June 24, 1952 R. E. PROUTY 2,601,556

SNAP SWITCH

Original Filed Oct. 31, 1947

Fig. 1.

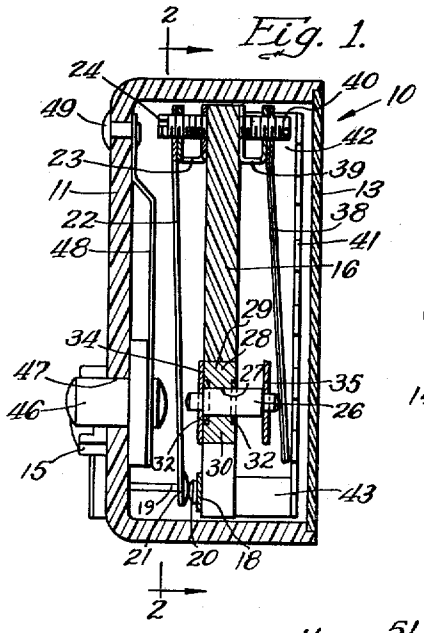


Fig. 2.

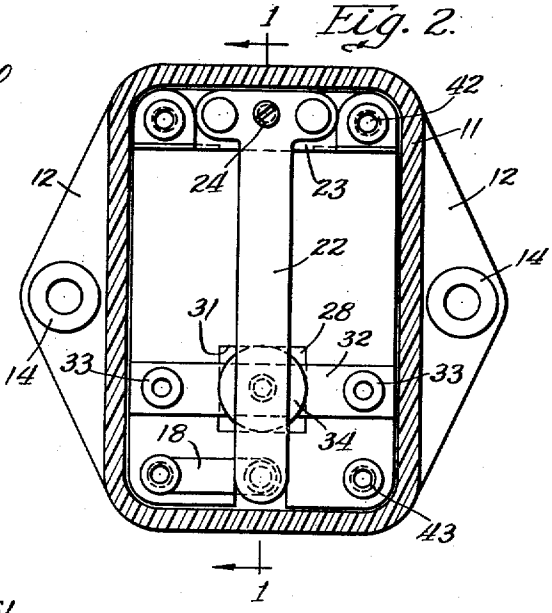


Fig. 3.

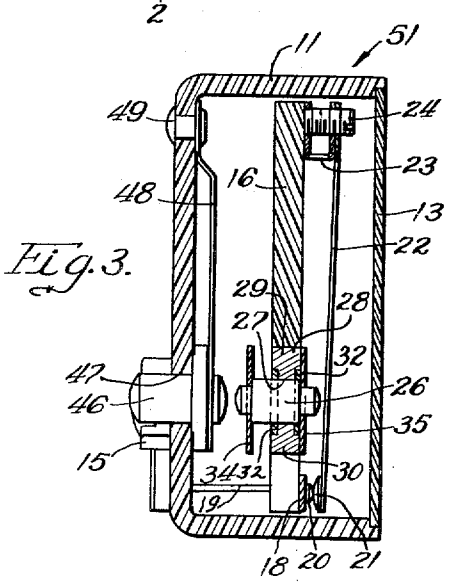
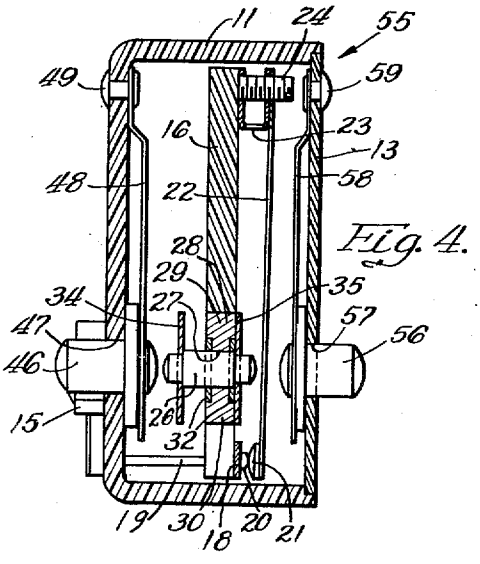


Fig. 4.



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SNAP SWITCH

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2 Claims. (Cl. 200—67)

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My invention relates, generally, to circuit interrupters, and it has particular relation to switches of the snap acting type. More specifically, it relates to the provision of manually operable resetting means for the thermal relay disclosed in my copending application, Serial No. 783,411 filed October 31, 1947, now abandoned, and assigned to the assignee of this application, and further my present application constitutes a divisional application of my copending application, Serial No. 783,412, filed October 31, 1947, now Patent No. 2,547,171, being directed to the species of switch displayed in Figures 3 and 4 of the latter referred to and this present application.

Among the objects of my invention are: To maintain a thermally operable overload protector relay in the operated position once it has operated in response to an overload; to reset such a relay to the normal operative position; to employ an actuator operating through a permanent magnet and carrying an armature for controlling the functioning of the relay contacts; to provide a self-closing switch that is manually operable to the open position; and to hold the switch in either the closed or open position by the cooperation of a pair of armatures and a permanent magnet and to move the same from one position to the other by manually operable push buttons.

Other objects of my invention will, in part, be obvious and in part appear hereinafter.

My invention is disclosed in the embodiments thereof shown in the accompanying drawing, and it comprises the features of construction, combination of elements and arrangement of parts which will be exemplified in the constructions hereinafter set forth and the scope of the application of which will be indicated in the appended claims.

For a more complete understanding of the nature and scope of my invention reference may be had to the following detailed description, taken together with the accompanying drawing, in which:

Figure 1 is a detail sectional view taken along the line 1—1 of Figure 2 and illustrating how the thermal overload relay disclosed in my copending application, above referred to, can be constructed so that it remains in the operated position when it has been operated in response to an overload and arranged to be restored to the original position by operation of a push button;

Figure 2 is a detail sectional view taken along

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the line 2—2 of Figure 1, showing the switch construction in front elevation;

Figure 3 is a view, similar to Figure 1, but showing a self-closing switch employing a permanent magnet and an armature to control the operation of the switch contacts as permitted by a manually operable push button; and

Figure 4 is a view, similar to Figure 1, showing a magnetic control which is operative to either position of the switch contacts and which includes a pair of manually operable push buttons for operating the switch contacts in opposite directions.

Referring now particularly to Figures 1 and 2 of the drawings, it will be noted that the reference character 10 designates, generally, a resettable thermal overload protector relay in which the present invention is embodied. The relay 10 can be employed, as described in my copending application above referred to, in conjunction with a motor starting relay for protecting the motor from being subjected to overloads. The relay 10 is constructed so as to require manual resetting once it has operated.

The relay 10 is provided with a housing or case 11 of insulating material, such as a phenolic condensation product. It has integrally formed foot portions 12 and a cover 13 formed of the same material and secured thereto by tubular rivets 14. Screw terminals 15, only one of which is illustrated in Figure 1, are provided on the case 11 for making external connections to the relay 10.

Within the housing or case 11 there is located a support 16 of insulating material, such as a phenolic condensation product, and it carries near one end a conductor strip 18 which may be connected to one of the screw terminals 15 by a lead 19 and to which may be secured a contact 20, preferably in the form of a silver button. The stationary contact 20 is arranged to be engaged normally by a movable contact 21, also preferably a silver button. The movable contact 21 is carried by a spring 22 which may be anchored in cantilever fashion to a bracket 23 that in turn is secured to the support 16. The bracket 23 preferably is constructed as described in detail in my said copending application and is provided with an adjusting screw 24 which serves to change the biasing force exerted by the spring 22 as will be understood readily.

In order to move the spring 22 for the purpose of separating the contacts 20 and 21, an actuator 26 is employed in the form of a pin of

non-magnetic material, such as aluminum. The actuator 26 is slidably mounted in an aperture 27 in a generally rectangularly shaped permanent magnet 28 having an I-shaped cross section which provides poles 29 and 30 at opposite ends. The magnet 28 is positioned in a generally rectangular opening 31 in the support 16 and is secured in position thereon by plates 32 on opposite sides which are held in place by rivets 33.

At the ends of the actuator 26 stop members 34 and 35 are provided. The stop members 34 and 35 both may be formed of magnetic material to provide armatures for cooperating with the permanent magnet 28. As shown, they are in the form of circular washers. Alternatively, the stop member 34 may be formed of non-magnetic material and the stop member 35 of magnetic material.

The actuator 26 may be moved by a bimetallic strip 38 which is anchored in cantilever fashion to a bracket 39 that is similar to the bracket 23 but on the opposite side of the support 16, as illustrated. An adjusting screw 40 serves to adjust the biasing force applied by the strip 38 and to change its calibration. Heat may be supplied to the bimetallic strip 38 by a heater element 41 whose terminals are secured to conducting sleeves 42 and 43 that project through the support 16. The sleeve 42 serves in part to secure the brackets 23 and 39 to the support 16. It also interconnects the contacts 20 and 21 and the heater element 41 in series circuit relation, as shown more clearly in my copending application above referred to. Suitable means are provided for interconnecting the conductor strip 18 and the sleeve 43 to the external screw terminals 15.

Once the actuator 26 has been moved by the bimetallic strip 38 to open the contacts 20 and 21, the actuator 26 remains in the operated position, since the armature 35 is held adjacent the poles 29 and 30 of the permanent magnet 28. When this occurs, it is necessary to provide external means for restoring the actuator 26 to the initial position so as to permit the spring 22 to again close the contacts 20 and 21. For this purpose a push button 46 is slidably mounted in a suitable aperture 47 in the housing or case 11. A spring 48, held by a rivet 49, serves to bias the push button 46 to its outermost position.

In operation, on the occurrence of an overload as a result of which sufficient heat is applied to the bimetallic strip 38 to move the actuator 26 sufficiently to open the contacts 20 and 21 with a snap action, the circuit there through is opened and, if the relay 10 is connected in series with a motor or like electric device, the energizing circuit thereto is opened. While heat is no longer applied to the bimetallic strip 38 and it returns to its initial position, the actuator 26 remains in the operated position by the attraction of the stop member or armature 35 to the permanent magnet 28. If the stop member 34 is also formed of magnetic material, there is an appreciable time delay before the actuator 26 is moved by the bimetallic strip 38 over that which is provided when the stop member 34 is formed of non-magnetic material. By depressing the push button 46 either manually or by a machine part, the actuator 26 is moved so as to separate the armature 35 from the permanent magnet 28. The contacts 20 and 21 are then permitted to reclose with a snap action and the circuit therethrough is reestablished.

In Figure 3 of the drawing there is illustrated, generally, at 51 a reclosing contact mechanical switch which employs certain of the parts used in the switch construction shown in Figures 1 and 2 and described hereinbefore. It will be observed that the contacts 20 and 21 and the spring 22 are located on the opposite side of the support 16 in Figure 3. Also, the stop member 34 is in the form of a non-magnetic washer while the stop member 35 is of magnetic material and constitutes an armature for cooperation with the permanent magnet 28. As before, the contacts 20 and 21 are normally closed and held in this position by the spring 22. When the push button 46 is depressed sufficiently to engage the adjacent end of the actuator 26, it is moved to in turn move the spring 22 and separate the contacts 20 and 21 with a snap action. When the push button 46 is released, the biasing force of the spring 22 and the magnetic attraction between the permanent magnet 28 and the stop member or armature 35 serves to move actuator 26 to the left and close contacts 20 and 21 with a snap action, thereby restoring the switch 51 to the initial condition shown in the drawing.

In Figure 4 a mechanical switch is illustrated, generally, at 55. This switch employes certain of the details shown in Figures 1 and 2 and described hereinbefore. The mechanical switch 55 is so constructed that the contacts 20 and 21 are held in either the open or the closed position and the application of an external force is required for operating them in opposite directions. In this construction both of the stop members 34 and 35 are formed of magnetic material. A second push buton 56 is provided and slidably mounted in an aperture 57 in the cover 13. The push button 56 is carried by a spring strip 58 which is secured by a rivet 59 to the cover 13. The spring 58 serves to restore the push button 56 to the position shown in the drawing when the pressure applied thereto is removed.

When the switch is positioned as shown in Figure 4, the application of sufficient pressure to the push button 46 moves the actuator 26 to the right. This separates the stop member or armature 35 from the permanent magnet 28 and causes the spring 22 to move the contact 21 away from the stationary contact 20 with a snap action. The stop member or armature 34 is moved partly as a result of the movement of the push button 46 and partly as a result of attraction by the permanent magnet 28. It is held against the permanent magnet 28 and the contacts 20 and 21 remain separated after the pressure applied to the push button 46 is removed.

Now when pressure is applied to the other push button 56, it moves the spring 22 and the actuator 26 to the original position shown in the drawing where the contacts 20 and 21 are closed with a snap action and remain in the closed position.

Since certain further changes can be made in the foregoing constructions and different embodiments of the invention can be made without departing from the spirit and scope thereof, it is intended that all matter shown in the accompanying drawing and described hereinbefore shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In a switch, in combination, a generally rectangular permanent magnet having an I-shaped cross section with the ends forming opposite poles and an aperture in the interconnecting portion, a non-magnetic actuator movable through said aperture, armatures car-

ried by said actuator for attraction by opposite sides of said magnet, a pair of relatively movable contacts one cooperating with said actuator for movement relative to the other contact, and a pair of manually operable push buttons for moving said actuator from one position to the other to move one armature away from said permanent magnet and the other toward the same and for operating said one contact from one position to the other.

2. In a switch, in combination, a single wall support, a bracket fastened to said support, a spring secured in cantilever fashion at one end to said bracket, a pair of contacts one being stationarily mounted and the other being mounted at the other end of said spring for movement therewith and relative to the one contact, a permanent magnet having an aperture therein mounted in said support, a non-magnetic actuator slidingly journalled in the aperture of said magnet, transversely of said support; an armature carried by said actuator and movable therewith toward and away from said magnet, said actuator cooperating with said spring to

effect movement thereof and of said other contact relative to said one contact, push button means disposed on one side of said support, selectively engageable with one end of said actuator, for manually effecting axial movement of said actuator in one direction, and additional push button means disposed on the opposite side of said support for likewise effecting axial movement of said actuator in an opposite direction.

ROBERT E. PROUTY.

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