United States Patent

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[54] HUMIDIFIER CONTROL SYSTEM

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[52] **U.S. Cl.** **126/113**, 261/70, 261/DIG. 46

[51] **Int. Cl.**.....**F24f 3/14**

[58] **Field of Search**.....126/113; 261/97, 99, 70, DIG. 46

[56] **References Cited**

UNITED STATES PATENTS

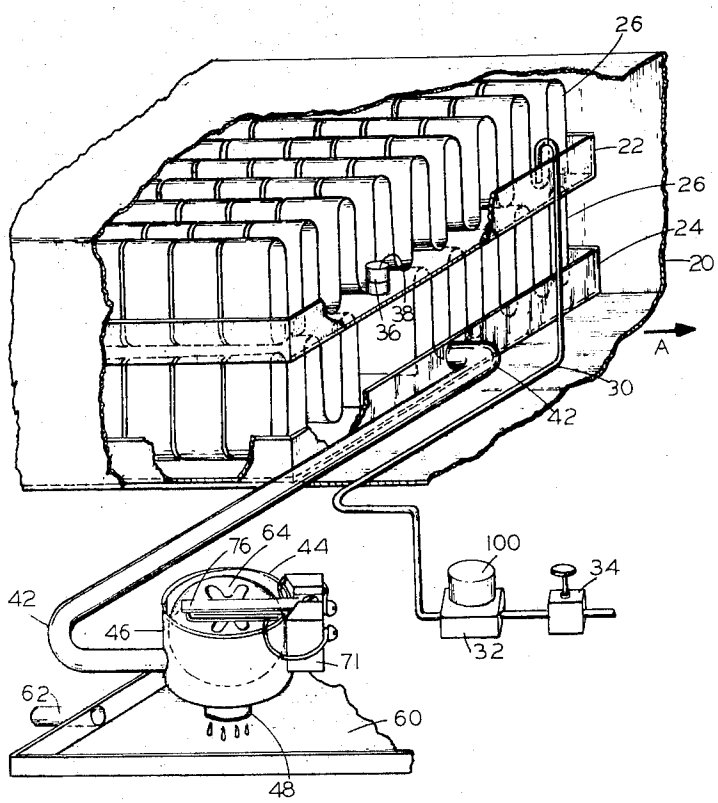
3,157,716	11/1964	Morris	261/97 X
2,708,435	5/1955	Lewis	126/113
3,265,371	8/1966	McGrath	126/113 X
3,302,631	2/1967	Kellogg	126/113
3,314,412	4/1967	Krause	126/113
3,136,829	6/1964	Skerritt	126/113 X
3,188,061	6/1965	Alguire	261/DIG. 46
3,315,948	4/1967	Martin	126/113 X

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[57] **ABSTRACT**

Humidifier for hot air heating systems having a water-evaporating pan with an overflow, means to supply water to said pan, at a rate exceeding the rate of evaporation, a removable partially submerged fin, a float chamber receiving the overflow and having an adjustable bleed, and a float actuated switch to control the water supply.

11 Claims, 5 Drawing Figures



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SHEET 1 OF 2

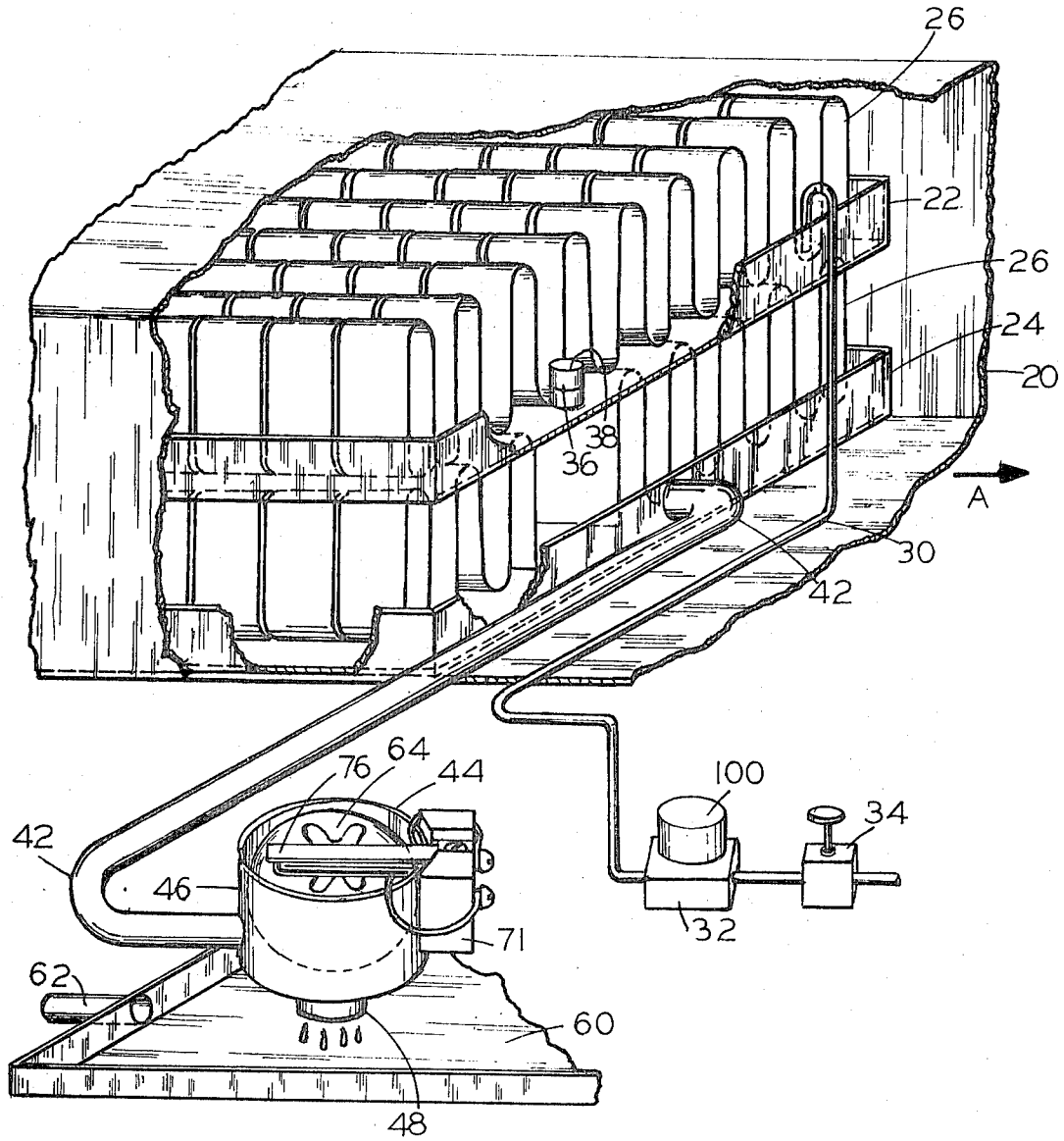


FIG. 1

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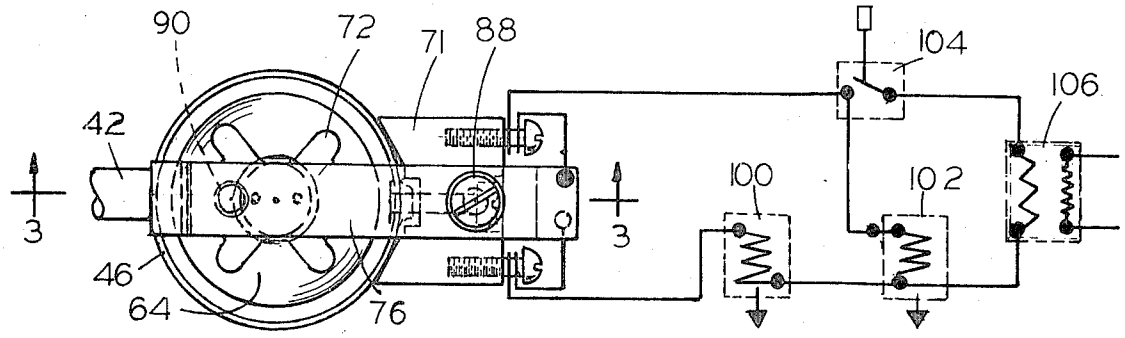


FIG. 2.

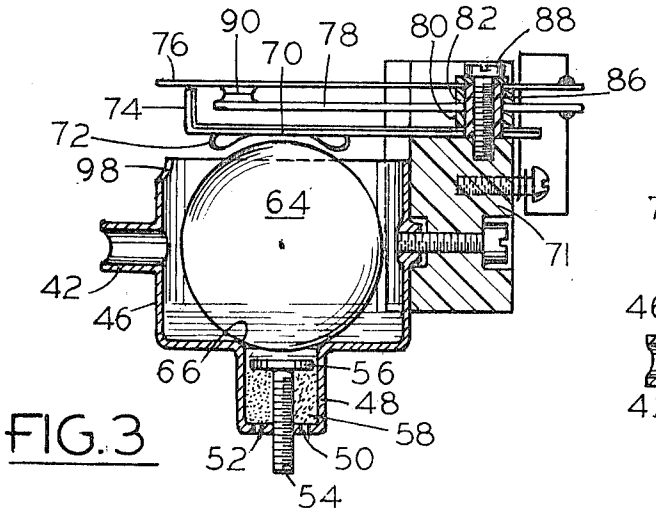


FIG. 3

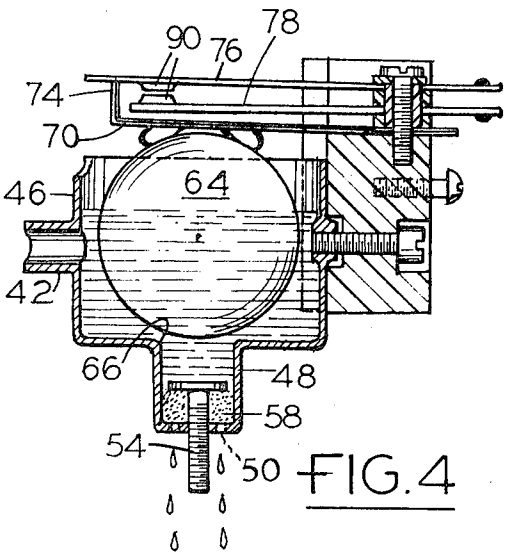


FIG. 4

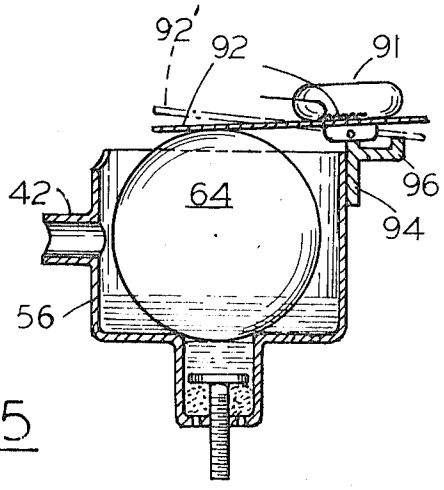


FIG. 5

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HUMIDIFIER CONTROL SYSTEM

This invention relates to humidifiers and more particularly to humidifiers for forced hot air systems and control means therefor.

Humidifiers heretofore employed in hot air ducts generally have consisted of water evaporation pans with some form of feed to maintain a level of water in the pan. As water is evaporated from the pan, the solids such as lime and other foreign matter in the water is left as a deposit and in a short time the buildup of foreign matter is such as to interfere with the heat transfer effecting evaporation, as well as tending to interfere with the liquid level control.

The present invention is directed to a humidifier wherein the water level is controlled in one or more pans by an overflow bleed which removes continuously during water feed, some of the water from the pan, the water so bled containing a substantial portion of the impurities which would otherwise be left to accumulate in the pan.

More particularly the humidifier pan or pans are supplied with water for evaporation at a fixed predetermined rate in excess of the evaporation rate, the excess with impurities concentrated therein being bled off by overflow, provision being made for a relatively fixed rate of bleed, irrespective of evaporation rate, which bleed rate, when exceeded effects controls of the water supply valve to temporarily suspend feed.

The above and other novel features of the invention will appear more fully hereinafter from the following detailed description when taken in conjunction with the accompanying drawings. It is expressly understood that the drawings are employed for purposes of illustration only and are not designed as a definition of the limits of the invention, reference being had for this purpose to the appended claims.

In the drawings, wherein like reference characters indicate like parts:

FIG. 1 is a schematic perspective view of an evaporator disposed in an air duct, with a wall cut away, and indicating water supply and overflow bleed controls;

FIG. 2 is a top plan view of a float actuated bleed control with electric control circuitry;

FIG. 3 is a sectional view of the control taken substantially on the line 3—3 of FIG. 2;

FIG. 4 is a fragmentary sectional view of the float chamber of the control taken substantially on the line 3—3 of FIG. 2 with the float chamber filled; and

FIG. 5 is a sectional view of a modified control employing a mercury switch.

Referring to FIG. 1, there is shown a hot air duct 20 in which are located level water-evaporating pans 22 and 24, one above the other. In each pan sinuous fins 26 are arranged with their lower convolutions submerged in the water in the pan, and the upper convolutions disposed in a manner such as to permit the relatively free passage of hot air through the duct, for example in the direction of arrow A, while offering substantial surface for heat transfer from the hot air to the fins for transfer of heat into the water in the pan to heat the water and promote the evaporation thereof at a suitable rate.

The upper pan 22 is provided with a water supply line 30 controlled by a solenoid valve 32. The line is also provided with a needle valve 34 to control the flow rate, when the valve 32 is opened. The upper pan is also provided with a short over flow tube 36 extending through the pan bottom, and having a water level controlling annular lip 38. The tube 36 is so positioned as to overflow into the pan 22 therebelow.

The water level of the lower pan is controlled by an overflow aperture in a sidewall 40 of the pan, the aperture leading into a conduit or bleed tube 42 leading to a bleed float control 44 disposed at a level in relation to the water level in the pan 22, such that overflow water may readily flow into the float control 44, and rise in the bowl or float chamber 46 thereof to a level sufficient to actuate the control switch.

The bleed control as shown in FIGS. 2–4 comprises the float chamber 46 having a sidewall connection to the end of the bleed tube 42. The chamber is provided with a circular or cylindrical sump 48 having outlet ports 50 in the bottom 52.

A stem 54 threaded centrally in the sump bottom, has at its upper end a circular disk or head 56 adapted to be moved up or down in the sump. Disposed in the sump beneath the bead and around the stem is an annular mass of loose fiber glass 58. By raising or lowering the head 56, the fiber glass mass may be compacted to such a degree as to control the rate of bleed from the float chamber.

In practice the bleed control may be located over a drain pan 60 having a drain conduit 62. Within the float chamber, is a ball float 64 adapted to rest on an annular seat 66 above the sump, when the water level in the chamber is below a certain level to thereby close off the sump from the chamber.

Above the float is a resilient arm 70 mounted to one side of the float chamber on a bracket 71 and extending over the float, the arm having inclined centering fingers 72 adapted to engage the ball float when it rises in response to a rise in the water level in the chamber. The arm is provided with an upwardly extending projection 74 on its end, adapted to engage the upper resilient leaf of a pair of normally closed contact members 76 and 78 also supported from the bracket 71.

In practice the arm 70 and contact leaves or members 76 and 78 may be disposed between spaced insulation collars 80 and 82 disposed about an insulating sleeve 86, on a bolt 88 extending into the bracket 71.

In FIG. 4, the float is shown as having actuated the upper switch leaf to open the contacts 90, the arm 70 having limited upward movement by abutment against the underside of the relatively stiff leaf 78.

In FIG. 5 there is shown an alternative switch in utilizing a small mercury switch 91 mounted on an arm 92 pivoted on a bracket 94 extending from the wall of the chamber 46, the arm extending over the ball 64 thereshown. The rocking of the arm may be limited from a position where contact in the mercury switch is made when in the position shown in FIG. 5, and broken when rocked clockwise by the lift of the ball in response to an increase in water level in the chamber, to a position where the arm 92 engages an abutment 96, as indicated at 92'.

The chamber may have an overflow 98 to prevent water from rising to the lip of the float chamber.

Referring to FIG. 2, there is shown a circuit including the switch contacts 90 (or mercury switch 91) and water solenoid 100 for the connected in parallel with a gas valve solenoid 102 to a room thermostat 104, all supplied from a stepdown transformer 106. When the thermostat 104 closes, a circuit will be established through contacts 90 (or mercury) to open the water by energizing solenoid 100 to open water valve 32, provided contacts 90 are closed. When the thermostat 104 closes, valve 102 is opened to supply fuel to the hot air furnace and power to the blower. At the same time assuming float switch contacts 90 are closed, water commences to flow into tray 22 and overflows into tray 24, which in turn overflows into float chamber 46 from which it bleeds through the ports 50, as soon as the chamber 46 fills sufficiently to lift the ball 64 from its seat 66. If the overflow rate from pan 24 exceeds the bleed rate through ports 50, the float 64 rises, deflecting arm 70, and lifting contact arm 76 to open the contacts 90. When the contacts 90 open, the water supply valve is closed, until the chamber 46 bleeds sufficiently to permit the contacts 90 to reclose. In this manner there is provided a relatively constant bleed rate from the chamber 46, which establishes the average rate of overflow from the pans, such average rate being sufficient to eliminate a substantial portion of the solids, in solution or floating, by means of the overflow water being a concentrated solution in respect of the foreign matter, in the water supplied to the evaporating pans from the water supply 30.

A humidistat may be installed in series with the solenoid valve as is commonly used, but with this system it is not required and for most homes is undesirable. In practice, it has been found that the proposed system automatically maintains

the ideal relative humidity for a wide range of outdoor conditions. For example, with an outdoor temperature of −10° F., with indoor humidities of 25 percent, windows, and walls will not receive undue condensation, whereas with +20° F., a relative humidity of 35 percent is acceptable. As the evaporation of water is in direct ratio to the "On" time of the furnace burner, this moisture emission has proven to be the correct amount as required for good practice in homes as indicated above.

While a single form of the invention with a modification has been illustrated and described, it is to be understood that the invention is not limited thereto. As various changes in the construction and arrangement may be made without departing from the spirit of the invention, as will be apparent to those skilled in the art, reference will be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. In a humidifier for hot air heating systems and the like, a water-evaporating pan having an overflow adapted to maintain a fixed level of water in the pan, means to supply water to said pan at a rate exceeding the rate of evaporation ro provide continuous flow through said overflow from said pan, and means responsive to a rate of overflow in excess of a predetermined overflow rate for temporarily discontinuing the supply of water by said water supply means to said pan at the supply rate exceeding the rate of evaporation, whereby to reduce the overflow rate to the predetermined rate.

2. In a humidifier as set forth in claim 1 wherein the rate responsive means comprises a float responsive switch.

3. In a humidifier as set forth in claim 2 wherein the means to supply the water comprises a settable bleed valve, and a solenoid flow valve, and in which the solenoid is in circuit with the float responsive switch whereby a rise in the overflow rate opens the switch and the circuit to said solenoid, whereby to cut off the flow through the flow valve.

4. In a humidifier as set forth in claim 1, wherein the pan is provided with fins, a portion of which are submerged below the level of the overflow, and the remainder of which are exposed to the stream of hot air of the hot air heating system.

5. In a humidifier as set forth in claim 3, a thermostatic switch connected in series with a solenoid-actuated fuel supply valve, and having the flow valve solenoid and the float switch contacts connected in series, and parallel with the fuel valve solenoid.

6. In a humidifier as set forth in claim 3, wherein the pan is provided with removable fins, a portion of which are submerged below the level of the overflow, and the remainder of which are exposed to the stream of hot air of the hot air heating system.

7. In a humidifier as set forth in claim 2, wherein the float responsive switch comprises a float chamber having an overflow connection to one side of the chamber, and a constant flow bleed in the bottom of the chamber.

8. In a humidifier as set forth in claim 7, wherein the constant flow bleed comprises an adjustably compressed annulus of fiber glass disposed above a bleed aperture in the bottom of the chamber.

9. In a humidifier as set forth in claim 7, wherein the constant flow bleed comprises an adjustably compressed annulus of compressible pervious material disposed above a bleed aperture in the bottom of the chamber.

10. In a humidifier as set forth in claim 7 wherein the constant flow of bleed is adjustable.

11. In a humidifier as set forth in claim 7 wherein means are provided for regulating the rate of bleed.

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