March 15, 1966 M. S. HELLAND 3,240,205

HUMIDIFIER FOR HOT AIR FURNACE

Filed April 24, 1964 2 Sheets-Sheet 1

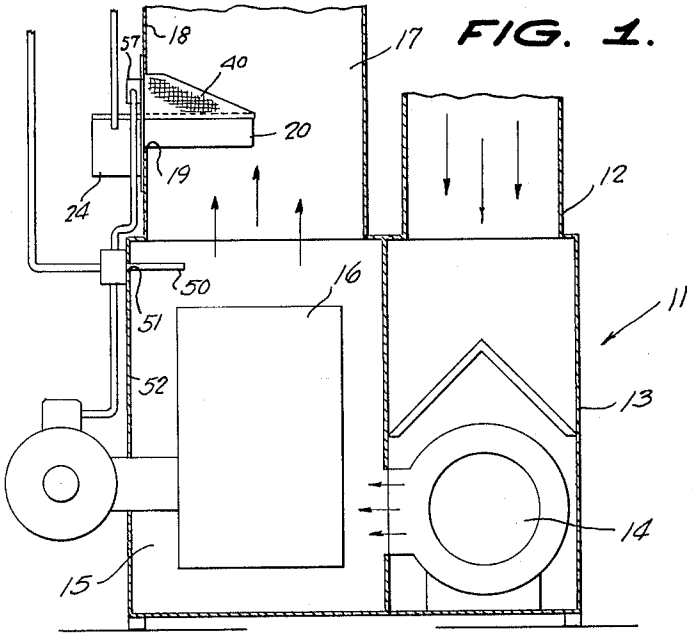
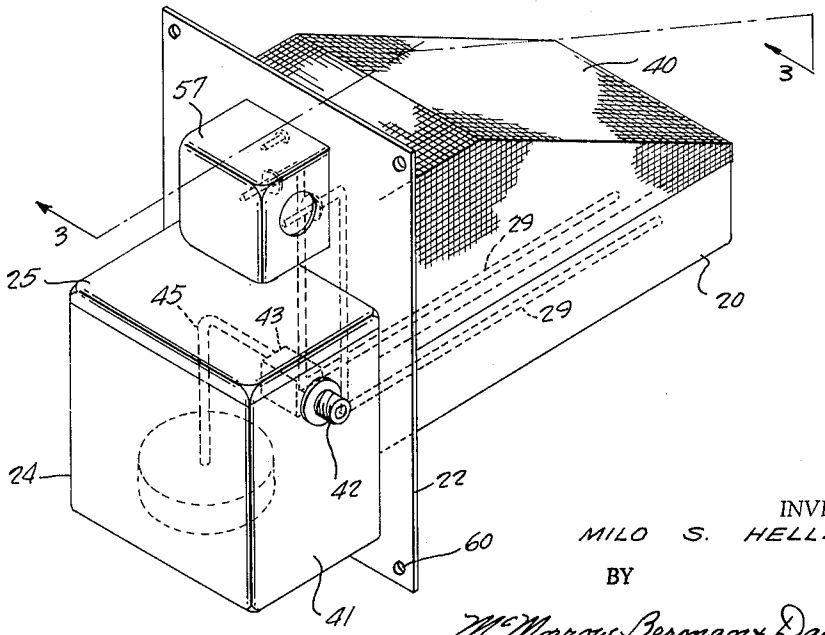


FIG. 1.

FIG. 2.



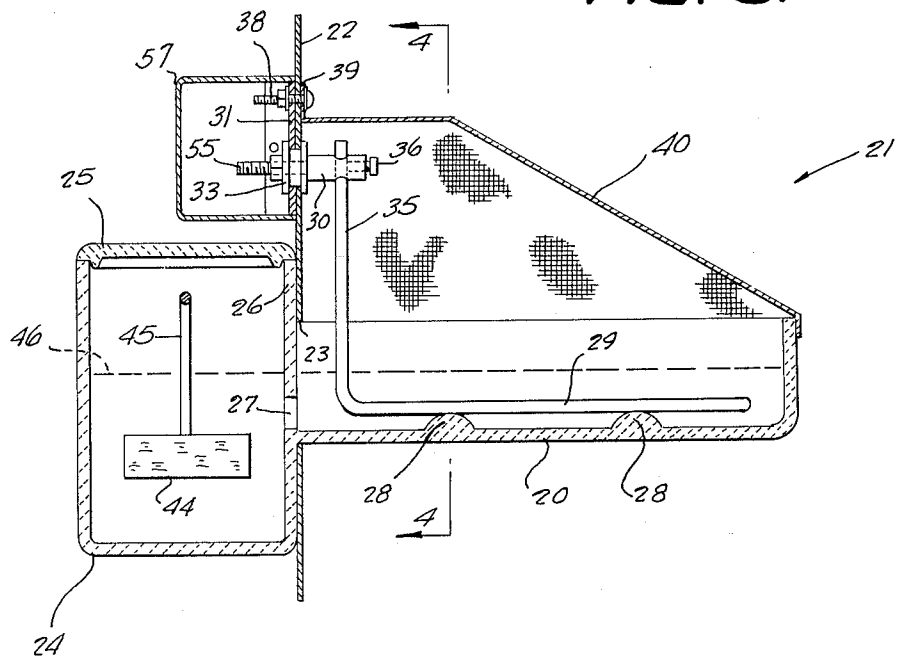
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FIG. 3.



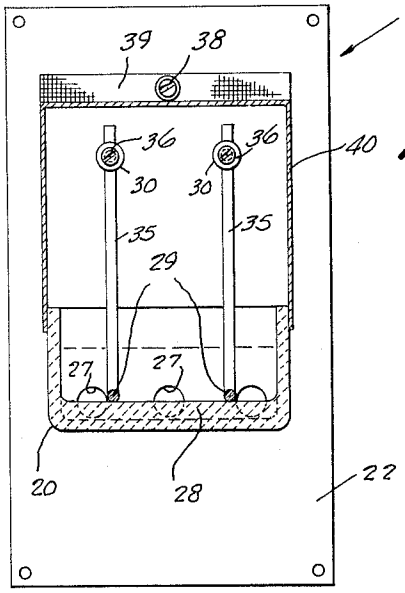


FIG. 4.

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United States Patent Office 3,240,205
Patented Mar. 15, 1966

3,240,205

HUMIDIFIER FOR HOT AIR FURNACE

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Filed Apr. 24, 1964, Ser. No. 362,235
1 Claim. (Cl. 126—113)

This invention relates to humidifiers, and more particularly to an apparatus for supplying water vapor within the plenum chamber of a hot air furnace.

A main object of the invention is to provide a novel and improved electrically operated hot air furnace humidifier wich is relatively simple in structure, which is easy to install, and which can be readily regulated to maintain a desired and uniform humidity.

A further object of the invention is to provide an improved apparatus for introducing vaporized moisture into the warm air stream of a hot air heating system, the apparatus being inexpensive to fabricate, being durable in construction, being reliable in operation, and involving relatively few parts.

A still further object of the invention is to provide an improved electrically operated humidifier for use in the plenum chamber of a hot air furnace, the humidifier being relatively compact in size, being relatively light in weight, being easy to maintain in operating condition, and not having any parts which may burn out because of passage of heavy electrical currents.

A still further object of the invention is to provide an improved humidifier for use in the plenum chamber of a hot air furnace, the humidifier being substantially self-cleaning and not being adversely affected by mineral deposits from the water being vaporized, being arranged to provide efficient utilization of energizing current in the vaporization of the water with which it is employed, and automatically becoming inoperative when the water level of the tray in which humidification takes place drops to a predetermined low level.

Further objects and advantages of the invention will become apparent from the following description and claim, and from the accompanying drawings, wherein:

FIGURE 1 is a diagrammatic vertical cross sectional view taken through a hot air heating system having a plenum chamber provided with an improved humidifying apparatus constructed in accordance with the present invention.

FIGURE 2 is an enlarged perspective view of the humidifying apparatus employed in the heating system of FIGURE 1, the humidifying apparatus being in accordance with the present invention.

FIGURE 3 is a longitudinal vertical cross sectional view taken substantially on the line 3—3 of FIGURE 2.

FIGURE 4 is a transverse vertical cross sectional view taken substantially on the line 4—4 of FIGURE 3.

Referring to the drawings, 11 generally designates a hot air furnace provided with a return duct 12 leading to an intake chamber 13 containing a blower 14 which forces air into a furnace chamber 15 provided with an air heating furnace 16. The output from the air heating chamber 15 is delivered to a plenum chamber 17 which leads to the various ducts associated with the heating registers in the different locations of a residence or other building to be heated.

A wall 18 of the plenum chamber 17 is formed with a generally rectangular aperture 19, through which extends a horizontal tray member 20 forming a part of a humidifying apparatus designated generally at 21. The apparatus 21 comprises a main supporting plate or flange 22 formed with a generally rectangular opening 23 through which the tray member 20 extends, the tray member 20 being integral with a generally rectangular reservoir 24 which is secured to the front face of the supporting

flange 22. The reservoir 24 and tray member 20 may be integrally molded of suitable electrically insulating material, such as ceramic material. The reservoir 24 is provided with a removable top cover 25, which may be of the same material as the reservoir, for example, molded ceramic material.

The tray member 20 is of substantial length and projects horizontally from the intermediate portion of the rear wall 26 of the reservoir. The rear wall 26 is formed with a horizontal row of apertures 27 located adjacent the bottom wall of the tray member 20 and establishing communication between the reservoir 24 and said tray member. The tray member bottom wall is integrally formed with transversely extending upstanding ribs 28, 28 which serve as supports for a pair of longitudinally extending electrodes 29, 29 and act as spacing means for maintaining said electrodes a short distance above the bottom wall of the tray member.

A pair of horizontally extending terminal rods 30, 30 are secured on a panel board 31 of insulating material and extend through the upper portion of the supporting frame 22, being insulated therefrom by means of suitable insulating bushings 33, as shown in FIGURE 3. The electrodes 29 are integrally formed with upstanding terminal end portions 35 which extend through transverse bores provided in the terminal rods 30 and are clampingly secured therein by clamping screws 36 threaded axially through the inner end portions of the rods 30 and being clampingly engageable with the top end portions of the electrode terminal elements 35.

A fastening bolt 38 extends through the top marginal portion of the insulating panel board 31 and the frame 22, and also extends through a supporting flange 39 provided on the top forward edge of a protective wire mesh screen 40 which is shaped to fit over the tray member 20. The protective wire mesh hood-like member 40 prevents the entry of solid particles of any substantial size into the tray member from above, while allowing water vapor to freely escape from said tray member.

Connected to the upper portion of the front wall 41 of the reservoir 24 is a water supply conduit fitting 42 adapted to be connected to a water supply line. A conventional float controlled valve 43 is mounted on the inside surface of the wall 41 the valve 43 being provided with a float member 44 of insulating material operatively connected to the valve by a rod 45, also of insulating material, and being arranged to open the valve when the water level in the reservoir 24 drops to a relatively low value, namely, to a level substantially below the normal water level therein, indicated at 46.

As shown in FIGURE 3, the electrodes 29 are supported on the transverse ribs 28, 28 at a level substantially below that of the normal water level 46, and extend longitudinally in the tray member 20 in spaced parallel relationship. The terminal rods 30, 30 are adapted to be connected to a suitable source of energizing current, for example, to the domestic alternating current supply lines through suitable control means adapted to energize the electrodes 29, 29 at the same time as the blower 14 and under conditions wherein humidification is required. Thus, the control system associated with the electrode terminal elements 30, 30 may include a conventional humidistat mounted in the area to be heated, said humidistat serving as a control switch to place the humidifier in operation when the humidity in the controlled area drops below a predetermined desired level. The humidistat and associated control circuitry is conventional, and in itself forms no part of the present invention. Similarly, the control means for energizing the blower 14 and the operating elements of the furnace 16 are also conventional, and may include a thermostat 50 mounted in an opening 51 in the front wall 52 of the furnace chamber 15, and acting to

simultaneously control the energization of the blower 14, the electrical portions of the furnace 16 and the energization of the humidifying electrodes 29, 29, the electrodes 29, 29 being further controlled by the above-mentioned humidistat. Thus, the circuit containing the electrodes 29, 29 and the humidistat may be connected in parallel with the circuit containing the motor of the blower 14 and other electrical furnace operating elements, so that the energizing current is applied simultaneously to the furnace electrical elements and to the humidifying electrodes 29, 29, the electrodes 29, 29 being energized only if the associated humidistat is in a condition demanding humidity, namely, as its contacts close.

In operation, when the humidistat contacts are closed and the furnace is energized, the electrodes 29, 29 are connected to the electric current supply lines so that current flows between the electrodes and through the water in the tray 20, the flow of current generating heat which causes the water to vaporize. The vaporized water emerges from the exposed top of the tray member, passing through the screen 40 and joins the stream of warm air passing upwardly through the plenum chamber 17. Vaporization of the water continues as long as the water level remains above the level of the electrodes 29, 29 and as long as said electrodes are connected to the current supply wires. If the water level should drop below the electrodes 29, 29, the circuit therebetween is broken and the humidifier is automatically deenergized. Under normal operating conditions, the float 44 operates the associated valve 43 to admit water into the reservoir 24 so as to maintain the water level 46, shown in dotted view in FIGURE 3, which is substantial distance above the level of the electrodes 29, 29 but which is spaced well below the valve 43. Thus, water when admitted to the reservoir must drop into the reservoir, whereby to prevent direct electrical contact between the energized water in the reservoir and the water line.

The outer end portions of the terminal rods 30 are threaded, as shown at 55, so as to be easily connected to the associated lead wires for energizing the electrodes from the supply line conductors. The connections are enclosed in a suitable terminal box or cover 57 secured over the terminal panel 31.

As will be readily understood, the humidifier described above provides many important advantages, particularly, enables moisture to be introduced into the heated air, as required, whereby healthy and more comfortable heat is provided, and whereby improved economy in heating is provided since humidified warm air is not required to be at a high a temperature as dry air in order to keep humans comfortable. The proper amount of moisture in the warm air also prolongs the life of household furniture, carpets and other household articles.

It will be further noted that the evaporation of the water, which ordinarily causes deposits of lime and other minerals contained in the water, does not interfere with

or clog any parts of the humidifying apparatus described above, and that this deposit material may be readily cleaned out, whenever it becomes necessary, by detaching the supporting flange 22 from the plenum wall 18 and dismounting the humidifying apparatus, thereby providing access to the tray member 20 for cleaning. The flange 22 may be easily disconnected from the plenum wall 18, since it is secured to the plenum wall 18 by ordinary removable fasteners such as sheet metal screws engaged through apertures 60 provided in the respective corners of the flange 22.

While a specific embodiment of an improved furnace humidifying apparatus has been disclosed in the foregoing description, it will be understood that various modifications within the spirit of the invention may occur to those skilled in the art. Therefore, it is intended that no limitations be placed on the invention except as defined by the scope of the appended claim.

What is claimed is:

In combination with a hot air furnace provided with a plenum chamber and means for forcing heated air through said plenum chamber, the wall of said plenum chamber being formed with an aperture, a water reservoir secured to said wall externally adjacent said aperture and having an elongated horizontally extending open tray portion of electrically-insulating material in communication therewith and extending through said aperture into said plenum chamber in the path of and exposed to heated air moving through the chamber, a water supply conduit connected to said reservoir and including a control valve, a float member in said reservoir, means operatively connecting said float member to said valve to maintain a predetermined water level in said tray portion, a pair of spaced parallel rod-like electrodes disposed longitudinally in said tray portion below said predetermined water level, said tray portion including electrically-insulating transverse spaced ribs integral with and supportingly-engaging said electrodes above the bottom wall, a pair of supply terminals mounted on said wall and adapted to be connected to a source of current, said electrodes having upstanding integral end terminal portions, and means clampingly connecting said upstanding terminal portions to said supply terminals, whereby to energize said electrodes from the source of current and to vaporize the water between the electrodes by the heating effect of the electric current flowing therebetween.

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