

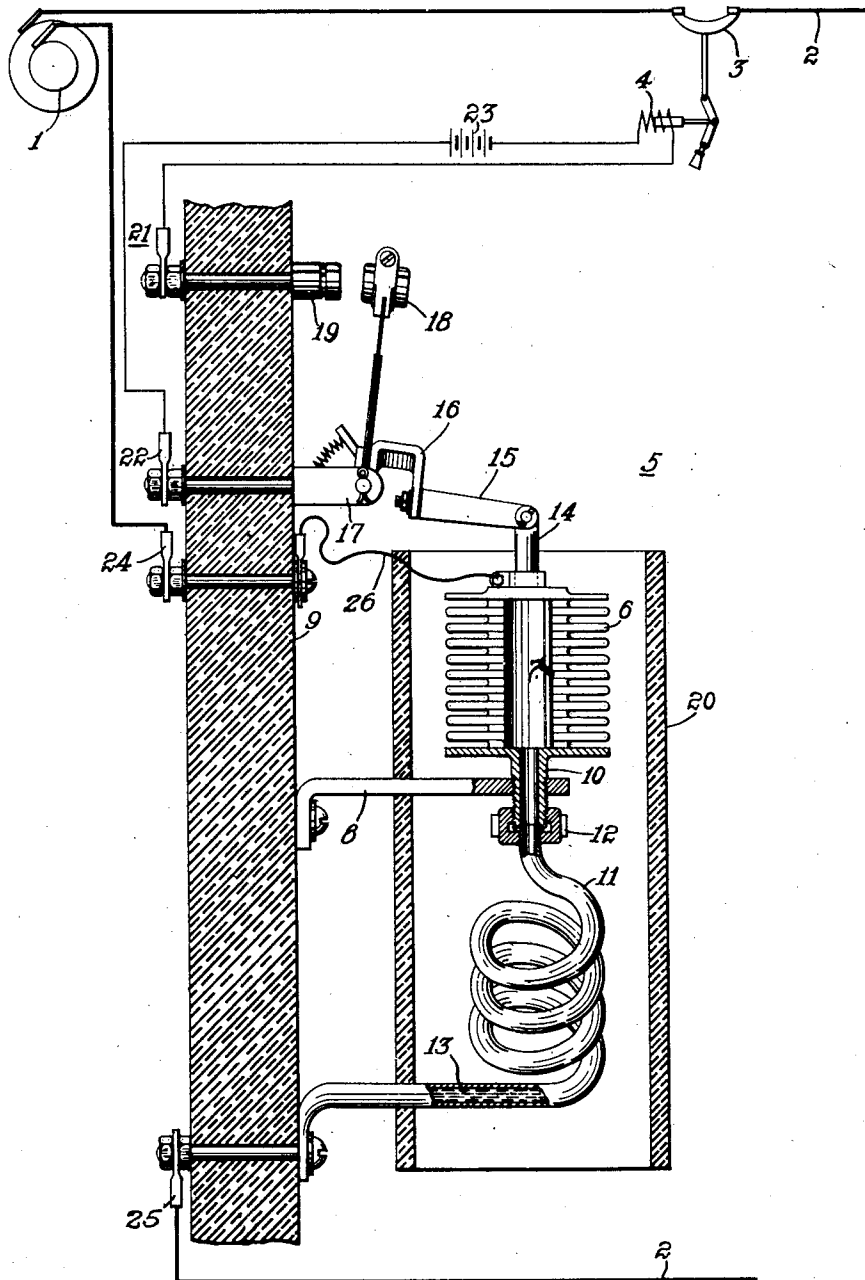
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R. J. WENSLEY

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THERMAL RELAY

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WITNESSES:

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THERMAL RELAY.

Application filed October 29, 1920. Serial No. 420,423.

To all whom it may concern:

Be it known that I, ROY J. WENSLEY, a citizen of the United States, and a resident of Edgewood Park, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Thermal Relays, of which the following is a specification.

My invention relates to protective devices and particularly to thermal relays.

One object of my invention is to provide a thermal relay that shall have a sufficient time interval in the operation thereof to protect electrical apparatus from overload.

Another object of my invention is to provide a thermal relay that shall have a temperature gradient substantially in accordance with the temperature gradient of the apparatus to be protected.

Another object of my invention is to provide a relay that shall serve to control auxiliary protective devices in an electrical circuit in accordance with the temperature of the electrical apparatus to be protected.

A further object of my invention is to provide a thermal relay that shall be simple and rugged in construction, and reliable and effective in its operation.

Heretofore, various types of thermal relays have been employed but they have required the use of an additional switch or relay having sufficient current-carrying capacity to accommodate a current for energizing control or regulating apparatus.

In my copending United States patent application, Serial No. 328,741, filed October 6, 1919, is disclosed a thermal relay embodying a bellows member of cylindrical shape containing a volatile fluid and a conductor surrounding the bellows that is connected in circuit with the electrical apparatus which is to be protected.

As the bellows, and, consequently, the fluid therein are heated by reason of the current traversing the conductor surrounding the bellows, the fluid volatilizes, and the increased pressure produced by the volatilized fluid tends to expand the bellows. A movable contact member, that is controlled by the bellows, is caused to engage a stationary contact member, whereby an auxiliary control circuit is completed to energize devices that are employed to protect the electrical

apparatus from overheating, or that are employed to disconnect the apparatus from the supply circuit when a predetermined temperature is attained in the apparatus.

In the device described above, the heat that is required to volatilize the fluid in the bellows member is received by convection from the conductor that surrounds the bellows.

In my present invention, I provide a similar bellows of cylindrical shape, but, instead of disposing the fluid within the bellows member and heating the same by means of a conductor surrounding that member, I provide a coiled tubular inexpandible conductor that has the volatile liquid disposed therein. The tubular conductor has one end thereof so connected to the bottom of the bellows member as to permit the volatilized fluid to enter the bellows to expand the same when the conductor becomes heated to a predetermined degree by currents traversing the same. A stationary contact member is thereupon engaged by a movable contact member that is actuated by the bellows and thereby completes an auxiliary control circuit for effecting the disconnection of the apparatus from a supply circuit by the time the temperature of the apparatus has attained a predetermined value.

The single figure of the accompanying drawing is a diagrammatic view of an electrical circuit and a device embodying my invention.

An electrical apparatus 1 is supplied with energy from a source 2 of electromotive force through a circuit interrupter 3. The interrupter 3 is provided with a trip coil 4, the circuit of which is controlled by a thermal relay 5.

The relay 5 comprises a bellows 6 of cylindrical shape enclosing a supporting cylinder 7 and is supported, at the bottom, by a supporting member 8 that is mounted on a base 9. The cylinder 7 serves as a mechanical spacer to preclude collapse of the bellows. The bellows 6 is provided with a tubular threaded portion 10, to which is connected one end of an inexpandible coiled tubular conducting member 11 by means of a union 12 or other similar clamping device. The other end of the tubular member 11 is closed and has a terminal member 25 con-

5 nected thereto for connecting the same to the conductor of an external circuit. The tubular conducting member 11 contains a volatile fluid 13 that is adapted, when volatilized, to enter into the bellows 6 and to cause the same to expand.

10 A short rod 14, that is mounted on the top of the bellows 6 extends to an arm 15 of a pivoted member 16 that is pivotally connected to the rod 14 and is pivotally mounted on a bracket member 17. A movable contact member 18 is resiliently mounted on the member 16 and is adapted to engage a stationary contact 19 that is mounted on the base 9 above the bracket member 17. A non-conducting tube 20 encloses the bellows 6 and the conducting member 10 to prevent undue convection of heat therefrom.

20 The contact member 19 is provided with a terminal member 21, and the bracket member 17 is provided with a terminal member 22 that are respectively connected to the terminals of the trip coil 4 through a battery 23. A flexible conductor 26 connects the rod member 14 to a terminal 24 to permit the relay to be inserted in the external circuit 2. As illustrated in the drawing, the coiled conductor 11 and the bellows 6 are connected in circuit with the conductors of the circuit 2, and, being traversed by the current that traverses the apparatus 1, are accordingly heated in accordance therewith.

35 The heat that is generated by the current traversing the conductor 11 is conducted to, and absorbed by, the fluid 13 that is contained therein. When a predetermined temperature is attained thereby, the fluid volatilizes and passes into the bellows member 6 and causes the same to expand by virtue of the increased pressure on the inner surface thereof. When the bellows member 6 is expanded to a predetermined extent, engagement is effected between the contact members 18 and 19, whereby the circuit is completed for energizing the trip coil. The interrupter 3 is thereupon actuated, and the apparatus 1 is disconnected from the circuit 3.

50 The time lag in the operation of the relay is of such value as to adequately protect the apparatus to which it is connected. It is constructed with a time factor equal to about one half that of the apparatus. Of course, the ideal case would be to cause the coiled conductor 11 to have the same temperature characteristics as the apparatus to be protected, but, for commercial reasons this is impracticable, and, consequently, the relay is so adjusted as to provide a safe time limit for the apparatus to be protected.

65 Although I have shown a preferred form of relay embodying my invention, I do not limit it to the form that is illustrated as various modifications may be made therein

without departing from the spirit and the scope of the invention as set forth in the appended claims.

I claim as my invention:

1. In a relay for an electric circuit, the combination with an expansible member and a switch member controlled thereby, of a fluid container secured to the expansible member and traversed by the circuit current, a fluid enclosed therein, and adapted when heated and volatilized, to act upon the expansible member, and a heat-retaining casing around said member.

2. In a relay for an electric circuit, the combination with an expansible member and a switch member controlled thereby, of a fluid container secured to the expansible member and traversed by the circuit current, a fluid enclosed therein and adapted, when volatilized, to enter the expansible member, and a heat-retaining means around the expansible member and the fluid container.

3. In a relay for an electric circuit, the combination with an expansible member and a switch member controlled thereby, of a fluid container secured to the expansible member and embodying an electrical conducting means traversed by the circuit current, a fluid enclosed therein and adapted to be volatilized, when heated by the current traversing the enclosing conducting means, to enter the expansible member, and a heat-retaining means around said member and the container.

4. The combination with a bellows member and a switch member actuated thereby, of a base, a bracket mounted on the base for supporting the bellows member, a fluid-containing means connected to the bellows member, a fluid enclosed in the containing means and adapted, when heated, to enter the bellows member to cause the same to expand, and a heat-retaining casing disposed around the bellows member and the containing means.

5. The combination with a bellows member and a switch member actuated thereby, of a base, a bracket mounted thereon for supporting the bellows member, a fluid-containing member comprising a tubular electrical conducting means connected to the bellows member, a fluid enclosed in the conducting member and adapted, when volatilized, to enter the bellows member, and a casing around the bellows and the fluid-containing members.

6. The combination with a bellows member and a switch member actuated thereby, of a tubular conducting member, a fluid enclosed therein and adapted, when volatilized, to enter the bellows member, and a heat-retaining means for enclosing the tubular and the bellows members.

7. A relay for an electric circuit comprising an expansible member, a fluid-containing

member joined to the expansible member and traversed by the circuit current, and a fluid therein adapted to expand the expansible member when volatilized.

5 8. A protective device for an electric circuit containing electric apparatus comprising an element embodying a volatile fluid, the element being in circuit with the apparatus and an expansible means controlled
10 by the volatilization of the fluid for controlling the apparatus.

9. A thermal relay for a translating device comprising a relatively long inexpandible tube connected in circuit with the translating device, a highly volatile fluid in the
15 tube and an expansible member communicating with the tube.

10. A thermal relay for a translating device comprising a relatively high-resistance
20 inexpandible tube connected in circuit with the translating device, a volatile fluid in the

tube and an expansible member communicating with the tube.

11. A thermal relay for a translating device comprising a relatively high-resistance
25 inexpandible tube, an expansible member communicating therewith and connected in circuit with the translating device, and a volatile fluid in the tube for expanding the
30 expansible member when volatilized.

12. A protective device for an electric circuit containing electric apparatus, comprising an expansible member, an auxiliary chamber communicating therewith, a quantity of volatile fluid in the auxiliary chamber and means for inserting the chamber in
35 the electric circuit whereby the fluid may be heated by the circuit current.

In testimony whereof, I have hereunto subscribed my name this 27th day of October 1920. 40

ROY J. WENSLEY.