Dec. 25, 1934. T. FINIZIE 1,985,633

ELECTRIC SWITCH

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Fig.1.

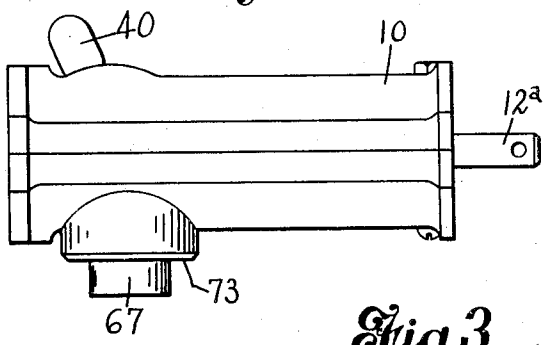


Fig.2.

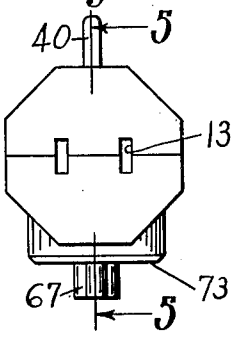


Fig.3.

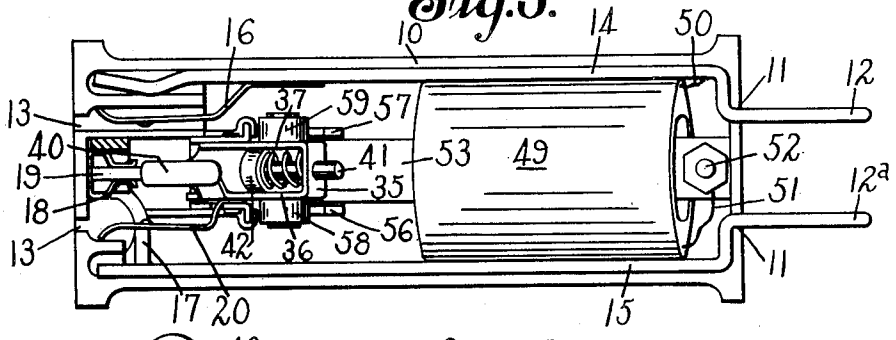


Fig.4.

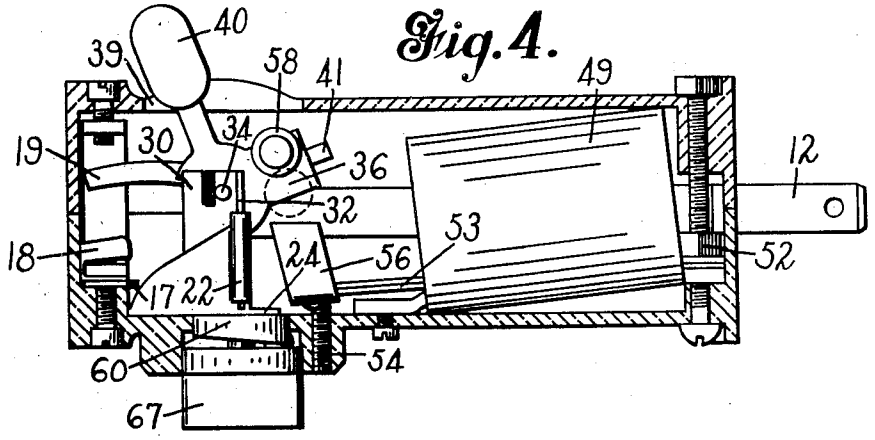
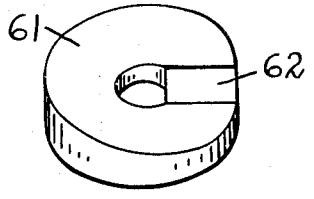


Fig.10.



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Fig. 5.

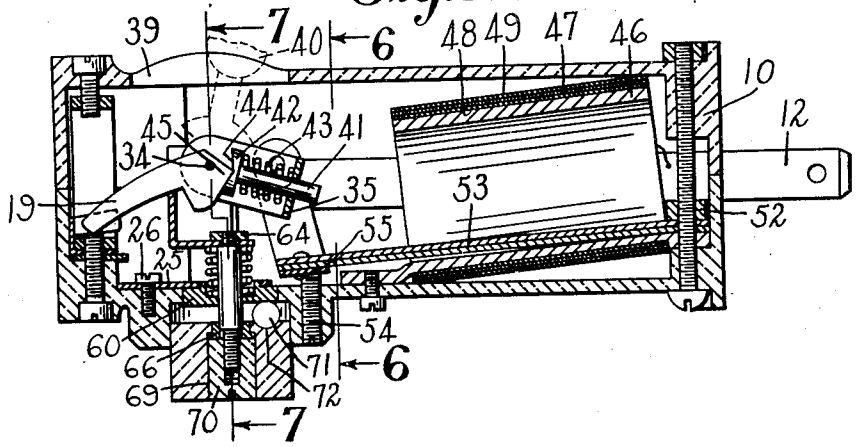


Fig. 6.

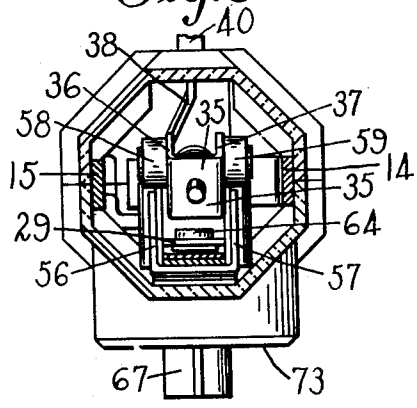


Fig. 7.

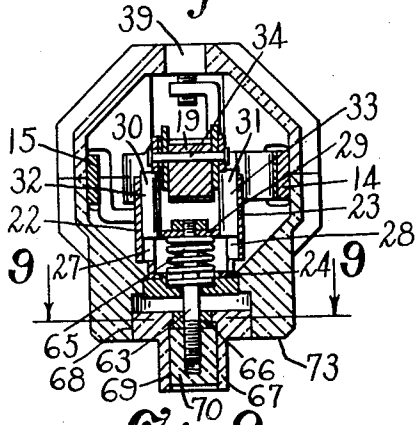


Fig. 8.

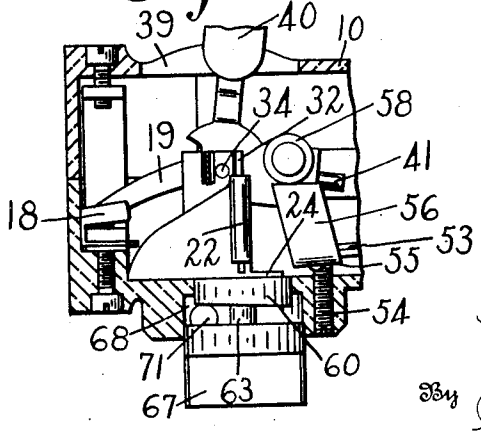
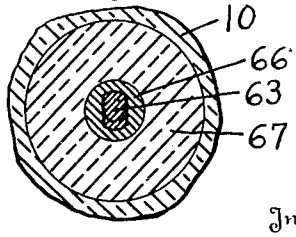


Fig. 9.



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UNITED STATES PATENT OFFICE

1,985,633

ELECTRIC SWITCH

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Application November 19, 1931, Serial No. 576,065

16 Claims. (Cl. 200—115.5)

This invention relates to electric switches and more particularly to a switch which may be operated manually in the usual manner to turn the current on and off, and which may also, if desired, be used as a time-controlled switch so that the current passing through the switch to an electrical appliance will be automatically turned off after a predetermined period of service.

In the use of electrical devices of various kinds, such as radios, washing machines, lamps, etc., it is sometimes desirable that the current be automatically turned off after the appliance has been in use for a given period of time. Moreover it is also desirable that such a switch may be operable in the usual manner of a standard switch to furnish continuous current if desired.

One object of my invention, therefore, is the provision of a switch of this character which may be used either as an ordinary switch to deliver continuous current, or may be set or adjusted to turn off the current passing through the switch after a predetermined period of time.

Another object of the invention is to provide a switch of this character in which the length of time which elapses before the current is turned off may be varied to suit different conditions.

A further object of my invention is the provision of an automatic or time-controlled switch which may be economical to manufacture and efficient and positive in operation.

Another object of the invention is the provision of a switch of the character described which may be permanently attached to the electrical appliance with which it is adapted to be used, or may be embodied in a plug to be inserted in the usual wall socket and thereby be placed in circuit with the appliance with which it is adapted to be used.

To these and other ends, the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a side elevational view of a plug embodying my invention;

Fig. 2 is an end view of the same;

Fig. 3 is a top plan view of the switch structure with the upper half of the plug casing removed;

Fig. 4 is a side view of the switch structure showing the casing in section;

Fig. 5 is a longitudinal sectional view on line 5—5 of Fig. 2;

Fig. 6 is a transverse sectional view on line 6—6 of Fig. 5;

Fig. 7 is a transverse sectional view on line 7—7 of Fig. 5;

Fig. 8 is a side elevational view of a part of the switch structure similar to Fig. 4, but showing the parts in a different position;

Fig. 9 is a sectional view on line 9—9 of Fig. 7, and

Fig. 10 is a perspective view of the cam member employed to adjust the time of opening of the circuit.

To illustrate a preferred embodiment of my invention I have shown a casing 10 within which the switch mechanism is housed, the casing having a pair of openings 11 at one end through which project blades 12 and 12ª adapted to be inserted in the usual wall socket, and having at the other end a pair of openings 13 for the reception of similar blades attached to the usual plug current tap of any electrical appliance with which the switch is to be used. While in the form of my invention illustrated the switch mechanism is embodied in a plug casing arranged to be placed in the line leading to the electrical appliance by being plugged into a receptacle or outlet, it will be understood that the switch structure may be built into the electrical appliance as a permanent part thereof if desired.

The blades 12 and 12ª constitute the ends of conductors 14 and 15 which extend to points adjacent the opposite end of the casing 10. To the conductor 14 is secured the spring contact finger 16, which extends toward one of the openings 13 to contact with the blade of a current tap which may be inserted into that opening so that the current entering the plug through the blade 12 will be carried directly to the blade of the current tap of the electrical appliance with which the switch is used.

A conductor 17 is secured to the forward end of the conductor 15 and connects this member electrically with a contact member 18 which is adapted to be engaged by the switch arm 19. Connected to another part of the switch structure which is in electrical contact with the switch arm 19 is a resilient contact member 20 extending adjacent the other opening 13 so as to contact with the other blade of the current tap leading to the electrical appliance. It will be apparent, therefore, that current entering through the blade 12ª passes through the conductor 17, through the contact member 18, through the switch arm 19, and the switch mechanism to be described hereinafter, to the resilient contact member 20, and thus to the appliance with which the switch is used. It will be apparent that when the switch arm 19 is out of contact with the contact member 18, the current entering through the blade 12ª will get no further than the contact member 18 and hence, when the switch arm 19 is in that position, current will be cut off from the electrical appliance.

The structure of the switch which I employ will now be described. Secured to the plug casing is a U-shaped supporting member comprising legs 22 and 23 and a web or bight portion 24 connecting the legs 22 and 23. The web portion may be provided with a forwardly projecting tongue 25 which is secured to the casing by means of the

screw 26 so as to hold this U-shaped supporting member firmly in position. The legs 22 and 23 are provided with guide channels or guideways 27 and 28 which, as shown in Fig. 7, extend in a vertical direction.

A second U-shaped member is slidably mounted between the legs 22 and 23. This member comprises a web or bight portion 29 and legs 30 and 31, these legs being provided with laterally extending portions or lugs 32 and 33 slidably engaged in the guideways 27 and 28. A pivot pin 34 is supported by the legs 30 and 31 and extends across the space between these legs. Upon this pivot pin is pivotally mounted the switch arm 19 heretofore referred to.

A yoke member having a bight portion 35 has its legs 36 and 37 pivotally mounted upon the pin 34, and to the leg 36 is secured the manually operable arm 38, which projects through a slot 39 in the casing 10, and is provided upon its projecting end with a manually engageable finger piece 40 by which the switch may be operated.

Passing through an opening in the bight portion 35 of the yoke is a plunger 41 having a head 42 between the rear face of which and the bight portion 35 is disposed a compression spring 43 which normally urges the head 42 in a direction away from the bight member 35 of the yoke. Upon this outer face, the head 42 is provided with a V-shaped groove or channel 44 which is adapted to cooperate with the V-shaped end portion 45 of the pivoted switch arm 19. This arrangement serves to provide for a snap action of the switch arm 19, as it will be obvious that when the manually engageable member 40 is moved from the rear to the forward end of the slot 39, the yoke member will be swung from the position shown in Fig. 5 to the position shown in Fig. 4. This will result in pressure being applied to the point of the V-shaped end 45 of the arm 19 by the head 42 of the plunger in a line below the pivot pin 34, so that the switch arm 19 will be moved suddenly from the position shown in Fig. 5 to that shown in Fig. 4. A reverse movement of the switch-operating member 40 will effect reverse movement of the switch arm 19 as soon as the line of pressure passes above the pivot 34.

It will be understood that the above mechanism is that which provides for a manually controlled switch, and that movement of the lever 40 from one position to the other would serve to effectively control the current passing through the conductors 14 and 15 to the electrical appliance used with the switch. The mechanism for automatically operating the switch will now be described. Secured in the casing is a metallic cylindrical core 46, about which is wound a resistance coil 47, the coil being insulated from the core and from the conductors 14 and 15 by the insulating coverings 48 and 49. One end of this coil is connected by the wire 50 to the conductor 14, and the other end connected by the wire 51 to a binding post 52 to which is secured a bimetallic thermostatic member 53. It will be understood that the member 53 is secured at one end only, that which is engaged with the binding post 52, so that the other end will be free to move upwardly when the thermostatic member is heated as will be readily understood by those skilled in the art.

The free end of the thermostatic member 53 may rest upon an adjusting screw 54 so that its position of rest, that is when no current is passing through the resistance coil 47, may be adjusted with relation to the switch structure with which it cooperates. To this free end of the thermostatic member 53 is secured the bight portion 55 of a U-shaped member having legs 56 and 57 extending upwardly on opposite sides of the legs 36 and 37 of the yoke member heretofore described. Mounted upon the outer sides of the legs 36 and 37 are rollers or contact members 58 and 59 which are adapted to make contact with the upper ends of the legs 56 and 57 when the automatic feature of the switch is employed.

It will be apparent that, when the rollers 58 and 59 are in contact with the legs 56 and 57 and the switch is in the "on" position, current will be conducted from the members 15 and 17 through the switch arm 19 to the switch structure and through the rollers 58 and 59 and legs 56 and 57 to the thermostatic element 53, and thence through the wire 51 to the coil 47 and passing out through the wire 50 to the conductor 14. Thus when the rollers 58 and 59 are in contact with the legs 56 and 57 and the switch is in the "on" position, current will always pass through the coil to heat the thermostatic element. When, however, the switch is in the "off" position or when the rollers are not in contact with the legs 56 and 57, no current will be passed through the coil 47.

The mechanism which serves to set the device for automatic operation and to adjust the time interval necessary to cause the switch to be automatically thrown will now be described. It will be recalled that the legs 30 and 31 upon which the switch mechanism is mounted have been described as movably or slidably carried by the legs 22 and 23 of the U-shaped member secured to the casing. Secured to the bight portion of this U-shaped member is a member 60 having upon its lower surface a spiral cam face 61 shown more especially in Fig. 10 and provided with a step 62 between its high and low surfaces. Passing loosely through an opening in the member 60 is a stem 63 which also passes through an opening in the bight portion 29 of the movably mounted switch-supporting member, and received upon its upper end is a nut 64. The stem 63 is oblong or non-circular in cross section, except at its threaded ends which are reduced in size and circular. The opening in the element 60 is sufficiently large to permit the stem 63 to turn therein. A spring 65 reacts between the upper face of the member 60 and the bight portion 29 so as to urge the member 29 away from the member 60. Non-rotatably mounted upon the stem 63 is a washer 66, which is rigidly secured in a turn button 67 rotatably mounted in a recess 68 provided in a portion of the casing 10 so that the parts 63, 66 and 67 rotate together. Within an opening 69 in the turn button 67 a nut 70 is loosely received and threadedly engaged with the lower threaded end of the stem 63. This nut, as will be apparent, serves to hold the turn button 67 in position within the recess 68. Between the upper surface of the turn button 67 and the spiral cam face 61 of the member 60, is a ball 71 which is mounted within a shallow recess 72 in the upper face of the turn button 67 so that this ball will be carried around as the button is turned.

As the spring 65 tends to urge the bight portion 29 of the U-shaped switch-supporting member upwardly, it will also urge the stem 63 upwardly and therefore urge the turn button 67 toward the spiral cam face 61 as permitted by the ball 71.

When the button is turned so that the ball travels from the low to the high portions of the spiral cam 61, the stem 63 and, therefore, the

bight portion 29 of the switch-supporting member will be drawn downwardly due to the engagement of the ball 71 with the spiral cam face 61 so that the pivot pin 34 and switch mechanism mounted thereon will also be drawn downwardly as illustrated in the drawings. When the switch mechanism is thus drawn downwardly, the rollers 58 and 59 will contact with the upper ends of the legs 56 and 57 and tend to move the switch toward its "off" position, thus shortening the throw of the switch-operating member 40 necessary to cut off the current. The nut 70 is threaded upon the lower end of the stem 63, and it will be apparent that, when this nut is rotated relatively to the turn button 67, the rod 63 will be drawn downwardly as this rod is prevented from turning by its non-rotatable connection with the washer 66 which connection is shown more especially in Fig. 9. This adjustment of the stem 63 by the nut 70 will be desirable to adjust the switch device for currents of varying strength, as it is well known that the ordinary house current for example may vary from 105 to 120 volts.

The operation of my device may now be briefly described. When the turn button 67 is in what may be termed the "off" or inoperative position, the ball 71 will lie against the step 62 or opposite the low portion of the cam 61. The pivot pin 34 and associated switch structure will then be in its uppermost position and the rollers 58 and 59, as shown in dotted lines in Fig. 4, will be out of contact with the legs 56 and 57 which are attached to the thermostatic element 53. Under these circumstances no current will pass through the thermostatic element and coil 47 regardless of whether the switch is in the "on" or "off" position. The switch will at this time operate as a manual switch to be thrown to "on" and "off" positions in the usual manner by the operator.

If, however, it is desired to employ the automatic or time-controlled device of the switch, the turn button 67 is turned to move downwardly the pivot pin 34 and associated switch structure. As soon as the rollers 58 and 59 contact with the legs 56 and 57, current will be supplied to the coil 47 when the switch is in the "on" position, and the thermostatic element becomes operative to throw the switch when it has been heated to a sufficient extent to cause its free end to move upwardly and carry with it the rollers 58 and 59 secured upon the legs 36 and 37 of the switch yoke member. The extent of the upward movement necessary to throw the switch will depend upon the position of the pivot pin 34, for it will be obvious that the lower the position of this pin, the less will be the upward movement which will be required to cause the plunger 41 and head 42 to act in a line below the pin 34. Therefore, the switch may be set to be thrown at shorter and shorter intervals by movement of the turn button 67 to bring the ball 71 opposite the higher portions of the cam 61. When the highest portion or that portion adjacent the step 62 has been reached, the switch will be thrown in the shortest interval of time possible for the particular setting of the device. It will be found desirable to mark the lower face 73 of the portion of the casing in which the turn button 67 is mounted with appropriate designations to indicate the number of minutes required to throw the switch at various positions of the turn button.

The time necessary to effect a given upward movement of the free end of the thermostatic element 53 will, of course, depend upon the rapidity of rise of temperature of this element which will, of course, vary depending upon the voltage of the current passing through the coil 47. When the voltage varies considerably, as it may in the house currents of different cities, the nut 70 may be adjusted so as to vary the position of the switch mechanism slightly without affecting the position of the turn button 67, so that the designations upon the surface 73 may be rendered accurate regardless of variations in current voltages.

While I have shown and described a preferred embodiment of my invention, it will be understood that it is not to be limited to all of the details shown, but is capable of modification and variation within the spirit of the invention and within the scope of the appended claims.

What I claim is:

1. Electric switch mechanism comprising a movable contact arm, and a controlling member to effect movement of said arm, an abutment adapted to be thermostatically operated to engage said control member and move said arm to open position, said control member being mounted for adjustment relatively to said abutment to place said abutment either in or out of engagement with the control member when the switch is closed.

2. Electric switch mechanism including a casing and switch mechanism therein comprising a movable contact arm, and a manually operable controlling member extending without the casing to effect movement of said arm, an abutment adapted to be thermostatically operated to engage said control member and move said arm to open position, said control member being pivoted, and means to adjust the position of its pivot relatively to said abutment to vary the action of the latter on the control member to open the switch.

3. Electric switch mechanism comprising a movable contact member, supporting means for said mechanism, said supporting means being mounted for adjustment, thermostatically operated means to engage said switch mechanism to move the contact member to open position, and the adjustment of said support serving to vary the time of action of said means and to interrupt the current actuating the thermostatically operated means.

4. In an electric switch, a switch mechanism including a movable contact member and means for supporting the same, thermostatically operated means to engage the switch mechanism to move it to open position, and manually operable means to move said supporting means relatively to the thermostatically operated means to vary the time of opening of the switch and to interrupt the current actuating the thermostatically operated means.

5. In an electric switch, a casing, supporting means on the casing, a switch-supporting member movably mounted on said supporting means and having switch mechanism mounted thereon, said switch mechanism including a contact member and controlling means therefor, manually operated and thermostatically operated means to move said switch mechanism to open position, and means to move said switch-supporting member relatively to the supporting means on the casing to vary the action of the thermostatically controlled means.

6. In an electric switch, a casing, supporting means on the casing, a switch-supporting member movably mounted on said supporting means and having switch mechanism mounted thereon,

said switch mechanism including a contact member and controlling means therefor, manually operated and thermostatically operated means to move said switch mechanism to open position, and means to move said switch-supporting member relatively to the supporting means on the casing to vary the action of the thermostatically controlled means, and said casing having contact blades projecting from one end thereof and contact receptacles at the other end whereby it may be placed in an intermediate position in the circuit.

7. In an electric switch, a casing, supporting means on the casing, a switch-supporting member movably mounted on said supporting means and having switch mechanism mounted thereon, manually operated and thermostatically operated means to move said switch mechanism to open position, and means to move said switch-supporting member relatively to the supporting means on the casing to vary the action of the thermostatically controlled means, said means for moving the switch-supporting member comprising a member having a spiral cam face, and means movable on said face to effect a cam action on said switch-supporting member.

8. In an electric switch, a casing, supporting means on the casing, a switch-supporting member movably mounted on said supporting means and having switch mechanism mounted thereon, manually operated and thermostatically operated means to move said switch mechanism to open position, means to move said switch-supporting member relatively to the supporting means on the casing to vary the action of the thermostatically controlled means, said means for moving the switch-supporting member comprising a member having a spiral cam face, and a manually operable member rotatable relatively thereto, and means for adjusting the position of said switch-supporting member relatively to said moving means.

9. In an electric switch, a casing, supporting means on the casing, a switch-supporting member movably mounted on said supporting means and having switch mechanism mounted thereon, manually operated and thermostatically operated means to move said switch mechanism to open position, and means to move said switch-supporting member relatively to the supporting means on the casing to vary the action of the thermostatically controlled means, said means for moving said switch-supporting member comprising a manually operable member connected thereto, and a cam secured to the casing along which said member is moved.

10. In an electric switch, a casing, supporting means on the casing, a switch-supporting member movably mounted on said supporting means and having switch mechanism mounted thereon, manually operated and thermostatically operated means to move said switch mechanism to open position, and means to move said switch-supporting member relatively to the supporting means on the casing to vary the action of the thermostatically controlled means, and said means for moving said switch-supporting member comprising a manually operable rotatable member connected to said switch-supporting member, and said rotatable member being adapted to rotate over a spiral cam face to move the switch-supporting member.

11. In an electric switch, a casing, supporting means on the casing, a switch-supporting member movably mounted on said supporting means and having switch mechanism mounted thereon, manually operated and thermostatically operated means to move said switch mechanism to open position, and means to move said switch-supporting member relatively to the supporting means on the casing to vary the action of the thermostatically controlled means, and said means for moving said switch-supporting member comprising a manually rotatable member connected thereto, and cam means to move said switch-supporting member when said manually operable member is rotated.

12. In a switch mechanism, contact members, movable means to effect engagement and disengagement of said members, manually operable means for moving said movable means, thermostatically operated means engaging said movable means to move the same, and means to change the relative positions of said movable means and thermostatically operated means to render the last-named means operative.

13. In a switch mechanism, contact members, movable means to effect engagement and disengagement of said members, manually operable means for moving said movable means, electrically actuated, thermostatically operated means engaging said movable means to move the same, and means to change the relative positions of said movable means and thermostatically operated means to prevent passage of a current therethrough and render the last-named means inoperative.

14. A switch mechanism comprising contact members, a movable switch control member to effect engagement and disengagement of said contact members, manually operable means to operate said switch control member, thermostatically operated means to operate said switch control member, said thermostatically operated means being connected in shunt across the circuit controlled by said switch, and means for changing the relative positions of said switch control member and said thermostatically operated means to effect passage of current through said thermostatically-controlled means and render the same operative.

15. A switch mechanism comprising contact members, a movable switch control member to effect engagement and disengagement of said contact members, manually operable means to operate said switch control member, thermostatically operated means to operate said switch control member, a casing for said switch mechanism, and means extending exteriorly of the casing for manual operation to move said switch control member toward said thermostatically operated means to render said thermostatically-operated means operative or inoperative as desired.

16. A switch mechanism comprising contact members, a movable switch control member to effect engagement and disengagement of said contact members, manually operable means to operate said switch control member, thermostatically operated means to operate said switch control member, a casing for said switch mechanism, and means extending exteriorly of the casing for manual operation to render said thermostatically-operated means operative or inoperative as desired, said last-named means also being operable to vary the time of operation of said thermostatically-controlled means.

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