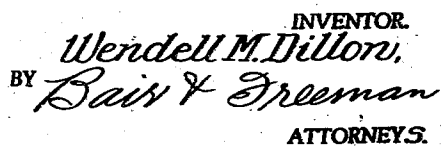


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THERMOSTATIC CONTROL VALVE

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THERMOSTATIC CONTROL VALVE

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4 Claims. (Cl. 236-12)

My invention relates to a device for use in a water system of the recirculating type and particularly a recirculating control valve for governing the temperature in the recirculating portion of the system.

This application is a division of my co-pending application, Serial No. 243,965, filed December 5, 1938, now Patent No. 2,245,967, dated June 17, 1941.

Among the objects of my invention is the provision of a new and improved circulation control valve device which is simple in its construction and efficient in its operation.

Another object is the provision of a new and improved circulation control device for maintaining a predetermined temperature condition in a recirculating water system during periods of no draft when no water is being drawn from the system.

Another object is the provision of a new and improved circulation control valve device which is so constructed that it can completely shut off one opening thereto while still maintaining an open passage through it to allow free circulation of liquid at another temperature.

A further object is the provision of a new and improved control valve provided with a plurality of outlets, one of which is adapted to be closed by a resiliently mounted valve subject to be opened by pressure exerted upon one side of the valve during periods of draft and to be opened or closed during periods of no draft by means of a thermal element. Included among the objects also is the provision of an adjusting means whereby the thermal element may be caused to actuate under different predetermined temperature conditions.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawing, in which:

Figure 1 is a longitudinal sectional view of the circulation control valve device embodying my invention.

Figure 2 is a horizontal sectional view of the control valve device taken on the line 2-2 of Figure 1.

Figure 3 is a right end elevation of the valve device.

Figure 4 is a left end elevation of the device shown partially in section taken on the line 4-4 of Figure 1.

In hot water systems and particularly hot water supply systems for domestic use wherein water is drawn therefrom at intermittent intervals difficulty has been experienced in the past in preserving a proper temperature for the water supply at points immediately adjacent the taps. For example, a system designed for supplying a certain limited number of taps which are being used more or less constantly during the day when water is being continuously drawn from the system will not always operate properly during and directly after late hours of the night when practically no water is drawn off from the system.

In order to avoid difficulties it is frequently the practice to use what may be termed a tempering valve and a recirculating system or loop so that hot and cold water may be mixed in certain proportions to supply water to the service line at a suitable temperature for use and then recirculated back to some source such as a storage tank in order that there may be a continuous passage of water past the service outlets. Such a system, while working properly during periods of use falls to operate during periods of no use. Under such circumstances, which occur chiefly during the late hours of the night and early hours of the morning, tempering valves of the sort commonly used are not designed to completely shut off hot water from the tank and as a result the water in the recirculating system or loop gradually heats up to tank temperature sufficiently so that the first users of the water in the morning are apt to be scalded by the first water drawn off. In such systems which do not even employ a tempering valve these conditions of excessive hot water at the taps in the morning is especially pronounced.

To avoid difficulties of the type referred to, my invention contemplates the provision of a circulation controlling valve device of particular design for application to such a recirculating system or loop and provided with a bypass connection so that in effect there is formed another recirculating loop within the first. It is contemplated, however, that the device will be suitable for use in a variety of ways in addition to the manner herein suggested. In my co-pending application, Serial No. 243,965, filed December 5, 1938, examples of systems utilizing my novel valve structure are shown and described.

As will be observed in Figure 1 water may circulate constantly through the two oppositely disposed openings of the control valve device but can be shut off from the single lateral opening by application of valve moved against it by spring

pressure. By reason of a flexible mounting for the valve if the pressure is reduced in the loop which freely circulates water through the valve device by the opening of a faucet, then the valve may be lifted from the lateral opening due to relative difference in the water pressure behind it, permitting a required flow of water through the valve into the loop.

My invention comprises essentially a circulation control valve device including a valve body indicated generally by the numeral 10 which has formed therein a rather ample space 12 in which there is an inlet opening or port 14 at the bottom, an outlet opening or port 16 at the top and a supply opening or port 18 at one side. On the side of the body opposite from the supply opening there is a large rectangular opening 20 closed by a cap or cover plate 22 which is fastened to the body by means of screws 24 making a fluid tight joint therewith. At the inlet opening 14 there is shown the end 26 of a by-pass line, at the outlet opening 16 is shown the end 28 of a service line and at the opening 18 is shown the end 30 of a tempered or heated water supply line. Recirculating water is designed to pass from the by-pass line 26 through the valve and outward through the service line 28 while tempered or heated water is designed to pass into the valve from the tempered water line 30 mixing within the space 12 with the recirculating water and then pass together with it outward through the service line 28.

The supply opening 18 is provided with a valve seat 32 within the valve body upon which is seated a disc valve 34. The disc valve is held in place by means of a spiral coil of bi-metal 36 which is attached by means of a bolt or rivet 38 to the center of the disc valve 34. At its opposite or inner end the spiral coil of bi-metal is attached to a sleeve 40 which is designed to rotate about a pin 42. This pin in turn is mounted upon a U-shaped bracket 44 which suspends it in place approximately at the center of the upper portion of the space 12. The U-shaped bracket in turn is secured by means of screws 46 to the cap 20 so that upon removal of the cap the entire bimetallic element and disc valve can be extracted from the valve body.

In order to vary the temperature at which the bi-metallic element becomes effective, there is provided an adjusting device comprising a lever 48, one end of which is attached to the sleeve 40, the other end of which is extended adjacent the cap 20. The other end thus extended has a portion 50 bent to an L-shape so as to lie parallel to the cap and in this portion there is provided an aperture 52 which in the embodiment shown is in the form of a slot. Located in the cap 20 adjacent the portion 50 is an adjusting screw 54 which extends through the cap and is provided with a screw driver slot 56 accessible from outside the valve. The inside end of the adjusting screw is provided with a flange 58 bearing against a washer at the inside wall of the cap from which protrudes an eccentric pin 60 which is positioned within the aperture 52 of the lever 48. A lock nut 62 is provided to fix the position of the screw 54.

When operating the adjustment the lock nut 62 is loosened and the adjusting screw 54 rotated in one direction or another, whereupon by means of the eccentric projection 60 the lever 48 is tilted upward or downward, thereby decreasing or increasing tension on the bimetallic coil as the case may be. This change in tension correspond-

ingly changes the temperature at which the coil will permit opening and closing of the disc valve 34.

While water is being drawn more or less frequently from the service outlets, there is no appreciable passage of water through the bypass line 26. When, however, under conditions which occur late in the night or early in the morning when the service outlets are not being used, a substantially static condition is set up in the circulating system and in the circulating loop comprising the pipes 26 and 28.

As heat is lost, however, by the water in the recirculating loop, lowering its temperature somewhat, the water in contact with the bimetallic element 36 will become cooler, causing the bimetallic element to contract slightly opening the disc valve 34 a small amount sufficient to admit a quantity of hot or tempered water from the tempering valve. As soon as this hot or tempered water has been admitted into the recirculating loop in sufficient quantity to raise the temperature to the set maximum, the bimetallic element will again positively close the disc valve 34 and maintain that temperature. Should it be desired to alter the maximum temperature, this can be done by adjusting the bimetallic element by means of the adjusting screw 54. A system operating in this manner causes spring actuated movement of a valve to shut off position for water from the tempering valve which, by reason of the manner of operation, does not permanently shut off the passage of hot water from the tank to the service line. Except for the control valve device, scalding tank water in periods of no draft would eventually creep back of the tempering valve and through the service line to the service outlets, setting up an undesirable condition which the control valve system avoids. The control valve in effect acts as a heat regulator during periods of no draft in that by permitting hotter water to enter the recirculating loop the temperature of the water therein is raised by heat supplied to it from the hotter water.

There has thus been described a circulation control valve device of a distinctly novel structure which is capable of maintaining circulation of water therethrough while at the same time selectively admitting or denying passage thereof into of water of another temperature adapted to modify the temperature of the water normally circulating therethrough. Such a device, as has been described, is suitable for a variety of uses by means of which it may maintain any selected temperature in a recirculating loop.

It is furthermore to be borne in mind that although the invention has been described primarily in connection with hot water systems, wherein it is desired to maintain a minimum high temperature, the valve may as readily be applied to cold water systems by a suitable reversal of the bimetallic element in order that the temperature in what may be termed a recirculating cold water loop might be prevented from passing above a certain temperature as for example brine pipes which might be used to cool a tank of water or for any generally cooling purpose.

Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim as my invention:

1. A valve device for controlling the convectional circulation of liquid in the absence of any other pressure flow therethrough including a valve body having a chamber therein, a normally closed supply opening, a valve for closing said opening and permanently open inlet and outlet openings having their sole communication with the supply opening within the valve body, a resilient temperature responsive element mounted in the chamber and attached to the valve providing the sole securing means for said valve and resiliently pressing the edges of said valve with a predetermined force toward a position closing the opening and permitting opening thereof by a pressure flow through said opening, said valve in the absence of pressure flow being adjustable to partial open position in response to the effect of temperature of fluid in said valve on said temperature responsive element, and adjusting means on said element having different positions of adjustment for one end of the coil simultaneously affecting both pressure of the valve against the port and the temperature adjustment.

2. A valve device adapted to control the temperature of water circulating convectionally through a system where temperature and pressure differences occur comprising a valve body having a valve chamber therein open on one side, a supply port and a valve normally closing the supply port, a plate closing said chamber opening, an outlet port and an inlet port both continuously open to said system, a bracket secured to the plate within the body, a shiftable pin on the bracket, a spirally wound coil of bimetal in the fluid path between the continuously open ports secured at one end to the pin, said normally closed valve within the body being secured to the other end of the coil and having a position resiliently urged against said supply port in response only to inherent resiliency in said bimetal and adapted to open and close said port in response to pressure thereupon during periods of draft between limits determined by the action of temperature on the coil, said valve being movable during periods of no draft solely in response to action of water of different temperatures upon said bimetal coil and an adjusting means to simultaneously shift the temperature and resilient setting of the coil accessible from outside the valve body, said plate having said bracket and accompanying bimetal coil, said valve and said adjusting means attached thereto as a unit for insertion into and removal from the valve body.

3. A valve adapted to control the temperature of water circulating through a system where temperature differences occur comprising a valve

body having a chamber, a supply port communicating therewith, a constantly open outlet port and a constantly open inlet port integral with said body communicating with the supply port, said body having a side opening opposite the supply port to give access thereto and a cover plate detachably secured thereover normally sealing said opening, a bracket having an extension and means for detachably securing one end of the bracket to the inside of said plate, and a resilient coil of thermal responsive metal having one end pivotally secured to the extension and a valve at the other end adapted to close one of said ports in response to pressure exerted by the coil, a lever having one end attached to the pivoted end of the coil and another end extending to a position adjacent to the cover plate having a slot therein, an aperture in the cover plate and an adjusting element extending through and sealed within the aperture, said element having means at the end outside of said plate for manual adjustment and having sealed within said chamber at the inside end an eccentric projection positioned within said slot and having contact with the sides of the slot for changing the lever position and the tension on said coil in response to manual adjustment of said element outside the valve.

4. A valve adapted to control the temperature of water circulating through a system where temperature differences occur comprising a valve body having a chamber therein and a supply port, a constantly open outlet port and a constantly open inlet port, said body having a side opening and a cover plate detachably secured thereover sealing said opening, a bracket having a pair of arms and means for detachably securing one end of the bracket to the inside of said plate, a pin pivoted on said arms, a sleeve pivoted about the pin and a resilient coil of thermal responsive metal having one end secured to the sleeve and a valve at the other end adapted to close one of said ports in response to pressure exerted by the coil, a lever having one end attached to the sleeve and another end extending to a position adjacent and parallel to the cover plate having a slot therein, said cover plate having an aperture therethrough and an adjusting screw extending through the cover and sealed within the aperture having a screw driver slot and locking device at the outside end and at the inside end an eccentric projection positioned within said slot and having contact alternatively with the sides of the slot for changing the lever position and the tension on said coil in response to rotation of the adjusting screw by application of force outside the cover plate.

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