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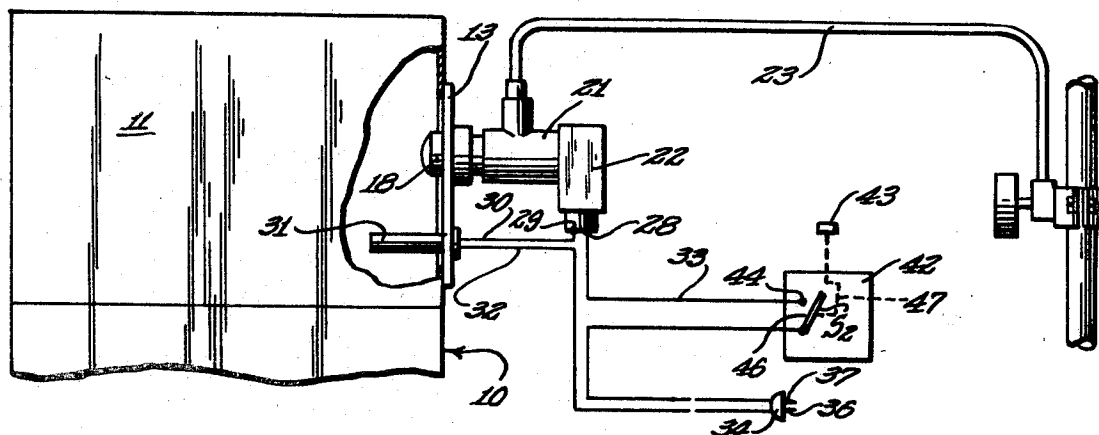
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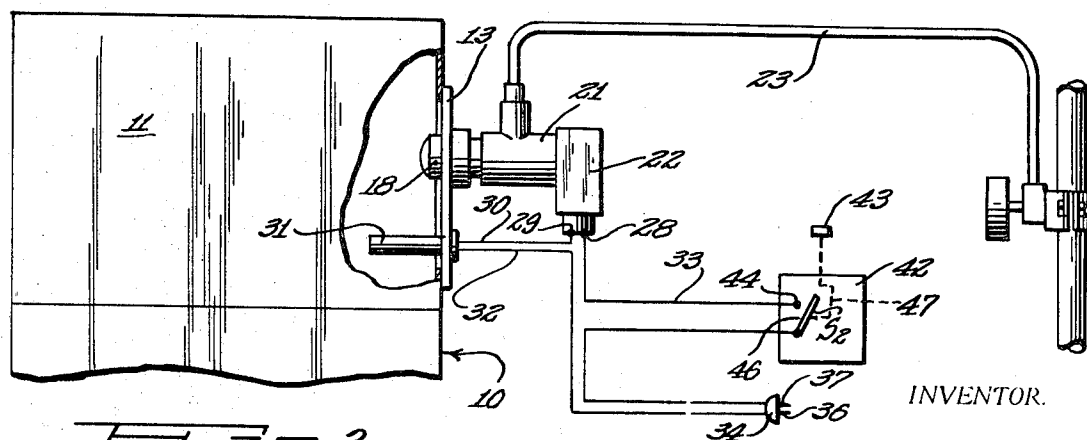
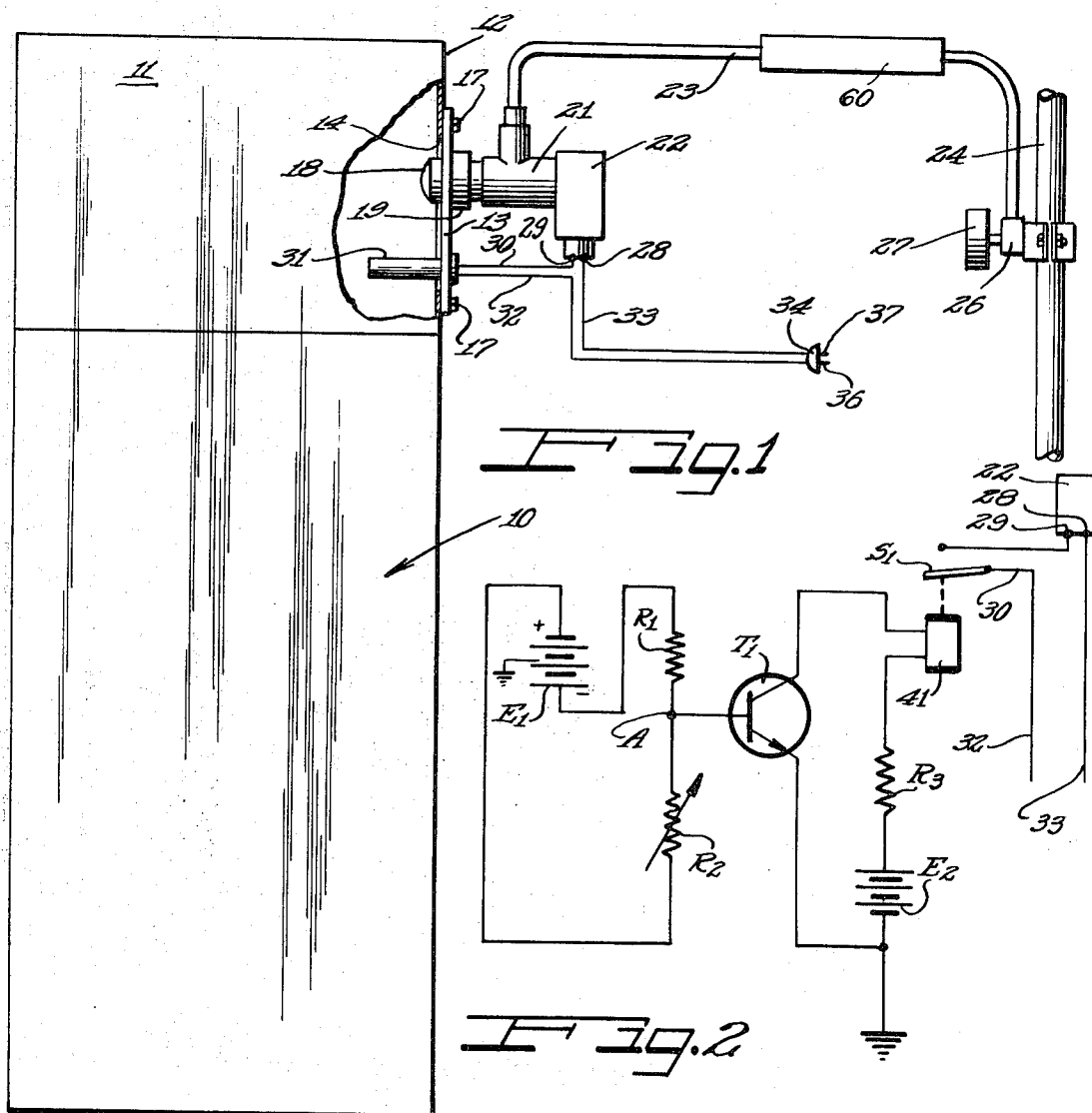
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[54] **THERMAL CONTROLLED WATER SPRAY HUMIDIFIER**
 2 Claims, 3 Drawing Figs.

[52] U.S. Cl..... 126/113,
 236/44
 [51] Int. Cl..... F24f 3/14
 [50] Field of Search..... 126/113;
 236/44, 44 (A), (Transistor Digest)

ABSTRACT: A water spray humidifier for use in furnace heating systems, is disclosed. Water is sprayed into the heating system in response to temperature changes in the distribution chambers of the heating system. The humidifier is very simple and requires few parts because it is not connected to the fuel supply or electrical system of the furnace.





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THERMAL CONTROLLED WATER SPRAY HUMIDIFIER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to humidifiers and in particular to water spray humidifiers.

2. Description of the Prior Art

Prior art humidifiers for furnaces have taken different forms. For example, one form comprises a tank in the plenum chamber of the furnace to which water is supplied through a float valve. The float valve keeps the water in the tank at a predetermined level and turns off incoming water when it reaches the desired level. Such systems do not add adequate moisture to the air when it is relatively dry and are unsatisfactory. Water spray humidifiers have been known in which the spray nozzle valves are controlled by the circuitry to the fuel control valves, the fan motors, and the room thermostats. Such systems require that extensive wiring connections be made to standard furnaces. Also, such systems cannot be easily installed in coal fired or electric furnaces, for example.

SUMMARY OF THE INVENTION

The present invention comprises a furnace humidifier in which a spray nozzle is connected to a suitable water supply through a control valve which is actuated by a temperature responsive element mounted in the plenum chamber of the furnace. The structure is simple and may be easily and cheaply installed in existing warm air furnaces of all types without modifying the wiring, the fuel supply, the blower or the thermostat control system of the furnace.

A preferred embodiment utilizes a simple metallic thermostat containing electrical contacts and a second embodiment utilizes a thermostat in an electronic circuit for controlling the spray valve. A further embodiment utilizes a humidistat control which prevents the addition of moisture when the humidity is above a preset level.

Other objects, features and advantages of the present invention will be readily apparent from the following detailed description of certain preferred embodiments thereof taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view of the improved humidifier of this invention installed in a furnace with a portion of the furnace cut away;

FIG. 2 is a schematic view of a modification of the invention illustrating an electronic control circuit for the invention; and

FIG. 3 illustrates a further modification of the invention including a humidistat control.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates the humidifier of this invention installed in a furnace which is designated generally as 10. The furnace might, for example, be a forced air furnace of any type which has a plenum chamber 11 attached to it for distributing the heated air. A wall 12 of the plenum chamber is formed with an opening 14 over which a plate 13 is attached by self-tapping screws 17. A water spray nozzle 18 is attached to the plate 13 and extends into the plenum chamber 11 of the furnace. The nozzle 18 is formed with a shoulder 19 which bears against the plate 13 and is connected to a valve 21 that is controlled by a solenoid 22. Conduit 23, for example, plastic or copper tubing, extends from the valve 21 to a valve 26 which is mounted in the cold water line 24. The valve handle 27 controls the valve 26 to turn it on and off.

The solenoid 22 has electrical terminals 28 and 29 and terminal 28 is connected to a lead 33 that is connected to a prong 37 of plug 34. A prong 36 of the plug 34 is connected to a lead 32. Prongs 36 and 37 are connected to a suitable line voltage, as for example, 115 volts AC. The terminal 29 of the solenoid 22 is connected to a lead 30 which is connected to a thermoresponsive element 31 mounted on the plate 13 and which extends into the plenum chamber 11 of the furnace. The

second lead of the thermodevice 31 is connected to the power lead 32.

The thermodevice 31 may be a conventional bimetallic thermoresponsive switch of conventional type which opens and closes in response to temperature changes; for example a Fenwall type thermoswitch.

In operation, the valve handle 27 is opened to allow water to be supplied to the valve 21. The thermoresponsive switch 31 is in series with the water solenoid valve 22 across the line voltage and an open circuit is maintained by the thermoresponsive switch 31 until the temperature in the plenum chamber reaches a preset temperature. At this preset temperature, the humidifier control 31 closes, connecting leads 30 and 32, thus energizing the solenoid 22 to open the valve 21. Water sprays from the nozzle 18 into the furnace plenum and the warm air absorbs the moisture and is distributed through the heating distribution system. The valve 21 remains open until the temperature in the plenum chamber 11 drops to a preset level thus opening the thermoresponsive switch 31 disconnecting the power to the solenoid valve 22 and closing the valve 21. The temperature drops in the plenum chamber 11 when the fuel to the furnace has been cut off because the temperature in the distribution system has reached a preset value. The temperature control for the furnace may be conventional and is not electrically connected to the humidifier of this invention. The humidifier will cycle on and off in response to temperature changes detected by the thermoresponsive element 31 as required. Since the air in the plenum chamber is warm when moisture is sprayed into the chamber, all of the moisture can be absorbed by the air and none will be deposited in the furnace.

FIG. 2 illustrates a modification of the invention in which an electronic circuit is utilized for the control of the solenoid 22 rather than the bimetallic thermostatic element 31. A thermistor R_2 is mounted to detect the temperature in the plenum chamber 11 and has one end connected to a battery E_1 which has its other terminal connected to a resistor R_1 which has its other side connected to the second side of the thermistor R_2 . Junction point A between the resistor R_1 and thermistor R_2 is connected to a control element of a transistor T_1 which has its collector connected to a relay 41 that has its other side connected to a resistor R_3 . The resistor R_3 is connected to a voltage source E_2 which has its other terminal connected to the emitter of transistor T_1 .

The relay 41 controls the position of the switch S_1 which is connected between leads 30 and 32. When the relay 41 is closed, power is supplied to the solenoid 22 turning on the valve 21 to spray water into the plenum chamber. The thermistor R_2 has a negative resistance characteristic and the voltages E_1 and E_2 are chosen so that the transistor T_1 would be biased to cut off when the temperature within the plenum chamber is below a predetermined level and the transistor T_1 will be biased on when the temperature in the plenum chamber is above a predetermined level. Thus, relay 41 will be energized above a predetermined temperature level to close switch S_1 and spray water into the plenum chamber. The relay 41 will be deenergized to open switch S_1 , thus turning off the valve 21 below a predetermined temperature level.

FIG. 3 illustrates a further modification of the invention wherein a humidistat 42 is connected in series with the thermoresponsive element 31 and the solenoid 22 in the power lead so that the valve 21 will be turned on only when the temperature in the plenum chamber is above a preset level and further, only when the humidity detected by humidistat 42 is below a preset level. In FIG. 3 the elements which are common with those of FIG. 1 are indicated by the same numerals. It is to be noted that the power lead 33 is connected to a terminal 44 of the humidistat 42. A movable contact 46 of the humidistat engages contact 44 when the humidity is below a predetermined level. The contact 46 is controlled by a humidity-responsive element 47 of the humidistat. Lead 48 is connected from contact 46 to prong 37 of the power plug 34.

A control knob 43 is connected to the humidistat 42 and allows the desired humidity level to be established.

In operation, the humidistat 42 is mounted in a central area in which the humidity is to be controlled and the knob 43 is set to a predetermined desired humidity level. For example, if it is desired to maintain a 40 percent relative humidity level, the knob 43 is set to this point and the switch S₂ will not close until the humidity falls below the 40 percent level. As long as the humidity is above the 40 percent level, the contacts 44 and 46 will not engage, and the solenoid 22 will not be energized because of the open circuit in the line between contacts 44 and 46. This is true even though the temperature sensed by the element 31 is such that the thermoelement 31 would normally close the circuit to the solenoid 22.

When the humidity falls below the level set by the knob 43, as for example 40 percent, the contacts 44 and 46 will engage and the solenoid 22 will be controlled by thermocontrol 31. As soon as the moisture added to the system brings the humidity in the controlled area above the preset level, the humidistat 42 will open the contacts 44 and 46 and the humidifier will be again deactivated. It is to be realized, of course, that as long as the humidity is below the preset level, the valve 21 will be controlled by the thermoresponsive element 31.

It is seen that the invention provides a simple humidifier for a furnace in which only the nozzle 18 and the thermoresponsive element 31 is connected to the furnace. The motor control for the furnace which energizes the blower and the fuel valve system of the furnace are not interconnected with the humidifier of this invention, and thus, the installation is simple and inexpensive and may be quickly made.

As shown in FIG. 1, an ion exchange cylinder 60 may be installed in conduit 60 to remove sodium and calcium from the water sprayed into the furnace so that it does not appear as dust in the hot air system. Cartridges may be mounted in the transparent cylinder 60 and replaced when their color indicates they are expended. Such cartridges may be obtained from the Illinois Water Treatment Company of Rockford, Illinois, for example.

Although various minor modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within

the scope of my contribution to the art.

I claim:

1. A humidifier for a warm air furnace having a plenum chamber and furnace controls comprising:
 - a temperature responsive means comprising a bimetallic thermostat switch mounted within the plenum chamber and not in the firebox of said furnace;
 - means for spraying moisture into said plenum chamber comprising a spray nozzle;
 - a valve connected to said spray nozzle;
 - a solenoid for controlling said valve;
 - a humidistat connected in series with the solenoid and the bimetallic switch so that the spraying means is controlled and responsive to the temperature in the plenum chamber rather than the firebox and the moisture in the air heated by said furnace; and
 - a power circuit which is completely independent of the furnace controls connected to said bimetallic switch and to said solenoid and to said humidistat such that the means for spraying moisture into the plenum chamber is turned on when the temperature in the plenum chamber is above a preset level.
2. A humidifier for a warm air furnace having a plenum chamber and furnace controls comprising:
 - a temperature responsive means mounted in said plenum chamber of said furnace and not in the firebox and comprising a thermistor;
 - a gating circuit including a transistor;
 - biasing means which are independent of the furnace controls for said transistor and said thermistor forming a portion of said biasing means;
 - means for spraying moisture into said plenum chamber comprising a spray nozzle;
 - a valve connected to said spray nozzle and a solenoid for controlling said valve; and
 - a power circuit completely independent of said furnace controls connected in circuit with said solenoid and transistor such that the moisture spraying means is turned on when the temperature in the plenum chamber is above a preset level.