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S. MAYNER

2,279,172

CONTROL MECHANISM

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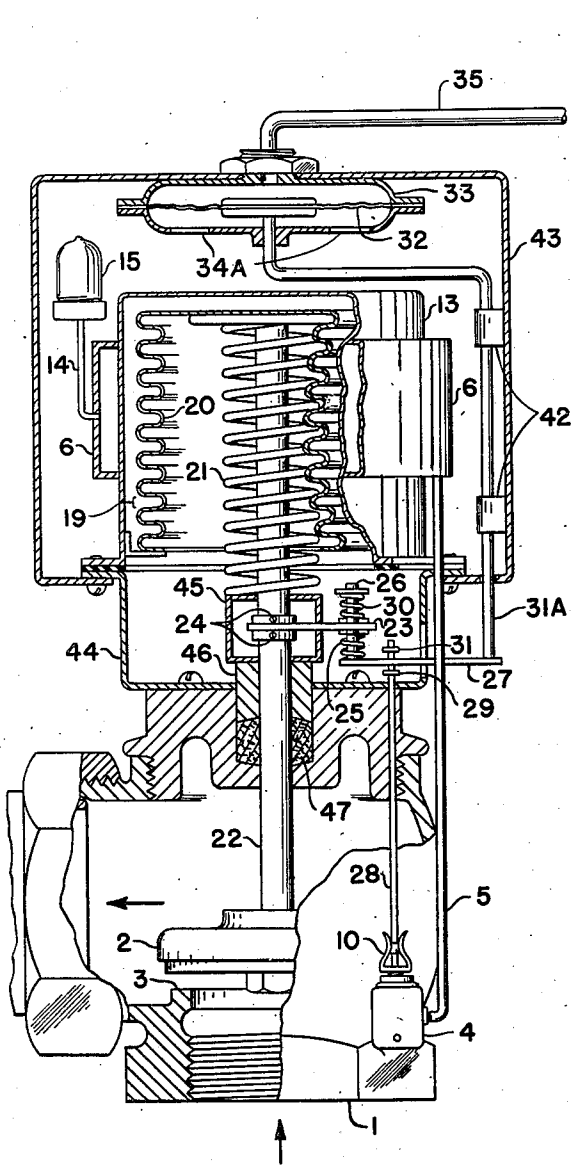


FIG. 1

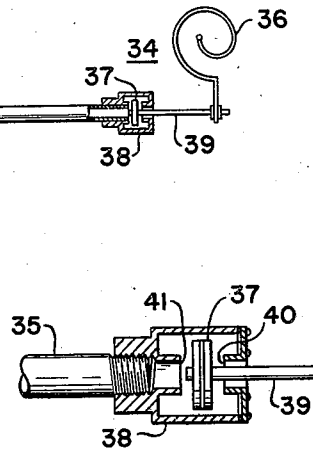


FIG. 2

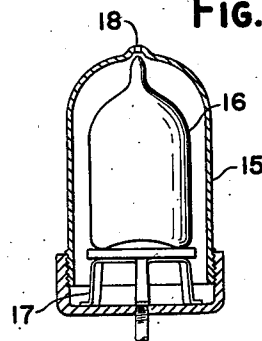


FIG. 4

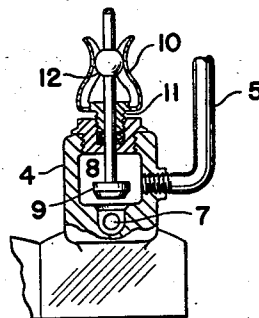


FIG. 3

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CONTROL MECHANISM

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4 Claims. (Cl. 236—68)

This invention relates to temperature regulating and controlling apparatus, more particularly to an apparatus for use in connection with heating plants employing a fluid heating medium. A more specific adaptation of my invention is in controlling the passage of the heating fluid to a radiating device and thus to regulate the temperature of a room, or compartment, to a desired degree.

It is an object of my invention to provide an improved and simplified automatic temperature regulating device.

It is another object of my invention to provide a device that is sensitive to temperature and thereby control the degree thereof by governing the admission of a heating fluid to a radiator or similar device.

It is a further object to provide means that utilize the heat furnished by the heating fluid to control the position of a heating fluid admission valve.

It is still a further object to provide a temperature control apparatus that is readily applicable to various forms of heating systems.

These and further objects will be apparent from the drawing and description thereof.

Figure 1 represents a partially cut-away cross-section of my invention.

Figure 2 is a cross-section of a part of a wall thermostat.

Figures 3 and 4 are admission and exhaust valves respectively.

Referring to Figure 1, I show therein a valve that is adapted to be connected to a source of heating fluid, as steam, or hot water or heated gases, and that has an outlet source that may lead to a radiator or similar device. Heating fluid will enter the valve casing 1 through its base as indicated, pass through the opening between the valve 2 and its seat 3 and out into a radiator or similar device (not shown). Upon entering the valve casing some of the heating fluid will be diverted through a smaller attached by-pass valve 4, the valve therein being open, will continue through pipe 5 into a circular annular chamber 6.

The valve construction in by-pass 4 is more particularly shown in Figure 3. Heating fluid comes from within the main valve casing 1 into the by-pass valve chamber 8 through an opening 7, the valve 9 being open, thence upward through pipe 5 into chamber 6. I utilize concave compression spring leaves 10 attached to the gland nut 11 to hold the valve 9 either in an open or closed position by holding land 12 above

or below the spring bearing surfaces. The pressure of the heating fluid, as in a house steam heating system, being usually very low seldom exceeding three pounds, I find that such spring leaves 10 are sufficient in keeping valve 9 in a tightly closed position when so dictated.

The heating fluid entering the annular chamber 6, surrounding a bellows container 13, will force out air therefrom taken in during cooling, through pipe 14 and exhaust valve 15. The air exhausted, the heating fluid will cause a closure of the opening of the exhaust valve and thus prevent any further escape of the heating fluid. The exhaust valve is shown more particularly in Figure 4. It is a standard type of a radiator exhaust valve having a bottle-like container 16 having an inwardly indented base filled with a volatile fluid and resting on a spider 17. Heat surrounding the container 16 will cause the inside fluid to expand forcing out the base thus causing the closure of opening 18. With exhaust valve 15 closed the heating fluid will fill chamber 6 and in turn heat the volatile fluid contained in chamber 19, the chamber being formed by an outer fixed wall 13 and bellows 20. The expansion of this fluid will force the bellows 20 downwardly compressing spring 21 and shutting valve 2, thus preventing the admission of any more heating fluid to a radiator.

As the valve stem 22 is forced downwardly it also carries with it a member 23, fastened to it by means of set-screws 24. Member 23, through compression springs 25, 30 around pin 26, effects movement of associated member 27, to which 26 is rigidly fixed. Thus when arm 23 is caused to move downwardly it will force through spring 25 member 27 in the same direction and cause by-pass valve stem 28 to move downwardly by bearing against pin 29. Should the motion of valve stem 22 be upward then arm 23 would bear against compression spring 30 lifting member 27 and by-pass valve stem 28 by means of pin 31, the valve stem 28 moving through the member 27. The action of the by-pass valve is a snap action, the spring 10 either holding it down securely or leaving the valve open.

The compression springs 25 and 30 are so arranged on pin 26 that merely one is compressed and in the direction of movement or further expansion. This arrangement avoids the use of any additional force but the movement of the valve stem in opening or shutting of valve 4.

To member 27, at one end, and rigidly fixed thereto is rod 31A joining said member to diaphragm 32. Rod 31A moves through guides 42

attached to frame 43 which in turn is fastened to frame 44 that is rigidly fixed to the valve casing 1. The diaphragm 32 is contained in a casing 33 having openings 34A to the atmosphere. The diaphragm serves to arrest the motion of rod 31A actuated by valve 2, the valve motion being absorbed by springs 25 or 30. The diaphragm position is in turn controlled by the thermostatic device 34, sensitive to temperature at some distant point as will be hereinafter explained. Thermostatic device 34 may be located wherever it is desired to control temperature and joins with the diaphragm chamber 33 by means of capillary 35. The size of the capillary may be varied as well as of the thermostatic device 34 to get whatever sensitivity of the system desired.

Without the diaphragm and device 34 control valve 2 and by-pass valve 9 would go into a fluttering cycle; for, a portion of the heating fluid flowing through valve casing 1 is diverted through the by-pass valve 9 into the heating chamber 6 at all times that the by-pass valve is open. Upon a heating of the expansible fluid in chamber 19 valve 2 would be forced closed and it would carry with it by-pass valve 9, then with the heating fluid shut off chamber 19 would cool allowing spring 21 to open valve 2 and with it valve 9. Thus without a control of the by-pass valve the repeated opening and closing would go on as long as heating fluid would be passing through the valve casing.

The thermostatic control as shown in Fig. 2 and remotely located of valve 2, controls the positioning of, or the holding of the by-pass valve in a desired open or closed position in accordance to the temperature controlled. The diaphragm chamber 33 is joined with the thermostatic control device 34 by means of a capillary 35. The device 34 consists of a cylindrical chamber 38 having inwardly projecting oppositely facing valve seats 40 and 41. The chamber is threaded onto the capillary at one end and is open to the atmosphere at the other. Positioned between the two seats 40, 41 is floating valve 37 adapted to fit against either seat very closely and preventing any exhausting of or taking in of atmosphere when seated against a proper seat. The position of the floating valve is in turn governed by a temperature sensitive element 36, diagrammatically shown, and to which is attached a connecting rod 39 having thereon valve 37. Thus valve 37 is responsive to the temperature it is designed to control.

I have herein stated that valve 37 when seated against a particular seat prevents either the intake of air or its exhaust from the capillary 35 and diaphragm chamber 33. For example, when the diaphragm chamber is filled with atmosphere and floating valve 37 is positioned against seat 40 then any upward motion of valve 2 will not carry with it rod 31A and diaphragm 32 for the entrapped air in the diaphragm chamber 33 and capillary 35 prevents such upward motion of the diaphragm, and the valve 2 motion is taken up by compressing spring 30, the by-pass valve 9 as a result, remains in its original position. Now, should the floating valve 37 be at the same seat 40 and diaphragm 32 in a raised position then a downward motion of valve 2 will carry with it rod 31A and force by-pass valve closed, by carrying with it the diaphragm 32. This is possible for nothing obstructs the downward motion of the diaphragm as the temperature sensitive element 36 is resilient enough to

permit air to be sucked in. Thus in the position of the floating valve just described air can be taken in but not let out, but with the valve against seat 41 the reverse is true, air may be forced out but not let in.

The operation of my control mechanism is as follows: Suppose the controlled temperature becomes below that desired and until then valve 2 was closed. The by-pass valve, until that moment, was held open supplying heating fluid to heating chamber 6 keeping valve 2 closed, the diaphragm 32 was upwardly held, spring 25 was compressed, and floating valve 37 was against seat 41. The cooling of the controlled point then causes sensitive element 36 to contract and to place the floating valve 37 against seat 40 of chamber 38, permitting spring 25 to expand, snapping by-pass valve 9 into a closed position. As stated in the description of Fig. 2 it is possible to pull down the diaphragm for as it descends it sucks in atmosphere, the resilient element 36 permitting a sufficient displacement of valve 37, allowing the filling of the entire system with air. Since no heating fluid is now permitted to chamber 6 the expansible fluid in the expansible chamber 19 contracts permitting the retractive spring 21 to open valve 2 allowing the flow of heating fluid to the controlled point. Meanwhile the position of element 36 will not change if not sufficient heat has been supplied to the point it represents, and floating valve 37 remains on seat 40. As main valve 2 had risen it attempted to carry with it the by-pass valve 9 but was prevented from doing so because such motion was resisted by the air filled system above the diaphragm, the motion being absorbed by compression of spring 30. Heating fluid will then be continuously supplied to the controlled point and none to the chamber 6 where if any were supplied thereto a closing of valve 2 would immediately occur.

When a sufficient quantity of heating fluid had been supplied to the controlled point, element 36 will expand forcing the floating valve 37 away from seat 40 towards seat 41, at once releasing the entrapped atmosphere which is forced out of the system by the expansion of spring 30 about pin 26 moving rod 31A and diaphragm 32 upwardly and snapping by-pass valve 9 open. With valve 9 open heating fluid immediately is bypassed to annular heating chamber 6 causing the expansion of the fluid in expansible chamber 19 and thus closing main valve 2. Then as long as element 36 remains in an expanded state the floating valve 37 will remain against seat 41 and diaphragm 32 cannot move downwardly to thereby close by-pass valve 9. And as main valve 2 being closed due to the expansion of the fluid in chamber 19 by-pass valve 9 will remain open due to the vacuum created in the system above the diaphragm upon exhaustion of the atmosphere therefrom. As long, then, as this condition exists heating fluid will be supplied chamber 6 and valve 2 thus kept closed. If, however, this condition should change due to a cooling off of the controlled point, element 36 will draw the floating valve away from seat 41 permitting atmosphere to enter into the system and allow, through the expansion of compressed spring 25, to shut the by-pass valve, thereby cooling chambers 6, 19 and opening main valve 2.

The device of Fig. 2 can be made as sensitive as desired, the sensitivity being dependent upon its relative size. I have found that the smaller the device the greater its sensitivity. The mo-

tion of the floating valve is usually slight for the distance between the valve seats is very small. This distance essentially determines the degree of control desired, that is, the shorter this distance the less movement of the valve is necessary and therefore less change in the temperature sensitive element.

In my construction of Figure 1, I have avoided the use of a threaded gland nut, although I could have used it, to retain the packing 47 about the valve stem 22. Instead I prefer a construction as shown, a gland washer 46 being forced down against the packing material 47 and it in turn being compressed by an enclosed hollow cylinder 45 surrounding the valve and upon which rests the compression spring 21. The pressure exerted by the spring 21 in its normal position is sufficient to tightly compress the packing about stem 22 and thus avoids periodic adjustments.

In the illustration I have shown a thermostatic temperature control apparatus but it is evident from the disclosure that I am not limited thereto, as an additional example, I may employ the actuating power of the bellows to position a regulating element as a damper, or I may use my device as a compressing means where great pressure may be desired. It is further apparent that my invention is capable of other uses and advantages not herein described; hence it will be appreciated that the disclosed embodiment is illustrative only.

I claim:

1. Temperature control mechanism of the character described comprising in combination, an expansible fluid operated regulating and controlling valve of a heating fluid supply, a heating chamber for the expansible fluid, a by-pass conduit for by-passing a portion of the heating fluid to said heating chamber, a by-pass valve in said by-pass conduit and adapted to be actuated by said regulating and controlling valve, a thermostatic controlling means sensitive to variations in temperature and including a conduit system having a flexible walled chamber at one end and a two-way control valve at the other open to atmosphere, means connecting the flexible wall of said flexible walled chamber to the by-pass valve in the by-pass conduit whereby said flexible wall is actuated when said by-pass valve is moved, and said thermostatic controlling means adapted to control the position of said flexible wall and said by-pass valve.

2. Temperature control mechanism of the character described comprising in combination, an expansible fluid operated regulating and controlling valve of a heating fluid supply, a heating chamber for said expansible fluid, a by-pass conduit for by-passing a portion of the heating fluid to said heating chamber, a by-pass valve in said by-pass conduit and actuated by said regulating and controlling valve, a temperature sensitive element responsive to variations in tem-

perature, a conduit system having a two seat valve open to the atmosphere at one end and a flexible walled chamber at the other, a floating valve positioned between the seats of said two seat valve and attached to said temperature sensitive element, means interconnecting said flexible wall with said by-pass valve, said means adapted through the actuation of said by-pass valve by the regulating and controlling valve to deflect said flexible wall thereby taking in or exhausting atmosphere from said conduit system, and said temperature sensitive element determining the presence or absence of atmosphere in the conduit system and thereby the position of the flexible wall and by-pass valve.

3. A temperature control system comprising in combination, an expansible fluid operated controlling and regulating valve of a heating fluid supply for controlling and regulating the temperature of an enclosed compartment, a heating chamber for said expansible fluid, a by-pass conduit by-passing a portion of the heating fluid to said heating chamber, a valve in said by-pass conduit and adapted to be actuated by said controlling and regulating valve, thermostatic means sensitive to variations in temperature of the controlled compartment and including a conduit system open to atmosphere at one end through a two-way control valve and having a flexible walled chamber at the other end, means connecting the flexible wall of said chamber to said by-pass valve, and said flexible wall adapted to restrain the movement of the by-pass valve in a sense determined by the position of the two-way control valve and regulating the flow of heating fluid through the by-pass to the heating chamber.

4. In a temperature control system including an expansible fluid operated controlling and regulating valve of a heating fluid supply having a heating chamber for the expansible fluid and actuating a by-pass valve in a by-pass conduit regulating the supply of said heating fluid to the heating chamber, and a thermostatic controlling means controlling said by-pass valve comprising, a temperature sensitive element, a two-way control valve open to atmosphere positioned by said temperature sensitive element, a conduit system having a flexible walled chamber at one end and the two-way control valve at the other, said conduit system admitting or exhausting atmosphere through the two-way valve when the flexible wall of the chamber is actuated, means inter-connecting the flexible wall to the by-pass valve and to the expansible fluid operated controlling and regulating valve, and said thermostatic controlling means desirably regulating the actuation of the by-pass valve and the flow of heating fluid to the heating chamber.

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