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B. E. GETCHELL
THERMAL CIRCUIT BREAKER

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Fig. 1.

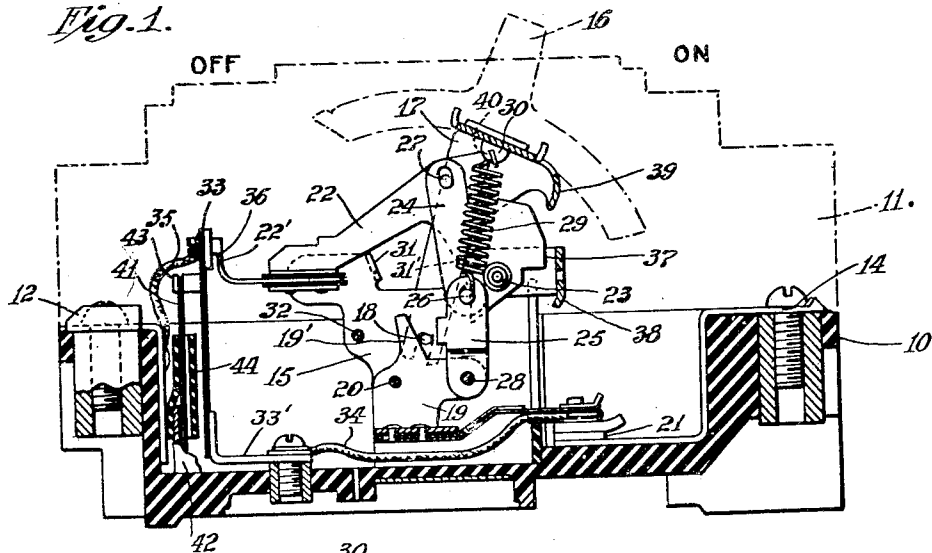


Fig. 2.

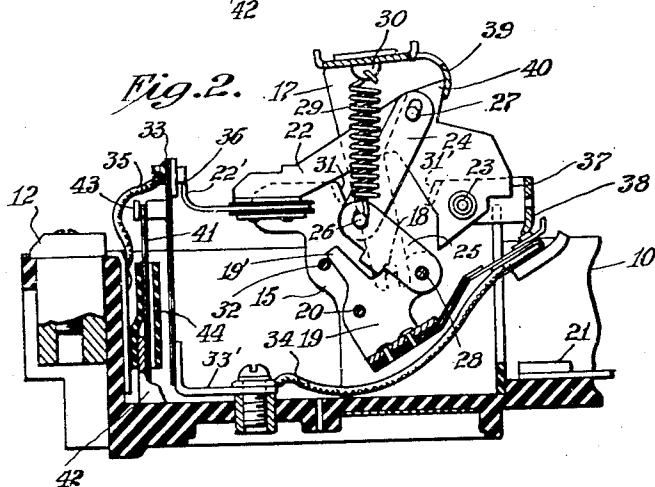


Fig. 3.

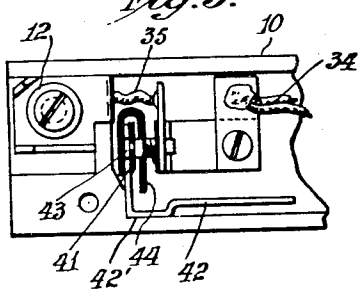
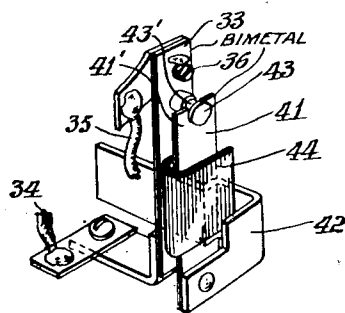


Fig. 4.



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THERMAL CIRCUIT BREAKER

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My invention relates to electric switches and particularly to the type which is manually operable and also provided with electro-thermal means for automatically breaking the circuit upon an overload in the circuit.

Such devices are frequently subjected to considerable changes in ambient temperature from below zero to excessive temperatures although sometimes only momentarily even up to one hundred degrees centigrade or higher. As the switches are ordinarily designed to take care of normal operating conditions only, it is obvious that excessive low or high temperatures may produce serious errors in operation. To avoid this I have sought to find a way to overcome this difficulty and, so to speak, counterbalance the system so that changes in ambient temperature will not materially affect the operation of the circuit breaker.

In solving the problem I have designed a simple way to protect the circuit which is applicable to various forms of switches and have shown the invention embodied in a conventional structure.

Fig. 1 is a side view and partial section of one form of switch embodying my invention, the parts being in the closed circuit or "on" position.

Fig. 2 is a similar view showing the parts in the open circuit or "off" position.

Fig. 3 is a plan view showing the thermostatic elements of the invention.

Fig. 4 is a perspective view of the thermostatic elements and their immediate supports.

In the form shown the conducting parts are enclosed in a housing having a base 10 and a cover 11. The terminals 12 and 14 are mounted on the base. The operating mechanism is carried by a metallic frame 15 mounted in the base and provided with a reciprocable finger piece 16 accessible through the cover. This piece 16 is mounted on the outer end of the actuating lever 17 which is pivoted at 18 in the frame.

The switch member 19 is pivoted at 20 in the frame and adapted to engage the stationary contact 21 which is connected to the terminal 14.

The automatic trip lever 22 is pivoted at 23 in the frame. The snap action toggle links 24 and 25 are hinged together at 26. Link 24 has a slight lost motion connection 27 with the lever 22 and link 25 is hinged at 28 to a part of the switch member 19. A throwing spring 29 connects the hinge pin 26 with a loop 30 in the upper end of lever 17.

The frame has lugs 31, 31' which serve as stops to limit the swinging movement of the lever 17. Switch member 19 has a lug 19' which strikes a

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pin 32 carried by the frame to limit the opening movement of the switch member.

The bimetal arm 33 is secured at its lower end to a support 33' secured to the insulating base 10. The foot is connected by a flexible pigtail 34 to the contact tip of the switch member 19 but otherwise insulated from the switch mechanism. The outer end of the arm 33 is connected by a flexible pigtail 35 to terminal 12 so that when the switch is in the closed circuit or ON position current flows between 12, 35, 33, 34, 19, 21 and 14.

Arm 33 has a latch member 36 normally engaged by the tip 22' of the trip member 22. The spring 29 always exerts a tension on the hinge pin 26 and links 24, 25 so as to pull the tip 22' against the latch 36. Latch 36 is adjustable in the arm 33 so as to properly calibrate the action and after adjustment is usually soldered or otherwise permanently fixed with respect to the arm. In the open circuit position occasioned by manual action, the toggle spring exerts a bias on the actuating lever 17 so that its shoulder 39 presses against a shoulder 40 on the trip lever when the lug 19' of the switch member strikes the stop pin 32.

When an overload occurs in the circuit the bimetal arm 33 is warped and thus releases the latch pin 36 from the tip of the lever 22 and permits the spring 29 to actuate the toggle action and open the circuit whereupon the right hand shoulder 37 of the lever 22 stops against the wall 38 of the frame. In the open circuit position occasioned by automatic release the shoulder 39 of the lever 17 normally engages the shoulder 40 of the lever 22 to limit the open circuit movement of the actuator and transmits the movement of the operating handle 16 to the lever 22 when resetting the switch after an automatic release and the shoulder 31 serves as a rigid stop when resetting the switch after an automatic release.

The parts thus far described constitute the foundation upon which I have based the simple means for balancing the action against extreme changes in ambient temperature.

For this purpose I provide a supplementary or auxiliary bimetal arm 41, the characteristics of which are exactly the opposite to those of arm 33 so that when one arm tends to bend or warp in one direction with an increase or decrease in ambient temperature the other arm will tend to bend in the other direction to the corresponding degree. These arms are connected together at their movable ends by a stud 43. This arm 41 is carried by its support 42 which is secured to the base in any suitable manner. The support

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42 is positioned in the recess occupied by the arm 33 but is close to the side wall and directly engages said wall for a substantial area as at 42' whereby it picks up temperature changes directly from said wall and transmits them by conduction to the said bimetal arm 41. A stud 43 carried near the upper end of arm 33 projects outwardly therefrom and has a circumferential groove 43' for receiving the bifurcated end 41' of arm 41 whereby the two arms are slidably connected together so that they move in unison in both directions upon rise and fall of temperature due to the current-induced heat from the bimetal arm 33.

Preferably the arm 41 has substantially the same mass and same rate of expansion and contraction as the arm 33 so that the arms will always counterbalance each other except when arm 33 is affected by the heating effect of an overload in the circuit. I preferably provide a thermal insulating member 44 which is interposed between the arms 41 and 33 so that the heating of arm 33 due to overload will not affect arm 41. It will be understood of course that the characteristics of arm 33 must be such that it will be warped so as to release the lever 22 upon the predetermined permissible overload in spite of the fact that the arm 41, being unaffected by the current, is in effect holding back the arm 33.

Both arms 33 and 41 are under the influence of the ambient temperature and the heat given off by the breaker mechanism but the characteristics of the arms are such that they tend to move in opposite directions thereby counterbalancing the movement of each other induced by such factors. However upon an overcharge of current, the primary arm 33 is additionally influenced by such current and moves in its intended respective direction and due to the rigid connection between the arms carries the supplementary arm along with it so as to retract the latch pin 36 and permit the spring 29 to actuate the toggle mechanism and open the circuit.

Such a construction has been found reliable to function satisfactorily at its predetermined rated overload regardless of small or extreme changes in ambient temperature.

I claim:

1. In an electric switch construction, an insulating housing containing the stationary and movable contacts and including a spring-pressed movable member, a thermostatic latch in the switch circuit normally restraining said movable member and adapted to release said movable member in case of a predetermined change in the condition in the circuit in which the switch is connected, an auxiliary compensating thermostatic member mounted in the housing alongside of but independently of the thermostatic latch and independent of the electric circuit and having a sliding connection with the thermostatic latch and having a substantial contact with a wall of the housing whereby both thermostatic members are subject to same changes in ambient atmospheric temperature but in offsetting directions and the compensating thermostatic member is

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delayed by the heat conducted to the housing wall when the latch is heated electrically.

2. In an electric switch construction, an insulating housing containing the stationary and movable contacts and including a spring-pressed movable member, a thermostatic latch normally in the circuit of the movable member and restraining said movable member and adapted to release said movable member in case of a predetermined change in the condition in the circuit in which the switch is connected, an auxiliary compensating thermostatic member mounted on a support in the housing alongside of the thermostatic latch, operative means of connection between said latch and said auxiliary thermostatic member, said support having an angular portion directly contacting a substantial area of the wall of the housing whereby both thermostatic members are subject to same changes in ambient atmospheric temperature but in offsetting directions and the compensating thermostatic member is sensitive to the changes in temperature of the housing wall and means for thermally insulating the auxiliary member from said latch.

3. In an electric switch, a housing, a movable switch member, manually operable mechanism for actuating said switch member, thermally controlled latch mechanism for holding the switch member in closed circuit position including a bimetal arm having a support secured to the base of said housing, another bimetal arm having thermal characteristics opposite to said first-named bimetal arm and having a support secured to the base, each of said arms having one end fixed to its support and its other end movable, a slidable connection between the movable ends of the arms and means for electrically heating one of said arms upon an overload in the circuit of the switch means for thermally insulating the other arm from the electrically heated arm, the support for said second-named bimetal arm being positioned along the side wall of the housing with a substantial portion in contact with said wall for transmitting the ambient temperature changes of said wall to said bimetal arm.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,952,040	Frank et al. -----	Mar. 20, 1934
1,954,588	Frank et al. -----	Apr. 10, 1934
2,224,885	Sola -----	Dec. 17, 1940
2,237,262	Miller -----	Apr. 1, 1941
2,284,383	Elmer -----	May 26, 1942
2,284,825	Jennings -----	June 2, 1942
2,308,401	Taylor -----	Jan. 12, 1943
2,315,633	May -----	Apr. 6, 1943

FOREIGN PATENTS

Number	Country	Date
242,726	Great Britain -----	Nov. 19, 1925