Jan. 9, 1951 C. E. COX 2,537,211

HUMIDIFIER AND CONTROL THEREFOR

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FIG. 1.

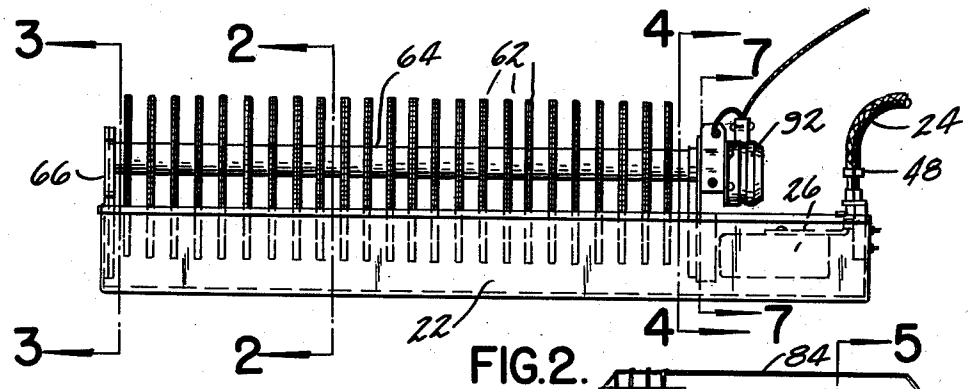


FIG. 2.

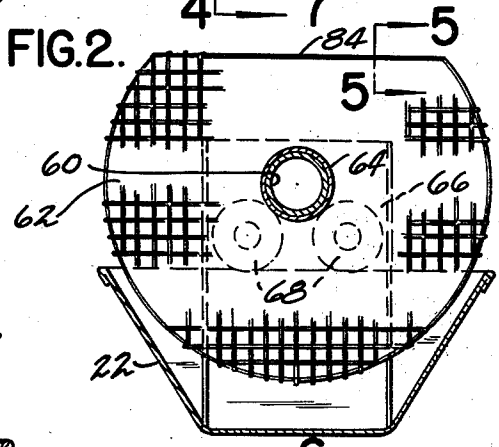


FIG. 3.

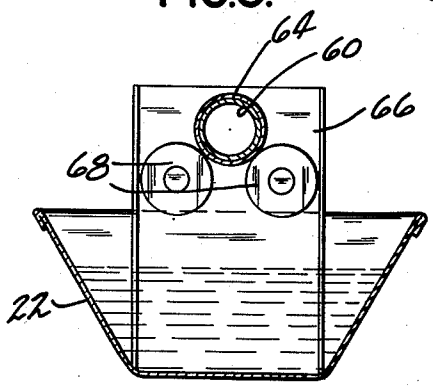


FIG. 4.

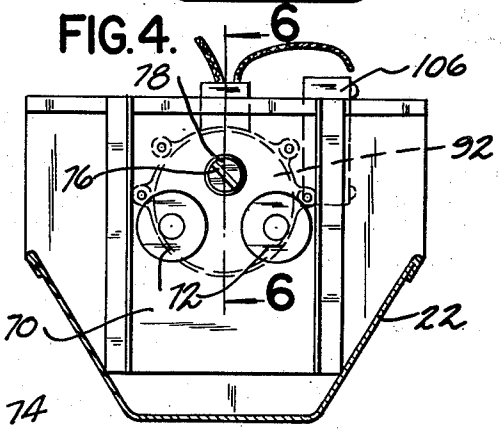


FIG. 5.

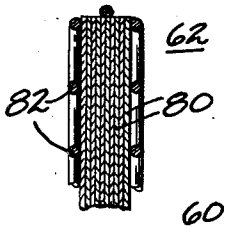
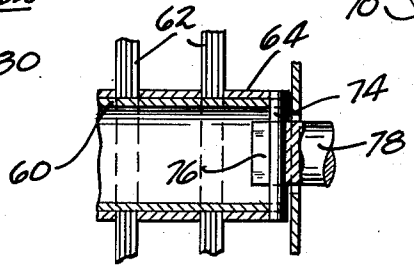


FIG. 6.



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FIG. 10.

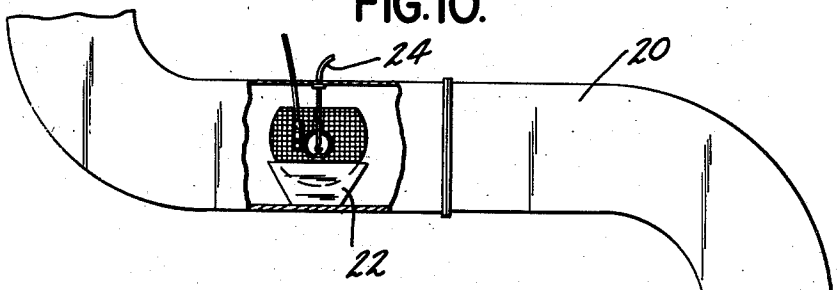


FIG. 7.

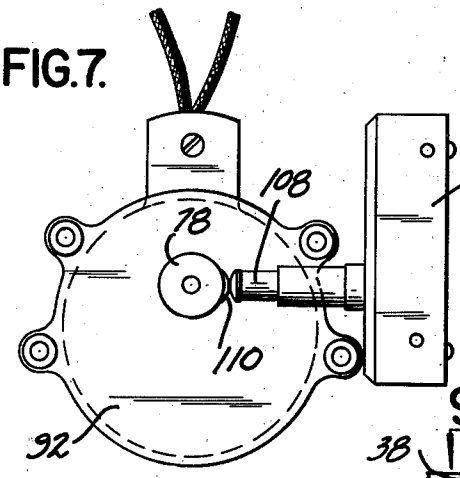


FIG. 9.

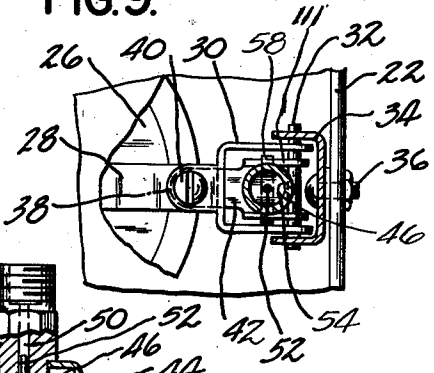


FIG. 8.

FIG. 11.

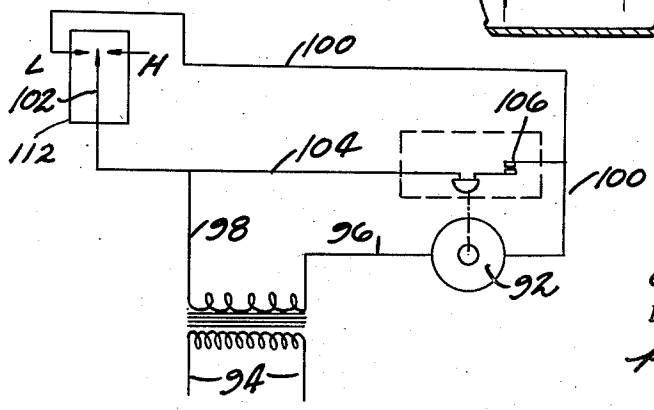
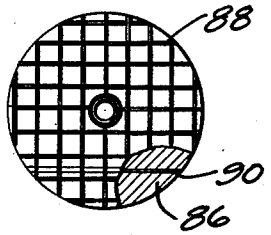


FIG. 12.



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HUMIDIFIER AND CONTROL THEREFOR

Claude E. Cox, Detroit, Mich.

Application June 27, 1946, Serial No. 679,701

7 Claims. (Cl. 236—44)

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This invention relates to improvements in humidifiers.

More particularly it relates to that type of humidifier which is adapted to be disposed in any place through which a current of air is passed for ventilation purposes, such as in a hot air furnace outlet conduit or in association with a unit heater assembly blower.

The object is to provide a simple, inexpensive, uniformly effective humidifier adapted to automatically add moisture to the air from time to time in such amount as is requisite to maintain the proper humidity of the air.

It has heretofore been conventional practice to provide humidifiers of the evaporator pan type wherein a current of air was passed over the surface of a body of water. When more evaporation was required it was the practice to employ wicks or absorbent pads which dipped into the water pool and elevated water therefrom to be picked up from the surface of the wick exposed to the air passing thereover. Another practice has been to pass air through a liquid shower created in one manner or another.

This invention relates to apparatus of the absorbent element type wherein liquid absorbent ments is moved through a cycle which includes passage through a body of liquid to pick up liquid therefrom and subsequent exposure of the thus wetted portion of the absorbent element above the liquid level and to an air stream passing thereover.

An object is to provide a unitary device of the character described which employs absorbent means supported to be moved through a pool of liquid and into position for exposure to the air above the liquid pool and wherein the movement of the liquid absorbent means is automatically controlled by a humidostat.

A meritorious feature is that the mechanism which moves the liquid absorbent means is of such a character that such means is actuated to deliver liquid to the air in response to a humidostat calling for the addition of liquid to the air and is controlled to discontinue that movement of the means which delivers liquid to the air when the humidity of the air within the space to which air is being delivered reaches a predetermined humidity.

More particularly, the device embodies liquid absorbent means in the form of an absorbent plate or disc pivotally supported to be swung through a liquid pool and into a position of exposure to the air above the pool. In a preferred embodiment this liquid absorbent means consists

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of an assembly of axially spaced apart substantially parallel liquid absorbent discs supported for rotation first through a body of liquid and thereafter through an air stream. Rotation of the discs causes absorbent portions thereof to travel first through the liquid and thereafter through the air space above the liquid to deliver liquid to the air passing over the discs.

An advantage of the construction is that the discs may be formed, in part at least, of absorbent material and such discs are so supported that upon their rotation their liquid absorbent portions are adapted to elevate liquid above the liquid body and into the space through which the air is traveling. The control over the revolution of the discs is so maintained that when the rotation of the discs is stopped, such stoppage will occur at such a point in their revolution that no further liquid will be wicked up to the air exposed portions of the discs above the liquid body.

The assembly of discs may have segmental portions removed so that when the rotation of the discs is stopped it will be at a point at which the discs are no longer dipping into the liquid. On the other hand, each disc may represent a full circumference and uniformly balanced element throughout and a segmental portion of each disc may be separated by a liquid barrier from the remainder of the disc and the revolution of the discs may be so controlled that upon stoppage of rotation such barrier will prevent migration of the liquid from one portion of the disc to another portion thereof.

The disc assembly is adapted to be readily removed from the casing and from the liquid container. The entire structure is adapted to be readily disposed as a unit in any desirable location so that air may be passed thereover.

Other objects, advantages and meritorious features will appear from the following description, appended claims and accompanying drawings wherein:

Figure 1 is an elevation partly in section of a humidifier unit embodying this invention,

Figure 2 is a vertical sectional view taken on the line 2—2 of Figure 1,

Figure 3 is a vertical sectional view taken on the line 3—3 of Figure 1,

Figure 4 is a vertical sectional view taken on the line 4—4 of Figure 1, with the disc supporting shaft removed,

Figure 5 is a vertical sectional view through a single disc taken on the line 5—5 of Figure 2,

Figure 6 is a fragmentary section taken on the

line 6—6 of Figure 4 but with the disc carrying shaft shown in place,

Figure 7 is a view taken on the line 7—7 of Figure 1,

Figure 8 is a view showing the float mechanism partly in section,

Figure 9 is a view taken on line 9—9 of Figure 8,

Figure 10 is a view showing a fragment of a hot air conduit with an embodiment of my humidifier disposed thereon,

Figure 11 is a diagram of an electric circuit provided for the humidostat control of the humidifier, and

Figure 12 is an elevated view of a fragment of a disc showing a modified form as compared with Figure 2.

This improved humidifier is adapted to be disposed in association with means for passing an air stream thereover to pick up liquid to be carried by the air stream to an air space for ventilating or heating such space. It is shown in Figure 10 as mounted within an air conduit 20, which conduit may lead from the hot air furnace to the room of a dwelling. The humidifier might be disposed in front of a unit heater of the fan type from which a blast of air would be directed over the liquid carrying faces of the humidifier discs.

The humidifier comprises a tank or liquid container 22 which is adapted to receive liquid from an inlet pipe 24. This inlet pipe enters one end of the tank. The flow of liquid through the pipe is controlled by a float valve assembly. The float itself is indicated by the numeral 26. The float rises and falls to cut off the admission of water or to turn on the same.

A bracket 28 is secured to the top of the float body. It is provided with a pair of ears 30 apertured to receive a pivot pin 32 by which it is pivoted upon a support 34, which support may be secured by bolts or the like 36 to the wall of the tank as shown in Figure 8. The bracket also has an ear 38 which is turned upwardly as shown in Figure 8 between the two ears 30. An adjusting screw 40 extends through the ear 38 and through a tongue 43 of a supporting lever 42, which lever 42 carries a plunger 44, which plunger telescopes within a valve chamber 46 as shown in Figure 8.

The fitting 48 within which the valve chamber 46 is formed communicates with the conduit 24, as shown in Figure 1. This fitting has a liquid passageway 50 extending therethrough. There is a pin 52 carried by the plunger 44 which is slidably received within the passageway 50. The plunger 44 has a valve facing 54 which is adapted, when the float is elevated, to seat against the end of the fitting within the valve chamber 46 closing the passageway 50 and closing the outlet therefrom. When the float is lowered to the open position shown in Figure 8 liquid can flow through the passageway 50 and around the plunger and into the tank.

The supporting lever 42 has a pair of ears 111 journaled upon the pin 32 as are the ears 30 of the bracket 38. This part 42 has a forward tongue portion 43 which is received over the screw 40. A spring 56 encircles the adjustment screw between the ear 38 of the bracket 28 and the tongue 43 of the supporting lever 42. The supporting lever 42 supports the plunger 44 through a pin 58, as shown in Figures 8 and 9.

It is apparent therefore that through operation of the adjustment screw 40 the plunger 44 may be raised or lowered within the valve chamber so as to cause the flow of liquid to be cut off at different levels within the tank 22. It is apparent also that when the float is raised to shut off the discharge of liquid, the liquid will remain in the tank at such level without admitting more liquid until the humidifier has discharged by evaporation sufficient liquid to cause the float to fall sufficiently to open the valve.

The humidifier proper comprises a shaft 60 which is shown as of tubular formation. Upon this shaft 60 are mounted a number of discs 62 formed in part at least of absorbent material. These discs are held in axially spaced apart parallelism upon the shaft 60 by tubular spacers 64. The shaft is supported at opposite ends for rotation. At one end of the tank there is a standard 66 upon which is mounted a pair of rollers 68, as shown in Figure 3. Such end of the shaft is freely removably supported upon these rollers.

Adjacent to but spaced from the opposite end of the tank is a standard 70 upon which are supported for rotation a pair of rollers 72 adapted to rotatably support the opposite end of the shaft. Such opposite end of the shaft is provided with a connecting pin 74 adapted to be received within a kerf 76 formed diametrically within the end of a motor drive shaft 78.

These absorbent discs shown in Figures 1 and 2 may be formed of a plurality of layers 80 of woven asbestos fabric or other suitable material. In the drawing these several layers are shown as held together by an open weave metal screen or mesh 82. Each disc is shown as being in the general form of a circular disc from which a segmental portion has been removed, forming a flatted edge 84. The shaft is so supported above the normal surface of the liquid that if the rotation of the disc is stopped with the flatted edge downward the disc will be above the surface of the water. During rotation of the disc, however, it travels through the liquid within the tank.

The disc above described is that illustrated in Figure 2. A modification is shown in Figure 12 wherein the several discs are similar in all respects to the disc assembly hereinabove described except that each individual disc has a circular contour throughout, but a segmental portion indicated as 86 is separated from the remaining portion 88 of the disc by a moisture blocking barrier 90. It is therefore apparent that in the rotation of this disc shown in Figure 12 that if the disc were stopped in its rotation so that the segmental portion 86 were submerged within liquid, that liquid would not travel therefrom to the air exposed portion 88 because of the presence of the liquid barrier 90. The disc shown in Figuer 12 may be rotated more easily at a uniform rate due to the uniform balance of the disc.

The rotation of the discs is produced by an electric motor indicated in Figures 1 and 11 as 92. The motor shaft 78 has heretofore been described as to its connection with the hollow shaft 60 upon which the discs are mounted. The motor is adapted to rotate the disc assembly at intervals as controlled by a humidostat. The humidostat 112 may be located in the air space such as the room to which the air current passing over the discs is delivered.

In Figure 11 the primary circuit of a transformer is indicated as 94 and the secondary circuit has a lead 96 to the motor and a lead 98 to the humidostat. The humidostat has a low

and a high side indicated by the letters "L" and "H" and a lead 100 extending from the low side to the motor 92. When the humidostat registers low as to humidity and the contact extension 102 of the lead 98 is brought into contact with the lead 100 of the low side of the humidostat the circuit is closed through the motor and the motor rotates the assembly of discs hereinabove described.

When the humidity exceeds a determined low point and the contact member 102 leaves the low side, indicated by the letter "L" of the humidostat, the circuit above described is broken. It is desired, however, that the discs be stopped at a determined point in rotation so that liquid will not be wicked up to the exposed portions of the discs during the time that the device is idle. It is therefore desired that the discs shown in Figure 2 be stopped with the flat side downwardly so that these discs will not, when idle, dip into the liquid. It is also desired that the discs shown in Figure 12, when at rest, have the segments 86 dipping into the liquid rather than any part of the segments 88.

Inasmuch as the humidity may reach its high point and break the circuit hereinabove described at any point in the rotation of the discs, it is necessary to provide means to assure continuance of rotation through that portion of the arc of rotation necessary to be accomplished to bring the discs to rest at the desired point in their rotation. The circuit diagram of Figure 11 therefore includes a branch circuit comprising a lead 104 extending from the lead 98 through a microswitch 106 to the lead 100 which leads to the motor. The microswitch 106 includes a plunger 108 (Figure 7) which is spring held outwardly so that the outer end bears against the motor shaft 78. The motor shaft has a protuberance or button 110 thereon, as shown in Figure 7, which button is adapted to ride over the end of the plunger during each revolution of the shaft. As the button travels over the plunger it urges the plunger inwardly against its control spring and this movement of the plunger inwardly opens the switch 106. The switch therefore is opened once during each revolution of the shaft. The switch is open when the button 110 is holding the plunger inwardly. At all other times the switch is closed.

If the humidostat breaks the circuit at the humidostat switch at any point in the revolution of the disc assembly shaft other than when the button 110 is in contact with the plunger 108 the disc assembly shaft will continue to rotate until the button 110 does come in contact with the plunger 108 because the microswitch will be closed and will maintain a circuit through the motor even though the humidostat switch is open. This circuit through the motor by way of the microswitch will be maintained only for the completion of the revolution of the motor shaft necessary to bring the button 110 into engagement with the plunger 108. When this occurs the microswitch is opened and the motor stops.

What I claim is:

1. In a humidifier, a liquid containing tank, an assembly of axially spaced apart substantially parallel discs supported for rotation through the liquid within the tank and the air space above the liquid level, said discs formed in part of liquid absorbent material, and mechanism including an electric motor coupled with the discs to rotate the same, an electric circuit connected with the motor, a switch in the circuit, a humidostat coupled with the switch to make and break the circuit, a shunt line in the circuit by-passing the humidostat switch, a switch in the shunt line, said last mentioned switch coupled with the assembly of discs to be actuated thereby in one position of rotation of the discs to break the shunt line circuit, said discs having segments cut away so that at one position to which rotated the discs do not dip into the liquid in the tank, said mechanism responsive to said humidostat and switches to stop the rotation of the discs at that position at which they do not dip into the liquid.

2. In a humidifier, a liquid containing tank, a plurality of liquid absorbent full circumference discs mounted upon a shaft in axially spaced apart substantially parallel relationship, said shaft rotatably supported to revolve the discs through the liquid in the tank and through the air above the liquid level, said plurality of discs having axially aligned segmental portions separated from the remainder of the discs by a liquid blocking barrier to prevent the wicking of liquid from said segments to the remainder of the discs, and mechanism including an electric motor coupled with the shaft to rotate the same, an electric circuit including the motor, a switch in the circuit, a humidostat coupled with the switch to make and break the circuit, a shunt line in the circuit by-passing the humidostat switch, a switch in the shunt line, said last mentioned switch coupled with the shaft to be actuated thereby in one position of rotation of the shaft to break the shunt line circuit to the motor.

3. In a humidifier, a liquid containing tank, an assembly of axially spaced apart substantially parallel discs supported for rotation through the liquid within the tank and the air space above the liquid level, said discs formed in part of liquid absorbent material, and mechanism including an electric motor coupled with said assembly of discs to revolve them through the liquid and through the air space above the liquid, said discs having segments cut away so that at one position to which rotated the discs do not dip into the liquid in the tank, an electric circuit including the motor, a switch in the circuit, a humidostat coupled with the switch to make and break the circuit, a shunt line in the circuit by-passing the humidostat switch, a switch in the shunt line, said last mentioned switch coupled with the assembly of discs to be actuated thereby in one position of rotation of the discs to break the shunt line circuit.

4. In a humidifier, a liquid containing tank, a plurality of liquid absorbent full circumference discs mounted upon a shaft in axially spaced apart substantially parallel relationship, said shaft rotatably supported to revolve the discs through the liquid in the tank and through the air above the liquid level, said plurality of discs having axially aligned segmental portions separated from the remainder of the discs by a liquid blocking barrier to prevent the wicking of liquid from said segments to the remainder of the discs.

5. In a humidifier, a liquid containing tank, and a plurality of liquid absorbent plates mounted upon a shaft in axially spaced apart substantially parallel relationship, said shaft rotatably supported to revolve the plates through the liquid in the tank and through the air above the liquid level, said plurality of plates comprising liquid absorbent material, the wicking function of said material being limited to a continuous area bounded by an arc of a circle substantially coincident with the periphery of the plate for a

distance not exceeding 300° and by a chord extending between the ends of said arc.

6. In a humidifier, a liquid containing tank, and a plurality of liquid absorbent plates mounted in axially spaced apart substantially parallel relationship upon a shaft spaced above the liquid level in the tank, said plates each comprising a major sectoral portion of liquid absorbent material extending radially outwardly in one direction from the shaft to a radial distance exceeding the distance by which the center of the plate is spaced above the liquid level and a minor sectoral portion of liquid absorbent material extending radially outwardly from the shaft in another direction a distance less than the distance by which the center of the plate is spaced above the liquid level.

7. The invention as defined in claim numbered 6 characterized in that: a motor is coupled with the shaft to rotate the same; an electric circuit is provided including the motor; a switch is provided in the circuit; a humidostat is provided coupled with the switch to actuate the same to make and break the circuit; said circuit is provided with a shunt line by-passing the humidostat switch and itself provided with a switch; such shaft is provided with a part operable upon each rotation of the shaft and at a determined position in its rotation to actuate the shunt line switch to make and break the circuit; said determined position of rotation of the shaft being that at which the plurality of liquid absorbent plates mounted upon the shaft are so disposed that the said major sectoral portions of the plates are disposed above the liquid level.

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