Feb. 9, 1932. M. H. WARD 1,844,488

THERMOSTAT DEVICE

Filed Jan. 23, 1929

Fig. 1.

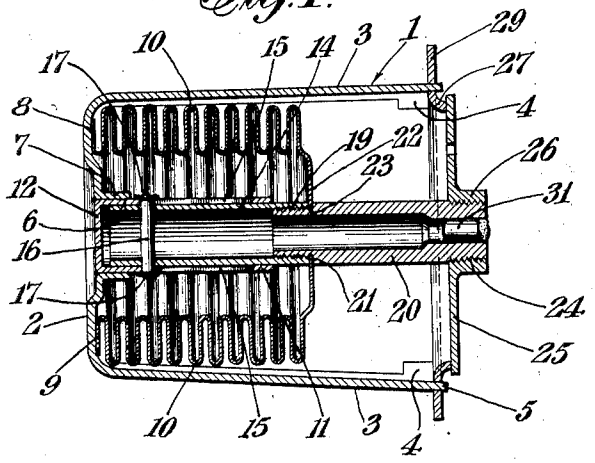
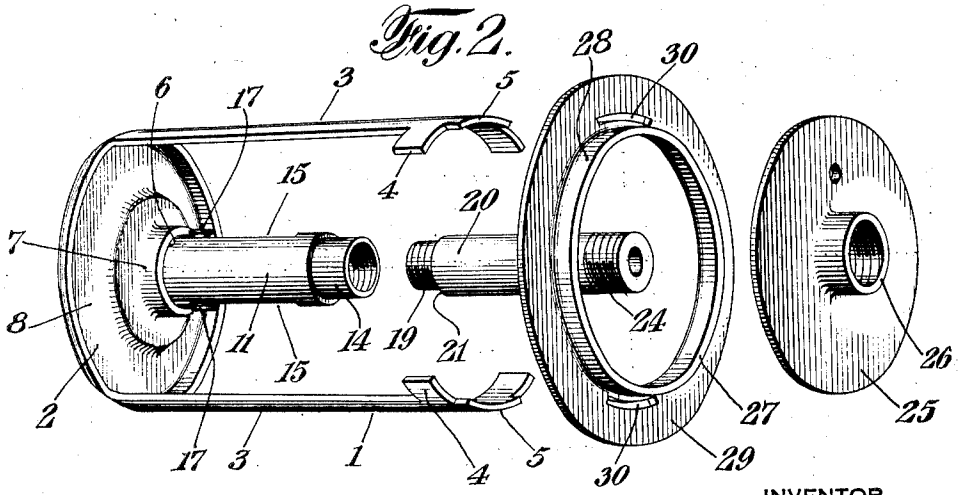


Fig. 2.



INVENTOR
Marshall H. Ward
BY
Prindle, Wright, Neal & Bean
ATTORNEYS

Patented Feb. 9, 1932 1,844,488

UNITED STATES PATENT OFFICE

MARSHALL H. WARD, OF BROOKLYN, NEW YORK

THERMOSTAT DEVICE

Application filed January 23, 1929. Serial No. 334,455.

This invention relates to improvements in thermostat devices and is designed primarily for controlling temperature of circulating water in the water-cooling system of an internal combustion engine.

Such devices have been previously used, but this invention is an improvement thereon, the principal object being the provision of such a device which is composed of few parts, easy to assemble, cheap to manufacture, efficient in operation, and having a long life, and which may be adjusted during its manufacture permanently to operate under certain predetermined and fixed conditions.

Another object of the invention is the provision of such a device in which a valve is directly and positively operated by means of a metallic bellows, the valve stem having a limited movement, and the guiding means and stopping means being located within the bellows so as not to be subject to corrosion and reducing obstruction to the free flow of fluid therethrough.

Other objects will be apparent from a consideration of the following specification and the drawings.

To the accomplishment of the foregoing, and such other objects as may hereinafter appear, this invention consists in the construction, combination and arrangement of parts hereinafter described and then sought to be defined in the appended claims, reference being had to the accompanying drawings forming a part hereof and which show merely for the purpose of illustrative disclosure, the preferred embodiment of my invention, it being expressly understood, however, that various changes may be made in the drawings within the scope of the claims without digressing from my inventive idea.

In the drawings,

Fig. 1 represents a vertical longitudinal section through a device constructed to embody my invention.

Fig. 2 represents an exploded view of the various parts constituting the assembled device, shown in Fig. 1, the metallic bellows being omitted.

The cage or frame 1 is formed of any suitable material, preferably brass, and includes a pan or saucer shaped bottom member 2 with side arms 3 extending upwardly from the rim or edge thereof. These arms are formed or provided with arc shaped extensions 4 at their upper ends which have the arc-shaped lugs 5 extending upwardly therefrom. The bottom member 2 is formed or provided with an opening 6 surrounded by a circular extension or flange 7, forming a socket. The bottom member is also shaped or formed to provide a flattened area or base 8 to receive and support the open end 9 of the extensile and contractile member 10, which is securely fastened thereto as by welding, soldering or the like. This member 10 is preferably in the form of a thin walled metallic bellows, as shown.

A holding member 11 is mounted within the socket formed by the circular flange 7 and is in the form of an elongated cup or shell having its lower end 12 closed and securely fastened within said socket by soldering, welding or the like. This holding member 11 extends upwardly within the bellows 10, and has its upper end 13 open to slidably receive a sleeve or tube 14 which is open at both ends. The holding member 11 is provided with slots 15 in its sides which are elongated and are adapted to receive a pin or pins 16 secured to sleeve 14 and projecting radially therefrom. Heads 17 are formed or provided on said pin or pins so as to overlap the sides of said slots, the pins by engaging in the slots serving as guiding means for the sleeve 14 and also being adapted to engage the ends of the slots to limit the movement of the sleeve in each direction.

The sleeve or tube 14 is internally screw-threaded near its upper end 18 to receive the externally screw-threaded lower end 19 of the valve stem 20, which is reduced in diameter to form a shoulder 21 to provide a bearing face for the upper and closed end 22 of the bellows 10. This end 22 of the bellows is apertured, as at 23, to fit over the reduced end 19 of the valve stems, and this portion of the bellows is held and tightly clamped between the upper end of sleeve 14 and said shoulder 21. This joint may also be soldered or welded so as to be fluid tight.

The valve stem is bored so as to be hollow or tubular and its upper end 24 is externally screw-threaded to receive the valve 25 which has an internally threaded hub or boss 26 for that purpose. This valve when closed rests upon valve seat 27 provided by the inner annular flange 28 formed or provided on the flat ring-shaped member 29. This ring member rests upon the upper edges of the arc-shaped extensions 4 and is provided with arcuate slots 30 to receive the arc-shaped lugs 5 on said extensions 4. These lugs are riveted or headed or welded or soldered to hold the member 29 and valve seat 27 firmly in position upon the frame or cage.

In assembling, the bellows assembly is first completed and a small quantity of volatile fluid, such as alcohol, for example, is introduced into the bellows through the tubular valve stem 20. Then the threaded end 24 of the valve stem is screwed into a fixture and the air pressure within the entire internal chamber, formed by the bellows 10, holding member 11, sleeve 14, and hollow valve stem 20, is reduced or lowered to a predetermined point. This chamber is then sealed by driving a pin or plug 31 into the end of the tubular valve stem and soldering the end of the same therein. The ring member 29 is then placed in position upon the frame or cage 1 and fastened.

The valve 25 is then screwed onto the threaded end 24 of the valve stem 20. The entire device is then placed in a bath of water heated to the temperature at which it is desired that the bellows shall expand sufficiently to cause the valve to just open, when in use. The valve is then screwed down on the valve stem and brought into predetermined relation to its seat, and is then penned or riveted or otherwise suitably fastened in fixed adjustment and relation to the valve stem.

When in use for controlling the temperature of the circulating water in the water cooling system of an internal combustion engine, the valve 25 remains seated and short-circuits the flow of water so that it does not pass through the radiator, until the temperature thereof reaches the predetermined point. Then due to the expansion of the volatile liquid in the bellows, the latter is extended, moving the valve off its seat and permitting the water to circulate through the radiator or other cooling means. When the temperature of the water lowers sufficiently, the bellows will contract and close the valve, short-circuiting the radiator, until the temperature again reaches the predetermined point.

The device is simple in construction, composed of few parts, cheap to manufacture, easy to assemble, fixed in adjustment, effective in operation and capable of lengthy and extended use. The guide and stop for the bellows and valve are within the sealed bellows and therefore protected from the corrosive action of the water or other medium in which the thermostat may be operating. Furthermore, these parts are removed from the path or flow of the circulating fluid thereby reducing obstruction to free flow.

What I claim is:

1. A device of the character described, including in combination, a frame having a closed end with side arms extending upwardly therefrom, a resilient hollow extensile and contractile member having one end secured to said closed end of the frame, a valve seat member positioned upon and secured to the upper ends of said side arms, a valve adapted to fit said seat, a valve stem connected to said valve and to the other end of said resilient extensile member, and means within sand resilient extensile member for guiding and limiting the movement of said valve stem.

2. A device of the character described, including in combination, a frame having a closed end with side arms extending upwardly therefrom, a resilient hollow extensile and contractile member having one end secured to said closed end of the frame, a valve seat member positioned upon and secured to the upper ends of said side arms, a valve adapted to fit said seat, a valve stem connected to said valve and to the other end of said resilient extensile member, and means within said resilient extensile member for guiding and lmiting the movement of said valve stem, said means including a stationary shell secured to the closed end of the frame, a sleeve movably mounted with respect to said shell and connected to said valve stem, and means connected to said shell and said sleeve for guiding and limiting the movement of the sleeve relative to the shell.

3. A device of the character described, including in combination, a frame, a resilient hollow extensile and contractile member secured to said frame, a valve seat member secured to another part of said frame spaced from said resilient extensile member, a valve for said valve seat, a valve stem having an adjustable connection with said valve, said valve stem being directly connected to one end of said resilient extensile member, and means within said resilient extensile member for guiding and limiting the movement of said valve stem.

4. A device of the character described, including in combination, a frame, a resilient hollow extensile and contractile member secured to said frame, a valve seat member secured to another part of said frame spaced from said resilient extensile member, a valve for said valve seat, a valve stem having an adjustable connection with said valve, said valve stem being directly connected to one end of said resilient extensile member, a stationary guiding member within said resil-

ient extensile member, a sleeve connected to said valve stem and slidable with relation to said guiding member, said guiding member and sleeve having means cooperating to guide and limit the movement of the sleeve and valve stem with relation to the guiding member.

5. A device of the character described, including in combination, a frame, a resilient hollow extensile and contractile member secured to said frame, a valve seat member secured to another part of said frame spaced from said resilient extensile member, a valve for said valve seat, a valve stem having an adjustable connection with said valve, said valve stem having a shoulder, a sleeve within said resilient extensile member, one end of which clamps one end of the resilient extensile member against said shoulder on the valve stem, a stationary guiding member for said sleeve within said resilient extensile member, said guiding member and sleeve having means cooperating to guide and limit the movement of the sleeve relative to said guiding member.

6. A device of the character described, including in combination, a frame, a resilient hollow extensile and contractile member secured to said frame, a valve seat member secured to another part of said frame spaced from said resilient extensile member, a valve for said valve seat, a valve stem having an adjustable connection with said valve, said valve stem having a shoulder, a sleeve within said resilient extensile member, one end of which clamps one end of the resilient extensile member against said shoulder on the valve stem, a stationary guiding member for said sleeve within said resilient extensile member, said guiding member and sleeve having means cooperating to guide and limit the movement of the sleeve relative to said guiding member, said means including a slot provided in one of said members and a pin connected to the other of said members and positioned within said slot so that it is guided thereby and its movement is limited by the ends of the slot.

7. A device of the character described, including in combination, a frame having a circular dish-shaped closed end with side arms extending upwardly therefrom, a valve seat member having an enlarged opening therethrough secured to the upper ends of said side arms and a valve for said valve seat, a resilient hollow extensile and contractile member mounted upon and secured to the closed end of said frame, a valve stem connected to said valve at one end and connected at its other end to the other end of said resilient extensile member, and means within said resilient extensile member and connected to said valve stem for guiding and limiting the movement of said valve stem.

8. A device of the character described, including in combination, a frame having a circular dish-shaped closed end with side arms extending upwardly therefrom, a valve seat member having an enlarged opening therethrough secured to the upper ends of said side arms and a valve for said valve seat, a resilient hollow extensile and contractile member mounted upon and secured to the closed end of said frame, a valve stem connected to said valve at one end and connected at its other end to the other end of said resilient extensile member, and means within said resilient extensile member and connected to said valve stem for guiding and limiting the movement of said valve stem, said means including an elongated shell secured to the closed end of the frame, a sleeve connected to one end of the valve stem and slidably mounted within the shell, and means on the shell and sleeve cooperating to guide and limit the movement of the sleeve and its attached valve stem with relation to the shell.

9. A device of the character described, including in combination, a frame having a circular dish-shaped end provided with side arms extending upwardly therefrom, a valve seat member having an enlarged opening therethrough secured to the upper ends of said side arms and a valve for said valve seat, a resilient hollow extensile and contractile member having an open end mounted upon and secured to the dish-shaped end of the frame, said dish-shaped end of the frame being formed with a central socket, an elongated guiding shell having a closed end positioned in said socket and extending within said extensile member, a valve stem connected to said valve at one end and a sleeve slidably mounted within said guiding shell and connected to the other end of said valve stem, said valve stem extending into said extensile member and said sleeve serving as means to secure said end of the extensile member to said valve stem.

10. In a device of the character described, including in combination, a frame having a circular dish-shaped end with side arms extending upwardly therefrom, said side arms having arcuate extended portions at their ends and also having an arcuate lug extending upwardly therefrom, said dish-shaped end of the frame also having a socket formed therein, a guiding shell secured in said socket and extending upwardly therefrom, a resilient hollow extensile and contractile member having an open end mounted upon and secured to said dish-shaped end of the frame about said socket, a valve seat member of annular form provided with slots adapted to receive said arcuate lugs and be secured thereby, said valve seat member having an enlarged aperture therethrough with an annular seat projecting therefrom, a disc valve adapted to fit said seat, a valve stem for said valve having an adjustable connection at one

end thereof, said valve stem having a reduced portion at its other end extending within one end of the extensile member, a sleeve having a guided and limited movement with respect to said guiding shell, said sleeve being connected to the reduced end of the valve stem within the hollow extensile member and serving to secure the other end of said extensile member to said valve stem.

11. A device of the character described including, in combination, a frame, a resilient extensile and contractile member secured at its one end to the frame, a valve seat member secured to another part of said frame spaced from said resilient extensile member, a valve for said valve seat, a valve stem for said valve, a sleeve threadedly engaging the valve stem and adapted to clamp the other end of said resilient member to the valve stem, a guiding member for said sleeve, said guiding member and sleeve having means co-operating to guide and limit the movement of the sleeve relative to said guiding member.

12. A device of the character described, including in combination, a frame, a resilient hollow extensile and contractile member secured to said frame, a valve seat member secured to another part of said frame spaced from said resilient extensile member, a valve for said valve seat, a valve stem connected to said valve, said valve stem being connected to one end of said resilient extensile member, a stationary guiding member within said resilient extensile member, a sleeve connected to said valve stem and slidable with relation to said guiding member, said guiding member and sleeve having means co-operating to guide and limit the movement of the sleeve and valve stem with relation to the guiding member, said means including a slot provided in said guiding member and a pin connected to said sleeve and positioned within said slot so that it is guided thereby and its movement is limited by the ends of the slot.

In testimony that I claim the foregoing, I have hereunto set my hand this 21st day of December, 1928.

MARSHALL H. WARD.