Sept. 24, 1940. J. W. HAMILTON ET AL 2,215,788

SWITCH

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Fig. 1.

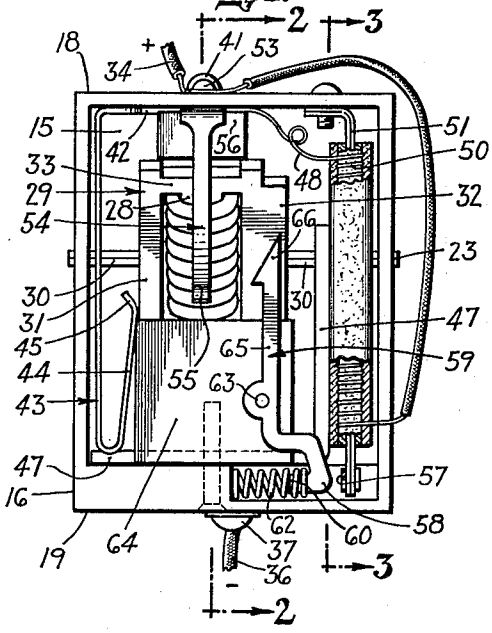


Fig. 2.

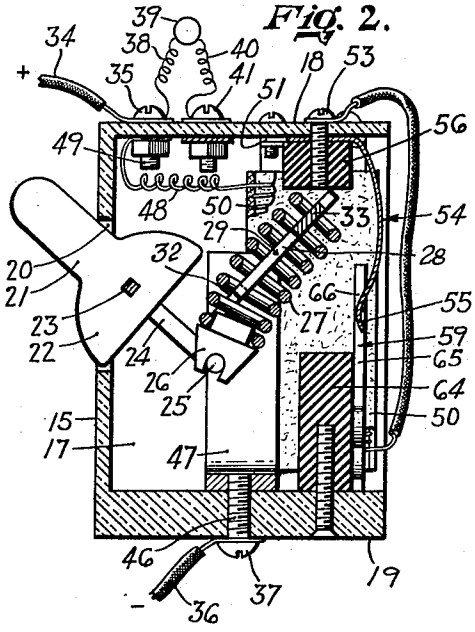


Fig. 3.

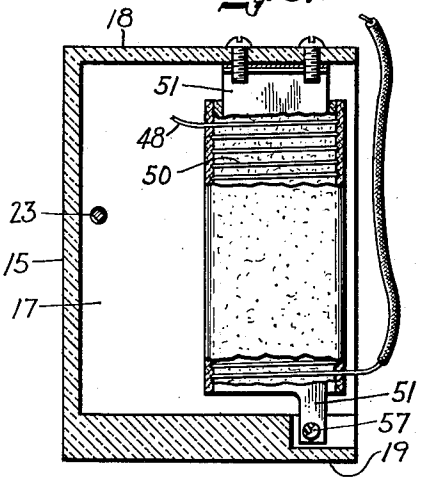


Fig. 4.

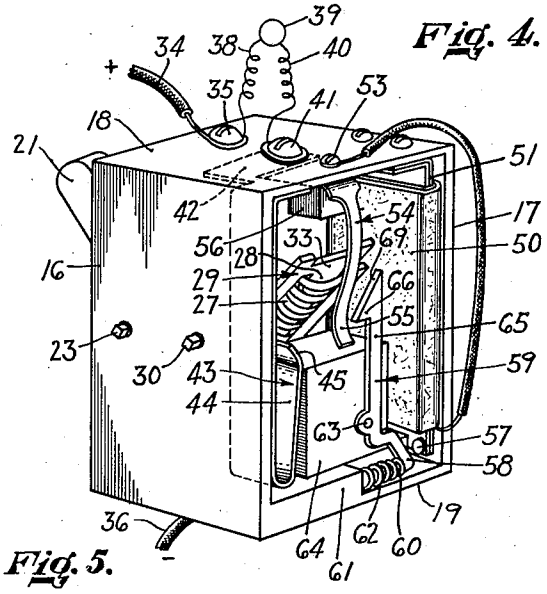
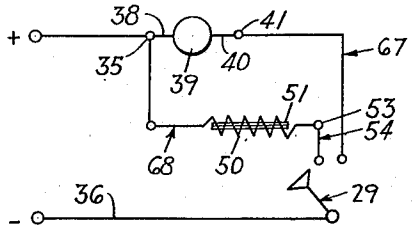


Fig. 5.



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Fig. 6.

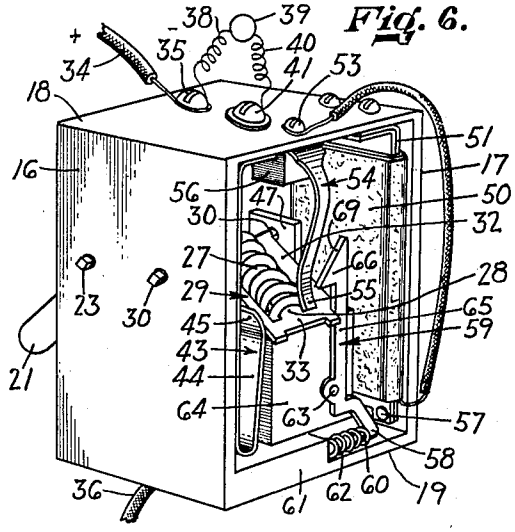


Fig. 7.

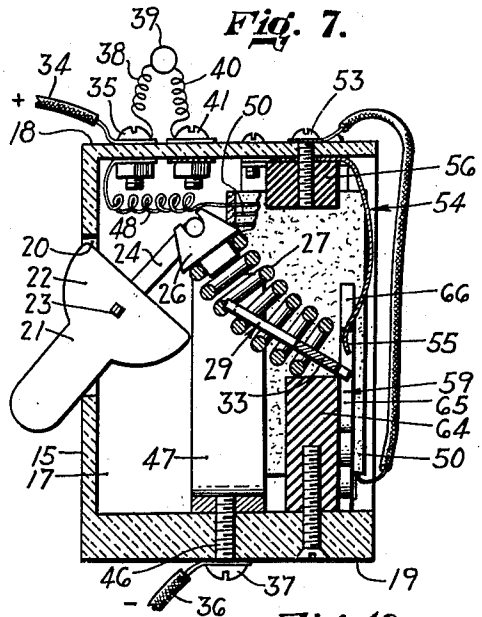


Fig. 9.

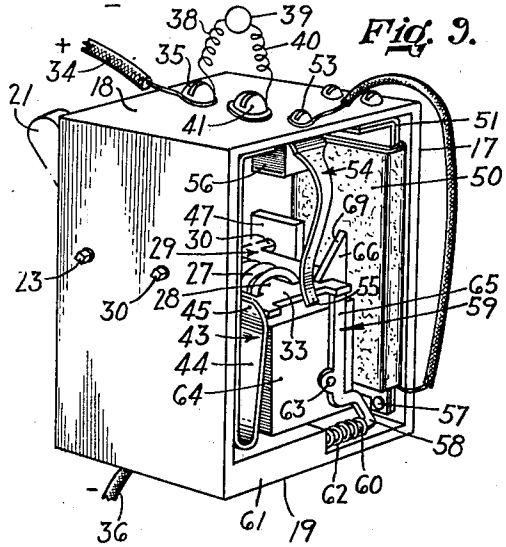


Fig. 10.

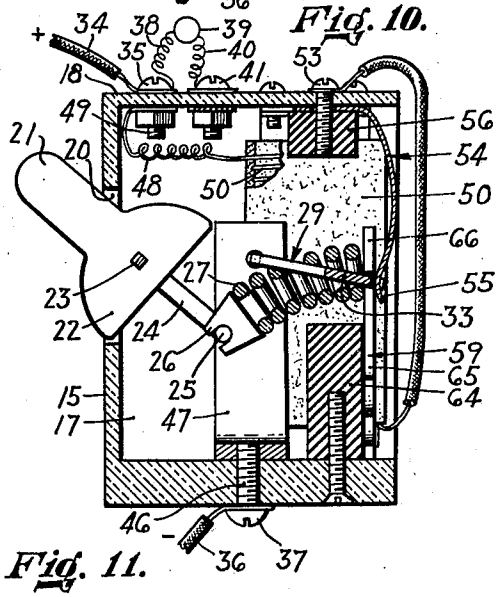


Fig. 8.

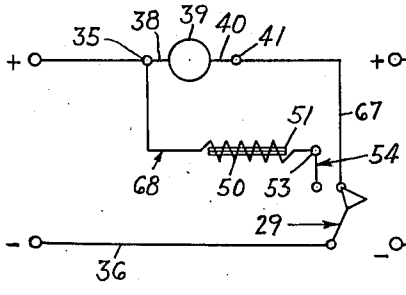
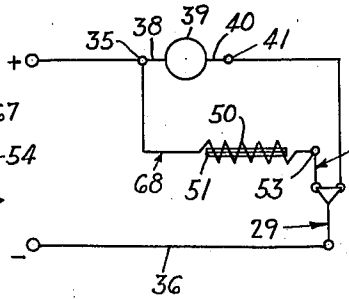


Fig. 11.



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2,215,788

SWITCH

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Los Angeles, Calif.

Application June 9, 1938, Serial No. 212,676

4 Claims. (Cl. 200—122)

This invention relates to a delayed action switch and refers more particularly to a time delay action electric switch suitable for light and other circuits.

This type of switch allows a person to manually actuate the switch, for example, to extinguish lights, but these will remain illuminated for a predetermined time period to enable the user to leave the premises while the lights are still on.

Switches of this type employ a thermostat of bi-metallic type having a heating coil which is usually in shunt with the main circuit; however, when the switch is thrown manually to the "off" position, the circuit of the heating coil is placed in series with the load, so that the coil operates as a part of the current path through the load circuit. This arrangement has the drawback that when the load is changed, the total resistance changes. If the load resistance is reduced materially, the current flow rises proportionately. And if this practice is carried too far, the heating coil will usually burn out, or not be heated at all. Consequently, switches of this character are limited to their specific loads. For example, practical experiments have shown that a switch designed to give a two-minute delay with a 40-watt load would have approximately a one-minute delay with a 60-watt load, a half-minute delay with 75 watts, and proportionally less time as the load increased until at about 250 watts the heating coil of the switch would burn in two.

An object of the present invention is the provision of a delayed action switch which will operate uniformly and without any variations in the time period of the delayed action irrespective of the magnitude of the load in the main circuit.

Another object is the provision of a delayed action switch capable of carrying any load which its main line contacts can carry.

Other objects of the present invention will be apparent in the course of the following specification.

The objects of the present invention may be realized by arranging the heating element of the thermostat in a multiple circuit relationship with the load, so that the heating element can work concurrently with but independently of the load. The heating element is, therefore, so constructed that it can be placed across the supply line independently of any other device or circuit.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawings, showing by way of example a preferred embodiment of the inventive idea.

In the drawings:

Figure 1 shows in rear elevation a switch constructed in accordance with the principles of the present invention;

Figure 2 is a section along the line 2—2 of Figure 1;

Figure 3 is a section along the line 3—3 of Figure 1;

Figure 4 is a perspective view of the switch in its off position;

Figure 5 is a diagram showing the electrical connections of the switch in the off position;

Figure 6 is similar to Figure 4 and shows the switch in its on position;

Figure 7 is a section similar to Fig. 2 and shows the switch in its on position;

Figure 8 is a diagram similar to that of Figure 5 and shows the circuit in the on position of the switch;

Figure 9 is similar to Figures 4 and 6 and shows the switch in its intermediate position with the heating coil of the thermostat included in its circuit;

Figure 10 is a section similar to Figs. 2 and 7 and shows the switch in its intermediate position; and

Figure 11 is a diagram similar to those shown in Figures 5 and 8 and illustrates the circuits at a time when the heating coil of the thermostat is energized by the electrical current.

The switch shown in the drawings may be conveniently affixed to a wall and comprises a switch box or casing having a front wall 15, side walls 16 and 17, the top 18 and the bottom or base 19. This switch box is made of an insulating material such as "Bakelite," porcelain or the like.

The front wall 15 has an opening 20 through which the finger-operated insulating lever 21 extends. The lever 21 has an inner round portion 22 which is rotatable along with its axis 23 mounted in the walls 16 and 17. An extension arm 24 is securely attached to the portion 22 of the finger lever 21 and carries a pivot pin 25. A fork 26 embraces the pivot pin 25 and is connected with one end of a coil spring 27, the opposite end of which surrounds an inner projection 28 of a yoke or swinging member 29.

The yoke or swinging member 29 is rotatable along with its axis 30 which extends through the side wall 16 and member 47 of the switch box. The yoke 29 comprises two side bars 31 and 32 which are interconnected by a transverse bar or

circuit-closer bar 33. This is the arrangement for giving an automatic, quick movement to the frame or yoke 29 when the finger-operated lever 21 is moved from the open circuit position or off position, shown in Figures 1 to 5, to the on position or the closed circuit position, shown in Figures 6 to 8.

An insulated wire 34 is connected with a plus terminal 35 carried by the top 18 of the casing. The minus terminal is connected with the wire 36 and is carried by the bottom 19 of the casing. The terminal 35 constitutes an end element common to the two circuits 67 and 68 (Fig. 5).

The terminal 35 is connected by means of a wire 38 with the device 39, which is illustrated diagrammatically in the drawings and which constitutes the load of the main circuit; it may be a lamp or a series of lamps, a heating device, or any other consumer of electrical energy. Hereinafter it will be referred to as the lamp 39.

A wire 40 connects the lamp 39 with another terminal 41 situated upon the top 18 of the casing. The terminal 41 is electrically connected with a strip 42 integral with the U-shaped contact 43, which is also a conductor of electricity. The contact 43 comprises an upwardly extending portion 44 provided with a bent end 45, and constitutes an end element of the load circuit. As shown in Figures 6 and 9, the bar 31 of the swinging yoke 29 is adapted to engage the portion 44 of the contact 43 in the on position of the switch.

The terminal 37, which constitutes the minus terminal of the switch, is connected by means of a terminal bolt 46 with an L-shaped conducting member 47, which is situated within the casing and which is always in contact with the bar 32 of the swinging yoke 29. Due to this arrangement, an electrical connection is established between the yoke 29, and the L-shaped member 47, and the minus terminal 37.

A wire 48 is connected to the terminal bolt 49, constituting a part of the plus terminal 35. The opposite end of the wire 48 constitutes the heating coil 50 of the bimetallic strip 51. The opposite end of the heating coil 50 is connected to the terminal 53 carried upon the top 18 of the casing.

A tongue or contact 54, which is provided with a curved portion 55, is situated within the casing and is electrically connected with the terminal 53 (Figs. 2, 7 and 10). An insulating block 56 is used to support the tongue 54 in its proper position within the casing. The member 54 constitutes an end element of the thermostat circuit 68.

An electrical connection is maintained between the tongue or the strip 54, which may be engaged by the transverse bar 33 of the swinging member 29, and the heating coil 50, as well as the positive terminal 35 of the switch.

The lower portion of the bimetallic strip 51 is provided with an insulating knob 57, which is adapted to engage the bent portion 58 of a double-armed lever 59, when the strip 51 is bent due to heating. The end portion 60 of the lever 59 is reciprocable in the direction toward and away from a block 61 constituting a part of the bottom 19 of the casing. A coil spring 62 engages the block 61, while its opposite end surrounds the portion 60 and presses against the bent portion 58 of the lever 59.

The lever 59 is pivoted at 63 upon an insulating block 64, which is situated within the casing. The spring 62 is used to maintain the lever 59 in its vertical position, which is shown in the drawings.

The vertical arm 65 of the lever 59 is provided with a hook or detent 66, which is adapted to engage the bar 32 of the swinging circuit closer 29 in the course of the return movement of the circuit closer 29 to its off position.

The operation of the device is as follows:

In the off position shown in Figures 1 to 4 of the drawings, the switch lever 21 is directed upwardly while the swinging circuit closer 29 also extends upwardly but is inclined in the opposite direction. As shown in Figure 2, the tongue 54 is out of engagement with the circuit closer 29, which is also out of engagement with the U-shaped contact 43. As shown in the diagram of Figure 5, in this position the load circuit 67 and the thermostat circuit 68 both remain open.

In order to close the switch, the operator pulls the lever 21 downwardly so that it assumes the position shown in Figures 6 and 7. The lever turns along with its axis 23 and the rod 24 of the lever swings upwardly along with the pivot 25 and the fork 26, which is engaged by the spring 27. Due to the pressure of the spring 27, the circuit closer 29 is rapidly swung in the opposite direction, with the result that the transverse bar 33 of the circuit closer 29 is moved downwardly into the position shown in Figures 6 and 7, in which it is situated underneath the tongue 55. In the course of this swinging movement of the circuit closer 29, the bar 32 slides along the inclined surface 69 of the hook 66, while the transverse bar 33 slides along the tongue 54. However, in the end position shown in Figures 6 and 7, the hook 66 is situated above the transverse bar 33 which is also out of engagement with the tongue 54.

As shown in Figure 8, in this position of the switch a circuit is established between the positive terminal 35 and the negative terminal 37. The alternating electrical current will flow through he wire 34, the terminal 35, the lamp 39, the connecting piece 42, the U-shaped contact 43, the circuit closer 29, the L-shaped member 47, the bolt 46, the terminal 37, and the wire 36. However, in this on position of the switch, the thermostat is not included in an electrical circuit.

If now the user desires to turn off the switch, he swings the lever 21 upwardly until it is moved into the position shown in Figures 9 and 10 of the drawings. Due to the described connections, the circuit closer 29 will also tend to swing upwardly and the transverse bar 33 will slide along the lever 59 until it is brought into engagement with the hook 66 and is stopped by that hook. This position is shown in Figures 9 and 10. In this position the transverse bar 33 of the circuit closer 29 is in contact with the tongue 54. At the same time the side bar 31 of the circuit closer 29 still remains in contact with the portion 44 of the U-shaped contact 43. Therefore, in this position of the switch, the load circuit 67 is still maintained while at the same time the thermostat circuit 68 is connected in parallel with the load circuit 67. This is illustrated in the diagram of Figure 11 of the drawings.

In this position, the current flowing through the plus terminal 35 will flow through the wire 48 (Fig. 2) and the heating coil 50 of the bimetallic strip 51. The current passing through the coil 50 will flow through the terminal 53 to the tongue 54, flowing from the tongue 54 to the

circuit closer 29, the L-shaped member 47 and the negative terminal 37.

The heating coil will heat the bimetallic strip 51, which will be bent as a result of this heating so that its projection 57 will move toward the bent portion 58 of the lever 59. Gradually the projection 57 will engage the portion 58 and will move the end 60 of the lever 59 toward the block 61, thereby compressing the spring 62. The lever 59 will thus be turned around its pivot 63, so that the hook 66 of the lever will move gradually toward the wall 17 sliding upon the underlying portion of the circuit closer 29 until finally the hook 66 will release the circuit closer 29. Then, under the action of the spring 27, the circuit closer will spring back from the position shown in Figures 9 and 10 to the off position shown in Figures 1 and 2 of the drawings. The engagement between the circuit closer 29 on the one hand and the tongue 54 and the U-shaped contact 43 on the other hand will be interrupted, so that no current will flow any more through the load circuit 67 or the thermostat circuit 68.

The bimetallic strip 51 will gradually cool and return to its original position, which is shown in the drawings, while at the same time the spring 62 will cause the lever 59 to return to its illustrated position.

Practical experience has shown that the period of time during which the current is caused to flow through the load circuit 67 after the lever 21 has been switched to its off position, depends entirely on the construction of the switch and is unaffected by the size of the load 39.

The switch may be so constructed that the circuit 67 is interrupted a few seconds to several minutes after the lever 21 has been switched off.

One of the important advantages of the present construction is that the thermostatic circuit 68 is operated while the load circuit 67 is intact, so that there are two individual, distinct and complete circuits in operation at one and the same time.

It is apparent that the specific illustration shown above has been given by way of illustration and not by way of limitation, and that the structure above described is subject to wide variation and modification without departing from the scope or intent of the invention. For example, the switch may have the form of a pedant switch or a socket switch. All of such and other variations and modifications are to be included within the scope of the present invention.

What is claimed is:

1. In a switch, a terminal adapted to be connected to one pole of a source of electrical energy and to the main consumer of said electrical energy, another terminal adapted to be connected to said consumer of electrical energy, a third terminal adapted to be connected to the other pole of said source of electrical energy, a circuit closer, an insulated toggle-type device engaging said circuit closer for swinging it backwards and forwards from an open circuit position to a closed circuit position and from the closed circuit position to the open circuit position, insulated restraining means positioned to arrest said circuit closer in the course of its movement from the closed circuit position to the open circuit position in an intermediate position, a conducting member engaging said circuit closer in all positions of the latter and permanently connected with the third-mentioned terminal, a single contact connected with the second-mentioned terminal and operatively engaging said circuit closer in its closed circuit position and in its intermediate position to maintain a flow of electrical energy from said source through said main consumer while the circuit closer is in the closed circuit position and while it is moved from the closed circuit position to the intermediate position, a thermostat, means conductively connecting said thermostat with the first-mentioned terminal, a single contact conductively connected with said thermostat and contacting said circuit closer in said intermediate position, whereby said thermostat is connected with said source in parallel to said consumer in said intermediate position, and means actuated by said thermostat when the latter is heated by current of said source to disengage the restraining means and permit further movement of the circuit closer from the intermediate position to the open circuit position, the last-mentioned contact being formed to remain longer in engagement with the circuit-closer than the first-mentioned contact in the course of the movement of the circuit-closer from the intermediate position to the open circuit position, whereby the connection of said thermostat with said source is interrupted after the interruption of the connection of said consumer with said source.

2. In a switch, a terminal adapted to be connected to one pole of a source of electrical energy and to the main consumer of said electrical energy, another terminal adapted to be connected to said consumer of electrical energy, a third terminal adapted to be connected to the other pole of said source of electrical energy, a conducting circuit-closing yoke having two side-bars, a transverse bar interconnecting said side-bars, and an axis connected with at least one of said side-bars; an insulated toggle-type device engaging the transverse bar of said yoke for swinging the yoke backwards and forwards from an open circuit position to a closed circuit position and from the closed circuit position to the open circuit position, insulated restraining means positioned to engage one of the side bars of the yoke in the course of the movement of the yoke from the closed circuit position to the open circuit position and thereby arrest the yoke in an intermediate position, a conducting member engaging the axis of said yoke in all positions of the latter and permanently connected with the third-mentioned terminal, a single contact connected with the second-mentioned terminal and operatively engaging another side bar of the yoke in the closed circuit position and the intermediate position of the yoke to maintain a flow of electrical energy from said source through said main consumer while the yoke is in the closed circuit position and while it is moved from the closed circuit poistion to the intermediate position, a thermostat, means conductively connecting said thermostat with the first mentioned terminal, a single contact conductively connected with said thermostat and contacting the transverse bar of the yoke in said intermediate position, whereby said thermostat is connected with said source in parallel to said consumer in said intermediate position, and means actuated by said thermostat when the latter is heated by current of said source to disengage the restraining means and permit further movement of the yoke from the intermediate position to the open circuit position.

3. In a switch, a terminal adapted to be con-

nected to one pole of a source of electrical energy and to the main consumer of said electrical energy, another terminal adapted to be connected to said consumer of electrical energy, a third terminal adapted to be connected to the other pole of said source of electrical energy, a circuit closer, a coil spring engaging said circuit closer, a fork connected with said coil spring, a pivot pin embraced by said fork, a finger level connected with said pivot pin and movable to two different positions to cause said pivot pin, said fork and said coil spring to swing said circuit closer from an open circuit position to a closed circuit position and from the closed circuit position to the open circuit position, insulated restraining means positioned to arrest said circuit closer in the course of its movement from the closed circuit position to the open circuit position in an intermediate position, a conducting member engaging said circuit closer in all positions of the latter and permanently connected with the third-mentioned terminal, a single contact connected with the second-mentioned terminal and operatively engaging said circuit-closer in its closed circuit position and in its intermedate position to maintain a flow of electrical energy from said source through said main consumer while the circuit closer is in the closed circuit position and while it is moved from the closed circuit position to the intermediate position, a thermostat, means conductively connecting said thermostat with the first-mentioned terminal, a single contact conductively connected with said thermostat and contacting said circuit closer in said intermediate position, whereby said thermostat is connected with said source in parallel to said consumer in said intermediate position, and means actuated by said thermostat when the latter is heated by current of said source to disengage the restraining means and permit further movement of the circuit closer from the intermediate position to the open circuit position.

4. In a switch, a terminal adapted to be connected to one pole of a source of electrical energy and to the main consumer of said electrical energy, another terminal adapted to be connected to said consumer of electrical energy, a third terminal adapted to be connected to the other pole of said source of electrical energy, a circuit closer, an insulated toggle-type device engaging said circuit closer for swinging it backwards and forwards from an open circuit position to a closed circuit position and from the closed circuit position to the open circuit position, an insulated swingable restraining lever positioned to arrest said circuit closer in the course of its movement from the closed circuit position to the open circuit position in an intermediate position, a conducting member engaging said circuit closer in all positions of the latter and permanently connected with the third-mentioned terminal, a single contact connected with the second-mentioned terminal and operatively engaging said circuit closer in its closed circuit position and in its intermediate position to maintain a flow of electrical energy from said source through said main consumer while the circuit closer is in the closed circuit position and while it is moved from the closed circuit position to the intermediate position, a bimetallic strip, a heating coil enclosing said bimetallic strip and conductively connected with the first-mentioned terminal, a single contact conductively connected with said heating coil and contacting said circuit closer in said intermediate position, whereby said heating coil is connected with said source in parallel to said consumer in said intermediate position, and insulated means movable by said bimetallic strip when the latter is heated by current of said source to swing said restraining lever and thereby permit further movement of the circuit closer from the intermediate position to the open circuit position.

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