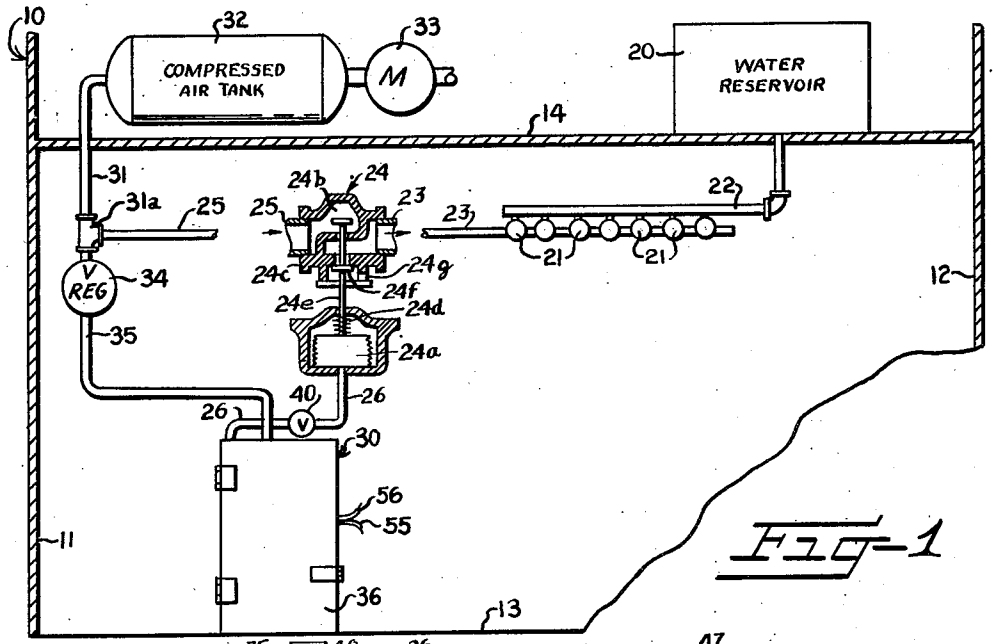
July 8, 1952 G. W. BASINGER 2,602,589

HUMIDITY CONTROLLING SYSTEM

Filed May 31, 1950 2 SHEETS—SHEET 1



Fig—1

Fig—3

Fig—2

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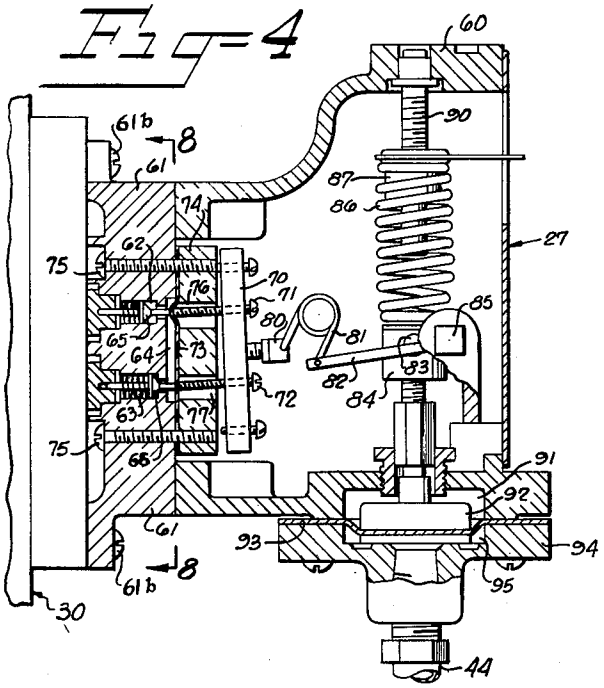
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HUMIDITY CONTROLLING SYSTEM

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Fig-4



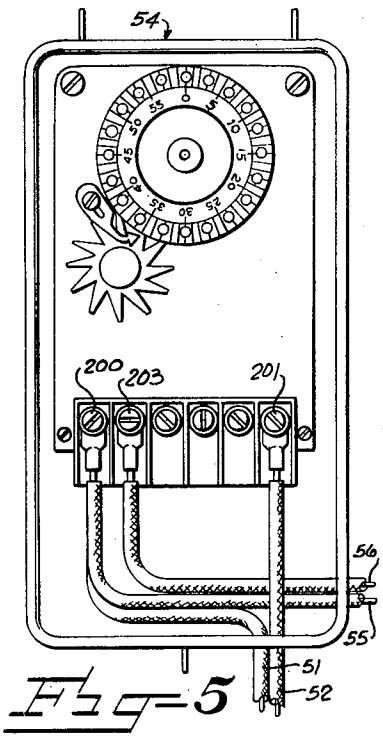


Fig-5

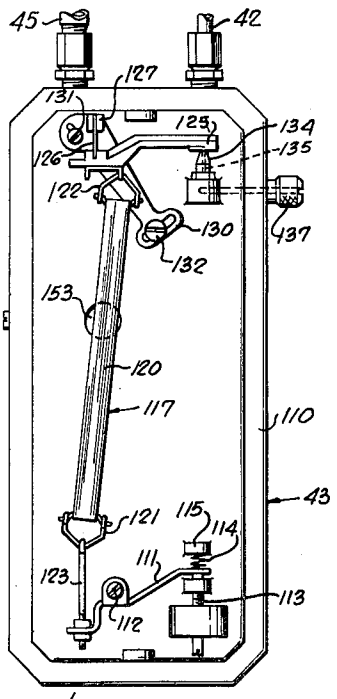


Fig-6

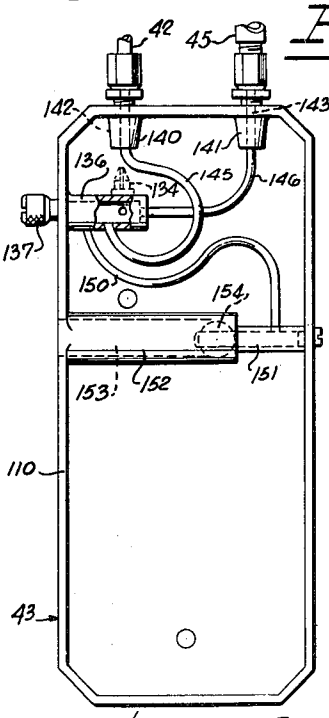


Fig-7

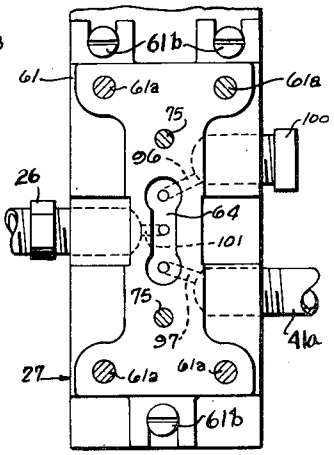


Fig-8

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Patented July 8, 1952 2,602,589

UNITED STATES PATENT OFFICE

2,602,589

HUMIDITY CONTROLLING SYSTEM

George W. Basinger, Charlotte, N. C.

Application May 31, 1950, Serial No. 165,339

1 Claim. (Cl. 236—44)

1

This invention relates to an improved humidity controlling system for regulating the flow of compressed air to the usual atomizers associated with the usual types of humidity controlling systems employed in industrial plants and particularly in plants wherein textile materials are processed.

The primary object of this invention is to provide an improved means for maintaining a uniform percentage of humidity in a given parcel of air without depending solely upon a hygrostat as the medium for controlling the admittance of compressed air to the humidifiers or atomizers.

It is well known, to those familiar with the art, that the usual humidifying systems include a plurality of atomizers or humidifiers to which moisture is admitted and to which compressed air is also admitted to mix with the moisture and this flow of compressed air to the humidifiers is usually controlled by a so-called blow-through or relief valve, the opening and closing of which is controlled by compressed air.

Heretofore, an instrument, usually a hygrostat or a hydrostat, has been employed for effecting the opening and closing of the pneumatic relief valve of the type heretofore described for admitting compressed air to the atomizers. This particular type of instrument includes a hygroscopic element responsive to variations in humidity, and suitable pneumatic connections have been provided for opening and closing the relief valve in response to the hygroscopic element. However, the hygroscopic element has not always responded promptly to the function of the atomizers with the result that there would often be a complete saturation of the atmosphere adjacent the atomizers before the moisture in the atmosphere could affect the hygroscopic element to, in turn, close the relief valve and stop the flow of compressed air to the atomizers.

It is, therefore, an object of this invention to provide an improved means for intermittently opening and closing the relief valve for predetermined relatively short intervals during the period at which the relief valve normally remains open, so the compressed air is intermittently admitted to the atomizers at like intervals, thus permitting the moisture from the atomizers to be more evenly dispersed about the room in which the atomizers are disposed and to produce the desired effect on the hygroscopic element of the hygrostat before the atomizers will have saturated the atmosphere.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

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Figure 1 is a schematic illustration of a typical humidity control system as it might be installed in a building;

Figure 2 is an enlarged view of the pneumatic relife valve or blow-through valve control unit with the cover removed;

Figure 3 is an enlarged elevation of an electric-pneumatic relay with the cover thereof removed, and with parts broken away and in section, this relay also being shown in the right-hand lower portion of Figure 2;

Figure 4 is an enlarged vertical sectional view taken substantially along the line 4—4 in Figure 2 and showing a pneumatic relay removed from the panel shown in Figure 2;

Figure 5 is an elevation of a typical electrically operated timer with the cover thereof removed, this timer also being shown in the upper right-hand portion of Figure 2;

Figure 6 is an enlarged elevation of a hygrostat with the cover thereof removed and which is also shown in the left-hand lower portion of Figure 2;

Figure 7 is a view looking at the opposite side of the hygrostat shown in Figure 6;

Figure 8 is a vertical sectional view taken substantially along the line 8—8 in Figure 4.

Referring more specifically to the drawings, the numeral 10 indicates a portion of a building in which the improved humidity controlling system is adapted to be disposed. The building 10 includes opposed side walls 11 and 12, a first floor 13 and a second floor 14.

The arrangement of the humidity control system other than that employed in controlling the blow-through or pneumatic relief valve to be later described, is shown by way of illustration only since it is evident that there are many different ways in which the humidity control system may be installed. In a humidifying system, a suitable reservoir 20 is usually provided and which is preferably disposed at a higher elevation than a plurality of spaced atomizers or humidifier nozzles 21 so that water will flow from the reservoir 20 through a pipe 22 which communicates with the atomizers 21 to thus direct the water from the reservoir 20 to the atomizers 21 by gravity. A compressed air pipe 23 is also connected to the atomizers 21 and this pipe 23 is connected to one side of a pneumatic pressure relief valve 24, this valve 24 also being known to the art as a blow-through valve. The valve 24 is shown, in Figure 1, as enlarged relative to

the atomizers 21 for purposes of clarity and will be later described in detail.

The pressure relief valve 24 has a pipe 25 connected to the end thereof remote from the end to which the pipe 23 is connected. This valve 24 is of a type such as is controlled for opening and closing by compressed air admitted to the valve 24 by a pipe 26, this pipe 26 being connected, at its end remote from the pressure relief valve 24, to a pneumatic relay broadly designated at 27 and disposed within a housing or on a control panel of a control unit broadly designated at 30. This control unit 30 broadly represents a compressed air control apparatus which is a part of the present invention and will be later described in detail.

The pipe 25 from the pressure relief valve 24 is connected at its end remote from the relief valve 24 by a pipe T 31*a* to a pipe 31. The pipe 31 is connected at its end remote from the pipe T 31*a* to a compressed air tank 32 to which compressed air is admitted by a suitable air compressor represented by a motor 33.

The end of the pipe 31 remote from the compressed air tank 32 is connected to one side of a regulator valve 34 to the other side of which a pipe 35 is connected, this pipe 35 extending from the valve 34 and entering the housing 30 (Figures 1 and 2). It is the usual practice to provide approximately thirty pounds per square inch of compressed air in the pipes 31 and 25 and which will be admitted to the atomizers 21 through the pipe 23 upon the pressure relief valve 24 being opened in a manner to be later described. It is preferable that the flow of compressed air be regulated for controlling the various control elements in the control unit 30 at a substantially lower pressure than that which passes through the pipes 31 and 25. Therefore, the regulator valve 34 is provided and may be a type which will substantially reduce the pounds per square inch of compressed air passing through the pipe 35, this pressure preferably being fifteen pounds per square inch.

It is evident that the control unit 30 need not necessarily be a housing since all of the instruments within the housing may be exposed if so desired. As a matter of fact, in order that the hygrostat 43, to be later described, may respond to the changes in relative atmospheric humidity, it is essential that this hygrostat be disposed so that the atmosphere may circulate through the hygrostat. Although this pneumatic valve control unit 30 is shown as a unit mounted in a housing or on a single control panel, it is to be understod that these parts may be disposed remotely from each other if desired, the showing in Figure 2 being a preferred arrangement of these elements. In Figure 1 the housing of the control unit 30 is shown provided with a hinged cover 36 which is omitted in Figure 2 for purposes of clarity.

The pipe 26, connected to the pneumatic relay 27, preferably has a conventional bleeder valve 40 interposed therein. The side of the pneumatic relay 27 remote from the side to which pipe 26 is connected has a pipe 41*a* suitably connected thereto and this pipe 41*a* is connected to a pipe T 41 which also has the pipe 35 connected to one branch thereof. The branch of the pipe T 41 remote from that to which the pipe 35 is connected has one end of a pipe 42 connected thereto and this pipe 42 is connected at its other end to one side of a hygrostat broadly designated at 43, to the other side of which one end of a pipe 44 is connected through the medium of a pipe T 45. The other end of the pipe 44 is connected to the lower end of the pneumatic relay 27. The pneumatic relay 27 and the hygrostat 43 will be later described in detail.

The pipe T 45 also has one end of a pipe 47 connected thereto, this pipe 47 communicating with an electric-pneumatic relay broadly designated at 50 and which will also be later described in detail.

The electric-pneumatic relay 50 also has a pair of wires 51 and 52 extending therefrom which extend to and are suitably connected to an electric timer broadly designated at 54, this electric timer 54 also having wires 55 and 56 extending therefrom and being connected at their other ends to a suitable source of electrical energy, not shown.

Now, the pneumatic relay 27, the hygrostat 43, the electric-pneumatic relay 50 and the timer 54 are independently conventional elements and there are many different types of elements similar to the elements 27, 43, 50 and 54, which may be employed in lieu of the elements 27, 43, 50 and 54, the particular types of elements shown in the drawings being shown by way of illustration only. The invention resides in the combination of these relays 27 and 50, the hygrostat 43 and the timer 54 which are arranged so as to produce not only a controlled reaction of the pressure relief valve 24 to changes in atmospheric relative humidity, but also to intermittently open and close the pressure relief valve 24 at periods during which the pressure relief valve 24 would normally remain open, as would be the case during periods of relatively low relative humidity of the surrounding atmosphere.

The pneumatic relay 27 may be of a type such as is manufactured by Minneapolis-Honeywell Regulator Company, Minneapolis, Minnesota, shown on a sheet issued by said company and identified as Form 95–1001–A under their type number RO49A2 and which is commonly termed a positive or snap acting diverting relay. Since this pneumatic relay 27 is independently a conventional element, the details of the same shown in Figures 4 and 8 are given merely to illustrate its manner of operation rather than its complete structure and its description is based accordingly. The pneumatic relay 27 may include a cast body member 60 suitably secured, as by screws 61*a* (Figure 8), to a base member 61, this base member 61 being adapted to be secured on the panel of the control unit 30 as by screw 61*b*.

The base member 61 has a common chamber or channel 64 in the right-hand face thereof, in Figure 4, which communicates with the chambers 62 and 63. The chambers 62 and 63 have respective spring loaded valve members 65 and 66 which are normally urged against the restricted outer ends of the chambers 62 and 63. A lever or plate 70 is provided with a pair of adjustment screws 71 and 72 which are alternately moved into engagement with the right-hand ends of the respective spring loaded valve members 65 and 66 through the medium of a flexible gasket 73. This gasket 73 is adapted to close the channel 64 and is held in place by a block 74 secured against the gasket 73 and the base member 61 by screws 75. The block 74 has suitable openings 76 and 77 therethrough which are loosely penetrated by the adjustment screws 71 and 72.

A pivot screw 80, threadably embedded in the plate 70 has one end of a torsion spring 81 pivot-

ally connected thereto, the other end of which is pivotally connected to a lever 82. The lever 82 is oscillatably mounted intermediate its ends, as at 83, on a movable plunger 84. The end of the lever 82 remote from the end which is connected to the torsion spring 81 is pivotally mounted, as at 85 on the body member 60.

It will be noted that this plunger 84 is normally urged downwardly in Figure 4 by a compression spring 86 which bears against a pilot 87 and is adjusted as to compression by an adjustment screw 90 bearing against the upper wall of the body member 60 and threadably embedded in the pilot 87. The body member 60 has a first diaphragm chamber 91 therein in which an enlarged portion 92 of the plunger 84 is disposed, this portion 92 being either an integral part of the plunger 84 or being suitably secured thereto as shown in Figure 4. The plunger 92 has a flexible diaphragm 93 suitably secured thereto and this diaphragm 93 is held against the lower surface of the body member 60 by a suitable flange 94 which has a second diaphragm chamber 95 therein. This flange 94 has the pipe 44 connected thereto and communicating therewith.

Referring to Figure 8, it will be observed that the base member 61 has a pair of passageways 96 and 97 therein which communicate with the respective chambers 62 and 63. The base member 61 has one end of the pipe 41*a* connected thereto and communicating with the passageway 97 and a tubular pipe plug 100 is provided so that one end of the passageway 96 is open to the atmosphere. The base member 61 also has a passageway 101 (Figure 8) therein which communicates with the channel 64 and also communicates with the pipe 40 which is suitably connected to the base 61. This completes the structure of the pneumatic relay 27 and its manner of operation will be later described.

The hygrostat 43 is shown in detail in Figures 6 and 7. This hygrostat 43 may be of a type such as is manufactured by Taylor Instrument Companies, Rochester, New York, and which is shown on their drawings numbered 6547 and 6548 relating to a "Taylor room-type hygrostat and relay."

The particular hygrostat 43 shown in Figures 6 and 7 comprises a hollow base member 110, on the outer face of which an adjustment lever 111 is mounted for oscillation, as at 112, its right-hand portion in Figure 6 being held in adjusted position by an adjustment screw 113 and a compression spring 114 bearing against a projection 115 on the hollow base member 110. The left-hand portion of the adjustment lever 111 has the lower end of a hygroscopic element designated broadly at 117 connected thereto. This hygroscopic element 117 includes a plurality of strands 120 which are responsive to changes in atmospheric relative humidity to move stirrups 121 and 122, to which they are connected, relative to each other.

The lower stirrup 121 is connected by a tie hook 123 to the left-hand portion of the adjustment lever 111. The upper stirrup 122 is pivotally connected intermediate the ends of a baffle member 125 which is supported by a leaf spring member 126, this leaf spring member being projected upwardly and being fixed, as by a pressed fit, in a projection 127 integral with a baffle adjustment lever 130, adjustably secured on the outer face of the base member 110, by any suitable means such as screws 131 and 132, this baffle adjustment lever being adjustable so as to increase or decrease the torsional pressure exerted on the baffle 125 by the leaf spring 126 and normally urging the baffle 125 out of engagement with a bleed-off nozzle 134 which also projects from the front or outer face of the hollow base member 110.

The bleed-off nozzle 134 has a passageway 135 therein which is adapted to at times to be closed by the baffle 125, this passageway 135 communicating with a hollow projection 136 on the rear surface of the hollow base member 110. A convention restriction pin 137 is provided for adjusting the size of the passageway 135 at its point of communication with the hollow projection 136.

It will be observed in Figure 7 that the hollow base member 110 has a pair of spaced projections 140 and 141 integral therewith which are provided with respective passageways 142 and 143 and to which the respective pipe 42 and pipe T 45 are connected. The ends of the projections 140 and 141 remote from the ends to which the respective pipe 42 and pipe T 45 are connected have respective pipes 145 and 146 connected thereto, the passageways 142 and 143 serving as the means of communication between the pipes 42 and 145 and the pipe T 45 and pipe 146.

It may be observed in Figure 7 that the projection 136 is of substantially less length than the width of the hollow base member 110 and the right-hand end thereof has the end of the pipe 146 remote from the projection 141 connected thereto. The end of the pipe 145 remote from the projection 140 is also connected and communicates with the hollow projection 136. One end of a pipe 150 also communicates with the hollow projection 136 and its other end is connected intermediate the ends of a horizontally disposed substantially tubular aspirator nozzle 151 projecting from the rear surface of the tubular base member 110.

The hollow base member 110 also has a tubular portion 152 projecting therefrom and forming a venturi, this tubular portion 152 being provided with a bore 153 which communicates with the tubular aspirator nozzle 151. The base member 110 has an opening 154 therein which communicates with the bore 153 in the venturi 152.

In operation, compressed air flows continuously from the compressed air tank 32 through the pipe 31, regulator valve 34, pipe 35, pipe T 41 and pipe 42 to the hygrostat 43. The compressed air then flows through the passageway 142 in the projection 140, through the pipe 145, through the hollow projection 136 and through the pipe 150 and finally through the aspirator 151 to be vented through the venturi 152. It is well known, to those familiar with the art, that the movement of compressed air past the opening 154 will cause air to circulate past the medial portion of the strands 120 of the hygroscopic element 117, through the opening 154 to thus assist in circulating the atmosphere, in the room in which the atomizers 21 are disposed, past the hygroscopic element 117.

The pneumatic relief valve 24 may be of conventional or any desired construction and, in this instance, the valve 24 is controlled by air pressure acting on a bellows or diaphragm 24*a* or other pressure-responsive means, movement of the diaphragm 24*a* serving to seat and unseat an air valve member 24*b* in a body housing 24*c*, to opposite sides of which the pipes 23 and 25 are connected and through which the air under pressure is adapted to pass to the atomizers 21

when the air valve member 24b is unseated. The pressure on the diaphragm 24a is counteracted by a spring 24d and said diaphragm is connected with the air valve 24b through a stem or the like 24e. The stem 24e also carries a second valve member 24f adapted to engage the bleed-off port 24g in the housing 24c, the bleed-off port being normally closed when the valve 24b is unseated, and vice versa.

During normal operation, as has heretofore been the case, and assuming the pneumatic relief valve 24 to be open, compressed air will flow from the compressed air tank 32 through the pipes 31, 25 and 23 to the atomizers 21 until the moisture emitted from the atomizers 21 will have produced a desired relative humidity in the surrounding atmosphere and, the moisture in the atmosphere then being such, as it passes the hygroscopic element 117, as to partially relax or increase the length of the strands 120 of the hygroscopic element 117 to where the leaf spring member 126 will cause partial counterclockwise movement of the baffle 125 to thus open the passageway 135 in the nozzle 134. Since the passageway 135 in the nozzle 134 communicates with the hollow projection 136 (Figure 7), compressed air entering the hollow projection 136 from the pipe 42, through the passageway 142 and pipe 145, will be partially exhausted through the passageway 135 of the nozzle 134. This will bleed the pipe 146 and its associated pipe 44 with the result that the parts of the pneumatic valve 27 will assume substantially the position shown in Figure 4.

With the parts of the pneumatic relay 27 in the position shown in Figure 4, the spring loaded valve member 66 will be in closed position and the spring loaded valve member 65 will be in opened position, with the result that the compressed air from the pipe 41a will be unable to enter the passageway 97 (Figure 8) and, therefore, will fail to admit compressed air to the pipe 26 (Figure 2). As is well known, this will cause the pneumatic relief valve 24 to close, since the air in pipe 26 will escape through passageway 101, channel 64, passageway 96 and tubular plug 100, to the atmosphere, in the course of which the spring 24d will seat the valve member 24b. This prevents compressed air from flowing from the pipe 25 to the pipe 23 and the associated atomizers 21. The downward movement of the valve stem 24e also moves the valve disc 24f off its seat and the air pressure still on the atomizers side of valve housing 24c is bled off through the now open bleed-off port 24g.

On the other hand, upon the relative humidity of the atmosphere decreasing below a predetermined point, the hygroscopic element 117 will decrease in length thus moving the baffle 125 against the nozzle 134 to close its passageway 135 and to prevent the nozzle 134 from bleeding the compressed air from the pipe 145. The compressed air from the pipe 145 will then flow through the pipe 146, passageway 143 in the projection 141, pipe T 45 and pipe 44 to enter the lower chamber 95 of the pneumatic relay 27 in Figure 4. This will cause the medial portion of the diaphragm 93 to move upwardly to, in turn, cause the plunger 84 to move upwardly against the compression spring 86. This will partially rotate the lever 82, in a clockwise direction in Figure 4, and will cause the plate 70 to reverse its position from that shown in Figure 4 to where the adjustment screw 72 will move the spring loaded valve member 66 to opened position and will permit the spring loaded valve member 65 to move to closed position.

Compressed air will then flow from the pipe 41a (Figure 8) through the passageway 97, through the channel 64 and thus through the passageway 101 to the pipe 26, to move stem 24e and valve members 24b, 24g upwardly thereby unseating valve member 24b, thus opening the pneumatic relief valve 24. This will permit compressed air to flow from the pipe 25 through the pipe 23 to the atomizers 21 in the manner heretofore described.

The arrangement of the hygrostat 43 and the pneumatic relay 27 and its operation as heretofore described is conventional and does not constitute a part of the present invention. However it is with these or similar parts arranged in the manner described that the arrangement constituting the present invention is adapted to be associated.

Heretofore, the pipe 44 has been connected directly to the hygrostat 43 and the pipe T 45 is provided as a means of connecting the pipe 47 (Figure 2) in communicating relation to the pipe 44.

There are many types of electric-pneumatic relays which may be employed in lieu of the relay 50, shown in Figures 2 and 3, the relay 50 being shown by way of illustration only. This relay 50 may be of a type such as in manufactured by Minneapolis - Honeywell Regulator Company under their type number RO400A and which is commonly termed an electrically operated pneumatic diverting relay. Since the electric-pneumatic relay 50 is also independently a conventional element, the details of this electric-pneumatic relay 50 shown in Figure 3 are given merely to illustrate its manner of operation rather than its complete structure and its description is based accordingly. This electric-pneumatic relay as described is illustrated and described on a sheet issued by said company and identified as form Number 59–1378.

The electric pneumatic relay 50 is shown, in the lower right-hand portion of Figure 2, with a cover 160 mounted thereon, this cover 160 being removed in Figure 3 to expose an irregularly-shaped base member 161 which suitably supports a cast member 162. A block 163, suitably secured to the cast member 162, has an armature 164 pivotally mounted thereon, as at 165. The armature 164 is adapted to be partially rotated in a counterclockwise direction, in Figure 3, upon a soft iron core 167 being energized through the medium of a magnetic coil 170 having wires 171 and 172 extending therefrom to respective terminals 173 and 174 to which the respective wires 51 and 52 heretofore described are connected. Upon movement being imparted to the armature 164, in a manner to be later described, a relay lever 176, secured to the upper portion of the armature 164, as by a screw 177, is caused to partially rotate in a like direction to that of the armature 164.

A valve lever 180, pivoted as at 181 on the cast member 162, has an outwardly projecting leaf portion or ear 182 integral therewith which is adapted to be engaged by an adjustment screw 183 threadably penetrating the relay lever 176. A tension spring 184 normally urges the relay lever 176 and the armature 164 in a clockwise direction and, in so doing, permits a spring loaded valve member 185 to assume a closed position as shown in Figure 3. The cast member 162 has a chamber 186 therein in which the spring

loaded valve member 185 is mounted for vertical sliding movement and the lower end of the chamber 186 is restricted so downward movement of the spring loaded valve member 185 will close the chamber 186. A passageway 186a in the casting 162 provides communication between the pipe 47 and chamber 186.

The cast member 162 has an open-ended channel 190 therein, the bottom of which is closed by a flexible member or gasket 191 held in place by an L-shaped strap iron member 192 secured, as by screws 193, to the cast member 162. The valve lever 180 is threadably penetrated by an adjustment screw 194 which, upon movement of the valve lever 180 in a clockwise direction in Figure 3, will move the valve member 185 to opened position through the medium of the flexible gasket 191. This will permit compressed air to bleed from the pipe T 45 through pipe 47 and passageway 186a, instead of entering the pipe 44, with the result that pneumatic relief valve 24 will be closed, in the manner heretofore described, since this will permit the parts of the pneumatic relay 27 to assume the position shown in Figure 4.

There are many types of time switches which may be employed in association with the present invention, the timer 54 in Figures 2 and 5 being shown by way of illustration only. This timer 54 may be of a type such as in manufactured by Paragon Electric Company, Two Rivers, Wisconsin, under their number C-817, Type CRI-IM and being provided with a 60 second dial. This particular timer or time switch is of a type substantially as described in United States Letters Patent No. 2,204,162 of December 17, 1935. Since the time switch 54 is shown in said patent, a detailed description thereof is deemed unnecessary, it merely being necessary that the wires 51 and 52 be connected to suitable output terminals 200 and 201 and that one of the wires 55 or 56 be connected to the terminal 200 and the other of the wires 55 or 56 be connected to an input terminal 203 (Figure 5). The time switch 54 should be of a type which may be adjusted to intermittently complete the circuit to the solenoid coil 170 of the electric-pneumatic relay 50 (Figure 3) for periods of a relatively short duration. The length of the periods during which the coil 170 is energized and the intervals therebetween may vary according to the atmospheric conditions and according to the relative humidity desired in the atmosphere of a particular room. For example, if it is desired that the relative humidity of the atmosphere in a particular room be held to approximately eighty percent, the time switch 54 should be adjusted substantially to complete a circuit to the magnetic coil 170 for six second periods at intervals of six seconds. The optimum periods and intervals therebetween may be determined by trial and error.

Thus, assuming the relative humidity of the atmosphere of the room shown in Figure 1 to have reached the desired percentage of, say, eighty percent, the hygrostat 43 (Figures 2 and 6) will bleed the compressed air from the pipes 146 and 44 in the manner heretofore described, permitting the movable parts of the pneumatic relay 27 to assume the position shown in Figure 4 and to thus prevent ingress of compressed air to the pipe 26, thereby permitting the pneumatic relief valve 24 to move into closed position. This will stop the flow of compressed air to the atomizers 21.

However, upon the relative humidity in the atmosphere surrounding the atomizers 21, and the hygrostat 43, falling below the desired percentage, the hygrostat 43 will again permit compressed air to flow from the pipe 42, through the hygrostat 43 and through the pipe 44 to reverse the position of the plate 70 in the pneumatic relay 27 (Figure 4) and to permit compressed air to flow from the pipe 41a (Figures 2 and 8), through the pneumatic relay 27, the pipe 26 and the interposed valve 40 to the pneumatic relief valve 24 to again permit compressed air to be admitted to the atomizers 21.

Now, at all times, the magnetic coil 170 (Figure 3) of the electric-pneumatic relay 50 will be intermittently energized, the circuit being completed thereto at the desired intervals and for the desired period between said intervals by the time switch 54. It is evident that the electric-pneumatic relay 50 will not be effective with respect to the hygrostat 43 during periods in which the baffle 125 of the hygrostat is not in engagement with the nozzle 134.

However, upon the baffle 125 moving into engagement with the nozzle 134 or to the position shown in Figure 6, as a result of the relative humidity falling below a predetermined percentage, the valve member 185 of the electric-pneumatic relay 50 (Figure 3) will intermittently bleed the compressed air from the pipe 44 through the medium of the pipe T 45, the pipe 47, and the passageway 186a, the compressed air entering the pipe 47 from the pipe T 45 and then passing through the chamber 186 of the electric pneumatic relay 50 and being discharged through the channel 190 in the cast member 162.

It is thus seen that the present apparatus and the arrangement thereof will bleed the compressed air from the pipe 44 at closely spaced intervals for periods of relatively short duration thus intermittently opening and closing the pneumatic relief valve 24 for predetermined relatively short intervals during the period at which the relief valve normally remains open, with the result that the moisture emitted from the atomizers may be homogeneously dispersed throughout the room in which the atomizers are disposed and, in so doing, produce the desired effect on the hygroscopic element 117 which, heretofore, has caused the pneumatic relief valve 24 to close for a substantially longer period than the period at which it is closed through the medium of the electric-pneumatic relay 50 and the cooperating time switch 54 or until the relative humidity has again dropped below a predetermined percentage. This will prevent the atomizers 21 from saturating the atmosphere immediately adjacent the same before the relative humidity of the atmosphere adjacent the hygrostat 43 will have reached the desired percentage to effect the closing of the pneumatic relief valve 24.

In the drawings and specification there has been set forth a preferred embodiment of the invention and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claim.

I claim:

In a humidity controlling system having a plurality of pneumatically controlled moisture emitting atomizers, a first pipe connection between a source of compressed air and the atomizers, a normally closed blow-through valve of a type having a by-pass to the atmosphere for the atomizers when the valve is closed interposed in the first pipe connection, a hygrostat, a second

pipe connection between the hygrostat and the source of compressed air, a snap-acting pneumatic relay, a third pipe connection between the hygrostat and the pneumatic relay, a fourth pipe connection between the source of compressed air and the pneumatic relay, a fifth pipe connection between the pneumatic relay and the blow-through valve, means on said hygrostat for admitting compressed air from the second pipe connection to the third pipe connection during periods of relative humidity below a predetermined percentage, means on the pneumatic relay for instantly effecting communication between the fourth and the fifth pipe connections when compressed air is admitted to the pneumatic relay through the third pipe connection, means for opening said blow-through valve upon compressed air being admitted thereto from the source of compressed air through the fourth and fifth pipe connections to thus permit compressed air to flow to the atomizers, said hygrostat also being operable to prevent compressed air from flowing from the second pipe connection to the third pipe connection and thus to the pneumatic relay and simultaneously exhausting the compressed air from the third pipe connection during periods of relative humidity above said predetermined percentage, means on the pneumatic relay for instantly preventing communication between the fourth and fifth pipe connections and simultaneously exhausting the compressed air from the fifth pipe connection upon the compressed air being exhausted from the third pipe connection to close the connection effected by the blow-through valve between the source of compressed air and the atomizers and to thereby permit the pressure in the atomizers to be exhausted through the blow-through valve to immediately close the atomizers, the combination of an electric-pneumatic relay, a time switch, a first electrical connection between a source of electrical energy and the time switch, a second electrical connection between the time switch and the electric-pneumatic relay, a sixth pipe connection between the electric-pneumatic relay and the third pipe connection, means on the time switch for intermittently energizing the electric-pneumatic relay, means on the electric-pneumatic relay normally closing the sixth pipe connection and means on the electric-pneumatic relay responsive to energization thereof for opening the sixth pipe connection to thereby exhaust compressed air from the third pipe connection at intermittent intervals of relatively short duration during the periods in which the hygrostat is permitting compressed air to flow to the third pipe connection to thereby prevent compressed air from flowing between the fourth and fifth pipe connections through the pneumatic relay intermittently to accordingly control the operation of the blow-through valve to thus insure homogeneous dispersion of moisture from the atomizers into the room in which they are disposed.

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