Sept. 9, 1941. E. T. PLATZ 2,255,330

SWITCH

Filed June 5, 1941 2 Sheets-Sheet 1

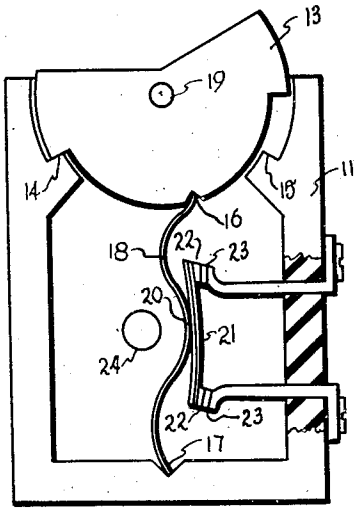


Fig. 1 ON

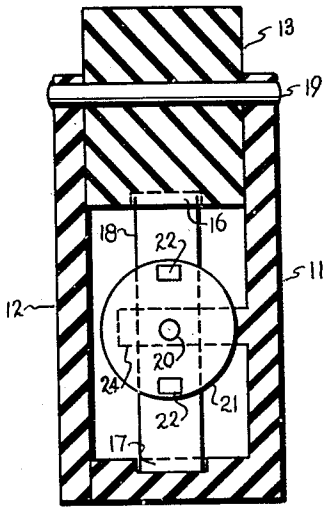


Fig. 2

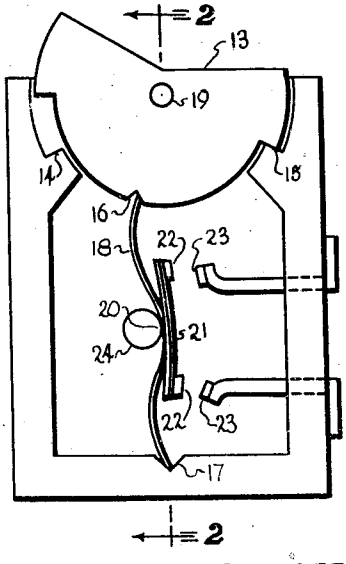


Fig. 3 OFF

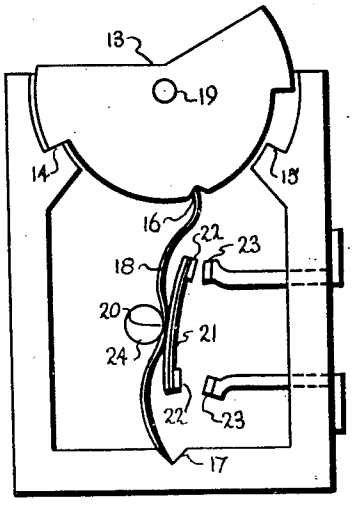


Fig. 4 TRIPPED

INVENTOR.

BY Elwood T. Platz

Daniel G. Cullen

Sept. 9, 1941. E. T. PLATZ 2,255,330

SWITCH

Filed June 5, 1941 2 Sheets-Sheet 2

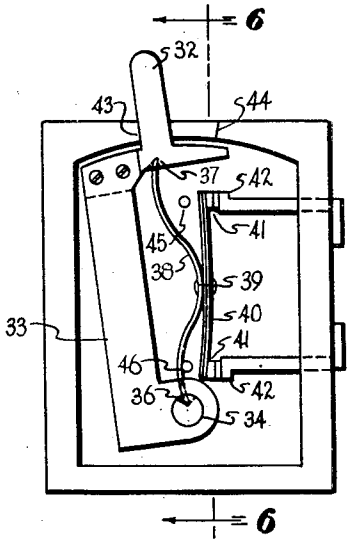


Fig. 5 ON

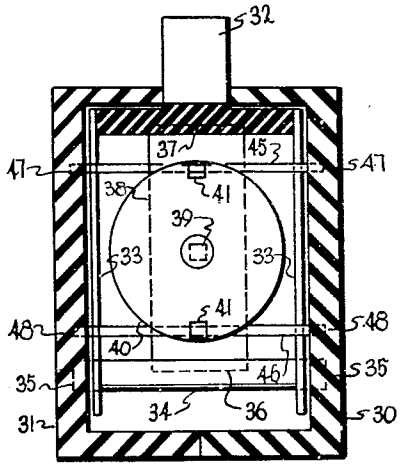


Fig. 6

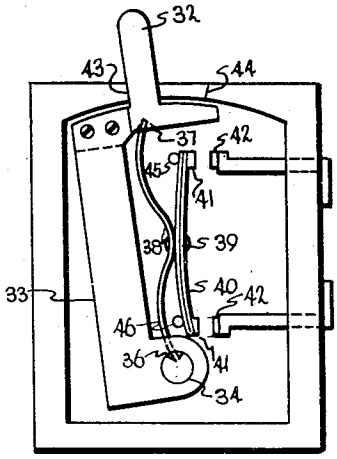


Fig. 7 TRIPPED

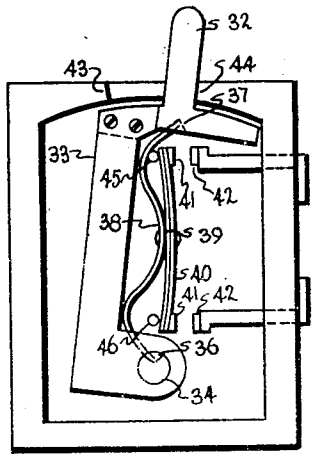


Fig. 8 OFF

INVENTOR.

BY Elwood T. Platz

Daniel G. Cullen

Patented Sept. 9, 1941 2,255,330

UNITED STATES PATENT OFFICE

2,255,330

SWITCH

Elwood T. Platz, Detroit, Mich., assignor to Bulldog Electric Products Company, Detroit, Mich., a corporation of West Virginia

Application June 5, 1941, Serial No. 396,686

14 Claims. (Cl. 200—113)

This application relates to switches and more particularly to switches which are manually operable, but which operate automatically for opening the circuit in the event of an overload.

A principal object of the invention is to provide a switch so compact as to enable it to be mounted in a conventional small size wall outlet box.

Another object is to provide a switch of the character described, employing a single leaf spring upon which is directly mounted a bi-metal element, which provides snap-action for manual operation and in addition provides a tripping force in the event of an overload.

A further object is to provide a switch of the character described in the preceding paragraph, wherein the contact movement on overload is quite substantial.

For attaining these and other objects, the switches disclosed herein have been provided. These have several desirable characteristics, among which are the following:

First, they are trip free; that is to say, their overload release operation may take place whether or not the handle be held.

Secondly, in the manual actuation, there is a desirable snap-action which imparts a snap-action feeling to the hand of the operator through the handle.

Thirdly, no flexible conductors or loops, commonly known as "pigtails," are employed.

Fourthly, no holding latches, releasable on overload, are employed.

The switches herein disclosed comprise two different embodiments, disclosed respectively in Figs. 1 to 4 and Figs. 5 to 8.

Figures 1, 2, 3 and 4 respectively show one embodiment in closed circuit position; in section on line 2—2 of Figure 3; in open circuit position; and in overload released position.

Figures 5 to 8 respectively show another embodiment in closed circuit position; in section on line 6—6 of Figure 5; in overload released position; and in open circuit position.

Figures 1–4

The snap switch herein disclosed includes a casing 11 having a cover plate 12, both being of insulation, and pivotally mounting a rocker handle 13, whose movement is determined or limited by stops 14 and 15. Pockets 16 and 17 of the handle and casing respectively receive the end of a leaf spring 18, normally held under compression to have two free or stable positions, one on each side of the straight line connecting pockets 16 and 17 at the ends of the spring. Such two free positions are shown in Figures 3 and 4 and they are to one side or the other of the line 17—18 passing through the center of movement of the handle 13, namely the handle pivot 19.

Mounted at its center point 20, by means of riveting or welding on to the spring 18, is a bi-metal element 21, preferably, although not necessarily, of the snap-action type, such as a disk, and welded to the outer points or edge of the disk are contacts 22 which move toward and away from stationary contacts 23 mounted in the casing.

When the element 21 is cold, it has the general shape shown in Figures 1 and 3, but when heated, it generally is of the shape shown in Figure 4.

A reset stop 24 formed on the casing 11 is provided so that, though the spring may occupy either one of its positions across line 16—17 when the handle is in the position of Figures 1 or 4, the spring may not occupy a position to the left of line 16/17, when the handle is in the position shown in Figure 3, but will occupy only a position to the right of that line.

The operation of the device is as follows: For manual actuation, the spring 18, always remains to the right of the line 16—17, regardless of the position of that line with respect to line 19—17, and since it is always under compression, the spring biases the handle towards the extreme positions, thus holding the handle there; also when the parts are in the closed circuit position of Figure 1, the spring maintains the movable contacts 22 in pressure engagement with the stationary contacts 23. As the spring is shifted by the handle across the line connecting points 19—17, it moves the movable contact towards or away from the stationary contact and at the same time moves the handle toward either of the two handle positions. This is the desired manual actuation and is accompanied by a desirable snap-action as well as by a snap feeling imparted to the hand of the operator on the handle 13.

The contacts 22 and 23 are so positioned that when the parts are in the closed circuit position of Figure 1, the spring 18 does not occupy its free position, such as is shown in Figure 3, but instead is slightly compressed, sufficiently to maintain contact pressure at 22/23.

On the arising of an overload, the bi-metal element 21 will become heated and will warp to the position shown in Figure 4 to cause the spring 18 to pass across line 16/17 with a snap

action and cause the parts to assume the position of Figure 4, the handle remaining stationary.

For resetting, it is merely necessary to rock the handle to the open circuit position of Figure 3. Spring 18, will be carried with the handle and as it reacts on stop 24 will be returned to its normal shape as shown in Figure 3, thus being flexed across its own line 16/17.

If desired, the spring 18 may be so designed as to have a larger range of movement between the closed circuit position of Figure 1 and the overload release position of Figure 4 and at the same time the contacts 23 may be so positioned that when the parts are in the closed circuit position of Figure 1, the spring 18 is very near a center position. A design of this character will give a relatively larger degree of contact opening travel when the circuit is opened, as an overload, considerably greater than would be the case if no such design were adopted. In addition, a design of this character will provide a snap-action during the movement of the contact from the closed circuit position of Figure 1 to the overload release position of Figure 4.

The bi-metal 21 is preferably of the snap-action type, such as a disk. This type of element provides for movement of the part with a snap-action only between one position and the other and the bi-metal element does not linger in any intermediate position. However, a bi-metal element which is not of the snap-action type may be employed though with not so great a degree of satisfaction as would be the case if the bi-metal were of the snap action type.

Figures 5 to 8

The circuit breaker or switch herein disclosed comprises a casing including complementary parts 30 and 31, and containing a handle 32 of insulation, secured by means of screws or the like to arms 33, in turn fastened to a shaft 34, journalled in pockets 35 moulded in the casing. Pockets 36 and 37 in the shaft and handle respectively seat a leaf spring 38 under compression between the pockets and this spring has two free positions, one on each side of the line 36—37. Secured to the center of the spring 38, by means of a rivet 39, is a bi-metal element preferably in the nature of a snap-action disk 40. It is mounted to have a limited degree of movement on the spring, being, however, restrained from rotation by the provision of a non-circular shoulder upon the rivet 39. Thus the disk may shift slightly upon the spring, but it cannot rotate around its axis.

On the outer edge of the bi-metal element are movable contacts 41, for engaging stationary contacts 42. Ends 43 and 44 of the casing slot receiving the handle 32 limit its movement. Stops 45 and 46, formed as pins or rods, and seated in pickets 47—48 molded in the casing are provided for purposes to be described.

Figures 5 and 8 show the cool or unwarped condition of the bi-metal element and Figure 7 shows its heated position.

The operation of the device is as follows:

When the parts are in the closed circuit position, as shown in Figure 5, and until the handle is moved toward the right, the contacts 41 will be biased with spring pressure against the contacts 42; on movement of the handle, line 36—37 will cross the spring 38 so as to snap it to the left of that line as shown in Figure 8 whereupon the contacts, as well as the handle, will be biased towards the open circuit position, as shown in Figure 8. If, thereafter, the handle is moved to the left, the bi-metal element 40 will react on the stops 45 and 46 to hold the spring 48 until line 36—37 crosses it, whereupon spring 48 will snap to move the contacts 41 with snap-action to the stationary contacts and the parts will resume their circuit closing position.

In the event of an overload or short circuit, the bi-metal element 40 will warp and snap and assume the position shown in Figure 7, and thus open the circuit. The stops 45—46 do not interfere with such movement or warping of the bi-metal. The bimetal element and the spring move a considerable distance, until the bimetal, so warped, reaches the stops 45 and 46. Thereafter, the spring will expand, and thus move the handle, as well as itself and the bimetal automatically to the open circuit position, there to remain, a characteristic which distinguishes the device of Figures 5 to 8 from the device of Figures 1 to 4 where the parts are not moved to and caused to remain in the normal open circuit position in the event of an overload. Thus, the breaker of Figures 5 to 8 may be described as of the automatic reset type meaning that the handle and other parts are moved automatically to and caused to remain in the normal open circuit position in the event of an overload.

However, if the handle be held by any means in the closed circuit position during an overload release, the parts will not remain in open circuit position but instead will return automatically to the circuit closing position and this defines the device as a circuit breaker of the automatic reclosing type, meaning that it closes the circuit automatically after an overload opening.

While the axis of the shaft 34, which mounts the lower end of the spring, is shown as concentric with the axis of rotation of the handle 32, which mounts the upper end of the spring, this is not absolutely necessary. The only requirement is that the handle pivot be in such a position that the component of force of the spring 38 tending to rotate the handle to the open circuit position when the circuit breaker is in the closed circuit position does not exceed the force tending to hold the handle in the closed circuit position and tending to maintain contact pressure. However, concentric pivots are preferred since they provide an identical overload release operation to the parts regardless of whether the handle be held or not held, which characteristic is not true if the pivots for the handle and shaft are eccentric.

Now having described the switches herein indicated, reference may be had to the claims which follow for a determination of the invention.

I claim:

1. A snap switch arranged for manual actuation and for automatic release on overload comprising a stationary contact, a handle, a snap spring, and a bimetal element on said spring and formed with a movable contact for engaging said stationary contact, with the parts so arranged that handle movement flexes the spring to cause snap movement thereof and the element thereon to and from the stationary contact and on an overload, the bimetal warps to leave the stationary contact, and to flex the spring and snap it to open circuit position, free of the handle if the latter be held.

2. A snap switch arranged for manual actuation and for automatic release on overload comprising a stationary contact, a handle, a snap

spring, and a bimetal element on said spring and formed with a movable contact for engaging said stationary contact, with the parts so arranged that handle movement flexes the spring to cause snap movement thereof and the element thereon to and from the stationary contact, and on an overload, the bimetal warps to leave the stationary contact, and to flex the spring and snap it to open circuit position, free of the handle if the latter be held, and to move the handle to open circuit position if it be not held, or if it be held, when released.

3. A snap switch arranged for manual actuation and for automatic release on overload comprising two stationary contacts, a handle, a snap spring, and a bimetal element on said spring and formed with two movable contacts for engaging and bridging said stationary contacts, with the parts so arranged that handle movement flexes the spring to cause snap movement thereof and the element thereon to and from the stationary contacts, and on an overload, the bimetal warps to leave the stationary contacts, and to flex the spring and snap it to open circuit position, free of the handle if the latter be held.

4. A snap switch arranged for manual actuation and for automatic release on overload comprising two stationary contacts, a handle, a snap spring, and a bimetal element on said spring and formed with two movable contacts for engaging and bridging said stationary contacts, with the parts so arranged that handle movement flexes the spring to cause snap movement thereof and the element thereon to and from the stationary contacts, and on an overload, the bimetal warps to leave the stationary contacts, and to flex the spring and snap it to open circuit position, free of the handle if the latter be held, and to move the handle to open circuit position if it be not held, or if it be held, when released.

5. A snap switch arranged for manual actuation and for automatic release on overload comprising a stationary contact, a handle, an overcenter spring, and a bimetal element on said spring and formed with a movable contact for engaging said stationary contact, with the parts so arranged that handle movement flexes the spring to cause snap movement thereof and the element thereon to and from the stationary contact, and on an overload, the bimetal warps to leave the stationary contact, and to flex the spring overcenter, free of the handle if the latter be held, the handle being in the form of a rocker pivotally mounted between its ends.

6. A snap switch arranged for manual actuation and for automatic release on overload comprising a stationary contact, a handle, a snap spring, and a bimetal element on said spring and formed with a movable contact for engaging said stationary contact, with the parts so arranged that handle movement flexes the spring to cause snap movement thereof and the element thereon to and from the stationary contact, and on an overload, the bimetal warps to leave the stationary contact, and to flex the spring and snap it to open circuit position, free of the handle if the latter be held, the spring being a flat leaf compression spring with one end connected to the handle and the other to a stationary part of the switch.

7. A snap switch arranged for manual actuation and for automatic release on overload comprising a stationary contact, a handle, a snap spring, and a bimetal element on said spring and formed with a movable contact for engaging said stationary contact, with the parts so arranged that handle movement flexes the spring to cause snap movement thereof and the element thereon to and from the stationary contact, and on an overload, the bimetal warps to leave the stationary contact, and to flex the spring and snap it to open circuit position, free of the handle if the latter be held, the element being center mounted and formed to snap and shift its mounting point when it warps.

8. A snap switch arranged for manual actuation and for automatic release on overload comprising a stationary contact, a handle, a flat leaf snap spring having one end connected to the handle and the other end mounted in an abutment, and a bimetal element on said spring and formed with a movable contact for engaging said stationary contact, the spring being normally under compression and to one or the other side of the center of handle movement to hold the handle in either of its two positions and to maintain the movable contact in pressure engagement with or separated from the stationary contact, with the parts so arranged that handle movement shifts the spring across said center and also flexes the spring to cause snap movement thereof and the element thereon to and from the stationary contact, and on an overload, the bimetal warps to leave the stationary contact, and to flex the spring without shifting its ends, but merely its center, and snap it to open circuit position, free of the handle if the latter be held, and thus change the shape of the spring.

9. A snap switch arranged for manual actuation and for automatic release on overload comprising a stationary contact, a handle, a flat leaf snap spring having one end connected to the handle and the other end mounted in an abutment, and a bimetal element on said spring and formed with a movable contact for engaging said stationary contact, the spring being normally under compression and to one or the other side of the center of handle movement to hold the handle in either of its two positions and to maintain the movable contact in pressure engagement with or separated from the stationary contact, with the parts so arranged that handle movement shifts the spring across said center and also flexes the spring to cause snap movement thereof and the element thereon to and from the stationary contact, and on an overload, the bimetal warps to leave the stationary contact, and to flex the spring without shifting its ends, but merely its center, and snap it to open circuit position, free of the handle if the latter be held, and thus change the shape of the spring, and a stop for being engaged by the spring, near the latter's center, to restore the latter to its normal shape, when the handle connected end of the spring is moved out of its closed circuit position, whereupon the spring, tho' in its normal shape, is in open circuit position, and holds itself, its contact, and the handle in their open circuit positions.

10. A snap switch arranged for manual actuation and for automatic release on overload comprising a stationary contact, a handle, a flat leaf snap spring having one end connected to the handle and the other end mounted in an abutment, and a bimetal element on said spring and formed with a movable contact for engaging said stationary contact, the spring being normally under compression and to one or the other side of the center of handle movement to hold the handle in either of its two positions and to main-

tain the movable contact in pressure engagement with or separated from the stationary contact, with the parts so arranged that handle movement shifts the spring across said center and also flexes the spring to cause snap movement thereof and the element thereon to and from the stationary contact, and on an overload, the bimetal warps to leave the stationary contact, and to flex the spring without shifting its ends, but merely its center, and snap it to open circuit position, free of the handle if the latter be held, and thus change the shape of the spring, the bimetal element comprising a center mounted bimetal element having the contact at an outer point.

11. A snap switch arranged for manual actuation and for automatic release on overload comprising a stationary contact, a handle, a flat leaf snap spring having one end connected to the handle and the other end mounted in an abutment, and a bimetal element on said spring and formed with a movable contact for engaging said stationary contact, the spring being normally under compression and to one or the other side of the center of handle movement to hold the handle in either of its two positions and to maintain the movable contact in pressure engagement with or separated from the stationary contact, with the parts so arranged that handle movement shifts the spring across said center and also flexes the spring to cause snap movement thereof and the element thereon to and from the stationary contact, and on an overload, the bimetal warps to leave the stationary contact, and to flex the spring without shifting its ends, but merely its center, and snap it to open circuit position, free of the handle if the latter be held, and thus change the shape of the spring, and a stop for being engaged by the spring, near the latter's center, to restore the latter to its normal shape, when the handle connected end of the spring is moved out of its closed circuit position, whereupon the spring, tho' in its normal shape, is in open circuit position, and holds itself, its contact, and the handle in their open circuit positions, the bimetal element comprising a center mounted bimetal element having the contact at an outer point.

12. A snap switch arranged for manual actuation and for automatic release on overload comprising a stationary contact, a handle, a flat leaf snap spring having one end connected to the handle and the other end mounted in an abutment, and a bimetal element on said spring and formed with a movable contact for engaging said stationary contact, the spring being normally under compression and to one or the other side of the center of handle movement to hold the handle in either of its two positions and to maintain the movable contact in pressure engagement with or separated from the stationary contact, with the parts so arranged that handle movement shifts the spring across said center and also flexes the spring to cause snap movement thereof and the element thereon to and from the stationary contact, and on an overload, the bimetal warps to leave the stationary contact, and to flex the spring without shifting its ends, but merely its center, and snap it to open circuit position, free of the handle if the latter be held, and thus change the shape of the spring, and a stop for preventing the element, when unwarped, from snapping over its own center, but so positioned as to permit the element, when heated, to snap over its own center and in so doing to shift the handle, if the latter be not held, to open circuit position.

13. A snap switch arranged for manual actuation and for automatic release on overload comprising a stationary contact, a handle, a flat leaf snap spring having one end connected to the handle and the other end mounted in an abutment, and a bimetal element on said spring and formed with a movable contact for engaging said stationary contact, the spring being normally under compression and to one or the other side of the center of handle movement to hold the handle in either of its two positions and to maintain the movable contact in pressure engagement with or separated from the stationary contact, with the parts so arranged that handle movement shifts the spring across said center and also flexes the spring to cause snap movement thereof and the element thereon to and from the stationary contact, and on an overload, the bimetal warps to leave the stationary contact, and to flex the spring without shifting its ends, but merely its center, and snap it to open circuit position, free of the handle if the latter be held, and thus change the shape of the spring, and a stop for preventing the element, when unwarped, from snapping over its own center, but so positioned as to permit the element, when heated, to snap over its own center and in so doing to shift the handle, if the latter be not held, to open circuit position, but if the handle be held, the element will automatically return to circuit closing position.

14. A snap switch arranged for manual actuation and for automatic release on overload comprising a stationary contact, a handle, a flat leaf snap spring having one end connected to the handle and the other end mounted in an abutment, and a bimetal element on said spring and formed with a movable contact for engaging said stationary contact, the spring being normally under compression and to one or the other side of the center of handle movement to hold the handle in either of its two positions and to maintain the movable contact in pressure engagement with or separated from the stationary contact, with the parts so arranged that handle movement shifts the spring across said center and also flexes the spring to cause snap movement thereof and the element thereon to and from the stationary contact, and on an overload, the bimetal warps to leave the stationary contact, and to flex the spring without shifting its ends, but merely its center, and snap it to open circuit position, free of the handle if the latter be held, and thus change the shape of the spring, and a stop for preventing the element, when unwarped, from snapping over its own center, but so positioned as to permit the element, when heated, to snap over its own center and in so doing to shift the handle, if the latter be not held, to open circuit position, the handle and the abutment being rotatably mounted on concentric pivots.

ELWOOD T. PLATZ.