

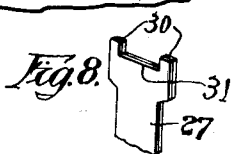
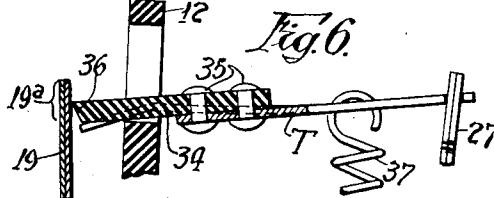
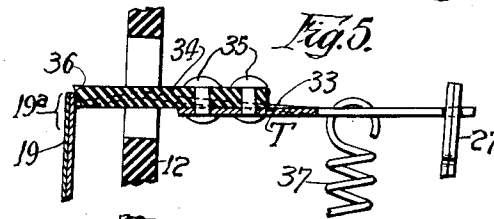
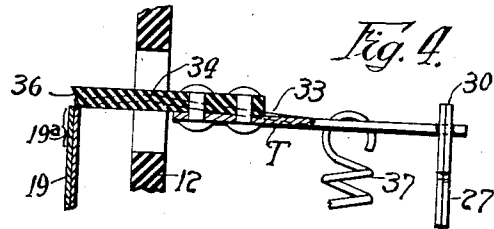
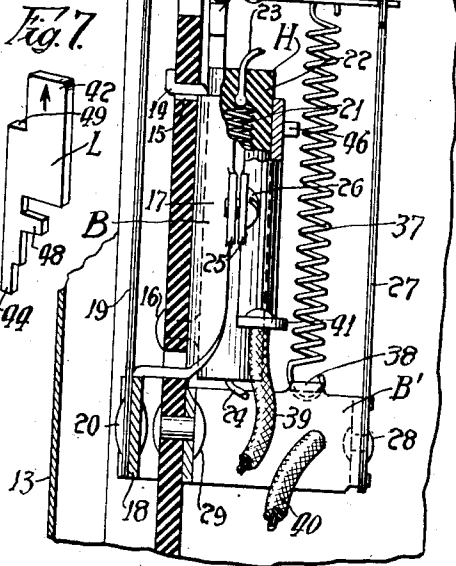
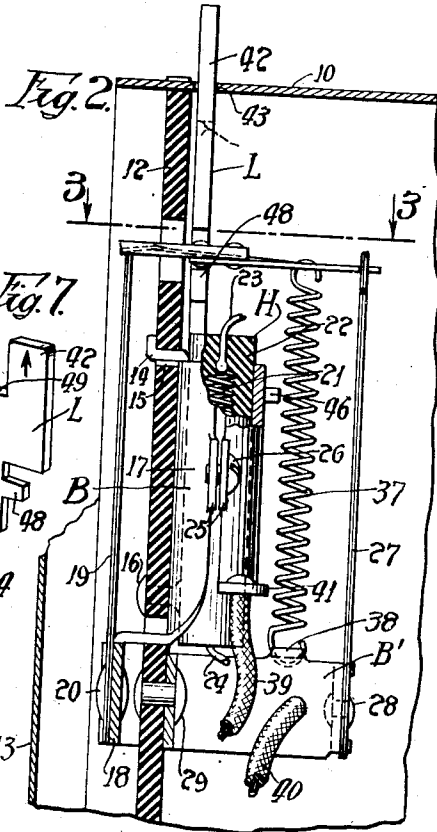
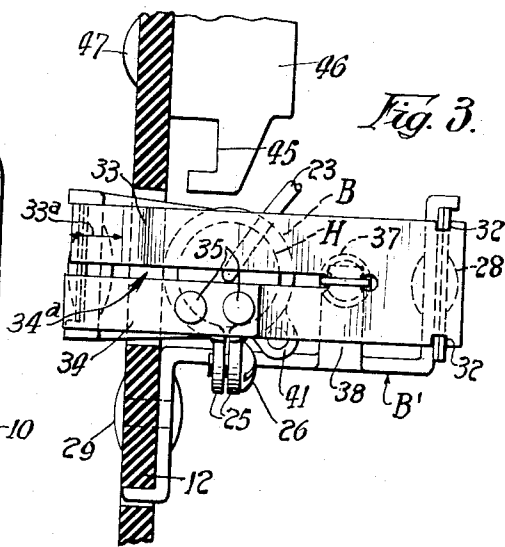
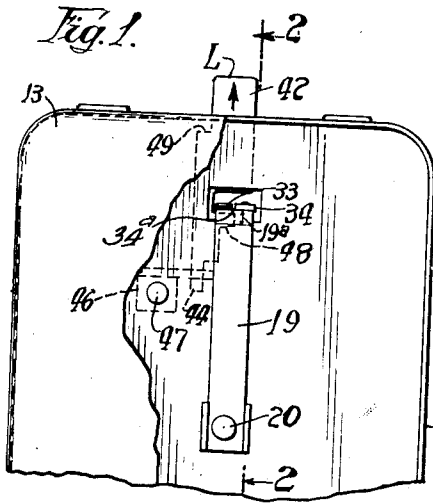
March 18, 1941.

B. E. SHAW

2,235,337

SAFETY SWITCH

Filed Sept. 11, 1939



Witness:
E. Camporini

Inventor:
Burton E. Shaw,
By: Bair & Freeman
Attorneys

UNITED STATES PATENT OFFICE

2,235,337

SAFETY SWITCH

Burton E. Shaw, Bristol, Ind., assignor to Penn
Electric Switch Co., Goshen, Ind., a corporation
of Iowa

Application September 11, 1939, Serial No. 294,409

8 Claims. (Cl. 200—122)

An object of my invention is to provide a safety switch for use in connection with stack switches and the like, my safety switch involving improved features of construction which make it more reliable in operation and accurate in response to a predetermined rise in temperature of a heater element used to operate the latch blade of the safety switch.

A further object is to provide a safety switch in which the number of parts is reduced to a minimum and a trip blade coacts with the end of a latch blade, the coacting ends serving as contacts and having a cam of insulating material so associated therewith that unlatching of the trip blade permits the cam to hold the contacts separated from each other.

Another object is to eliminate instability in the operation of a safety switch by means of mounting the heater element in the clamp portion of a bracket, the bracket having a portion on which a latch blade of bimetallic material is mounted and the bracket being of metal or the like for the purpose of conducting heat from the heating element to the latch blade.

A further object is to provide means for resetting the trip blade after the safety switch has operated, which means is pulled outwardly relative to the casing instead of being pushed inwardly as usual, thus eliminating the possibility of excess pressure being applied to such an extent that the contacts may be undesirably forced to closed position while the condition requiring safety is still unattended to, and to mount a trip lever in such manner on a latch blade and a compensator blade that it floats with them and they both swing in one direction or the other in response to a rise or fall in ambient temperature.

Still another object is to provide the safety switch mounted on a panel in such manner that the heating element is mounted back of the panel inside the casing and the latch blade is in front of the panel, a compensator blade being mounted also back of the panel and a trip blade coacting with the latch blade and the compensator blade and extending through an opening in the panel.

A further object is to provide a spring associated with the trip blade in such manner as to retain one of its ends in pivotal connection with the compensator blade and its other end latched on the free end of the latch blade in such manner that the spring operates the trip blade to open circuit position, once the latch blade has moved to unlatched position.

Still a further object is to provide an arrange-

ment in which the compensator blade compensates for a rise of temperature inside the casing and in which the latch blade and the compensator blade are arranged to compensate for any rise in temperature thereof caused by flow of current through the blades.

With the foregoing and other contemplated as well as obvious objects in view, the invention comprises the combination of elements and arrangement of parts so combined as to coact and cooperate with each other in the performance of the functions and the accomplishment of the results herein contemplated, and comprises in one of its adaptations the species or preferred form illustrated in the accompanying drawing, wherein

Figure 1 is a front elevation of a stack switch casing in which my safety switch is mounted, further details of the stack switch being shown in my copending application Serial No. 294,408, filed September 11, 1939.

Figure 2 is an enlarged sectional view on the line 2—2 of Figure 1;

Figure 3 is a further enlarged sectional view on the line 3—3 of Figure 2;

Figures 4, 5 and 6 are enlargements of a portion of Figure 2 showing the safety switch in nearly unlatched, in partially unlatched and in fully unlatched positions, respectively;

Figure 7 is a perspective view of a resetting lever for my safety switch, and

Figure 8 is a perspective view of the upper end of a compensator blade thereof.

On the accompanying drawing I have used the reference numeral 10 to indicate generally a casing. Within the casing 10, a panel 12 of insulating material is provided. A cover 13 is provided over the front of the panel, which cover may be removed when necessary to gain access to the safety switch.

A bracket 3 is mounted on the back of the panel 12 as by a finger 14 in a slot 15 thereof and a countersunk rivet at 16. The bracket 3 has a C-shaped clamp portion 17 and a latch portion 18. The latch portion 18 is adapted to support the lower end of a latch blade 19 of bimetal or the like secured to the portion 16 as by a rivet 20.

The C-clamp portion 17 receives a heater element H consisting of a coiled resistance wire 21 embedded in insulating material 22, such as a phenolic product. Leads 23 and 24 are provided for the ends of the heater element H and may be connected in a burner circuit or the like for the purpose of raising the temperature of the heat-

ing element H during the time that the current is flowing through the wire 21. The C-clamp portion 17 is provided with a pair of ears 25 with which a clamp screw 26 is associated for rigidly clamping the heater element H in position and to make good contact therewith for the purpose of conducting heat therefrom to the latch blade 19.

A second bracket B' is provided for supporting a compensator blade 27 of bimetallic material. The blade 27 is secured to the bracket B' by a rivet 28 and the bracket in turn is secured to the panel 12 by a rivet 29.

The upper end of the blade 27 is formed with a pair of ears 30 and a notch 31, as shown in Figure 8, to receive one end of a trip blade T. The trip blade T is notched at 32 to coact with the ears 30, as shown in Figure 3, whereby a loose connection—but one which will cause longitudinal movement of the blade T whenever the upper end of the blade 27 swings toward or away from the panel 12—is provided.

The blade T is split at 34a to provide a contact portion 33 and a cam portion 34. The cam portion 34 is made of insulating material and may be secured to the blade T by rivets 35. The terminal end of the contact portion 33, as indicated at 33a, is silver-plated, and correspondingly the upper end of the latch blade 19 is silver-plated as indicated at 19a, for the purpose of good electrical contact with each other when in the closed circuit position of Figures 4 and 5.

The cam 34 has an inclined end 36 so related to the terminal end of the contact portion 33 that its obtuse corner falls short of the terminal end and its acute corner extends beyond it. Accordingly, as the latch blade 19 moves outwardly to the position of Figure 4, the obtuse corner of the cam 34 will be passed by the latch blade, and shortly after the position of Figure 4 the terminal end of the contact portion 33 of the trip blade T will be free of the latch blade, as shown in Figure 5. It will be noted that the inclined end 36 of the cam 34 is now in engagement with the edge of the latch blade 19 under the influence of a spring 37 extending from the trip blade T to an extension 38 of the bracket B'. The spring 37 serves both to keep the right hand end of the blade T in position and to urge the left hand end against the upper end of the latch blade 19 in Figure 4, and causes the cam 34 to take up the positions of Figures 5 and 6 after the unlatching operation. This results in the cam 34 moving the latch blade 19 to the position of Figure 6, where it cannot thereafter contact with the contact portion 33 of the trip blade until the switch is reset.

The circuit to be broken by the safety switch at the contacts 19a and 33a is connected with wires 39 and 40. The wire 39 is soldered to an ear 41 of the bracket B and the wire 40 is soldered to the bracket B'. Accordingly, the current flows from the wire 39 through the bracket B, the latch blade 19, the trip blade T, the compensator blade 27 and the bracket B' to the wire 40. It is thus obvious that the contact portions 19a and 33a are in the circuit and are operable to break it when the positions of Figures 5 and 6 are assumed.

For resetting the trip lever T, I provide a resetting lever L having an upper portion 42 extending through a slot 43 of the casing 10. At the lower end, the lever L has a reduced extension 44 slidable in a notch 45 of a bracket 46. The bracket 46 is secured to the panel 12 by a rivet

47. The lever L has a hook or finger 48 adapted to engage under the trip lever T so that when the end 42 of the lever L is grasped between the finger and thumb of the operator, it will lift the blade T to a position somewhat higher than that shown in Figure 4. The limit of such position is fixed by means of a stop shoulder 49 on the lever L engageable with the casing 10. Such resetting position holds the contact 33a above the contact 19a, and engagement of these contacts is effected only when the resetting lever L is released. Thereafter the safety switch will again open in response to predetermined energization of the heater element H without any possibility of holding the safety switch closed while a dangerous condition obtains.

Making the contacts at 19a and 33a eliminates any separate switches or cutouts in addition to the latching mechanism and thus the manufacturing cost of the safety switch is reduced. The panel 12 serves as a shield between the interior heat of the casing 10 and the latch blade 19, while the bracket B serves as a heat conductor which reliably and accurately conducts the heat to the latch blade 19 and secures a degree of accuracy not heretofore obtainable in a radiation type heater. Compensation is had both for current flow through the blades 19 and 27 and for ambient temperature which may act upon both blades. Both blades are mounted so that upon heating they swing to the left (in Figure 2), thereby merely carrying the trip blade T with them in an obvious manner, and the spring 37 does not interfere with this action in any way whatsoever. The result is a freedom of action that eliminates any variation in operation of the safety switch, regardless of ambient temperature conditions.

My invention has been described in the foregoing specification and illustrated in the drawing more or less precisely as to details. It is to be understood, however, that changes may be made in the arrangement and proportions of parts and equivalents may be substituted without departing from the spirit and scope of the invention as set forth in the appended claims.

What I claim as my invention and desire to secure by Letters Patent of the United States is:

1. In a safety switch, a casing, a panel therein, a latch bracket secured to said panel and having a portion projecting therethrough, a latch blade of bimetallic material secured to said portion and adapted to warp away from said panel when heated, a heater element supported in a clamp portion of said bracket whereby heat from said heater element is conducted through said bracket to said latch blade, a second bracket secured to said panel, a compensator blade of bimetallic material secured to said second bracket, a trip blade engaging the free ends of said latch and compensator blades, a spring holding said trip blade in engagement with said ends, said trip blade having a cam portion of insulating material and a contact portion, said cam and contact portions engaging said end of said latch blade, said cam portion having an inclined end with its obtuse corner shorter than said contact portion and its acute corner longer than said contact portion to effect movement of said latch blade under the influence of said spring to circuit-breaking position with respect to said contact portion after said latch blade warps to unlatched position relative thereto as a result of heat from said heater element, and circuit connections through said latch blade, the contact portion of said trip blade and

said compensator blade by means of wires connected with said latch bracket and said second bracket.

2. In a safety switch, a casing, a panel therein, a latch bracket secured to said panel, a latch blade of bimetallic material and a heater element supported on said bracket whereby heat from said heater element is conducted through said bracket to said latch blade, a second bracket secured to said panel, a compensator blade of bimetallic material secured to said second bracket, a trip blade engaging the free ends of said latch and compensator blades, a spring holding said trip blade in engagement with said ends, said trip blade having a cam portion of insulating material and a contact portion, said cam contact portions engaging said end of said latch blade, said cam portion having an inclined end to effect movement of said latch blade under the influence of said spring to circuit-breaking position with respect to said contact portion after said latch blade warps to unlatched position relative thereto as a result of heat from said heater element.

3. In a safety switch, a latch bracket having a clamp portion and a supporting portion, a latch blade of bimetallic material secured to said supporting portion, a heater element supported in said clamp portion of said bracket whereby heat from said heater element is conducted through said bracket to said latch blade, a compensator blade of bimetallic material, a trip blade engaging against the free ends of said latch and compensator blades, a spring connected with said trip blade intermediate its points of engagement with said latch and compensator blades to hold the trip blade in such engagement, said trip blade having means to effect movement of said latch blade to circuit-breaking position with respect to said contact portion after said latch blade warps to unlatched position relative thereto as a result of heat from said heater element.

4. In a safety switch, a latch bracket having a clamp portion, a latch blade secured to said bracket, a heater element supported in said clamp portion whereby heat from said heater element is conducted through said latch bracket to said latch blade, a compensator blade supported in a position substantially parallel to and spaced from said latch blade, a trip blade having its ends engaging the free ends of said latch and compensator blades, a spring connected with said trip blade intermediate said ends to hold the trip blade in engagement with said ends, said trip blade having a cam and a contact, said cam and contact engaging said end of said latch blade, said cam effecting movement of said latch blade under the influence of said spring to circuit-breaking position with respect to said contact after said latch blade warps to unlatched position relative thereto as a result of heat conducted from said heater element.

5. In a safety switch, a panel, a latch bracket secured to one side of said panel and having a portion projecting therethrough, a latch blade of bimetallic material secured to said portion and adapted to warp away from said panel when heated, a heater element supported in said bracket on said side of said panel, a second bracket secured to said side of said panel, a com-

pensator blade of bimetallic material secured to said second bracket, a trip blade engaging the free ends of said latch and compensator blades and extending through said panel, a spring biasing said trip blade to engage said ends, said trip blade having a cam portion of insulating material and a contact portion, said cam and contact portions engaging said end of said latch blade, said cam portion having an inclined portion effective to move said latch blade under the influence of said spring to circuit-breaking position with respect to said contact portion after said latch blade warps to unlatched position relative thereto and circuit connections through said latch blade, the contact portion of said trip blade and said compensator.

6. A safety switch comprising a latch bracket, a latch blade secured thereto, a heater element supported in a clamp portion of said bracket whereby heat from said heater element is conducted through said bracket to said latch blade, a trip blade engaging the free end of said latch blade, a spring holding said trip blade in engagement therewith, said trip blade having a cam portion of insulating material and a contact portion, said cam and contact portions engaging said end of said latch blade, said cam portion having an inclined end with its obtuse corner shorter than said contact portion and its acute corner longer than said contact portion to effect movement of said latch blade under the influence of said spring to circuit-breaking position with respect to said contact portion after said latch blade warps to unlatched position relative thereto as a result of heat from said heater element.

7. In a safety switch, a latch bracket, a latch blade secured to said latch bracket, a heater element supported in a clamp portion of said latch bracket, a trip blade engaging one end of said latch blade, a spring biasing said trip blade toward such engagement, said trip blade having a cam portion and a contact portion, said cam and contact portions engaging said end of said latch blade, said cam portion being operable to effect movement of said latch blade under the influence of said spring to circuit-breaking position with respect to said contact portion after said latch blade warps to unlatched position relative thereto and circuit connections through said latch blade and the contact portion of said trip blade.

8. In a safety switch, a latch blade and a compensator blade both fixedly mounted at one end and extending substantially parallel to each other, the mounting means for said latch blade comprising a metallic bracket having a split tubular portion, a heater element clamped in said portion whereby the heat thereof is directly conducted to said latch blade, a trip blade spanning the unmounted ends of said latch and compensator blades, and a spring connected with said trip blade intermediate said latch and compensator blades and retaining said trip blade in contact with said unmounted ends of said latch and compensator blades, said latch blade, upon warping in response to the flow of heat from said heater element, releasing said trip blade.

BURTON E. SHAW.