April 22, 1930. H. L. VAN VALKENBURG 1,755,231

THERMAL OVERLOAD RELAY

Original Filed Oct. 19, 1926

FIG. 1.

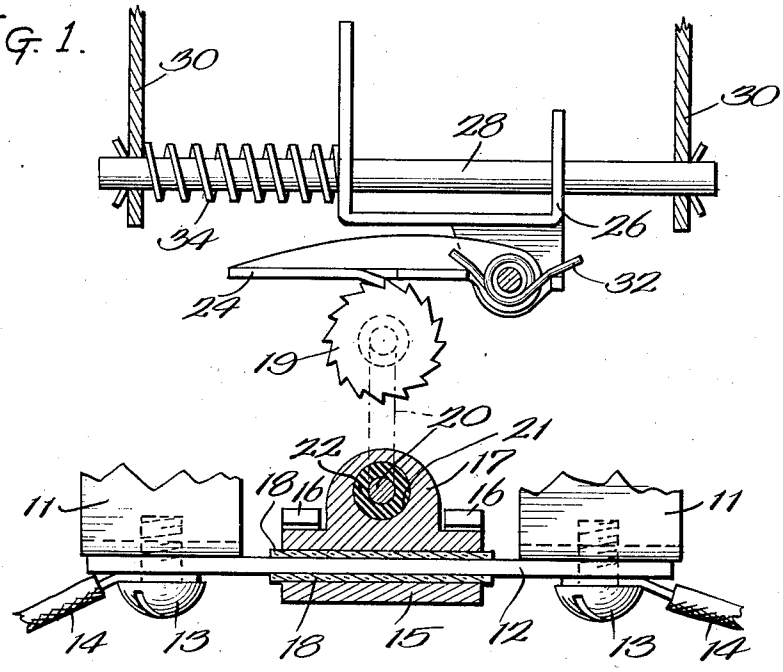


FIG. 2.

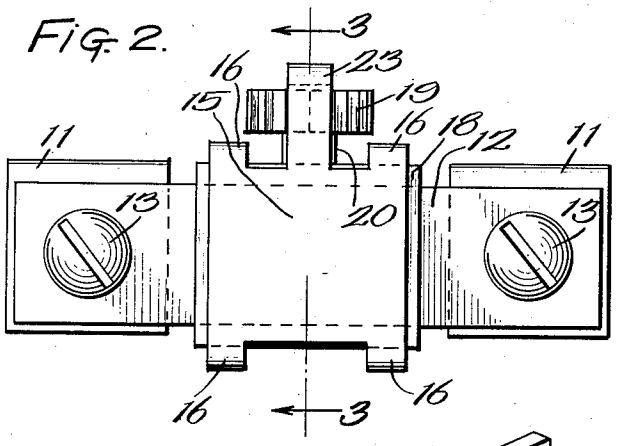


FIG. 3.

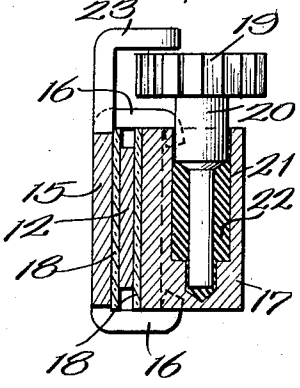
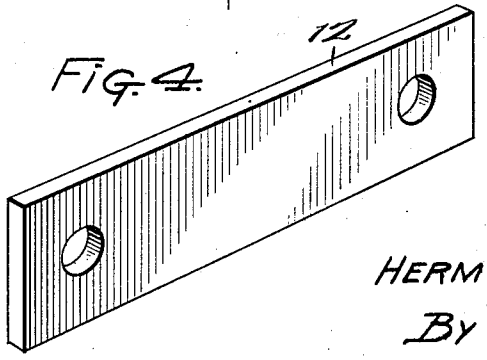


FIG. 4.



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Patented Apr. 22, 1930

1,755,231

UNITED STATES PATENT OFFICE

HERMON L. VAN VALKENBURG, OF MILWAUKEE, WISCONSIN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO SQUARE D COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN

THERMAL OVERLOAD RELAY

Original application filed October 19, 1926, Serial No. 142,625. Divided and this application filed January 25, 1928. Serial No. 249,472.

My invention relates to thermal overload relays and similar apparatus in which a detent is normally held in acting position by means of solder or other fusible material which melts and releases the detent when heated beyond a critical temperature, the fusible material being associated with an electric thermal element subject to electrical conditions in the line.

This is a division of my copending application Serial Number 142,625 filed October 19, 1926.

One object of the invention is to provide an improved type of mounting of a receptacle for the fusible material and an improved mounting for the detent.

Another object is to provide a simple and effective form of heating element by which the fusible material, usually an alloy of low melting point, is melted when the current conditions become excessive. Another object is to provide a construction in which the heating element performs the dual function of heating the alloy receptacle and also forming the sole support for it. Further objects and advantages will appear and be brought out more fully in the following specification and drawings, in which

Figure 1 is a projected plan view of my invention.

Figure 2 is a side elevation of the same.

Figure 3 is a cross section taken along the lines 3—3 of Figure 2, and

Figure 4 is a view of the heating element separate from its mounting.

The embodiment of this invention has its greatest utility in connection with electric circuits and control switches for the same in which the control switch is opened or released through the action of a certain excess current in the electric circuit comparable in a sense to the ordinary fuse action but differing essentially in that the fusible element is used not once only but again and again after each operation, thus providing a saving in cost and a more effective operating method. The device will be described more particularly for use with an electric circuit but its adaptation to other control devices in which the heat may be controlled through a lever or similar acting device will be apparent.

This application is a division of my copending applicaton filed October 19, 1926, Serial Number 142,625.

Referring now to the drawing wherein like numerals have been employed to designate similar parts throughout the various figures, it will be observed that a pair of brackets 11 serve to support a heating element or strip 12 which is suitably secured at opposite extremities to the brackets by means of screws 13. These screws 13 form binding posts for electrical conductors 14 through which an electric current may be supplied to the heating element 12. Positioned intermediate the extremities of the heating element 12 is a clamp 15 provided with fingers 16 which partially enclose the heating element and this clamp provides a very convenient means for securing a receptacle or cup 17 in a fixed position upon the heating element. The clamp 15 and receptacle 17 are electrically insulated from the heating element by means of plates of insulating material 18 and from the foregoing it will be clear that the heating element 12 serves not only as a means for heating the receptacle 17, but also as the sole support for the receptacle.

The receptacle 17 provides a means for mounting a ratchet wheel 19, said ratchet wheel being supported at the upper end of a vertical shaft 20 which extends downwardly within the receptacle. A portion of the shaft 20 extending within the receptacle is reduced and the lower extremity thereof is mounted in the bottom of the receptacle while the upper end is of increased diameter to enable the shaft to bear laterally against the walls of the receptacle near the upper end thereof. Surrounding the reduced portion of the shaft 20, within the receptacle 17, is a chamber 21 which is filled with a suitable metallic alloy 22 adapted to fuse at a predetermined temperature. An extended portion 23 of the clamp 15 is bent over and positioned adjacent the ratchet wheel 19 to prevent said ratchet from being dislodged from the receptacle. When the alloy is in a hardened state it will effectively prevent the

shaft 20 and the ratchet wheel 19 from being rotated and consequently the teeth of the ratchet wheel will function to hold and prevent the movement of a traveling pawl 24 (Fig. 1) pivoted upon a frame 26 which is slidable upon a horizontal guide rod 28 supported in spaced brackets 30. A spring 32 urges the pawl 24 into engagement with the ratchet wheel and a helical spring 34 urges the frame 26 and the companion pawl 24 along the rod 28 to the right (Fig. 1). In the event that the alloy is softened or fused in response to heat resulting from a predetermined flow of current within the heating element 12, the ratchet wheel 19 will be rotated and hence the pawl 24 will be free to move in response to the action of the helical spring 34.

As already suggested, the disclosed embodiment of my invention has great utility in connection with electric circuits and control switches for such circuits in which a control switch is opened or released through the action of a certain excess current in the circuit. From the foregoing description of my invention it will be clear that the frame 26, upon being released as a result of the softening of the alloy, may be employed as a means for actuating varied forms of circuit control or switching mechanisms (not shown). A more comprehensive understanding of the utility and practical application of the described embodiment of my invention may be obtained by reference to my above mentioned copending application wherein the disclosed circuit control mechanism is shown in operative association with an electric system.

It will be clear that by employing the described heating element 12 for the dual purpose of supporting as well as heating the receptacle 17, an efficiently operable control device is presented which requires a minimum number of parts and which enables the positioning of the alloy receptacle in close proximity to the heating element. Thus my invention presents a control device which is very economical in design and which, by having the alloy supported by and in close proximity to the heating element, is positively and readily responsive to controlling conditions.

Although my invention has herein been described in connection with a particular type of heating element and although reference has been made to the particular adaptability of the invention to electrical circuits and the like, it is to be understood that the heating element may be varied in design and the invention capable of various other applications where control devices responsive to temperature conditions are required, without departing from the spirit of the invention.

I claim:

1. An electro-thermo-circuit breaker having a movable circuit controlling element, a detent for holding it, a receptacle for fusible alloy, the detent having a stem projecting into the receptacle and pivoted therein and immersed in the alloy whereby the same may be held against pivotal movement in the receptacle when the alloy is solid and released for pivotal movement in the cup when the alloy is fused, and an electro-thermo-heating element adjacent to the receptacle for heating it and the alloy, said heating element forming a support for said receptacle.

2. In a thermo-overload relay, an alloy cup, a ratchet wheel having a shaft extending into and supported by said cup, a heating element for supporting and heating said cup, said heating element being provided with terminals at each end by which it may be electrically connected to the circuit breaker.

3. An electro-thermo-holding unit having a heating element, a receptacle for containing a readily fusible alloy, a free movable detent mounted out of contact with the alloy and having a portion projecting into said receptacle and immersed in the alloy to be held against rotation in the receptacle when the alloy is solid and released when the alloy fuses for performing the function of the unit, and means for holding the receptacle close to the heating element to receive the heat therefrom, said heating element being adapted for attachment to electrically energized supports and being of substantial cross-section whereby it may also form the sole support for the receptacle.

4. In combination, a frame, an electrical conductor mounted in the frame, means for connecting the conductor in an electrical circuit, a receptacle for fusible material, means for mounting the receptacle to the conductor within the influence of such heat as may be generated therein, means for electrically insulating the receptacle from the conductor, a member pivoted in the receptacle and having a portion immersed in the fusible material whereby the same may be held against rotation when the fusible material is solid, a switch mounted in the frame and means formed and arranged in the switch and pivoted member whereby the switch may be latched when the fusible material is solid and released when the fusible material is fused.

In witness whereof, I have hereunto subscribed my name.

HERMON L. VAN VALKENBURG.