insulating material and is provided with a metal core or insert 31 preferably formed integral with the operating arm 24, and the width of the force-receiving surfaces of the arms 27 and 28 is such as to be comfortably engaged by the end of the user's finger. Preferably, the sides of the cross-piece fit well between the side arms of the frame 21 adjacent the pivot rod 25 on which the lever teeters and which also passes through bearings provided in the cross-piece.

The operating or digitally engageable top surface of the cross-piece arms 27 and 28 may, in accordance with the present invention, have several different shapes and yet accomplish the results above referred to. In the preferred form, however, that shown in Fig. 1, the force-receiving surfaces of the arms 27 and 28 are made substantially flat or plane and slope downwardly toward the medium point 32 (that is, the point where the stem and cross-piece of the T meet) so as to form between them an obtuse angle. Further, in accordance with the present invention, the angularity of the arms 27 and 28 is preferably such that in each of the two positions of rest of the lever 26, one of the arms lies substantially parallel with the surface 33 of the cover plate 17 adjacent the opening 30 therein through which the cross-piece extends. Accordingly, as will be seen in one of the positions of rest, the force-receiving surface of one arm of the cross-piece will lie parallel and substantially flush with the surface 33, while the other arm of the cross-piece will protrude and have its operating surface sloping upwardly from the cover plate. For instance, as shown in Fig. 1, the force-receiving surface of the arm 27 lies substantially parallel to and flush with the surface 33 of the cover plate 17 while the arm 28 protrudes through the casing and has its force-receiving surface forming an incline plane with the cover plate.

Hence, with the parts in these positions, when it is desired to operate the switch, the user may place his finger on the surface of the arm 28 and by a thrust in the direction of the tailed arrow (Fig. 1) cause the lever 26 to teeter about the pivot 25 until finally the arm 28 will lie substantially flush with the surface of the cover plate and the arm 27 will be in inclined protruding position, such as is shown in Fig. 2. Instead of so operating the lever 26 by a thrust, the user may place his finger anywhere on the cross-piece of the lever between the edge of the arm 27 and the medium point 32 and wipe or slide it in the direction of the tailless arrow shown in Fig. 1 toward the edge of the arm 28. This movement of the operator's finger and accompanying pressure perpendicularly to the cover plate 17 will cause the arm 28 to be cammed down and thus teeter the lever to operate the switch. Thus it will be seen that the lever 26 may be operated either by a thrust on the arms 27 and 28 of the cross-piece in the direction of the tailed arrow, or by a wiping movement in the direction of the tailless arrow shown in Fig. 1, that is to say, either like a push-button or straight lever type switch, according to the option of the user.

In addition to these two modes of operation, because of the shape of the cross-piece or bar and smooth continuity of the force-receiving surfaces, the lever may be teetered from one position of rest to another in the manner indicated in Fig. 2, by the user placing his thumb or finger over the medium point 32, as indicated at 34, and rocking his finger in the direction of the arrow. This enables the switch to be quickly changed from one condition to another, for when the operator's finger is placed substantially as shown in Fig. 2, rocking it to and fro will alternately depress the arm 27 and the arm 28, and this may be done with great rapidity. Hence, a light may be repeatedly flashed without changing the position of the thumb or finger on the lever.

It is, of course, not essential, or even desirable in some cases, that the force-receiving surfaces of the arms 27 or 28 last operated lie flush with the surface 33 of the cover plate, so long as the arm next to be operated extends through the cover plate farther than the arm last operated, so as to clearly apprise the operator which arm or side of the lever's cross-piece is to be operated next to change the condition of the switch.

By having the operating means in the form of a T-shaped first-class lever, as, for instance, the lever 26 in the form of the invention shown, it is possible to positively limit the movement of the force-receiving cross-piece and support it in either of its positions of rest without imparting any strain to the mechanism operated thereby. This is accomplished in the embodiment of the

invention herein illustrated, by providing piers or abutments 35 and 36 on the base 10 under the arms 27 and 28 respectively, so as to be engaged thereby. These abutments 35 and 36 are of substantial size and are located directly under their respective arms so that when the arm (the arm 28, for instance, as the device is viewed in Fig. 1) is depressed, the under surface of the arm will engage the top of the abutment 36 and limit the teetering movement of the cross-piece. Since each abutment 35 and 36 is located directly under its arm in line with the point of application and the direction of force applied to the arm to operate it, the other parts of the operating means, including the pivot 25, arm 24, spring 23 and its yoke 22, are relieved of any strain incidental to limiting the movement of the lever 26, for there is no tendency for the abutment engaged to act as a fulcrum for the cross-bar and produce an upward thrust on the pivot 25 and other operating means, as the result of continued application of force after the cross-piece has come to its normal position of rest.

While the bar of the lever 26 has been described herein as a finger-piece, it should be clearly understood that it may be operated by foot or otherwise, and it is well adapted for foot operation because the switch is sturdy in construction and protected by the abutments 35 and 36 against excess force used to operate the lever 26.

As indicated above, one of the features of this invention is the provision of a switch in which the opening in the casing or cover plate through which the operating means protrudes is at all times closed or filled by the force-receiving part of the operating means. This is accomplished by shaping and positioning the lever 26 as shown, so that, for its full length, the cross-piece protrudes through the opening 29 in the casing 11 in all of its positions thereon, and by having the edges 37 of the arms 26 and 27 of the lever as well as the adjacent walls of the slot 29 arcuate, with the axis of the pivot 25 as the center of the arcs; and, further, by making the arcuate edges 37 of the cross-piece of such lengths that they never leave the slot 29. Thus, even when one of the arms 26 or 27 is in its position farthest from the cover plate 17, that is to say, when it is next to be operated, the lower edge of the arm still extends into the opening 29 so as to keep it closed.

The clearances between the sides of the cross-piece of the lever 26 and the longitudinal walls of the slot 29, and also between the arcuate edges 37 of the arms 27 and 28 and the correspondingly arcuate walls of the slot 29 in the casing 11, are substantially reduced by making the cross-piece and the casing 11 of a material or composition, preferably a phenol-condensation product, so that the coefficient of expansion of the one part will be substantially the same as that of the other part. Thus, there is avoided danger of parts sticking due to temperature changes and the parts may be made to fit more closely.

Since the handle or finger-piece of this invention is in the form of a T-shaped first-class lever having its two arms of the cross-piece of the T protruding through the cover plate and lying close thereto, danger of the cross-piece being struck a damaging sidewise or lateral blow is reduced so as to be substantially less than that existing with the push-button or straight lever finger-piece of the prior art which must necessarily protrude a substantial distance beyond the cover plate. Further, in these prior devices, the manually operated parts are relatively narrow and cannot be adequately supported against side thrust. Hence, they are more easily broken-off or bent when accidentally struck on the side. This is not so with the operating means of the present invention, for the cross-bar of the lever 26 is relatively long and its full length is at all times located in the slot 30 of the cover plate 17, thus presenting a broad surface to the cover plate in case it is forced thereagainst.

Even in shipping, the switch of the present invention is less likely to be damaged than the prior devices, because its protruding force-receiving surfaces of the lever 26 is substantially broader and lies closer to the cover plate or casing than is possible in the prior art switches. Notwithstanding this, the switch of the present invention is further protected against vertical thrust or pressure on the lever 26 which might tend to damage the switch by making the bearing of the lever 26 on the pivot rod 25 extend the full width of the lever which, it will be seen from Fig. 3, closely fits in the supporting frame 21 in which the pivot rod 25 is mounted. Therefore, any extraordinary stress on the pivot rod 25 will not bend it out of shape, and it is only by a stress sufficiently heavy to cause the rod 25 to be sheared off at the point where the side of the lever 26 lies adjacent the side of the supporting frame, that the switch may be destroyed or rendered inoperative.

To assist in supporting the lever 26 against side thrust and to facilitate its sliding movement in the casing and base, the casing is provided with webs or lugs 39 located at each side of the cross-piece and the base 10 is provided with corresponding webs or lugs 40 which align with the webs or lugs 39 on the casing and form a continuous guide for the lever 26. The members 40 with the abutments 36 form substantially U-shaped lugs within which the handle 28 is guided and by which lateral shifting movements on the handle are prevented.

As a result of the close fit between the cross-piece of the lever 26 and the portion of the casing 11 with which it engages and, due to the fact that the cross-piece completely fills the opening 29 in the casing in all of its positions thereon and further, due to the provision of the webs 39 and 40 on the casing and base which effectually separates the chamber in which the lever 26 lies from the space which contains the switch blade 19 and cooperating contacts, practically no vapor or dust can reach the portion of the switch containing the operating mechanism. Thus, freedom from trouble due to sticking of the parts caused by dust, or corroding of the parts by vapor or gas laden air is insured. Moreover, the path for air or gas between the exterior of the switch and the place where the blade 19 is located, due to the provision of the webs 39 and 40 and the close fitting of the cover 26, is so tortuous and baffled that danger of explosion caused by a spark incident to the breaking of a circuit by the switch is avoided.

In Figs. 1 and 2, the dot-and-dash lines indicate the stems and cross-piece of the T-shaped levers 26, 26′ etc.

Having thus described the invention, what is claimed as new and for which it is desired to obtain Letters Patent, is:—

1. In a snap switch the combination of a switch mechanism; a casing divided to form two separable parts and adapted to confine the switch mechanism between them; means for securing the two parts of the casing together; an actuator

for the switch mechanism comprising a teetering bar movable into "on" and "off" positions; and a substantially U-shaped lug forming a part of one of the casing parts and adapted to locate the teetering bar laterally and prevent lateral shifting thereof.

2. In a snap switch the combination of a switch mechanism; a casing of molded insulating material divided to form two separable parts, and adapted to confine the switch mechanism between them; means for securing the two parts of the casing together; an actuator for the switch mechanism comprising a teetering bar movable into "on" and "off" positions; and a pair of substantially U-shaped lugs molded integral with one of the casing parts, spaced longitudinally from each other and of the teetering bar, adapted to alternately accommodate the teetering bar as it is moved to "on" and "off" positions to locate it laterally with respect to the casing and to prevent it from shifting laterally.

3. In a snap switch the combination of a switch mechanism; a casing divided to form two separable parts, and adapted to confine the switch mechanism between them; means for securing the two parts of the casing together; an actuator for the switch mechanism comprising a teetering bar movable into "on" and "off" positions; and a pair of substantially U-shaped lugs molded integral with one of the casing parts, spaced longitudinally from each other and of the teetering bar, and below the latter, the inner side walls of the U-shaped lugs being adapted to confine the teetering bar against lateral shifting movement and the bottom of the U-shaped lug being adapted to form a stop and rest point for the underside of the teetering bar to limit its movement and prevent undue strains being transmitted to the switch mechanism.

4. In a snap switch the combination of a switch mechanism; a casing for said switch mechanism; an actuator for the switch mechanism comprising a teetering bar movable into "on" and "off" positions; and integral lugs on the casing adapted to locate the teetering bar laterally relative to the casing and to guide the bar and prevent lateral shifting thereof as it is moved into the "on" and "off" positions.

5. In a snap switch the combination of a switch mechanism; a casing divided to form an upper casing part and a lower casing part, for substantially enclosing said switch mechanism; means for securing two parts of the casing together; an actuator for the switch mechanism comprising a teetering bar, exposed for manual manipulation through a substantially rectangular opening in the upper casing part, and movable into "on" and "off" positions; and vertical downwardly extending lugs defining said opening in the upper casing part for locating the teetering bar relative to the upper casing part and for guiding and preventing lateral shifting of the bar during its manual movement into "on" and "off" positions.

6. In a snap switch the combination of a switch mechanism; a casing divided to form an upper casing part and a lower casing part, for substantially enclosing said switch mechanism; means for securing two parts of the casing together; an actuator for the switch mechanism comprising a teetering bar, exposed for manual manipulation through a substantially rectangular opening in the upper casing part, and movable into "on" and "off" positions; and lugs on the lower casing part adapted to similarly locate and guide the teetering bar in its movement to "on" and "off" positions adapted to align with the upper casing part lugs when said two casing parts are brought together with said securing means.

7. In a snap switch, the combination of a switch mechanism; a casing for said switch mechanism; an actuator for the switch mechanism comprising a teetering bar movable into "on" and "off" positions; and a substantially U-shaped lug on the casing, the vertical webs of which locate the teetering bar laterally relative to the casing and guide the bar and prevent lateral shifting thereof as it is moved into "on" and "off" positions, the horizontal portion of the lug being located directly under the end of the teetering bar to limit its movement in one direction.

8. In a snap switch, the combination of a switch mechanism; a casing for said switch mechanism; an actuator for the switch mechanism comprising a teetering bar movable into "on" and "off" positions; and a substantially U-shaped lug on the casing at each side of the fulcrum of the teetering bar, each lug engaging and locating one end of the teetering bar laterally of the casing to guide the bar and prevent lateral shifting thereof as it is moved into "on" and "off" positions.

9. In a snap switch, the combination of a switch mechanism; a casing for said switch mechanism; an actuator for the switch mechanism comprising a teetering bar movable into "on" and "off" positions; and a substantially U-shaped lug on the casing at each side of the fulcrum of the teetering bar, each lug engaging and locating one end of the teetering bar laterally of the casing to guide the bar and prevent lateral shifting thereof as it is moved into "on" and "off" positions, the height and location of the lugs being such that at all times at least one of said lugs is in engagement with the teetering bar.

10. In a snap switch, the combination of a switch mechanism; a casing for said switch mechanism; an actuator for the switch mechanism comprising a teetering bar movable into "on" and "off" positions; and a substantially U-shaped lug on the casing at each side of the fulcrum of the teetering bar, each lug engaging and locating one end of the teetering bar laterally of the casing to guide the bar and prevent lateral shifting thereof as it is moved into "on" and "off" positions, the horizontal portion of each lug being located directly under the end of the teetering bar to limit its movement in one direction.

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