May 7, 1946. R. HETHERINGTON 2,399,867

SNAP SWITCH OF GROUNDED TYPE

Filed May 10, 1944

Fig. 1.

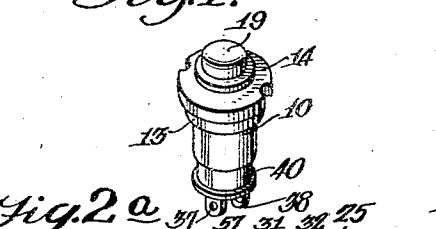


Fig. 2.

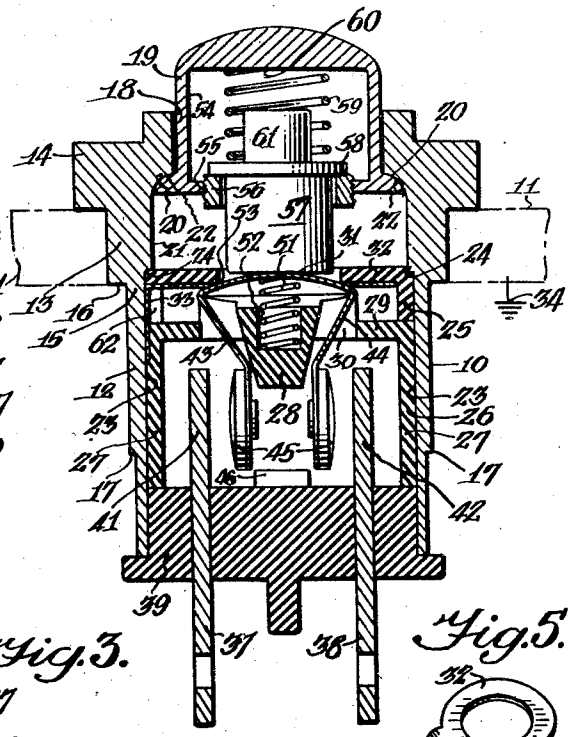


Fig. 2a

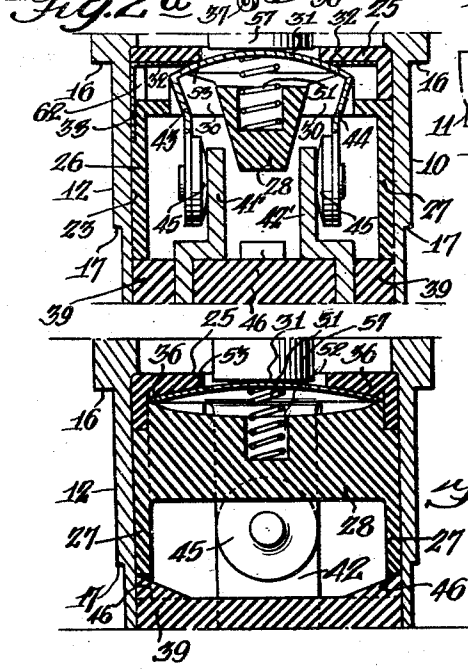


Fig. 3.

Fig. 5.

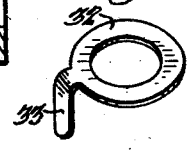


Fig. 4.

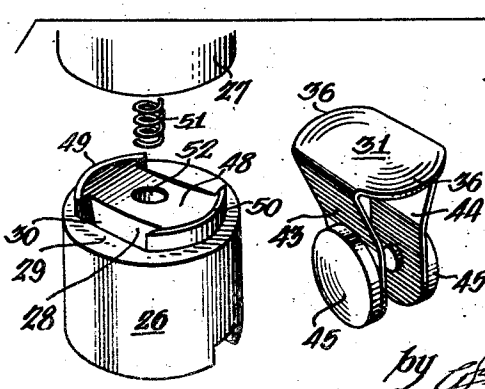
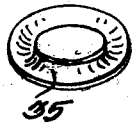


Fig. 6.



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SNAP SWITCH OF GROUNDED TYPE

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Application May 10, 1944, Serial No. 534,855

15 Claims. (Cl. 200—67)

My invention relates to a snap switch of a type in which a snap disc carrying edge arms, with a normal disc convexity forward is supported across an opening and the convexity forward is made sure by a rear retracting spring pushing the disc forwardly, and in which an operating push button by means of a plunger reverses the convexity of the disc so as to present it convexly toward the rear. The switch may be either normally open or normally closed.

A purpose of the invention is to provide a push button for a snap disc using a push button plunger resiliently pressed rearwardly in the push button and free to yield with respect to the button when the button is operated.

One of the purposes of the invention is to provide supports for a disc at the ends of a transverse insulation bridge and to recess the bridge between the ends whereby the disc may be flexed about the ends of the bridge as abutments rocking the arms bodily about the bridge ends.

A further purpose is to use the edges of a transverse insulation bridge in a switch to support a disc having depending arms and to rock the arms about the ends of the bridge.

A further purpose is to use a snap disc which convexes reversely to form differing contacts, rocking it upon sharp supports substantially at the edges of the disc.

A further purpose is to provide a permissibly grounded snap switch disc with plunger operating mechanism at the front, retraction from the rear and rearwardly trailing contact arms located at the disc edges and to rock the disc about sharp fulcrums closely adjacent the edges of the disc.

A further purpose is to provide rear switch fixed contacts to support a snap switch with trailing contact arms in position to engage the contacts at the rear and to key the parts carrying the disc circumferentially with respect to the contacts which the disc arms are to engage.

Further purposes will appear in the specification and in the claims.

Figure 1 is a reduced size perspective of a construction embodying my invention.

Figure 2 is a longitudinal section through the center of the switch showing the preferred form of the invention.

Figure 2a is a partial section corresponding to Figure 2, but of a modified form.

Figure 3 is a partial longitudinal section taken at right angles to the section in Figure 2.

Figure 4 is a disassembled view of some of my switch parts shown in perspective.

Figure 5 is a perspective view showing a ring and tang, seen in Figures 2, 2a and 3.

Figure 6 is a perspective view of a ring lacking a tang.

In the drawing similar numerals indicate like parts.

The switch is shown in completed form at 10 upon a support 11 seen in dot and dash. The support may be a switch board or a bracket or other frame part. The switch is housed within an outer shell 12 of any suitable material but which for some purposes of my invention will be made of electrically conducting material such as metal to provide a ground.

The front part of the switch casing comprises a body portion 13 which fits within the mount, and a flange 14 which limits the extent of entry into the mount. The rear portion of the switch casing comprises an extended sleeve-like shell 15 which may be reduced in diameter successively as at 16, 17 to the rear of the casing.

The front of the shell is bored at 18 to receive a button 19 outwardly flanged at 20. It is counterbored at 21 to receive the flange 20, resulting in a shoulder 22 against which the flange 20 engages to limit the forward movement of the button.

The interior of the shell is again counterbored at 23, leaving a shoulder 24 against which an insulation cap 25 engages to limit forward movement of the cap and of other insulation parts within the second counterbore. The cap engages an insulation block 26 comprising opposite side sleeve-like members 27 spaced laterally from a bridge 28. The insulation block is partly closed in front at 29 leaving openings 30. The bridge preferably extends from one sleeve-like side member to the opposite sleeve-like side member.

The fit of the block within the casing may be used to retain the cap against shoulder 24. The cap and block together retain between them a snap disc 31. Where the disc is to be grounded the cap may retain also an electrically conducting ring 32 and tang 33 as seen in Figure 5 in position so that the ring engages the disc and the tang makes contact with a metallic casing grounded through the support, diagrammatically indicated at 34. Where the cap is metallic the tang is not needed but the ring is preferably given resilience such as in the guttered copper ring 35 in Figure 6, engaging the outer perimeter of the disc where little or no flexing takes place, as at 36 in Fig. 4.

At the rear of the casing, fixed contact posts 37 and 38 are mounted within a rear insulation

block 39. The posts are cast into the block and the block is retained either by friction or by screws 40 (one only shown, Figure 1). The binding posts, adapted for soldered connection to outside wiring, are continued within the insulation block to form fixed contacts 41, 42.

The side edges of the disc are rigidly connected with and preferably integral with rearwardly directed arms 43, 44 which either directly connect or preferably connect through contact pads 45 with the fixed contacts 41, 42 in that position of the arms in Figure 2 assumed by the arms when the disc is convexed rearwardly, as distinguished from the position of the disc convexed forwardly in Figure 2.

Because the fixed contacts bear a proper relation circumferentially to the arm and pad positions, which relation must be maintained if good contact is to be made, the two insulation blocks are keyed to each other by lugs 46, 47 fitting into corresponding recesses.

The forward face of the bridge is dished or concaved at 48 and the ends 49, 50 of this dished portion 48 afford relatively sharp forward edges upon which the rear faces of the discs may be supported so that the relatively narrow limiting contact surface engaged by the rear of the disc may contribute to the flexing of the disc when the disc convexes rearwardly from the positions seen in Figures 2, 3 and 4.

The operating plunger bends the disc rearwardly against the bridge edges and against the section of the resetting spring 51 within recess 52. The disc is thus convexed rearwardly. When the button is released the resetting spring presses the disc forwardly, against the inner edge 53 of the cap opening, convexing the disc forwardly.

The push button is hollowed at 54 and is internally flanged and threaded at the back of the hollow at 55 so as to provide for the insertion of a threaded sleeve 56 within the flange. The plunger 57 slides within this sleeve 56 and is flanged inside the button at 58 so as to prevent the plunger from sliding rearwardly from the confines of the button.

The spring 59 rests at its front against the wall 60 of the hollow and at the rear against the plunger, surrounding boss 61, which maintains the spring in central position.

With the spring in place about the boss the plunger is inserted within the hollow of the button, after which the threaded sleeve is screwed in place to hold the plunger flange within the button. The rear end of the button engages the disc through the front opening in the cap.

In Figure 2 the switch is open and is closed by pressing the button to move the plunger down and reverse the convexity of the disc. In Figure 2a the parts are differently placed, the fixed contacts 41' and 42' being on the inside of the arms and pads and the pads being on the inside of the arms in order that the switch may be normally closed.

In Figures 2 and 2a the same type of push button and plunger operation is intended to be used and in both the disc can be grounded either by the ring and tang in Figure 5 or by the ring and metal cap of Figure 6.

Where the tang is used, the cylindrical flange of the cap 25, here preferably insulated, is cut to provide a notch 62 through which the tang is passed.

When the push button is pressed rearwardly the sleeve surrounding it is pushed along the plunger permitting the accumulating pressure of the spring 59 to press directly against the front of the plunger. When this accumulating pressure becomes great enough to reverse the convexity of the disc the switch is operated and the pads 45 make contact if in Figure 2 or break the contact if in Figure 2a.

The operation of the device physically is identical whether advantage be taken of the grounding as indicated diagrammatically at 34 or not. The switch is fully operative if the grounding ring and tang of Figure 5 and the grounding ring of Figure 6 be omitted so that no grounding could take place, the only difference being that in case the grounding rings are omitted the switch closes and opens a circuit passing through the fixed terminals 37 and 38 closing and opening simultaneously at two positions in the circuit; whereas if either of the grounding provisions be used, namely the ring and tang of Figure 5 or the ring of Figure 6, with a metallic cap, the switch is suited to control two single grounded circuits, one through the terminal 37, the pad at the left in Figure 2, the arm 43, the disc and the grounding ring and tang or grounding ring and metallic cap to the grounded support; and the other through the terminal 38, the right hand pad, arm 44, the disc and whichever grounding arrangement be used to the same grounded support.

It will be evident that the same two types of operation are available in the normally closed switch of Figure 2a, which corresponds with Figure 2 except for the difference in the normal position of the parts. The switch of Figure 2a can be used either to pass current from one terminal to the other through the switch parts interrupting at two points, or using one of the grounding provisions to pass two circuits through the respective terminals to the disc and thence to ground.

The disc could be so "set" as to convex forwardly naturally and when thrown past the center by the push button and plunger to return because of the "setting." The disc would then spread the arms when it passed the center, to make or break the contact and automatically resume its forwardly convex disc position to shift the arms back to their places in Figure 2 when the push button is released. This is far from the usual condition however as the disc normally needs assistance to reset to the position of Figure 2 after it has been convexed rearwardly. For this purpose the spring 51 is provided in the rear of the disc, pressing the disc forwardly at all times and making it necessary for pressure upon the push button to overcome the pressure of this spring before the disc can be convexed rearwardly. The spring 51 is shown as located within a recess 52 in the bridge 28.

The cap 25, whether it be insulating or electrically conducting, should restrain the disc against excessive movement but should not clamp it in the sense of interfering with the proper movement of the disc to convex forwardly and reversely as described.

It will be evident that the sleeve 56, threaded within the button, may be made a tight enough thread for it to remain in its adjusted position and may be screwed in or out to adjust initial compression of the spring 59.

It will be evident that the disc with its arms and bridge support comprise a clicker switch con-

struction of the disc type in which the initial position of the plunger is capable of adjustment to have the plunger in substantial engagement with the clicker disc.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such in so far as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a switch, an outer casing, a clicker disc within the casing, a forwardly concaved support for the disc, a plunger engaging the disc, a hollow push button for the plunger, a spring within the push button engaging the plunger and adjustable means between the plunger and the button for determining the initial axial position of the plunger and the initial compression of the spring.

2. In a switch, a metallic casing, a grounded support for the casing, a clicker disc within the casing, contact arms connected with the disc, contacts engaged by the arms, a support for the disc, electrically conducting connection between the disc and the casing, a spring pressed plunger engaging the disc, a push button for operation of the plunger and an adjustment between the push button and the plunger.

3. In a switch, a grounded metallic casing, a clicker disc therein, a support for the clicker disc, a metallic ring and tang connection between the clicker disc and the casing, arms on the clicker disc, connections engaged by the arms, a plunger adapted to engage the disc, a press-button spring urging the plunger toward the disc and adjustable means for determining the position of the plunger with respect to the button and disc.

4. In a plunger switch, a casing, a hollow button within the casing, a plunger partly within the button and having a flange near its forward end, a spring within the hollow button pressing the plunger rearwardly, an adjustable sleeve surrounding the plunger and retaining the flange within the button, providing adjustment of the position of rest of the flange of the plunger within the button and a disc clicker switch pushed by the plunger to differing extents according to the adjustment of the plunger flange within the button.

5. In a switch, a casing, a push button in the casing adapted to be pushed axially rearward, a spring within the push button, a plunger having a plunger flange within the push button engaged by the spring, a sleeve threaded within the rear of the push button and by its position adjusting the position of the plunger flange and the initial compression of the spring within the button, a disc clicker switch engaged by the plunger initially to varying extents according to the adjustment of the sleeve.

6. In a switch, a grounded metallic casing, a clicker disc within the casing, an insulating support on which the disc is mounted, switch opening and closing parts connected with the disc, an insulating cap in front of the disc, retaining the disc in proper position axially of the casing, a metallic ring engaging the disc, a tang connected with the ring and engaging the outer casing and adjustable plunger and push button operating means for the disc.

7. In a switch, a grounded metallic casing, a clicker disc within the casing, an insulating support on which the disc is mounted, switch opening and closing parts connected with the disc, a metallic cap in front of the disc retaining the disc in proper position, a resilient metallic ring connecting the disc and cap and adjustable plunger and push button operating means for the disc.

8. In a switch, a grounded metallic casing, a clicker disc within the casing, an insulating support on which the disc is mounted, switch opening and closing parts connected with the disc, a cap in front of the disc retaining the disc in proper position, means for grounding the disc against the casing, arms carried by the disc, contacts engaged by the arms and push button and plunger means for engaging and operating the disc.

9. A metallic casing, a disc having arms operating from the edges of the disc, contacts engaged by the arms, an insulating support for the disc, means for operating the disc, an insulating cover in front of the disc, a rear insulation block, outside contact means passing through the insulating block and keying means between the rear insulation block and the insulation supporting the disc, whereby the two are maintained in proper circumferential relation.

10. A casing, an insulating block within the casing, a transverse support within the block, forwardly concave and having relatively sharp radially outer supporting edges, a disc mounted upon the transverse support, arms carried by the disc, spring means pressing the disc forward, and plunger and press button means for operating the disc.

11. In a snap disc switch, a casing, a button, a spring-impelled plunger operated by the button, an adjustment for the position of the plunger, spaced fixed contacts, a snap disc, transversely disposed arms connected with the edges of the disc, means for supporting the disc including sharp edges engaging the disc close to the connection between the arms and the body of the disc so that the arms are in position to cause contact with the fixed contacts in one of the positions of the arms, whereby the disc tilts sharply about the supports for the disc, and means for normally pressing the body of the disc forwardly, to be overcome by the pressure of the plunger.

12. A casing, an insulating block comprising a cylindrical hollow outer wall and a bridge transversely across the wall, spaced from the wall at opposite sides to provide room for contact arms and having a forwardly facing mount for a spring upon the bridge, the bridge being forwardly concave, a disc, a cap for the disc restraining the radially outer edges of the disc with respect to the bridge, a spring upon the bridge normally convexing the disc forwardly, arms on the disc, fixed contacts engaged by the arms in one position of the disc, spring plunger means for reversing the convexity of the disc, insulation at the rear of the casing and interlocking projection-and-recess means for maintaining the body wall and bridge in proper angular relation to the fixed contacts.

13. In a snap switch, an outer casing, a button adapted to move longitudinally of the casing and to be pressed at the front of the casing, a plunger movable within the button and having an outer flange, an axially adjustable collar within the button engaging the flange and preventing the plunger from being withdrawn from the button, a spring within the button pressing against the

plunger, a disc engaged by the plunger, a concave support for the disc, a spring carried by the concave support tending to convex the disc forwardly, arms upon the disc, movable contacts at the ends of the arms farthest from the disc and fixed contacts engaged by the movable contacts at one end of movement of said arms.

14. In a switch, an outer casing, an insulation block including opposite side walls within the casing, laterally turned at one end toward the center of the casing, a bridge across from one side of the block to the other providing side recesses between the bridge and the laterally turned portions of the walls, a forwardly pressing spring connected with the bridge, a snap disc supported by said bridge, arms on the disc fitting down through the side recesses, contacts on the arms, insulation in the rear of the casing, connecting posts through the rear insulation, contacts supported by the posts in position to be engaged by the contacts carried by the arms at one limit of arm movement and plunger means for pressing the disc against the spring to shift the arms.

15. In a snap disc switch, a casing, a button, a spring-impelled plunger operated by the button, an adjustment for the position of the plunger, spaced fixed contacts, a snap disc, transversely disposed arms connected with the edges of the disc, means for supporting the disc in position including sharp edges engaging the disc from the rear close to the connection between the arms and the body of the disc so that the arms are in position to engage the fixed contacts in one of the positions of the arms, whereby the disc tilts about the supports for the disc and means for normally pressing the body of the disc forwardly, to be overcome by the pressure of the plunger.

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