

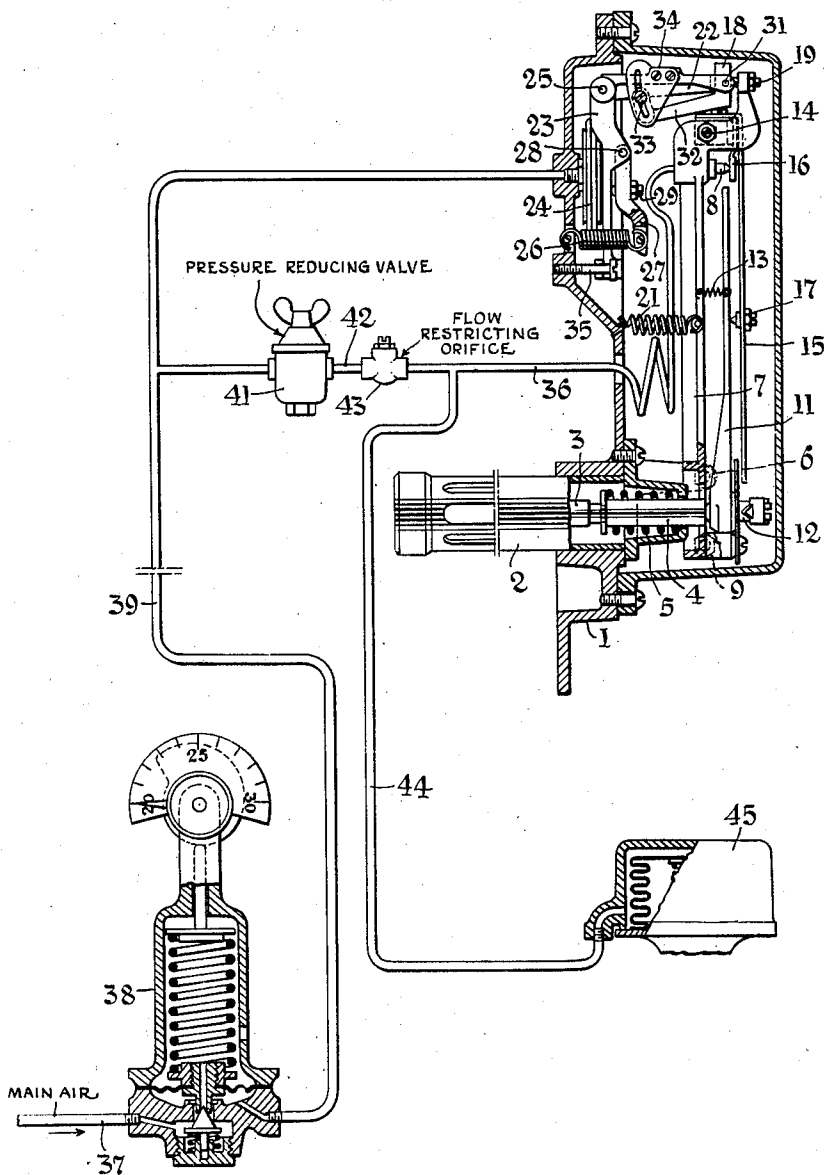
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TEMPERATURE AND HUMIDITY CONTROL

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TEMPERATURE AND HUMIDITY CONTROL

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1 Claim. (Cl. 236—79)

This invention relates to temperature and humidity control devices and particularly to a thermostat, humidostat or the like, of the remote, readjustable type so contrived as to require only one air line from the point of control.

Heretofore, night and day thermostats have been known in which the setting of the instrument was changed from high temperature for day to a low temperature for night, by changing the pressure in the supply line. Where the instrument is of the leak-port type, the change of supply pressure does affect the characteristic of the instrument independently of the adjustment of the thermostatic unit, or the selection between two differently adjusted thermostatic units, both these schemes being known in the prior art. It was, however, possible to make a compensatory adjustment where all the instrument did was to select between two definite control points. When the instrument was of the progressive acting type and the readjustment was progressive, the change in supply pressure became a disturbing factor for which no compensation could be made, because the error introduced by the change in supply pressure was progressive over the entire range of readjustment.

Consequently, in this type of instrument, it has been universal practice, so far as applicant is aware, to use two lines, one of which supplies air at uniform pressure to the instrument, the other line being confined to operation of the readjusting motor and subject to pressure changes which affect the readjustment. In cases where the control line is long, this scheme has undesirable aspects.

The purpose of the present invention is to eliminate the second line and permit changes in supply pressure which operate the readjusting motor and which do not affect the supply to the instrument because of the interposition of a pressure reducing valve between the supply connection and the supply line of the instrument.

To effect this result, satisfactorily, it is necessary to increase the supply pressure so that if the instrument operates at a supply pressure of fifteen (15) pounds, the variations in supply pressure which affect the control are all above fifteen (15) pounds.

A simple embodiment of the invention will now be described in connection with the accompanying drawing which is a diagram of a single instrument arranged for remote readjustment according to the invention.

The casting 1 is the base plate of the instru-

ment. Mounted in and projecting from this base plate is an expansible element 2 of the thermostatic couple. This might be a brass tube closed at its outer end. The rod 3 is a relatively in-
expansible element of the thermostatic couple and enters into thrust relation with the closed end of the tube, 2. It may be of the alloy known by the trade name "Invar." Having a negligible coefficient of thermal expansion, it transmits the changes of length of the tube 2 to the thrust head 4, which is guided in the base 1 and loaded by a coil compression spring 5.

Pivoted at 6 on the base 1 is a lever 7 which carries a leak-port 8. Pivoted on the lever 7 at 9 is a lever 11, against which the thrust head 4 reacts through an adjustable thrust screw 12 which is threaded in the lever 11 and serves as a means for adjusting and zeroing the instrument. A tension spring 13 draws the lever 11 toward the lever 7.

Pivoted on the lever 7 at 14 is a pendant lever 15 which is approximately parallel with the lever 11 and carries a pad 16 designed to throttle the leak-port 8. The lever 13 is weighted to gravitate in a direction to close the leak-port. Motion of the lever 11 is transmitted at varying ratios to the lever 15 by means of a thrust boss 17 which is adjustable in the direction of the length of the lever 15.

The pivot 6 is above the axis of the thrust member 4 so that angular movements of the lever 7 modify the adjustment effected by the screw 12. The position of the lever 7 is determined by cam 18 against which a thrust screw 19 reacts under the stress imposed by a tension spring 21 connected between the base 1 and the lever 7.

The cam 18 is carried on the end of one arm 22 of a bell crank lever, the other arm 23 overlying the adjusting bellows 24 mounted on base 1. The bellows 24 is simply a metallic diaphragm cell. The pivot for the bell crank lever is shown at 25 and the arm 23 directly engages the front of the bellows 24. To provide for adjustable resistance of the bell crank to the force exerted by the bellows, a spring 26 is connected to a secondary lever 27 which is pivoted at 28 on the arm 23 of the bell crank and which is adjustable by means of a thrust screw 29.

An inspection of the figure will show that the face of the cam 18 is slightly oblique to the path of the arm 22 and the degree of obliquity is adjustable. This result is secured by pivoting the cam 18 at 31, and clamping the arm 32 which is integral with the cam 18 in various adjusted

relations by means of the screw 33. The screw works in an arcuate slot formed in a plate 34 rigidly mounted on the arm 22 and engages plate 34. The range of motion afforded to the bell crank lever 22, 23, is determined by an adjustable stop screw 35.

The connection to the leak-port 8 is made by means of a flexible tube 36 which is coiled as indicated to permit motion of the lever 7.

No novelty is here claimed for the remote readjustable thermostat so far described.

A main air line 37 supplies air under a pressure of, say, thirty pounds (which is about twice that customarily used in pneumatic thermostat systems), to the adjustable pressure reducing valve 38 whose construction is clearly shown and for which no novelty is here claimed. This valve is connected to the air supply line 39 which leads to the remote readjustable thermostat already described and communicates freely with bellows 24. The sole function of the valve 38, and this function may be performed by any equivalent mechanism, is to vary progressively, according to the adjustment of the valve 38, the pressure in the line 39 between supply pressure (assumed to be thirty pounds) and some pressure slightly higher than the supply pressure to the remote readjustable thermostat (say twenty pounds).

The remote readjustable thermostat is assumed to be designed for a supply pressure of say fifteen pounds, which is usual in the art. With the assumed values, the tension of the spring 26 would be such that the bell crank 22 and 23 would be moved through its entire range of adjustment in response to a pressure change between twenty and thirty pounds.

A branch of the line 39 leads to a pressure reducing valve 41 and this delivers through the connection 42 to the flow restricting fitting 43 which is the supply connection of the thermostat. The flow restricting fitting 43 is connected to the tube 36, which leads to the leak-port 8 and is also connected to the branch line 44 which leads to the motor 45. The motor 45 is typical of any pressure motor capable of responding to variations of pressure in the line 44.

It will be understood that according to standard practice, the capacity of the fitting 43 is adjusted so that it is slightly less than the venting capacity of the leak-port 8 when fully open.

The reducing valve 41 functions to maintain a supply pressure of fifteen pounds gauge in the line 42 despite the variations of pressure which are produced in the line 39. It should be here stated that the assumed pressures are illustrative and in this instance are arrived at on the basis that the conventional supply pressure to a leak-port thermostat is fifteen pounds, and that the range of adjustment of pressure in the line 39 must be above fifteen pounds and sufficient to ad-

just the bell crank lever 22, 23 by the variations of pressure produced in the bellows 24.

It follows from what has been said above, that with a single line 39, it is possible to readjust the thermostat from a remote point by changing the pressure of air supplied to the thermostat. The only effect of the changed pressure is the changed adjustment of the thermostatic element with reference to the leak-valve. There are no secondary effects such as would be caused by a variation in the pressure of air supply leading to the thermostat. The reducing valve, which responds to pressure on its discharge side, assures a uniform pressure on the air supplied to the thermostat and thus stabilizes its operating characteristics.

The invention is particularly useful in those cases where the supply line 39 is long. It affords progressive readjustment with a single supply line and secures this result without substantial expense because the only additional apparatus required is the pressure reducing valve.

The invention is available wherever it is possible to use a supply pressure substantially above the immediate pressure of supply to the inlet connection of the thermostat.

It will be understood that the drawing is diagrammatic. No relay is shown between the connection 44 and the motor 45, but the use of pneumatic relays in this relation is so well known as to require no description. Such use can not involve patentable novelty and is mentioned here simply to indicate that the invention does not exclude the use of such a relay.

What is claimed is:

The combination of a control device of the pneumatic type having an inlet connection to which pressure fluid must be supplied at a definite pressure to establish precise operating characteristics of the device, said device including a leak-port fed by said inlet connection, a leak-port controlling valve, a responsive element arranged to operate the leak-port controlling valve, and adjusting means for progressively modifying the effect of said element on said valve; fluid pressure motor means connected to actuate said adjusting means and adapted to operate through its entire range in response to changes of fluid pressure through a range above said definite pressure; pressure fluid supplying means adjustable to deliver fluid at various desired pressures within the last-named range to said motor means; and a reducing valve of the type responsive to discharge side pressure, said reducing valve being fed by said supplying means and arranged to feed said inlet connection and maintain thereon said definite pressure irrespective of changes in supply pressure.

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