

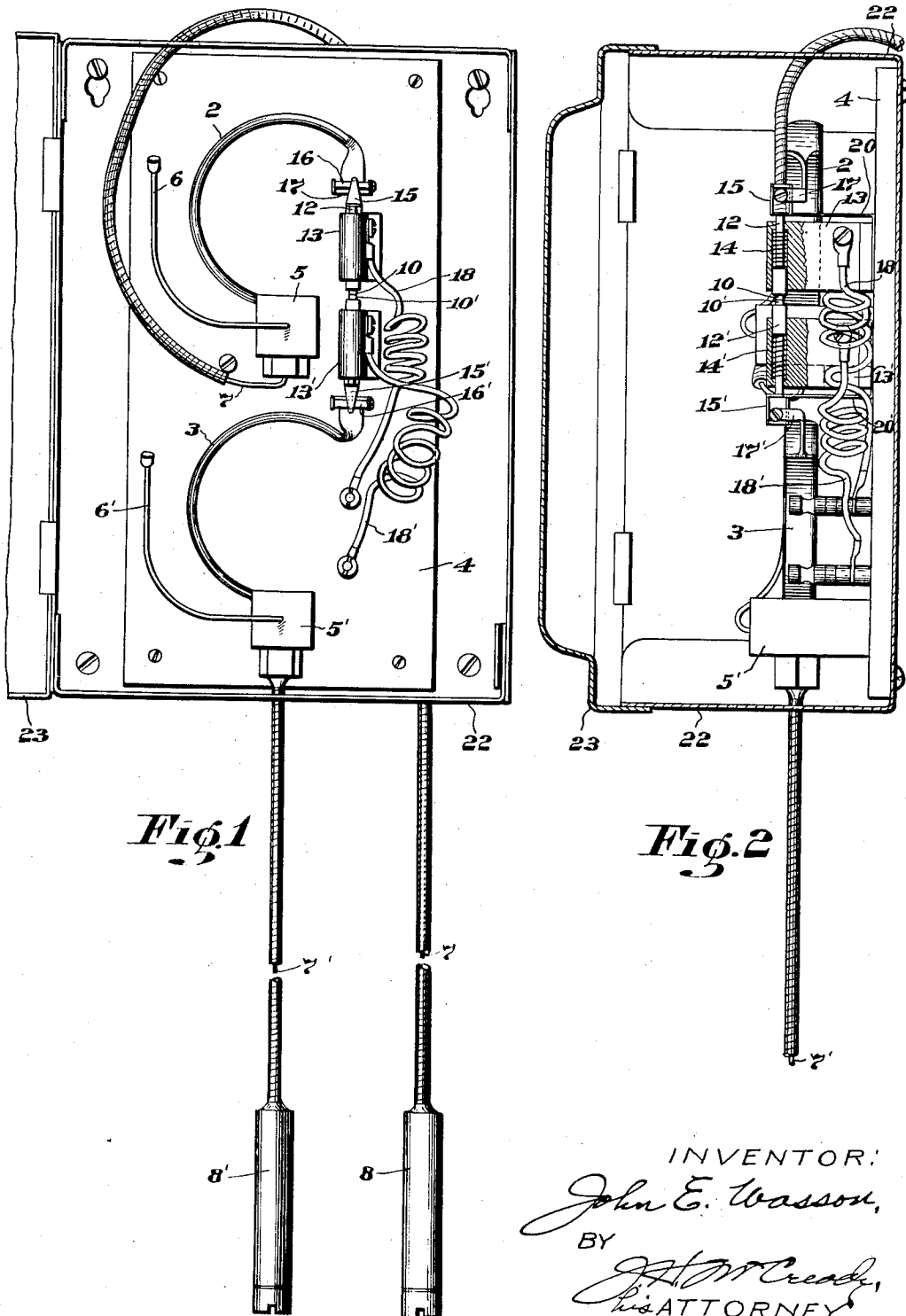
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J. E. WASSON

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THERMOSTATIC CONTROLLING APPARATUS

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INVENTOR:
John E. Wasson,
BY
J. H. McCreedy,
his ATTORNEY.

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THERMOSTATIC CONTROLLING
APPARATUS

John E. Wasson, Boston, Mass., assignor to Emerson Apparatus Company, Melrose, Mass., a corporation of Rhode Island

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It is sometimes desirable to control the operation of heating, ventilating, or other equipment, not directly in response to predetermined changes in temperature, as in the usual thermostatically controlled apparatus, but in accordance with, or in response to, certain differences in temperature existing at different locations. In some cases such a control is useful in conjunction with the more common types of temperature controls. To devise an instrument which will satisfy these requirements constitutes the chief object of this invention.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawing, and the novel features will be particularly pointed out in the appended claims.

In the drawing,

Figure 1 is a front elevation, with parts broken away, of an instrument embodying the invention; and

Fig. 2 is a vertical, sectional view, partly in elevation, of the apparatus shown in Fig. 1.

The instrument illustrated in the drawing comprises two thermostats indicated, respectively, at 2 and 3, each being substantially a duplicate of the other. Both are mounted in fixed positions on a base 4 of some suitable electrical insulating material, such as hard rubber, slate, or the like. In the particular form shown, the upper thermostat 2 consists of a Bourdon tube secured to a hollow base block 5 from which lead two capillary tubes, indicated at 6 and 7, respectively, the former being used simply for filling purposes, and the latter being an armored tube running to a bulb 8. The elements 2, 5, 6, 7 and 8 are all in direct communication with each other, and are all filled with some suitable thermo-responsive fluid, the nature of which necessarily will depend upon the requirements of different uses to which the instrument will be put. For many purposes a light mineral oil is a satisfactory fluid medium. As is well understood by those skilled in this art, the Bourdon tube of a thermostat of this type has considerable inherent resiliency, and when the temperature of the liquid medium with which it is filled rises, the pressure so created expands the tube, while a drop in temperature of said medium permits the tube to contract. Since the volume of the liquid in the bulb 8 is several times the total of that contained in the parts 2, 5, 6 and 7, the position taken by the free end of the Bourdon tube will be controlled almost entirely by the temperature of the liquid in said bulb.

The movement of the free end of the tube 2 is utilized to control the position of an electric contact 10 which is soldered to the lower end of a plunger 12, mounted to slide in the vertical bore of a stationary block 13 that is secured rigidly to

the base 4. A coiled spring 14 encircles a reduced portion of said plunger and urges this plunger downwardly. Rigidly secured to the upper end of the plunger is a yoke 15, the cross bar of which rides on a rod 16 which is mounted on, and supported by, the forked end piece 17 of the tube 2, the bar 16 being made of glass, porcelain, or some other anti-friction material. This arrangement enables the Bourdon tube to raise the plunger and the spring to lower it with relatively little resistance due to the differences in the directions of travel of the plunger and the end 17.

Attached to the block 13 is a wire or electric conductor 18. Also, in order to improve the conduction between the contact 10 and the block 13, a flexible metal strip 20, Fig. 2, is soldered at one end to the upper end of the plunger 12, extends at right angles to the plunger to a point close to the base 4, and then is bent to project under the base where it is clamped by the screws that secure the block to the base.

As above stated, the other thermostat 3 is substantially identical with that just described, and the corresponding parts are designated by the same, but primed, numerals. The two blocks 13 and 13' are so located that the plungers 10 and 10' are held in line with each other, but the plunger 12' is reversed with reference to the plunger 12. In other words, the lower plunger is normally pressed upward by the spring 14', and its contact 10' is located on the upper end of it instead of on the lower end, as in the construction above described.

Preferably the two thermostats are filled under identical temperature and pressure conditions, and they are so adjusted that when the two thermostats and their bulbs are at the same temperature, the contacts 10 and 10', will barely touch each other. Consequently, at this time the circuit in which these contacts and the conductors 18 and 18' are connected will be closed. If the temperatures of both thermostats should rise simultaneously and to the same extent, both contacts would rise simultaneously but they would still hold the circuit closed. On the other hand, if the temperatures of the thermostats should drop to the same degree and at the same rate, both contacts would fall at substantially the same rate and to the same extent, but they would still remain closed. In other words, the two contacts follow each other upon either a rise in temperatures of both instruments, or a drop in their temperatures, but they may be separated by the differential expansion and contraction of the two thermostatic units. So long as the temperature of the upper thermostat remains equal to, or below that of, the lower unit, the circuit will be kept closed, but when the temperature of the upper thermostat rises above that of the lower

thermostat, then the circuit will open and it will remain open so long as this condition obtains.

Such an instrument finds an important use in cold storage plants where the temperature inside the plant is normally maintained below that of the outside atmosphere, the inside atmosphere, however, being kept at such a point, say for example, somewhere between 32° and 40° F., that the outside temperature will at times drop below it. When such a drop in atmospheric temperature occurs, it is desirable, as a matter of economy, to shut off the refrigerating apparatus which maintains the inside temperature, and to start up a ventilating fan, open dampers, or to make some other adjustment for the purpose of circulating the outside atmosphere through the plant. The instrument shown can be used to automatically control the fans, dampers, or other apparatus required for this purpose. When used in such a relationship the bulb 8 will be located outside the building, or in some position where it responds to the temperature of the outside atmosphere, while the bulb 8' is placed inside the plant where it remains at substantially the inside temperature. Normally, or during most of the time, the outside temperature is higher than that inside the plant, and consequently, the contacts 10 and 10' are kept separated, and the control circuit remains open. When the outside temperature drops, however, to a point where it substantially equals the inside temperature, then the contacts 10 and 10' are brought together and the circuit which they control is closed, thus bringing into operation the ventilating blowers or other equipment governed by said circuit. This condition will continue until the outside temperature again rises above the inside temperature, at which time the contacts will be automatically opened and the ventilating equipment will be cut out of operation. When the control apparatus is used for this purpose it is designed to supplement the action of the ordinary control system used in such a plant. The instrument is also useful for numerous other purposes.

Usually it is preferable to enclose the operating parts of the apparatus in order to protect them from accidental injury, and for this purpose the base 4, and the parts mounted on it, may be secured in a box or casing 22 equipped with a hinged cover 23.

While I have herein shown and described a typical embodiment of my invention, it will be evident that the invention may be embodied in other forms without departing from the spirit or scope thereof. Also, that the operation of the instrument can be modified substantially by making minor adjustments of the parts. For example, if, instead of having the two contacts 10 and 10' in engagement with each other when the temperatures of both thermostats are the same, the ends of these contacts are filed off so that there is a slight clearance between them, then the circuit controlled by the contacts will remain open so long as the temperature of the upper thermostat remains above, or does not drop more than a specified minimum below, that of the lower thermostat. When, however, the temperature of the lower thermostat rises more than a certain specified maximum above that of the upper thermostat, the circuit will automatically close, this specified maximum being determined by the width of the gap separating the contacts when the temperatures of the two thermostats are equal.

Having thus described my invention, what I desire to claim as new is:

1. In an apparatus of the character described, the combination of two thermostats responsive to temperature changes in widely separated locations, and two contacts connected, respectively, with said thermostats and positioned for engagement with each other under certain temperature conditions, said thermostats being connected with said contacts to move both of them in the same direction and at substantially the same rate upon a rise in temperature at both of said locations and to move both contacts in the opposite direction and at substantially the same rate upon a drop in temperature at said locations.

2. In an apparatus of the character described, the combination of two thermostats responsive to temperature changes in widely separated locations, each of said thermostats being substantially a duplicate of the other, and two contacts connected, respectively, with said thermostats and positioned for engagement with each other under certain minimum temperature differences at said locations, said thermostats being connected with said contacts to move both of them in the same direction and at substantially the same rate upon a rise in temperature at both of said locations and to move both contacts in the opposite direction and at substantially the same rate upon a drop in temperature at said locations.

3. In an apparatus of the character described, the combination of two thermostats responsive to temperature changes in widely separated locations, two electrical contacts connected, respectively, with said thermostats to be moved by them, and means supporting said contacts for sliding movement into and out of engagement with each other, said thermostats being connected with said contacts to move both of them in the same direction upon a rise in temperature at both of said locations and to move both contacts in the opposite direction upon a drop in temperature at said locations.

4. In an apparatus of the character described, the combination of two thermostats responsive to temperature changes in widely separated locations, two electrical contacts connected, respectively, with said thermostats to be moved by them, means supporting said contacts for sliding movement into and out of engagement with each other, and two springs acting yieldingly on the respective contacts to move them toward each other, said thermostats being connected with said contacts to move both of them in the same direction upon a rise in temperature at both of said locations and to move both contacts in the opposite direction upon a drop in temperature at said locations.

5. In an apparatus of the character described, the combination of two thermostats responsive to temperature changes in widely separated locations, and two contacts connected, respectively, with said thermostats and positioned for engagement with each other under certain temperature conditions, said thermostats being connected with said contacts to move both of them in the same direction and at substantially the same rate upon a rise in temperature at both of said locations and to move both contacts in the opposite direction and at substantially the same rate upon a drop in temperature at said locations, and to move the contacts in opposite directions relative to each other, upon creation of a temperature differential between said locations.

JOHN E. WASSON.