May 29, 1934. W. F. MORTIMER 1,960,545

HUMIDIFIER

Original Filed Jan. 11, 1932

FIG. 1

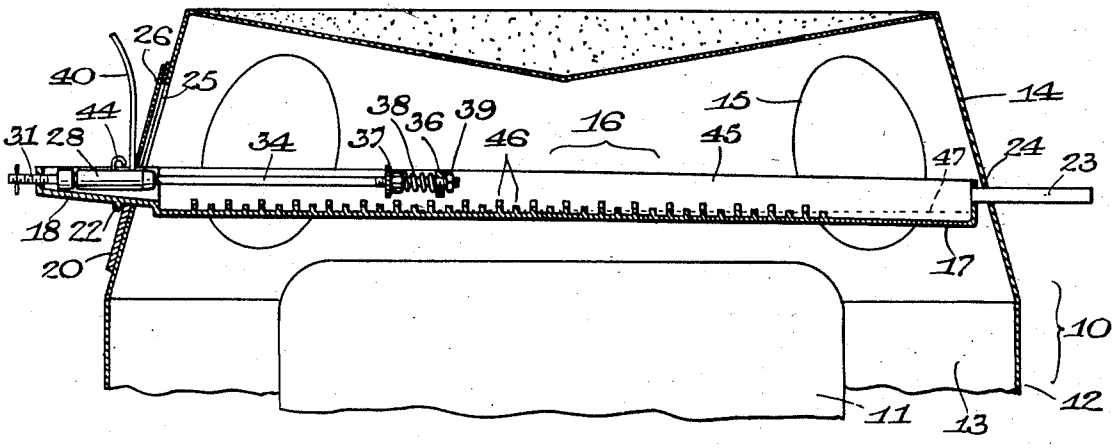


FIG. 2

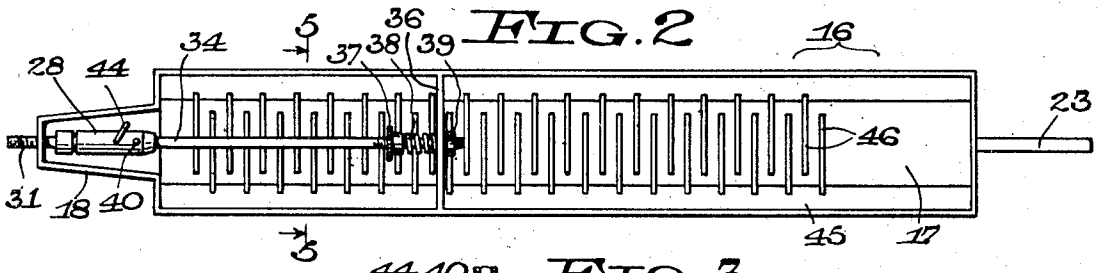


FIG. 3

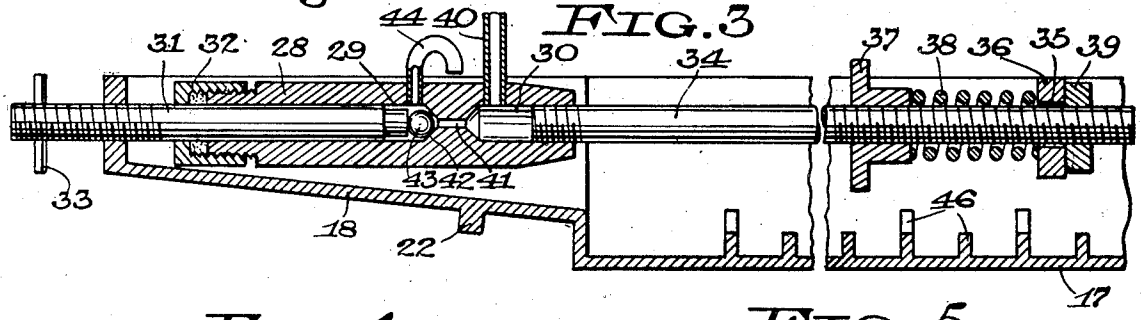


FIG. 4

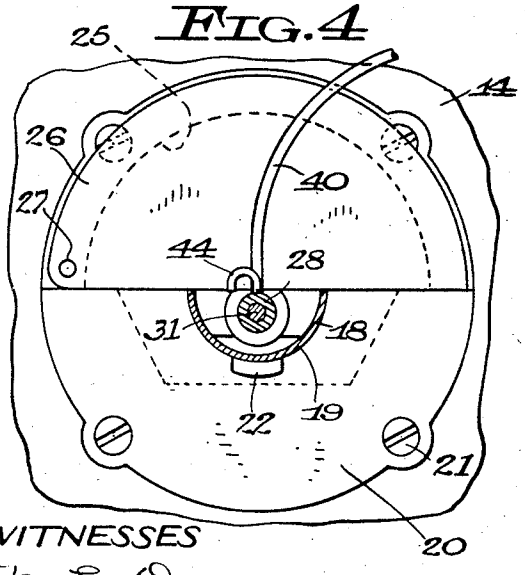


FIG. 5

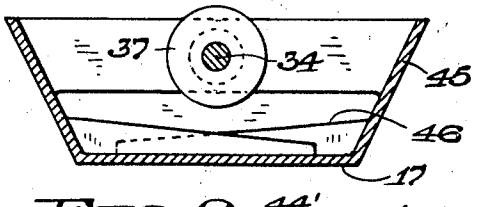
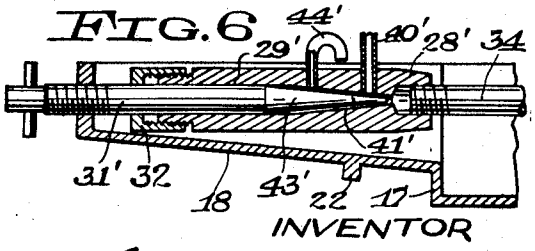


FIG. 6



WITNESSES

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UNITED STATES PATENT OFFICE

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HUMIDIFIER

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Application January 11, 1932, Serial No. 585,989
Renewed September 22, 1933

6 Claims. (Cl. 126—113)

The invention relates to humidifiers adapted for use in hot air furnaces.

An object of the invention is to provide a humidifier suitable for installation in the upper portion of a jacket of a hot air furnace and having an evaporating tray receiving therein a thin sheet of water, and along the bottom of which the water is caused to flow in a sinuous or staggered course from one end to the other to obtain rapid and voluminous evaporation.

Another object of the invention is to provide a furnace humidifier in which the admission of water to the evaporating tray is controlled thermostatically, and in which the tray forms part of the thermostatic means in order to be directly influenced by the water therein.

The invention further consists in the several features hereinafter set forth and more particularly defined by the annexed claims.

In the accompanying drawing, Fig. 1 is a transverse sectional view of the upper part of a furnace having mounted therein a humidifier embodying the invention, the humidifier tray being shown in longitudinal section;

Fig. 2 is a top plan view of the humidifier;

Fig. 3 is a fragmentary sectional elevation of the humidifier and the thermostatic valve means;

Fig. 4 is a detail view of an end mounting for the humidifier, parts being broken away and shown in section;

Fig. 5 is a transverse sectional elevation of the humidifier taken along the line 5—5 of Fig. 2, and

Fig. 6 is a sectional elevation of a modified form of valve means.

In the drawing, the numeral 10 designates a hot air furnace of the usual type having a fire box 11 surrounded by a casing or shell 12 to form therebetween an air heating chamber 13. In the present instance, the upper end of the casing is shown to have a conically formed bonnet 14 to which hot air ducts 15 are connected.

The humidifier 16 of the invention is placed in the air heating chamber above the fire box 11, where it will be effectively heated. The humidifier is provided with an elongated evaporating tray or pan 17, which may be formed of cast aluminum, extending between the opposite walls of the bonnet 14. At one end the tray is provided with an integrally formed extension 18 of semi-conical shape saddled in a semi-circular recess 19 formed in a plate 20 secured by screws 21 to the outer face of the bonnet 14, there being a depending lug 22 formed on the extension to prevent inward shifting of the tray. At its other end the tray is supported by means of an overflow pipe 23 secured thereto and extending through an opening 24 formed in the bonnet. The recess 19 in the plate 20 communicates with a larger upper opening 25 through which the tray may be inserted into the air heating chamber of the furnace, the opening 25 being closed by a swingably mounted cover 26 having at one side a pivotal mounting 27 on the plate.

A valve body 28 is mounted within the tray extension 18 and is provided with aligned longitudinally extending bores 29 and 30, which open at opposite ends of the valve body. The valve body is slidably mounted for longitudinal movement on a rod 31 which slidably fits in the bore 29, and which has a threaded outer end screwed through the end wall of the tray extension 18. The end of the valve body receiving the rod 31 is provided with a stuffing box 32, and the outer end of the rod carries a cross pin 33 by which the rod may be turned and thereby longitudinally shifted. The stuffing box may be omitted, if desired, as the liquid pressure about the rod 31 is negligible.

The bore 30 of the valve body has threaded therein one end portion of a rod 34 extending longitudinally of the tray, the other end portion of the rod passing through an opening 35 formed in a cross bar 36 on the tray. A thumb nut 37 is threaded onto the rod 34 to occupy a position between the valve body 28 and the cross bar 36. A coil spring 38 surrounding the rod is interposed between the cross bar 36 and the thumb nut 37, and is placed under pressure by the thumb nut 37. A nut 39 is threaded onto the outer end of the rod 34 and abuts against the cross bar 36 of the tray when the tray is heated, as hereinafter described. The rod 34 is formed of metal, such as steel, having a lower temperature co-efficient than the metal of the tray.

A metal tube 40 connected to a suitable source of supply, not shown, conducts water under pressure to the bore 30. A small bore 41 connects the aligned bores 29 and 30, and the bore 29 is provided with a conical seat 42 at the bore 41 to receive a valve ball 43, the valve ball being engageable with the inner end of the rod 31. A goose neck tube 44 is secured to the upper portion of the valve body 28 in communication with the inner end of the bore 29, and has its downwardly projecting outer end arranged to discharge water into the cavity formed in the tray extension 18. The valve seat and valve ball are thus kept under water to minimize incrustation thereon.

In the modified form of invention shown in Fig. 6, the valve body 28' is provided with a longitudinally extending bore 29' communicating with a conically-formed seat 41'. A needle valve 31' is threaded into the end wall of the tray extension 18 and is provided with a conically-formed end 43' engageable with the seat 41'. The water supply tube 40' and a goose neck discharge tube 44' both communicate with the conical seat 41', and are both closed by the needle valve when it engages the conical seat.

The tray 17 is provided with upwardly diverging side walls 45, and on the bottom of the tray are formed a series of upstanding parallel ribs 46 arranged in staggered relation, as best seen in Fig. 2, in order to cause water flowing along the tray to take a sinuous or tortuous course. The upper edges of the ribs 46 preferably slope downwardly toward the ends spaced from the side walls of the tray, as seen in Fig. 5. The tray preferably has a slight downward slope toward the overflow end, so as to provide a reservoir for water at this end, a water level being indicated at 47 in Fig. 1. With this arrangement, the end of the tray remote from the supply valve will not become dry, if the valve is suitably adjusted. However, it is possible to so adjust the valve that the water flowing along the tray will be completely evaporated before it reaches the overflow end of the tray.

When the furnace is relatively cool, the contraction of the aluminum tray urges the rod 31 into the bore 29 of the valve body, thus moving the valve ball 43 to its seat to close the valve and thereby prevent the flow of water to the tray. With the modified form of valve shown in Fig. 6, the seating of the needle valve on its seat, as the tray cools, will close both the supply tube and the discharge tube. As the tray becomes heated incident to the presence of heated air in the furnace, the tray expands more than the rod 34, thus slightly withdrawing the rod 31 and permitting the water under pressure to move the valve ball 43 from its seat. Water is then forced upwardly into the goose neck tube 44 and drips into the tray. The water in flowing toward the other end of the tray takes a sinuous or tortuous course between the staggered cross ribs 46, and is heated and evaporated. In practice, a film of water spreads upwardly along the ribs and hastens the evaporation. The valve rod 31 is preferably so adjusted that only a thin sheet of water will collect on the bottom of the tray, although a larger amount may collect at the lower end of the tray adjacent the overflow pipe. The sloping side walls of the tray present an extended surface which increases the transfer of heat to the tray. As the temperature of the tray increases, the valve opens farther, so that the quantity of water delivered to the tray varies in accordance with requirements. The water reaching the tray cools the metal thereof and tends to close the valve, thereby preventing the discharge of an excessive amount of water into the tray. The operation of the valve is thus influenced by the water in the tray. As the temperature of the furnace drops, the valve opening becomes constricted, but a sufficient amount of water is always present in the tray to insure satisfactory humidity of the air entering the hot air ducts. Upon further cooling of the furnace sufficient to close the water valve, the nut 39 on the rod 34 backs away from the cross bar 36 on the tray, and the pressure caused by the thermostatic action is then applied to the spring 38, thereby avoiding straining or breaking of the parts. The spring 38 is under an initial pressure, so that the pressure on the valve is not greatly increased as the furnace becomes cooler.

What I claim as new and desire to secure by Letters Patent is:

1. In a humidifier, an open evaporating vessel adapted to be heated, a valve for admitting water to said vessel and having a valve body provided with communicating aligned bores opening at opposite ends thereof, one of said bores having a valve seat at its inner end and having a discharge opening, the other of said bores forming an inlet, valve means movably mounted in said first-named bore and co-operating with said valve seat, said valve means having a connection with said vessel, and a support connecting said valve body with a part of said vessel remote from the point of connection of said valve means with said vessel, the material of said support having a temperature co-efficient different from that of the material of said vessel to form a thermostatic means controlling said valve.

2. In a humidifier, an evaporating vessel adapted to be heated, valve means for admitting water to said vessel, thermostatic means for controlling said valve means and including said vessel as a thermostatic element to open said valve means by increasing temperature, and means for preventing excessive stress in said vessel when the valve means is closed.

3. In a humidifier, an evaporating vessel adapted to be heated, valve means for admitting water to said vessel, thermostatic means for controlling said valve means and including said vessel as a thermostatic element to open said valve means by increasing temperature, spring means for preventing excessive stress in said vessel when the valve means is closed, and adjusting means for the valve means independent of said spring means.

4. In a humidifier, an evaporating tray adapted to be mounted in a furnace casing and having a reduced integrally formed end portion adapted to pass through and to be supported by said casing, said end portion having a transversely extending wall, a valve rod adjustably mounted in said wall, a valve body arranged at said end portion of the tray and having said valve rod relatively movable therein for admitting water to the tray, and a rod extending longitudinally of the tray and having opposite ends connected to said valve body and said tray, said last named rod and tray having different thermal coefficients of expansion and forming thermostatic control means for the valve.

5. In a humidifier, an evaporating tray adapted to be heated and having a longitudinally inclined bottom wall for the gravity flow of water therealong, a valve for admitting water to the elevated portion of said bottom, and thermostatic means for controlling said valve and including said tray as a thermostatic element.

6. In a humidifier, an open top evaporating tray adapted to be heated, valve means for admitting water to the tray, and thermostatic means for controlling said valve means and including said tray as a thermostatic element to open said valve means by increasing temperature.

WINFIELD F. MORTIMER.