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3,486,697

HUMIDIFIER UTILIZING SUPERHEATED STEAM

Filed Feb. 23, 1968

2 Sheets-Sheet 1

FIG. 1

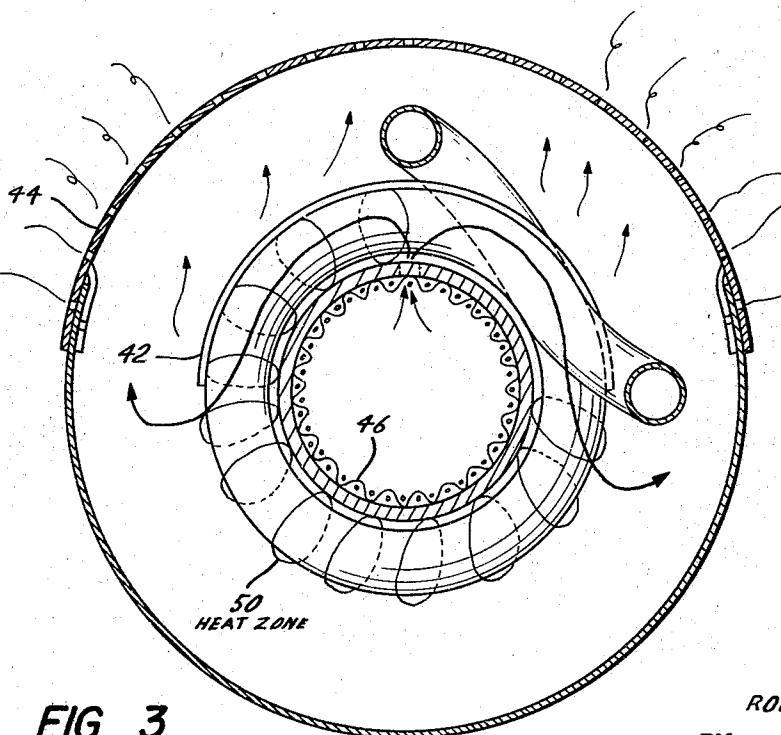
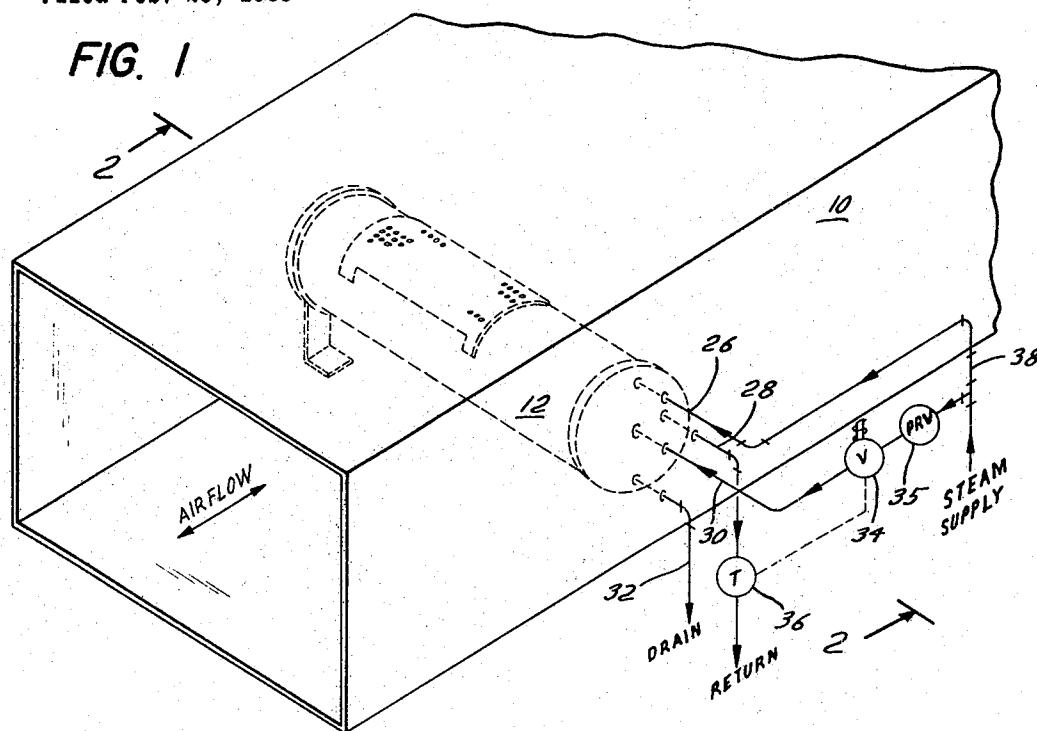


FIG. 3

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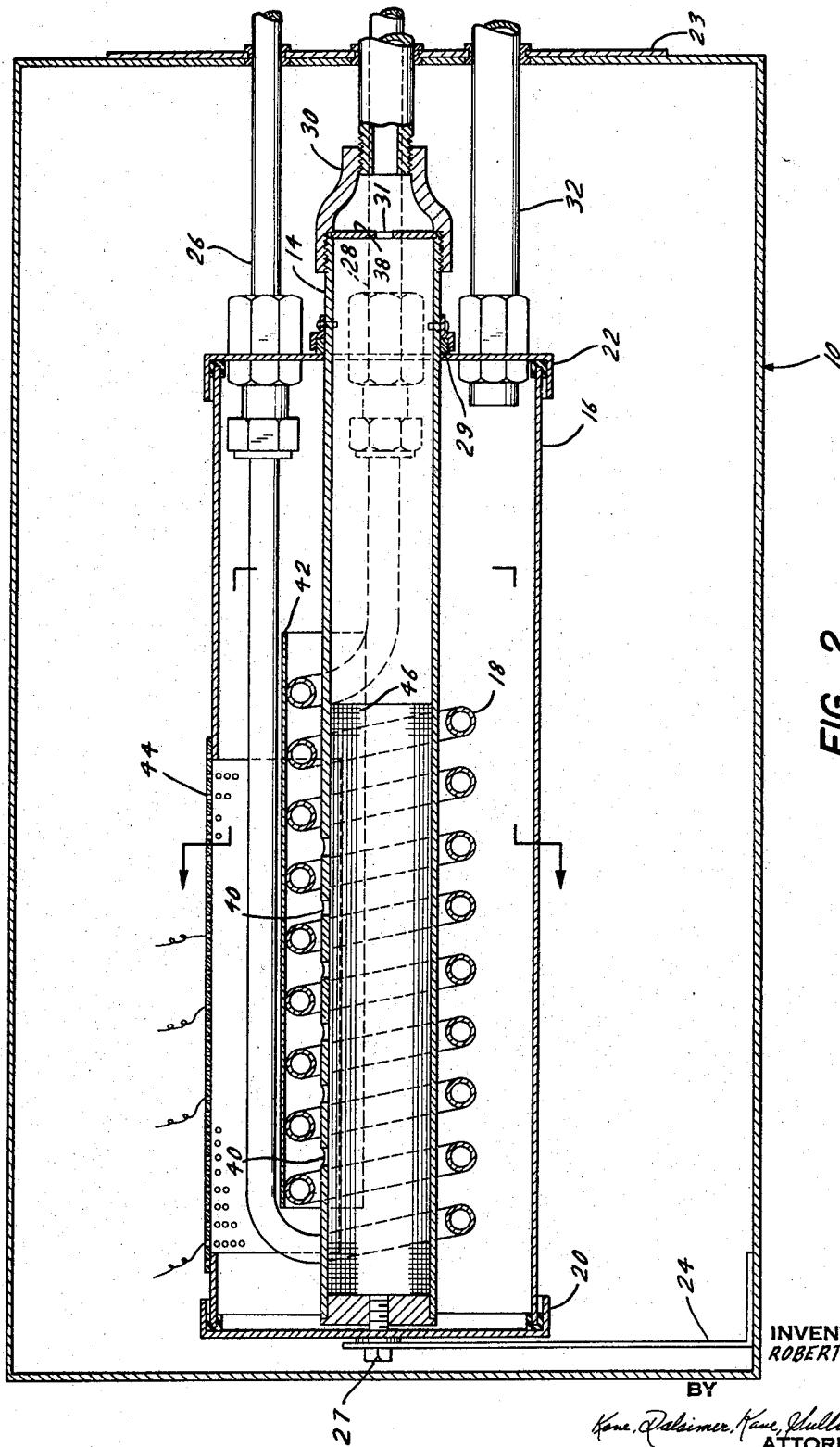
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## HUMIDIFIER UTILIZING SUPERHEATED STEAM

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2 Sheets-Sheet 2



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## HUMIDIFIER UTILIZING SUPERHEATED STEAM

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8 Claims

### ABSTRACT OF THE DISCLOSURE

A humidifier in which steam is introduced into the atmosphere through orifices in a pipe, said pipe being surrounded by means to create a zone of intense heat to dry the steam.

### BACKGROUND OF THE INVENTION

Humidifiers are used to introduce moisture into the atmosphere in order to raise the humidity thereof. Various means are used for this purpose, both as to creation of the humidified atmosphere and as to method of delivery. The present invention is concerned with the creation of humidified atmosphere in a duct system by the drying and introduction of steam therein. The invention is described for use in a duct system, however, it is applicable to utilization as a space humidifier with slight modification.

### SUMMARY OF THE INVENTION

A humidifier including a pipe, ports in said pipe for allowing steam to exit the pipe, a coil surrounding the pipe in the vicinity of the ports, a conduit containing steam, first control means for directing steam from the conduit into the coil to provide a heated zone in the vicinity of the ports, second control means for directing steam from the conduit into the pipe, sensing means and actuating means associated with the sensing means for actuating the second control means upon the sensing means determining that the steam flowing in the coil has achieved a predetermined condition.

### DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. 1 is a perspective view from above of a duct section with a humidifier constructed in accordance with the teachings of this invention disposed therein;

FIG. 2 is a longitudinal sectional view taken along the line 2—2 in the direction of the arrows in FIG. 1; and

FIG. 3 is a transverse sectional view taken along the line 3—3 in the direction of the arrows in FIG. 2.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

In the figures the numeral 10 designates the duct in which humidifier 12 is disposed. The humidifier includes inner and outer core pipes 14 and 16, respectively, and helical coil 18 surrounding pipe 14. End plates 20 and 22 close the end of pipe 16 which is mounted within the duct by plate 23 and bracket 24 fastened thereto. Flow pipes or lines 26, 28, 30 and 32 are shown entering the humidifier through end plate 22. The flow lines 26, 28, 30 and 32 are shown diagrammatically in FIG. 1. Lines 26 and 28, respectively, provide the inlet and outlet of coil 18. Line 30 provides the inlet to inner core pipe 14 and line 32 provides a condensate drain from the humidifier.

A normally closed electrically actuated solenoid valve 34 is placed in line 30 under the control of thermostat 36 disposed in line 28.

Lines 26 and 30 are connected to a steam supply, not shown, through line 38 shown diagrammatically in FIG. 1.

Line 38 is therefore supplied with steam which flows

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through inlet 26 into coil 18 and out outlet 28. When the valve 34 is in its normally closed condition there is no flow of steam into the inner core pipe 14 via line 30. Steam entering the system from the main steam line therefore passes through coil 18 to return or exhaust via line 28. The thermostat 36 located in the exhaust line 28 senses the temperature of the steam in return line 28 and upon the steam therein reaching a predetermined temperature level causes valve 34 to open allowing the steam to flow from pipe or line 38 via line 30 into inner core pipe 14. The steam, of course, continues to flow in coil 18.

A pressure reducing valve 35 is located between line 38 and valve 34 to reduce the pressure of the supply steam. This reduction in pressure lowers the temperature of the steam entering pipe 14. As a result, the steam in pipe 14 is in a saturated condition.

The steam entering inner core pipe 14 exits through the series of openings or ports 40 and strikes baffle 42 which circulates the steam until it exits or exhausts through exhaust grille 44 into duct 10. The mesh 46 shown in pipe 14 adjacent ports 40 prevents the whistling of the steam as it exits ports 40.

Orifice 31 is provided in plate 33 at the entrance to pipe 14. The size of orifice 31 determines the output of the unit.

The inner core pipe 14 is supported concentrically within outer core pipe 16 by end plates 20 and 22 and screw 27. Seal 29 is provided on pipe 14 to prevent escape of steam.

In operation, the saturated steam is not introduced into the inner core pipe 14 until a zone of intense heat is created around the inner core pipe by the steam passing through coil 18. When this zone of heat is created as sensed by thermostat 36 the steam is allowed to pass into the inner core pipe 14 and through ports 40 within the zone of intense heat so that the steam passing through this zone in the direction of the arrows as indicated in FIG. 3 will be dried. The zone of intense heat is indicated generally by shade lines in FIG. 3 and the numeral 50.

The saturated steam having been dried upon passing through ports 40 and zone 50 passes through the openings in mesh 44 to join with the air flow within duct 10 which develops the necessary moisture causing the desired humidified condition within duct 10.

It should be understood that a fan could be placed behind the humidifier 12 in the absence of the duct and the unit operated as a space humidifier.

The inner core can be formed of any suitable material such as brass, stainless steel or galvanized pipe. The outer core can be formed of the same material and the coil 18 should be formed of a high heat conductive material, such as copper.

I claim:

1. A humidifier utilizing steam including in combination a pipe for receiving said steam, ports formed in said pipe for allowing steam therein to exit said pipe, heat means, a high temperature heat zone created by said heat means and surrounding said pipe in the vicinity of said ports through which steam exiting said ports must pass, sensing means determining the presence of said heat zone and control means for allowing said steam to enter said pipe upon actuation by said sensing means.

2. A humidifier in accordance with claim 1 in which said heat means is a helical coil concentric with and surrounding said pipe.

3. A humidifier in accordance with claim 1 in which said heat means is a helical coil concentric with and surrounding said pipe and second control means are provided for allowing said steam to enter said coil to create said heat zone.

4. A humidifier in accordance with claim 2 in which a second pipe concentric with said first pipe and spaced outwardly therefrom provides an outer core and said heat zone is between said first and second pipes and an exhaust grille is provided in said second pipe for allowing steam to pass therethrough.

5. A humidifier in accordance with claim 2 in which a mesh is provided within said pipe adjacent said ports.

6. A humidifier utilizing steam including in combination a first cylindrical pipe for receiving said steam, a second cylindrical pipe concentric with said first pipe and spaced radially outwardly therefrom, a plurality of ports formed in said first pipe, a mesh opening formed in said second pipe overlying said plurality of ports in said first pipe, a baffle spaced from said first and second pipes and between said mesh and said ports, a helical coil surrounding said first pipe, a source of said steam, coil inlet and outlet lines, a pipe line, a first control for directing said steam into said coil inlet, a high temperature zone surrounding said first pipe created by steam in said coil, a sensing means associated with said coil outlet line and sensing the presence of said high temperature zone, and

second control means actuated by said sensing means to direct said steam into said pipe inlet.

7. A humidifier in accordance with claim 1 in which a plate having an orifice provided therein is disposed within said pipe between said ports and said control means whereby the steam passing through said ports is determined by the size of said orifice.

8. A humidifier in accordance with claim 1 including a steam supply line and a pressure reducing valve between said steam supply line and said control means.

#### References Cited

##### UNITED STATES PATENTS

15 3,386,659 6/1968 Rea \_\_\_\_\_ 126—113 X

EVERETT W. KIRBY, Primary Examiner

M. Y. MAR, Assistant Examiner

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126—113; 165—163; 236—44; 239—139; 261—115