Dec. 10, 1940. E. A. LOWE 2,224,738

PNEUMATIC AND FUSIBLE METAL ELECTRIC THERMOSTAT

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Fig. 1.

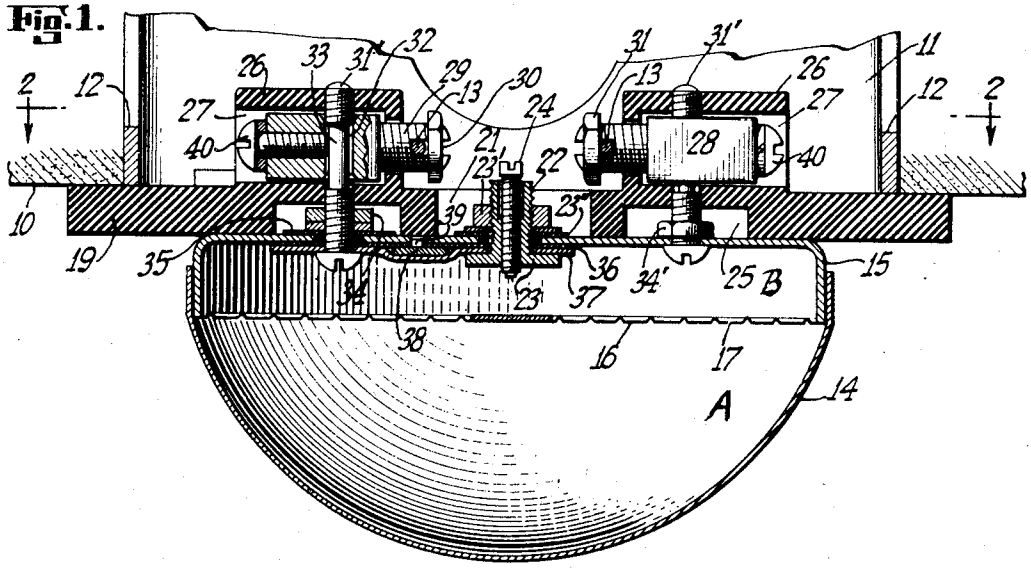
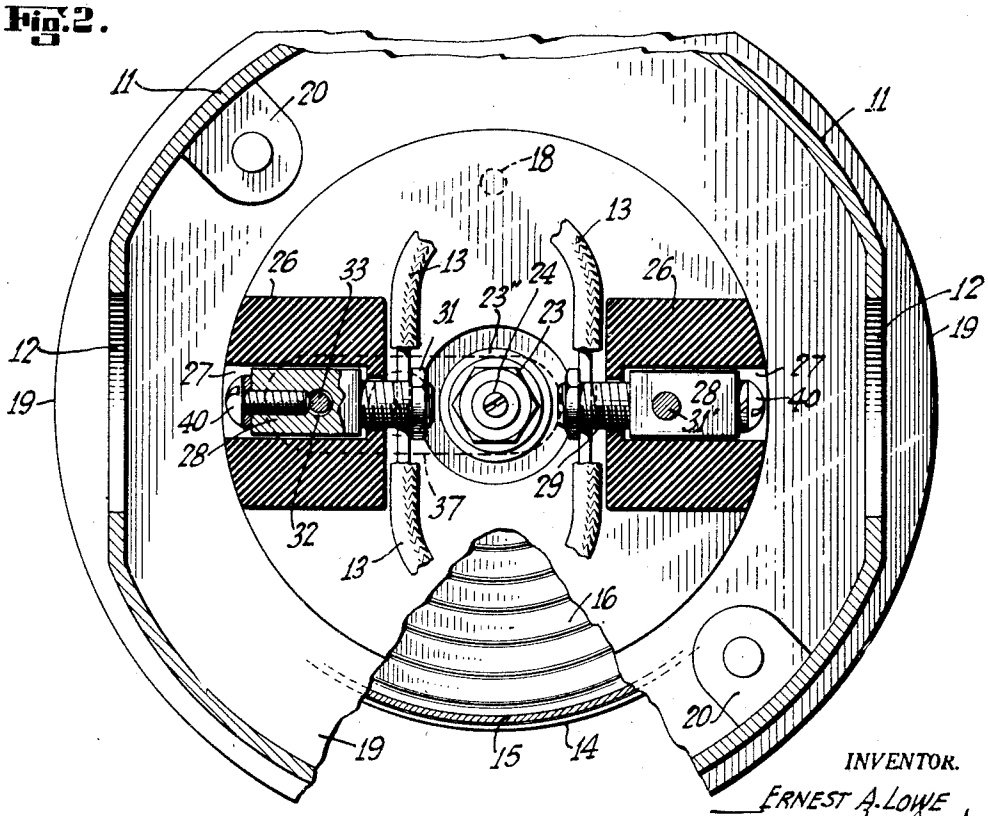


Fig. 2.



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Fig. 3.

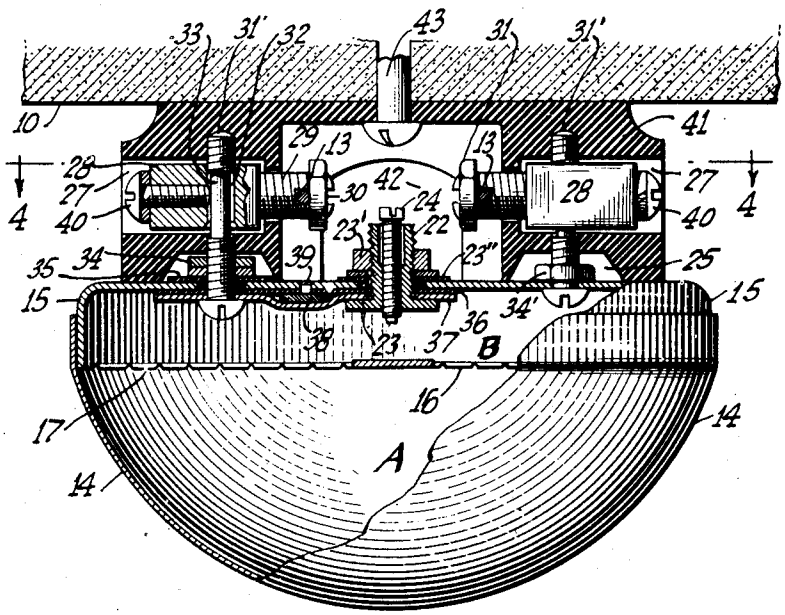
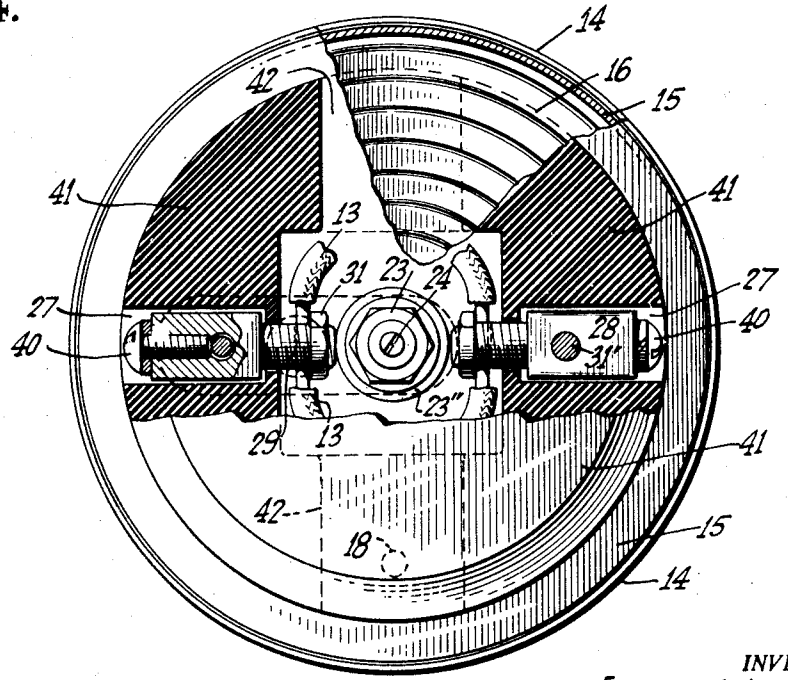


Fig. 4.



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PNEUMATIC AND FUSIBLE METAL ELECTRIC THERMOSTAT

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Application December 4, 1937, Serial No. 178,186

6 Claims. (Cl. 200—142)

This invention relates to a circuit controller for use and operation under changes of temperature to automatically cause the same to function. The invention relates more particularly to an electric thermostat susceptible to changes of temperature and which shall be so constructed as to energize a signal, either audible or visual, upon the presence of excessive heat such as that occasioned by a fire.

The principal object of the invention is the production of a thermostat or analogous device of the above character which shall be so constructed that it will operate automatically and faithfully not only upon the well known principle of the expansion of a confined body of air when heated, the body of air being vented to the atmosphere, said principle being known in the art as the "rate-of-rise" principle but also upon the attainment of a fixed or predetermined temperature the mechanism for both principles of operation being embodied in a single unit.

A further object of the invention is the production of a thermostat having the above characteristics which shall be of very simple construction and in which a number of parts of standard size and of standard material shall be used to produce a very compact and economical type of device.

A further object of the invention is the production of an automatic thermostat of the above character which may be readily and detachably fastened to the ceiling or upper wall of a room or other enclosure where it will be quickly susceptible to changes in temperature in the room or enclosure, it being well known, for instance, that air, when heated, ascends or rises upwardly.

A further object of the invention is the production of a thermostat adapted to be detachably fastened to the ceiling or other wall of a room and constructed in a manner to permit it to be readily replaced or removed for examination or substitution of parts without disturbing the electric wiring or circuit conditions.

A further object of the invention is the production of an electric thermostat of the above character which shall be adapted to operate a signal upon the expansion of a confined body of air by the heating thereof and which shall be provided with a fusible button or other element adapted to melt or fuse to close a gap in a circuit and thereby complete the circuit to operate a signal when the temperature reaches a fusing or fixed and predetermined degree.

Still other and further objects and advantages of the invention will be apparent from the subjoined description, the invention consisting in the novel thermostat and parts thereof and combinations of parts hereinafter more especially described and then specified in the claims.

In the accompanying drawings illustrating a practical embodiment of the invention:

Fig. 1 is a section taken through the device of the invention showing it detachably fastened to an electric fixture or support.

Fig. 2 is a horizontal section on the line 2—2 of Fig. 1.

Fig. 3 is a section (partly broken away) taken through a modification of the device.

Fig. 4 is a horizontal section (partly broken away) on the line 4—4 of Fig. 3.

Referring in detail to the several figures of the drawings and more particularly to Figs. 1 and 2 in the first instance:

The ceiling of a room or other enclosure is indicated at 10 and is cut out or recessed to receive a countersunk junction box 11 of standard form and construction and held therein in any desirable manner. The box 11 is provided with the usual knock-out openings 12 for the reception of electric conductors or wires 13. A hollow shell, semi-spherical in form and composed of thin metal is indicated at 14. Said shell receives an upper flanged thin metallic shell 15, the edge of the flange of which interfits with the shell 14 and a thin flexible and metallic diaphragm 16, preferably corrugated, is interposed between the shells 14 and 15 to provide two air chambers which I have designated as "A" and "B," chamber A being a "rate-of-rise" air chamber and chamber B being a "relief" chamber. The diaphragm 16 is provided with a "breather" opening 17 and the upper wall of the shell 15 is provided with a relief opening 18 whereby both chambers are normally at atmospheric air pressure. Normal and gradual changes in temperature, therefor, will be compensated for, and the air pressure on either side of the diaphragm 16 will be equalized because of the inclusion of said breather opening 17 and relief opening 18.

An annular plate of insulating material is indicated at 19. This plate may be detachably fastened to the junction box 11 by screws (not shown) passing through the plate and threading through perforated ears 20 secured to or forming a part of the wall of the junction box. The insulating plate 19 is provided with an opening at 21 for the reception of a center contact socket 22, headed as at 23, the shank of said socket passing through the upper wall of the shell 15 and the shank of the socket receiving a nut 23' adjust-

ably screwed thereon. An insulating washer 23'' is interposed between the nut 23' and the upper wall of the shell 15 and encircles the opening in said wall through which the shank of the contact socket 22 passes. The center contact socket 22 carries an adjustable contact screw 24 extending therethrough and adapted to be engaged by the diaphragm 16 when the shell 14 has been appreciably heated to thereby expand the confined air in chamber A to a degree exceeding the capacity of the breather opening 17 thus flexing the diaphragm 16 upwardly and into engagement with the lower end of contact screw 24.

The insulating plate 19 is recessed as at 25 and carries two insulated blocks or receptacles 26 which are fastened thereto or which may be made an integral part thereof. Said receptacles 26 are laterally recessed as at 27 for the reception of the metallic rectangular connectors 28 each having a threaded post 29 extending therefrom with the end thereof slotted as at 30 for the reception of the non-insulated portions of the wires or conductors 13 to afford an electric connection with a source of power and a signal, either audible or visual, said connection being made secure by means of the nuts 31 detachably screwed on the ends of said posts 29.

31', 31' indicate screw-threaded bolts or contact posts for connecting the chambers A and B to the receptacles 26 and making proper electrical connection between various parts of the device. The bolts pass through the upper wall of the metallic shell 15, through the insulating plate 19, the recesses 25 and through vertical openings 32 in the receptacles 26. Said bolts are reduced in diameter and un-threaded approximately centrally thereof to form shouldered portions 33. Locking nuts 34 and 34' are provided for holding said bolts to the shell 15, an insulating washer 35 also being provided and interposed between the nut 34 for bolt 31 and the shell 15 and surrounding the opening in the shell which receives said bolt 31.

An elongated insulating strip is indicated at 36 and is interposed between the upper wall of the shell 15 and a metallic spring retaining contact strip 37 of the configuration illustrated. The insulating strip 36 and spring retaining contact strip 37 are provided with openings receiving the shank of the bolt 31 and center contact socket 22, the head of bolt 31 and the head 23 of said contact socket engaging the strip 37 as shown.

The spring retaining strip 37 supports a fusible metallic button 38 in alignment with an opening in the insulating strip 36 and a corresponding opening 39 in the metallic shell 15, which opening has an upper bevelled edge. The connectors 28 carry screws 40 in their ends opposite the threaded posts 29, the ends of said screws being adapted to bear against the reduced portions 33 of screw-threaded bolts 31, 31' for tightening and holding purposes.

When the air expands in chamber A because of an abnormal rate-of-rise of temperature, the diaphragm 16 is flexed upwardly as previously described and engages the end of the adjustable contact screw 24, an electrical circuit is closed to energize a signal. The current in that case may flow from a source of power (not shown), through the left-hand contact post 31', through spring retaining contact strip 37, through center contact socket 22, contact screw 24, diaphragm 16, shell 15, right-hand contact post 31' and to the signal (not shown).

The opening 39 in metallic shell 15 provides a gap to normally prevent the flow of current to the signal or alarm. Should the temperature rise due to a fire, but the rate-of-rise be insufficient to flex the diaphragm 16 upwardly to engage the adjustable contact screw 24, but should the intensity of the heat nevertheless be sufficient to reach a predetermined or fixed degree, the button 38 will fuse and the molten metal thereof being under compression afforded by the spring retaining contact strip 37 will be forced into the opening 39 to bridge the gap in the electric circuit occasioned by said opening. This effects a bridging of the open contact between the diaphragm 16 and contact screw 24 and results in the energization of the signal, the current passing from contact strip 37 through the fused button, through the shell 15 and through the right-hand contact post 31'. Perfect and continued contact by the fusible metal of button 38 is obtained inasmuch as the outer or upper edge of the opening 39 is bevelled whereby the fused metal is permitted to head over the surface of shell 15 when the metal cools, thus making a fixed and staple connection. The molten metal of the button accordingly and obviously is discernible to the eye for identification and as a "tell tale" advantage.

In the modification illustrated in Figs. 3 and 4 the supporting insulating block for the thermostat is indicated at 41 and is slotted centrally thereof as at 42. The supporting block may thus be detachably secured to the ceiling by a screw or bolt 43, without cutting away or recessing the ceiling for reception of a junction box as in the preferred form of the invention.

From the above description it will be apparent that by using the insulated ceiling support carrying the contact screw posts 29, the conducting wires may be connected to said posts with ease and facility by simply stripping a small section of the insulation of the wire, then slipping the exposed wire in the slotted end 30 and holding the wire in connected position by means of the nut 31. The contact posts are thus securely and flexibly held in the support and may not be removed until the conducting wire and nut have been removed. As is obvious, the complete thermostat is locked in position by the engagement of the ends of the screws 40 with the grooves or the reduced portions 33 of the shanks of bolts 31, 31'. Also the construction described permits the use of twisted pairs of telephone wires for the conductors and the ready removal of the thermostat from the circuit by the simple loosening of the holding screws 40 without disturbing the circuit.

The connected wiring circuits are not shown or described as the thermostat may be used on any type of open circuit, or, when closed circuit wiring systems are desired, multiple wires shunted by the thermostat may be employed and the same results accomplished. The appended claims accordingly are to be construed with this explanation in view.

The invention claimed is:

1. A circuit controller having a portion of an electric circuit comprising a metallic plate with an opening therein having a bevelled edge, a spring retaining contact strip fastened to said plate over said opening, a fusible metallic button in alignment with said opening and supported by said strip and adapted to fuse and enter said opening and head over the bevelled edge thereof to complete the circuit through said plate upon the attainment of a predetermined fixed temperature and an insulating strip having an opening in registry with the opening in said plate

and interposed between said button and plate and normally preventing electrical contact therebetween.

2. A thermostat comprising an insulating support having receptacles mounted thereon, metallic connectors carried by said receptacles, a metallic chamber also carried by the insulating support, a metallic shell connected thereto and having an opening therein, a fusible element adapted to fuse and enter said opening upon the attainment of a predetermined temperature, bolts extending through said shell, support, connectors and receptacles, posts carried by said connectors and having slots in their ends receiving conductors connected with a source of current supply and means on said posts for clamping the conductors in said slots.

3. A thermostat comprising an insulating support having receptacles mounted thereon, metallic connectors carried by said receptacles, a metallic chamber also carried by the insulating support, a metallic shell connected thereto and having an opening therein, a fusible element adapted to fuse and enter said opening upon the attainment of a predetermined temperature, bolts extending through said shell, support, connectors and receptacles, posts carried by said connectors and having slots in their ends receiving conductors connected with a source of current supply, nuts on said posts for clamping the conductors in said slots and fastening screws extending in said receptacles and said connectors and engaging said bolts.

4. A circuit controller comprising an insulated support, a metallic plate bearing at one side against the support and having an opening therein, there being provided between the support and plate a receiving space about said opening, a spring metal retaining and contact strip located at the opposite side of the plate and fastened to said plate over said opening, a fusible metallic element supported by said strip adjacent to said opening and adapted to fuse and flow through said opening into the receiving space between the plate and support and head over the side of the plate bearing on the support so as to interlock the strip and plate and complete the circuit through said plate upon the attainment of a predetermined fixed temperature, and an insulating element interposed between said fusible element and plate and normally preventing electrical contact therebetween.

5. A thermostat comprising an insulating support, metallic connectors carried by said insulating support, a metallic chamber also carried by the insulating support, a metallic shell connected thereto and having an opening therein, bolts extending through said shell and support and engaging the connectors, one of said bolts being electrically connected with and the other insulated from the chamber and shell, a fusible element electrically connected with the bolt insulated from the shell and adapted to fuse and enter said opening upon the attainment of a predetermined temperature, and means for clamping electric circuit conductors to said connectors.

6. In a circuit closer, a pair of circuit terminals, a metallic conductor connected to one of said terminals and insulated from the other terminal, a pair of contacts electrically connected to each other and to the second-named terminal but insulated from the first-named terminal and the conductor, a heat influenced contact element connected to the conductor and movable upon a predetermined temperature rise into engagement with one of said contacts to close the circuit through said conductor and terminals, and a fusible element interposed between the conductor and the other contact and normally insulated from the conductor and adapted upon the attainment of a predetermined fixed temperature to be fused and to electrically connect said contact and conductor and close the circuit through the conductor and circuit terminals.

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