May 4, 1943. W. B. GRIFFITH 2,318,480

THERMOSTAT

Filed June 30, 1942

FIG. 1.

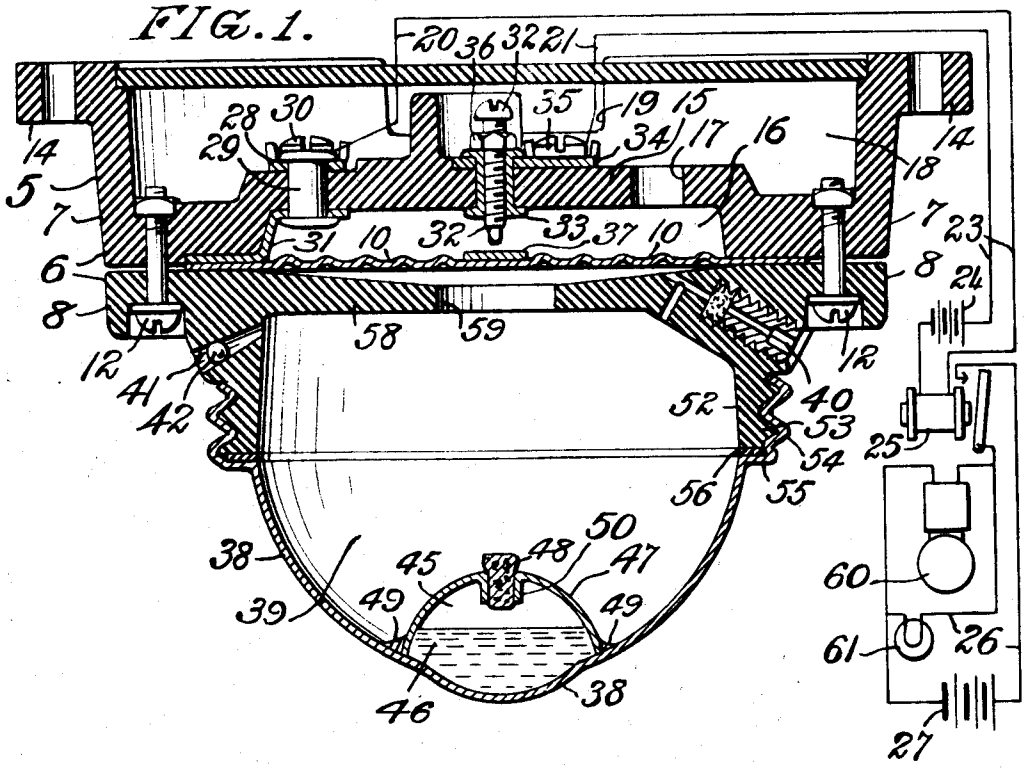
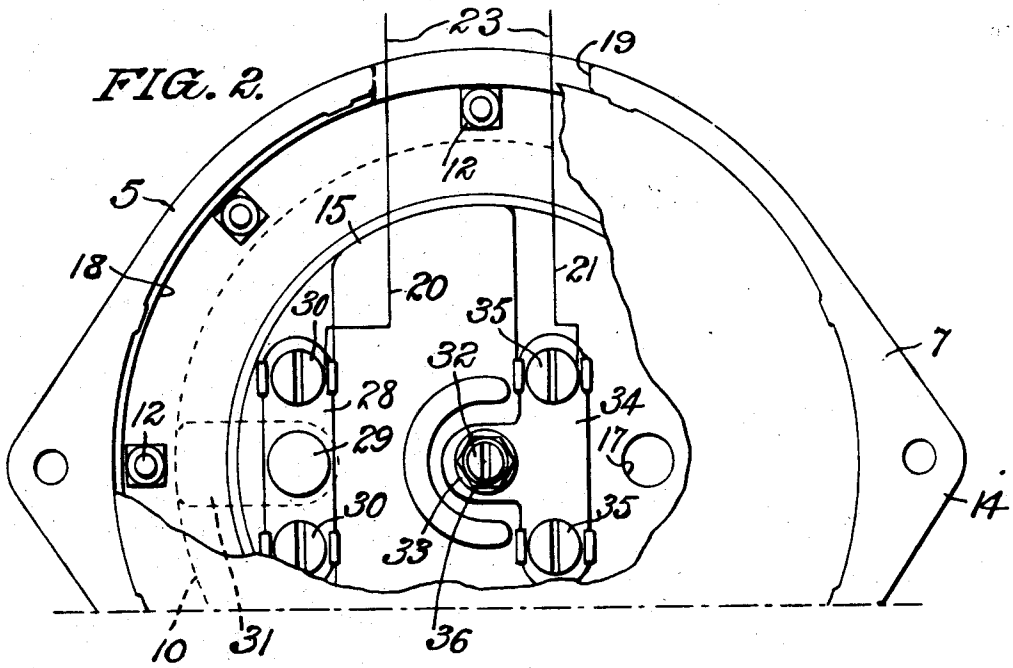


FIG. 2.



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2,318,480

THERMOSTAT

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Application June 30, 1942, Serial No. 449,072

4 Claims. (Cl. 200—140)

My invention relates to improvements in thermostats and particularly to thermostats having means actuated upon a rapid rate in rise of temperature for controlling electric circuits adapted for operating alarm, signal and like devices.

Thermostats to which my invention is applied comprise a heat transmitting shell forming an air chamber, with one wall of the chamber in the form of a flexible diaphragm adapted to be distended by the air in said chamber and close the circuit, upon a sudden rate in rise of temperature, in the event of a fire within the zone where the thermostats are located, for protection against fire.

The object of my invention is to provide novel means for actuating the thermostat at a predetermined temperature in addition to the rate in rise of temperature actuating means.

A further object is to arrange a small quantity of volatile material in communication with the air chamber of the thermostat, which material will become active at a predetermined temperature and expand the air in said chamber for distending the diaphragm and thereby controlling the circuit for actuating the alarm.

A further object is to locate a container within the air chamber of the thermostat for normally containing and sealing the volatile material and provide a seal for the container which will yield under pressure created by the volatilization of the material within the container.

A further object is to arrange the container for the volatile material so that the increased temperature of the atmosphere surrounding the air chamber will be readily conducted to the volatile material within the container.

A further object is to construct the shell forming the air chamber of the thermostat with means for readily detaching the shell from the base for making the container which is located within the shell accessible for filling the container and for inspection purposes.

These together with various other novel features of construction and arrangement of the parts, which will be more fully hereinafter described and claimed, constitute my invention.

Referring to the accompanying drawing:

Fig. 1 is a central vertical sectional view of a thermostat embodying my invention.

Fig. 2 is a partial plan view of Fig. 1.

In the drawing in which like reference characters refer to like parts, 5 illustrates a thermostat comprising a support, or body 6, formed of insulating material. Said support is made in two sections 7 and 8 adapted for clamping a flexible metal diaphragm 10 between the sections by means of bolts 12.

The base section 7 of the support is provided with ears 14 for fastening the device to a ceiling. A wall 15 of the sectional 7 is positioned horizontally and in spaced relation to the diaphragm 10 and forms an air space 16, which communicates, through an aperture 17 in the wall 15, with a cavity 18 formed in the section 7 above the wall 15, which cavity 18 in turn communicates with the atmosphere through openings 19 formed in the section 7 for the admission of electric conductors 20 and 21 of a circuit 23, including a source of current 24 and a relay 25, adapted for controlling an alarm circuit 26, including a source of current 27 and signal devices, such as a bell and a lamp.

A terminal plate 28 is mounted upon the wall 15 by means of a rivet 29, and said plate is provided with binding screws 30 adapted for the attachment of the conductor 20. A metal plate 31 forms a conductor between the rivet 29 and the diaphragm 10 and electrically connects the latter with the conductor 20.

An adjustable contact screw 32 extends through the wall 15 and is mounted in threaded engagement with a tubular rivet 33, which latter is secured upon the wall 15. A terminal plate 34 is also secured upon the wall 15 by the rivet 33, and said plate is provided with binding screws 35 for the attachment of the conductor 21.

The contact screw 32 is thus electrically connected with the conductor 21, and is adapted to be secured in adjusted position upon the rivet 33 by means of the lock nut 36, with the inner end of the screw normally in adjusted spaced relation with the diaphragm 10, which latter is provided with a metal disk 37, which engages the screw 32, and insures the thin metal diaphragm against being punctured by engagement with the screw 32. Said disk 37 also adds sufficient weight to the diaphragm so that it will normally move away from the screw 32 to form an air gap and open the circuit 23.

A thin metal hemispherical shell 38 is mounted upon the clamp section 8 of the support and forms an air chamber 39, with the diaphragm 10 forming a distendable wall of said chamber. The section 8 is provided with the usual slow leak aperture 40, through which slow changes in the pressure of the air in the chamber 39 may equalize with the atmosphere without moving the diaphragm. The section 8 is also provided with an aperture 41, for testing purposes, which aperture 41 is normally closed by a plug 42, as

described and claimed in an application for Thermostat filed by me December 12, 1941, Serial No. 422,762.

The present invention is adapted to be employed in a rate of rise thermostat such as above described, and comprises additional means for expanding the air in the chamber 39, for actuating the diaphragm and closing the circuit, at a predetermined temperature.

Mounted in communication with the chamber 39, formed by the shell 38, is a container 45 adapted for confining a small quantity of volatile material, or fluid 46, such as carbon tetrachloride, or similar material which will volatilize below a temperature of 165 degrees F.

The container 45 is normally sealed by a cork 48, or other suitable sealing means, which will yield when the material 46 volatilizes and allow the gas generated within the container 45 to enter the air chamber 39 and thereby subject the air in the latter to an increased pressure which will distend the diaphragm 10 into contact with the center contact screw 32 and close the circuit 23, including the relay 25, which in turn controls the circuit 26 for actuating the alarm and signal devices 60 and 61.

A preferred form of my invention is shown in Fig. 1, and comprises the container 45 formed by a hemispherical partition, or wall 47, having its edge portion secured, by means of solder 49 or other suitable means, to the inner surface of the shell 38. The container 45 is formed by the thin metal wall 47 and a portion of the shell 38, which latter forms the lower enclosure of the container, so that heat will be readily conducted through the shell 38 to the volatile material 46 within the container. The wall 47 of the container is provided with a neck 50, forming an opening which is normally sealed by the cork 48, which latter will be forced out of the neck 50 when the material 46 volatilizes.

The shell 38 is detachably mounted upon the clamp section 8, so that the inner container 45 may be readily accessible for filling and inspection purposes. The clamp section 8 is provided with a depending flange 52, having a screw thread 53 formed thereon, for the attachment of a screw thread 54, formed upon the shell 38. The shell 38 is provided with a shoulder 55, upon which a gasket 56 is adapted to be positioned and clamped between said shoulder 55 and the end facing surface of the flange 52, thus forming an air seal.

The top facing surface of the clamp section 8 is tightly clamped against the edge portion of the diaphragm 10, by the bolts 12, and forms an air-tight seal between the diaphragm and the section 8. An inwardly projecting flange 58, formed upon the section 8, provides a support for the flexible diaphragm 10 and restricts its downward movement. The flange 58 is provided with an opening 59 through which the air under pressure in the chamber 39 acts upon the diaphragm.

The operation is as follows: In the event of a fire causing a sudden increase in the temperature of the air surrounding the shell 38, the heat will be transmitted through the thin metal shell 38 and subject the air in the chamber 39 to an increase in pressure which will distend the diaphragm into contact with the screw 32 and close the circuit 23 and operate the signal devices 60 and 61. If the rate in rise of temperature is slow, the increase in the pressure of the air in the chamber 39 may equalize with the atmosphere, through the aperture 40, without moving the diaphragm, in which event the heat from the fire will be conducted through the shell 38 to the volatile material 46, within the chamber 45, which material will volatilize at a predetermined temperature and force the cork from the container 45.

The pressure generated by the volatilization of the material 46 will pass from the container 45 into the air chamber 39 and subject the air in the latter to an increase in pressure which will also move the diaphragm into contact with the screw 32 and complete the circuit 23 and operate the signal devices.

Various changes in the construction and arrangement of the parts may be made without departing from my invention.

I claim:

1. A thermostat comprising an insulating support, a pair of terminals mounted thereon and adapted for connection in a circuit with a source of current supply, an air chamber mounted upon said support, a flexible diaphragm forming one wall of said air chamber normally positioned in spaced relation to one of said terminals and adapted to be distended to establish electrical connection between said terminals and close said circuit by pressure of the expanded air in said chamber against the diaphragm responsive to the action of heat, a container in communication with said chamber, a seal normally closing communication between said container and said chamber, and volatile material in said container adapted to expand and break said seal at a predetermined temperature and subject the air in said air chamber to an increase in pressure for also distending the diaphragm to establish electrical connection between said terminals.

2. A thermostat comprising an insulating support, a pair of terminals mounted thereon and adapted for connection in a circuit with a source of current supply, an air chamber mounted upon said support, a distendable diaphragm forming one wall of said air chamber and normally positioned in spaced relation to one of said terminals and adapted to be distended to establish electrical connection between said terminals and close said circuit by pressure of the expanded air in said chamber against the diaphragm responsive to the action of heat, a container located within said chamber, said container having an aperture forming communication between said container and said chamber, a seal normally closing said aperture, and volatile material in said container adapted to expand and break said seal at a predetermined temperature and subject the air in said chamber to an increase in pressure for also distending the diaphragm to establish electrical connection between said terminals.

3. A thermostat comprising an insulating support, a pair of terminals mounted thereon and adapted to be connected in a circuit with a source of current supply, a thin metal shell mounted upon said support forming an air chamber, a distendable diaphragm forming one wall of said chamber and adapted to be distended to establish electrical connection between said terminals by pressure of the expanded air in said chamber against the diaphragm responsive to the action of heat, a wall having its edge portion secured to the inner surface of said shell and forming a container within the shell and separated from said air chamber by said wall, said wall having an aperture formed through the same communicating with said chamber, means normally sealing said aperture, and volatile material in

said container adapted to expand and break said seal at a predetermined temperature and subject the air in said chamber to an increase in pressure for also distending the diaphragm to establish electrical connection between said terminals.

4. A thermostat comprising an insulating support having a base section and a clamp section, a distendable diaphragm mounted between said sections, a pair of electrical terminals mounted upon the base section and adapted for connection in a circuit with a source of current supply, an annular flange upon said clamp section, a hemispherical metal shell, means detachably mounting the edge portion of the shell upon said flange, said shell forming an air chamber with the diaphragm forming one wall thereof, said diaphragm adapted to be distended to establish electrical connection between said terminals and close said circuit by pressure of expanded air in said chamber responsive to the action of heat, a partition wall having its periphery secured upon the inner surface of the shell and forming a receptacle within the latter, said partition wall having an aperture forming communication between the container and the air chamber, means normally sealing said aperture, and volatile material in said container adapted to expand and break said seal at a predetermined temperature and subject the air in said chamber to an increase in pressure for also distending the diaphragm to establish electrical connection between said terminals.

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