

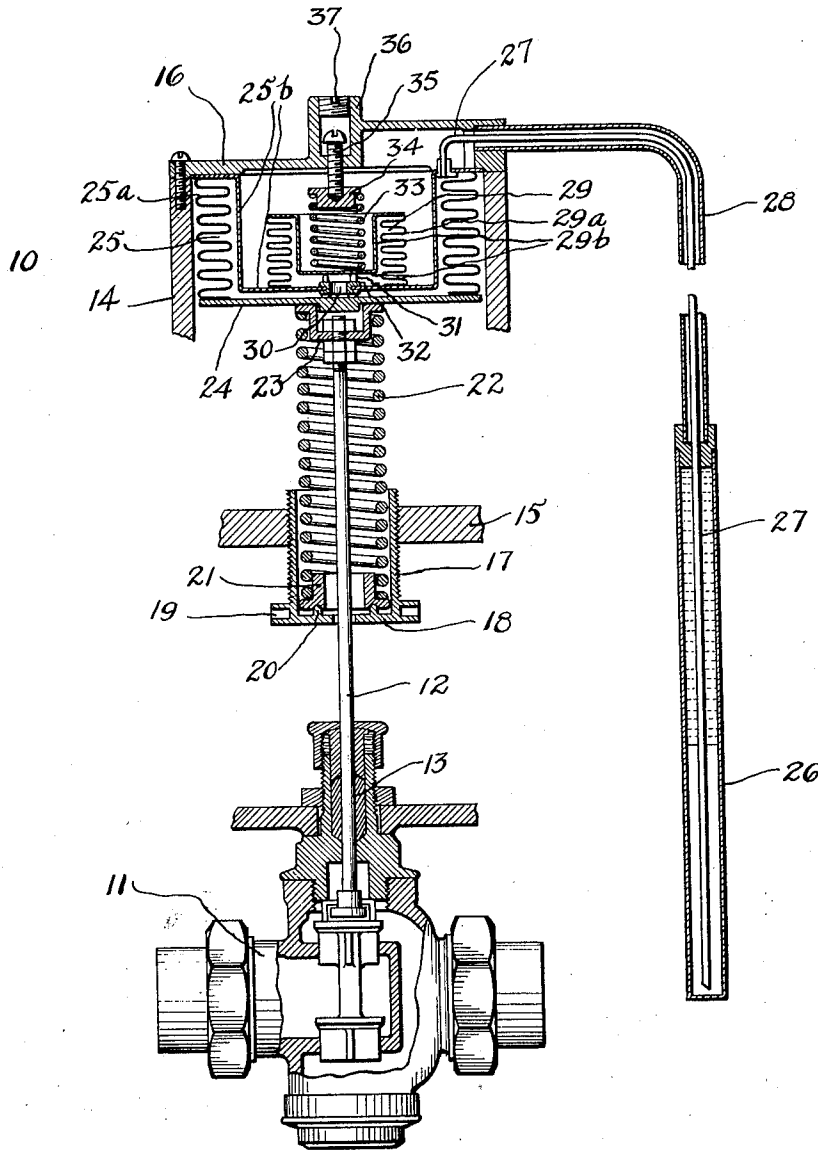
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TEMPERATURE REGULATOR

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UNITED STATES PATENT OFFICE

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TEMPERATURE REGULATOR

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This invention relates to temperature regulators, and has particular reference to devices of this character which are adapted to regulate the flow of a heating medium.

5 In thermostats of this nature, an inlet valve to a tank or other receptacle containing a heating medium, is controlled by a motor which is operated by a thermosensitive bulb. This bulb contains a volatile liquid, which, 10 with the rise or fall of the temperature in said tank, causes a corresponding expansion or contraction of the motor, which operates the valve accordingly. However, should the temperature, for some unforeseen reason continue to rise, and the motor having reached 15 its limit of expansion, the instrument would necessarily break.

It is an object of this invention to provide a device of the character described wherein 20 improved means renders the instrument safe against breakage due to overheating of the bulb.

A further object of this invention is to produce a device of the type mentioned, having 25 an expansible and collapsible relief chamber for the volatile fluid.

Another object of this invention is the production of a device of the class specified in which the relief chamber has improved coaction 30 with the valve motor, and with the means for adjusting the relief chamber to set the same to function at a predetermined temperature.

Other objects and advantages of the invention will become apparent as the specification proceeds. 35

With the aforesaid objects in view, the invention consists in the novel combinations and arrangements of parts hereinafter described in their preferred embodiments, 40 pointed out in the subjoined claims, and illustrated in the annexed drawing.

The drawing shows a sectional view in elevation of an embodiment of the invention. 45

Generally described, the invention resides in the provision of an expansible and collapsible relief chamber for the liquid in the bulb to prevent the instrument from bursting due 50 to overheating. This relief chamber is in alignment with the motor of the valve, and

is preferably positioned in the concave side of said motor, the direction of expansion of the relief chamber being opposite to that of the motor. An expansion spring acts to retain the relief chamber normally collapsed. 51 Coacting with the spring, is a member for adjusting the tension thereof. Since the relief chamber engages the adjacent wall of the motor, the said wall acts as an anchor for the relief chamber. 60

The device, as thus constructed, is extremely compact.

The advantages of the invention as here outlined are best realized when all of its features and instrumentalities are combined in one and the same structure, but, useful devices may be produced embodying less than 65 the whole.

It will be obvious to those skilled in the art to which the invention appertains, that the same may be incorporated in several 70 different constructions. The accompanying drawing, therefore, is submitted merely as showing the preferred exemplification of the invention. 75

Referring in detail to the drawing, 10 denotes a device embodying the invention. The same includes a valve 11 of any suitable construction for controlling the flow of a heating medium as, for example, steam to a 80 tank (not shown). The said valve comprises a stem 12 which is packed tight at 13. Supported on the valve is a frame 14 which can be of any desired construction, but as here shown, includes a cross member 15 intermediate the ends thereof, and a wall 16 at the 85 free end of the frame. Threaded into the cross member 15 is a sleeve 17 having an end wall 18, in proximity to which are a plurality of radial holes 19 for rotational adjustment 90 of the sleeve. An annular guide 20 is formed on the wall 18 to provide a seat for the bushing 21. The latter extends into the adjacent end of the helical spring 22, that enters the sleeve 17. The stem 12 passes centrally 95 through the spring 22, and is fixedly secured to a bushing 23 that engages the other end of the spring. Attached to bushing 23 is a movable disc 24, with which is engaged the motor 25. 10

The motor 25 constitutes an hermetically sealed expansible and collapsible chamber, having a corrugated outer wall 25^a and a rigid inner wall 25^b. The latter is secured to the member 16 of the frame in any manner well known in the art, while the movable portion 25^a has engagement with the disc 24.

A bulb 26 communicates with the motor 25 through a capillary tube 27. A flexible tube 28 connects the said bulb with the frame 14, and protects the capillary tube 27. The bulb 26 as well as the motor 25 and the capillary tube are filled with a volatile liquid. As the bulb responds to the temperature of the tank into which it extends, the vapor generated drives part of the liquid that is in the bulb, through the capillary tube, and into the motor 25. The latter thereupon expands and causes the valve stem to be moved to throttle the supply of heating medium to the said tank.

Positioned within the wall 25^b, in alinement with the motor 25, is a relief chamber 29. This is in the nature of an expansible and collapsible receptacle, comprising an outer corrugated wall 29^a, and an inner rigid wall 29^b. The said relief chamber is in communication with the motor 25, through an opening 30 in the wall 25^b, the bellows structure 29^a being secured to the rigid wall of the motor about the said opening. Lugs 31, mounted on a collar 32 engage the wall 25^b around the opening 30. These lugs retain the wall 29^b in spaced relation to prevent the same from closing the opening 30 so that a full and uniform pressure may be available at all times for expanding the relief chamber when an emergency arises, and all of the liquid in the bulb must be removed therefrom.

To retain the relief chamber 29 normally closed, an expansible coil spring 33 is mounted within the wall 29^b thereof in alinement with the relief chamber. One end of this spring bears directly on the wall 29^b, while the other engages a bushing 34. To adjust the tension of spring 33, a screw 35 acts against the said bushing. The relief chamber can thus be set to function only when the bulb has been heated beyond a given temperature. A hub 36 may surround the head of the screw, and be closed by a plug 37 to prevent unintended change of the adjustment.

The operation of the device will now be clearly apparent. In course of regulating the temperature, should the same for some unforeseen reason rise beyond the proper limit, the tension of spring 33 would then be exceeded, and the relief chamber 29 expand until all the liquid in the bulb had been removed therefrom. This expansion, it will be noted, is in a direction opposite to that of the motor 25.

It will be understood that within the scope of the invention, the springs 22, 33 as well as their screw threaded adjusting devices, may

be replaced by other tension adjusting devices, and that the term "spring" as used herein is therefore intended to be illustrative and not to limit the invention.

It is therefore seen that I have provided a device which fulfills the several objects of the invention and is practical and efficient in use.

I claim:

1. A device of the character described, including a valve for controlling the flow of a heating medium, a vessel having a flexible wall connected to said valve, a bulb in communication with said vessel, and a flexible walled relief chamber for the bulb in communication therewith, said bulb, said vessel, and said chamber being charged with an expansive fluid, said relief chamber being of smaller area than the vessel and expansible only after expansion of the vessel, said vessel and said chamber being in aligned relation and having a common wall therebetween, said wall having an opening affording communication between the vessel and chamber.

2. A device of the character described, including a valve for controlling the flow of a heating medium, a vessel having a flexible wall connected to said valve, a bulb in communication with said vessel, and a flexible walled relief chamber for the bulb communicating with said vessel, said bulb, said vessel, and said chamber being charged with an expansive fluid, the relief chamber being expansible after the vessel has reached its limit of expansion, and spring means tending to compress the said vessel and chamber, the vessel, chamber, and spring means being all in aligned relation, the vessel having a central concave wall to externally receive the chamber.

3. A device of the character described, including a valve for controlling the flow of a heating medium, a vessel having a flexible wall connected to said valve, a bulb in communication with said vessel, a flexible walled relief chamber for the bulb communicating with said vessel, the chamber, the bulb, and the vessel being filled with an expansible liquid, and means to set the chamber to expand in response to a given pressure of the liquid, said chamber being of smaller area than the vessel to be expansible only after expansion of the vessel, said vessel having a concave wall to externally receive said chamber for compactness of the device.

4. A device of the character described, including a valve for controlling the flow of a heating medium, a vessel having a flexible wall connected to said valve, a bulb in communication with said vessel, and a flexible walled relief chamber for the bulb communicating with said vessel, the chamber, the bulb, and the vessel being filled with an expansive fluid, the chamber being directly attached to the vessel and expansible in a direction opposite to that of the vessel, after the vessel

has reached its limit of expansion, and means at the place of attachment affording communication between the vessel and chamber, the chamber having a concave wall, a spring externally seated in said concave wall to close the chamber, said means holding the concave wall in spaced relation to said opening to prevent closure thereof by the wall.

5. A device of the character described, including a valve for controlling the flow of a heating medium, a vessel having a flexible wall connected to said valve, a bulb in communication with said vessel, and a flexible walled relief chamber for the bulb communicating with said vessel, the chamber, the vessel, and the bulb being filled with an expansive fluid, the chamber being expansible only after the vessel has reached its limit of expansion, the vessel and chamber being in alignment with each other and having a common wall at substantially right angles to their axes, the chamber and vessel expanding in opposite directions from said common wall.

6. A device of the character described, including a valve for controlling the flow of a heating medium, a vessel having a flexible wall connected to said valve, a bulb in communication with said vessel, and a flexible walled relief chamber for the bulb communicating with said vessel, the chamber, the bulb, and the vessel being filled with a volatile liquid, the chamber being expansible only after the vessel has reached its limit of expansion, the said vessel having a stationary concave wall, and the said chamber being positioned within said wall the chamber and vessel expanding in opposite directions from the stationary wall.

7. A device as set forth, including a valve for controlling the flow of a heating medium, a vessel having a flexible wall connected to said valve, a bulb in communication with said vessel, and a flexible walled relief chamber for the bulb communicating with said vessel, the chamber, the bulb, and the vessel being filled with a volatile liquid, the chamber expanding only after the vessel has reached its limit of expansion, means tending to collapse the chamber, and other means engaging the vessel at the point of communication thereof with the chamber and serving to space the adjacent wall of said chamber from said point of communication.

8. A device of the character described, including a valve for controlling the flow of a heating medium, a vessel having a flexible wall connected to said valve, a bulb in communication with said vessel, a flexible walled relief chamber for the bulb communicating with said vessel, the chamber, the bulb, and the vessel being filled with an expansive fluid, the chamber expanding only after the vessel has reached its limit of expansion, and a coil spring to set the chamber to expand at a predetermined temperature at the bulb, the ves-

sel, the chamber, and the spring being in alignment with each other, the vessel having a concave wall to receive the chamber, and the latter having a concave wall to receive the spring.

9. A device of the character described, including a valve for controlling the flow of a heating medium, a vessel having a flexible wall connected to said valve, a bulb in communication with said vessel, a flexible walled relief chamber for the bulb communicating with said vessel, the chamber, the bulb, and the vessel being filled with a volatile liquid, the chamber expanding only after the vessel has reached its limit of expansion, and a support, one wall of the vessel being fixed to said support, and an adjacent wall of the chamber being fixed to the aforesaid wall of the vessel.

10. A device of the character described, including means for controlling the flow of a heating medium, a bulb having an expansive fluid, a flexible vessel coacting to control said means, said vessel being responsive to the pressure of said fluid, a flexible relief chamber for the pressure, said vessel and said chamber being directly connected to each other, and a common support for both of them, said common support being in the nature of a concave wall for the vessel, the chamber having a concave wall aligned with the first mentioned concave wall, a spring for the chamber seated in the concave wall thereof, the first mentioned concave wall receiving both the chamber and its spring, and adjustable tension means for the vessel tending to compress the same.

In testimony whereof I affix my signature.
ALBIN JOHN NELSON.