Oct. 6, 1953 A. E. SCHARF 2,654,362

HUMIDIFIER

Filed April 5, 1950

Fig. 1

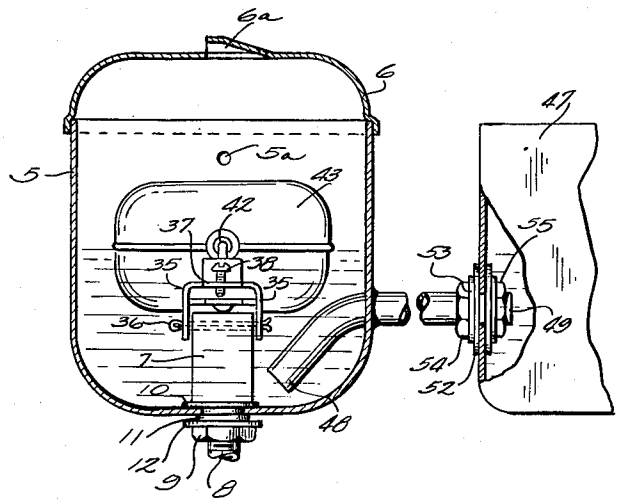


Fig. 2

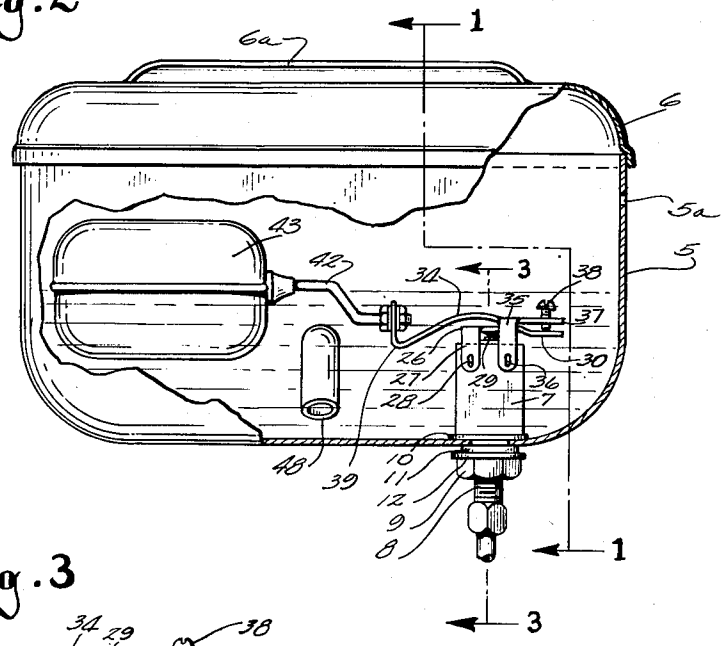
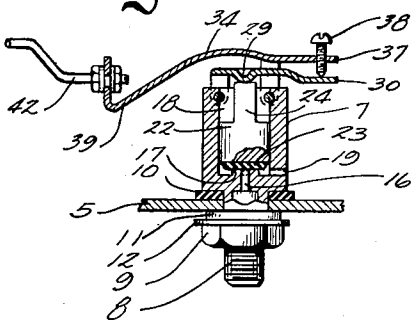


Fig. 3



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Patented Oct. 6, 1953

2,654,362

UNITED STATES PATENT OFFICE

2,654,362

HUMIDIFIER

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Application April 5, 1950, Serial No. 154,120

4 Claims. (Cl. 126—113)

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This invention relates to improvements in humidifiers for space heated by air flowing about a furnace of the hot air type.

This application is a continuation-in-part of abandoned application Serial No. 105,370, filed July 18, 1949.

Humidifiers of the present type include a chamber enclosing a float-operated valve and connected by a pipe with an evaporating pan, the chamber being exteriorly of the furnace casing but relatively closely adjacent thereto and the pan being located therein. When such humidifiers are used in regions where the water has a high mineral content, such minerals precipitate from the water as evaporation thereof takes place. Heretofore a considerable amount of such precipitation occurred in the valve-float chamber and on the movable parts therein, with the result that humidifiers required considerable maintenance work if they were to be kept in a satisfactory operation.

If the humidifier is so designed as to minimize transfer of heat from the evaporating pan to the valve-float chamber and its contents, to prevent flow of hot water from the pan to the chamber, and to make the feed water most effective in keeping a low temperature in such chamber, the degree of precipitation in such chamber can be greatly reduced. Providing for flow of air through the float-valve chamber prevents condensation of moisture on the cover and thus avoids dripping of moisture on the float, which would cause electrolytic corrosion and change in adjustment of the valve action, and keeps the joint between such chamber and its cover dry so that the cover may be easily removed at all times. Further, the effect of such precipitation as does occur, can be made negligible if the valve is made especially rugged and sensitive, if the operating means is made more powerful than really required and is adjustable, and if the valve and the major portion of its operating means are kept submerged in water. The parts should also be so related as to avoid settling of precipitates or slimes in the pipe connecting the valve-float chamber. A materially lower amount of maintenance is then required and the mechanism is usable for a much longer time than heretofore possible. The above results are particularly advantageous if they are accomplished without complication of construction or increase in cost of the humidifier.

It is therefore an object of the present invention to so relate the essential parts of a humidifier for adding moisture to the air flowing about a hot air type space heating furnace as to minimize the heat transfer from the evaporating pan of the humidifier and its water content to the valve-operating mechanism chamber and the water in such chamber.

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Another object of the invention is to provide a valve-float chamber with openings at several levels above the level of water therein to avoid condensing water in the chamber which would drip on the float and run into the joint between the chamber and its cover and thereby cause corrosion of parts and locking of the chamber-cover joint.

A further object of the invention is to so construct the humidifier for a hot air furnace as to prevent the flow of hot water from the evaporating pan back into the valve-operating mechanism chamber of the humidifier.

A further object of the invention is to keep the valve-float chamber of a humidifier for a hot air type space heating furnace at the lowest temperature possible by minimizing the size and volume of such chamber and thereby obtaining the maximum cooling effect thereon by the water flowing into the chamber.

A further object of the invention is to provide inflow control means for a humidifier for use in a hot air type space heating furnace in which substantially all of the moving parts are kept submerged in water at all times to minimize the hardening of any precipitates thereon.

Another object of the invention is to provide a humidifier with an especially rugged and sensitive valve and with operating means several times multiplying the force of the liquid level responsive float in the water inlet chamber to compensate for loss in sensitivity due to precipitation of minerals on the valve and its operating means from the water in the chamber.

Another object of the invention is to so form the pipe connecting the valve-float chamber and the evaporating pan of a hot air furnace humidifier as to prevent the collection therein of precipitates from the water and of slimes collecting on the surfaces of the water.

Objects and advantages other than those above set forth will be apparent from the following description when read in connection with the accompanying drawing in which:

Fig. 1 is a view showing the relationship of the float chamber with the evaporating pan, the float chamber being in section on the line 1—1 of Fig. 2 and a portion of the wall of the evaporating pan being broken away;

Fig. 2 is a side elevational view of the valve-float chamber with a portion of the wall broken

away to show the relationship of the valve, the float, the valve-float leverage, and the inlet end of the pipe connecting the float chamber with the evaporating pan, and

Fig. 3 is a cross-sectional view on the plane of line 3—3 of Fig. 2, of the valve shown in elevation in Figs. 1 and 2.

In the present construction, the valve is designed to require a minimum of operating force for seating of the valve body, and the valve operating means is designed to provide more than adequate force for closing the valve even if some minerals are deposited on such operating means and on the valve. The valve-float chamber is made a size sufficient only to provide adequate clearance for the valve, the float, and the valve-float connecting leverage, and to maintain such parts submerged in water at all times. The pipe connecting the valve-float chamber and the evaporating pan is so curved and so joined with the evaporating pan as to minimize the transfer of heat between the chamber and the pan, as to avoid reverse flow of water through such pipe and as to avoid collection in such pipe of precipitates or slimes forming in the pan. All of the above features cooperate in minimizing the temperature of the water in the valve-float chamber which minimizes the degree of precipitation therein, and the effect of such precipitates as are deposited is reduced by providing relatively powerful force multiplying operating means which are readily adjustable to compensate for the varying weights of such precipitates on the valve operating means. Condensation of such evaporation as does take place in the valve-float chamber is prevented by providing a continuous flow of air through the chamber, the air entering at opposite points of the chamber above the water level by a number of relatively small holes and discharging through a relatively large louvre-like opening axially and centrally in the cover.

Referring particularly to the drawings, the reference numeral 5 designates a tank made of corrosion resisting material which is readily shaped to obtain rounded corners and is provided with a cover 6 fitting relatively tightly on the tank. The tank 5 has relatively small holes 5*a* substantially centrally in the portions of the tank ends above the water level therein, and the cover 6 has a relatively large slot-like opening 6*a* axially and centrally of the cover with the cover struck upwardly to form a louvre-like opening. A continuous flow of air is obtained through the chamber which removes water vapor from above the water level therein and tends to keep all portions of the tank and its cover at ambient temperature. Tank 5 is shown equal in height to the edge of the evaporating pan but is preferably of a height sufficient only for movement of the valve and its operating means if the water level in the evaporating pan is kept below the then level of the upper edge of the tank.

A valve casing generally designated 7 has a portion 8 extending through an aperture in the bottom of the valve-float chamber 5, 6, and threaded to receive a nut 9 for clamping the casing on gaskets 10 and 11 about the chamber aperture within and outside of the chamber respectively. A washer 12 is interposed between gasket 11 and nut 9 so that adequate pressure may be applied to the gaskets for sealing the aperture. The valve casing has an inflow passage 16 ending in a boss 17 within a central bore 18 in the casing and has several discharge passages 19 relatively closely adjacent the bottom of the chamber 5, 6 and discharging to different sides of the valve.

A valve 22 is formed as a plug fitting into the casing bore 18 in freely slidable relation (to be readily lifted at water pressures as low as 40 pounds per sq. in.) and is preferably of a known type having a resilient insert 23 in one end of the plug to seat tightly on the boss 17 upon the exertion of a relatively low pressure on the valve. The other end of the valve is formed as a stem 24 of relatively small size with a plane end to extend slightly above the valve casing when the valve is seated. Such valves could not heretofore be successfully used in humidifiers because the temperature of the valve was so high as to cause deterioration of the insert. In the present construction, however, the valve temperature is 78° F. at an evaporating pan temperature of 160° F. and 83–88° F. at a pan temperature of 212° F. Even natural rubber will not deteriorate at such low temperatures and the various known elastomers last indefinitely.

A lever 26 has ears 27 at one end thereof to receive a pin 28 passing through the valve casing 7 and is formed with a rounded boss 29 engageable with the plane end of the valve stem, the other end 30 of such lever extending a considerable distance beyond the valve casing. Another lever 34 has ears 35 intermediate the lever ends and such ears likewise receive a pin 36 extending through the valve casing. One end 37 of the lever 34 overlies the end 30 of lever 26, and receives a screw 38 adjustable into contact with the end 30 of the lever 26. The other end 39 of the lever 34 is apertured to receive a rod 42 on which is fixed a float 43. A leverage is thus provided which considerably multiplies the force obtainable from the float, so that a small float may be used for obtaining a large closing force on the valve.

The plug valve requires a minimum of force for proper seating and such force is applied along the axis of the valve where it is most effective. The lengths of the several levers are so calculated and the levers are so related as to multiply the float action much more than is necessary for proper seating of the valve. Hence, even if some minerals precipitate from some of the hard waters encountered, there will be adequate force to seat the valve particularly when the insert is a soft elastomer. It will be noted that the valve and its leverage are submerged in water thus minimizing the precipitation of minerals and the depositing of slimes on the valve and its leverage. Further, the discharge passages from the valve are preferably so placed as to provide jets directed toward the walls of the tank 5 to promote turbulence about the valve and its leverage which keeps the valve and contacting leverage parts clear and keeps the valve at an even lower temperature than the remainder of the chamber 5, 6.

A pipe connects the chamber 5, 6 with an evaporating pan 47 to be substantially completely inserted in the plenum chamber of a space heater. The connection is made in such manner as to minimize heat transfer from the evaporating pan or its relatively hot water content, to the chamber by heat insulating the pipe from the pan, by preventing back flow of water from the pan to the chamber and by keeping at least a part of the end of the pipe in the evaporating pan substantially surrounded by a body of cool water flowing into the pan from the chamber. One end 48 of such pipe extends into the cham-

ber 5, 6 and is bent downwardly into substantially the plane of the cooler water entering the chamber through the valve discharge passages 19, and the other end 49 of the pipe extends into the evaporating pan 47 only sufficiently to provide for fastening of the pipe to the pan. The pipe thus has a rising gradient over a large portion of its total length, which prevents flow of water from the pan to the chamber and the end 49 of the pipe is at least in part surrounded by a body of cool water discharged from the pipe to sink slowly toward the bottom of the pan. It will be noted that pipe 48, 49 enters the wall of evaporating pan 47 intermediate the bottom of the pan and the water level therein and that the pipe end is vertical. Hence no precipitates in the pan can fall into the pipe and it is extremely unlikely that slimes on the water surface in the pan will enter the pipe. Even if the pipe should receive precipitates or slime, flow through the pipe is only from the chamber to the pan and will flush such materials into the pan.

The aperture in the pan wall and through which the pipe 48, 49 extends is larger than the outer diameter of the pipe. Heat insulating gaskets 52 are fitted on the pipe and are pressed on the wall of the evaporating pan by washers 53 and nuts 54 and 55 threaded on the pipe, in such manner as to hold the pipe in spaced relation with the edge of the aperture in the evaporating pan wall and thus avoids transfer of heat from such wall to the pipe. The pipe end 49 and nut 55 are surrounded at least in part by a body of cooler water discharging from the pipe so that heat transfer from the water in the pan to the end 49 of the pipe by way of the nut 55, is minimized.

It will thus be seen that various means are employed for minimizing the flow of heat from the evaporator pan and its contents to the valve chamber and of reducing the probability of mineral precipitation in such chamber therein. There can be no flow of water from the evaporating pan to the valve chamber. The condensation of moisture in the valve chamber is prevented by a flow of air which tends to keep the valve chamber and its contents at ambient atmospheric temperature. The valve and its operating means are cooled and always submerged which further minimizes precipitation of minerals thereon. And finally the valve is such as to require only a minimum force for seating but the force obtainable from the operating means is more than adequate for valve seating even if some mineral precipitation occurs on such operating means, and is adjustable.

The present construction provides a number of ways of keeping the float-valve chamber cool to minimize evaporation and the possibility of precipitation of minerals therein by avoiding metal to metal contact between such chamber and the evaporating pan, by curving the pipe between the chamber and the pan to maintain a constant chamber to pan flow which also prevents minerals and slimes depositing in such pipe, and by making the chamber as small as possible for maximum cooling effect of the fresh water admitted to the chamber. The minimum size of the chamber is obtained by employing a number of levers for their additive effect to utilize the smallest possible float and so arranging the levers that they are in overlying relation. The leverage is made adjustable for exact maintenance of valve sensitivity to water level changes during operations of the humidifier. The valve thereof is so made as to maintain turbulence in the water about the valve for keeping clear the contacting surfaces of the levers and the valve surfaces exposed to water in the chamber, and both the contacting portions of the leverage and of the valve are kept submerged at all times.

Although but one embodiment of the present invention has been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

I claim:

1. In a humidifier for use with an encased furnace of the hot air type, a pan adapted to be positioned within the furnace casing for evaporation of water therefrom, the pan having an aperture in the side wall thereof between the bottom of the pan and the minimum water level to be maintained in the pan, a chamber outside of the furnace casing for receiving water from a source of supply, a pipe connected with the pan and the chamber for conducting water from the chamber to the pan, one end of the pipe extending through the pan aperture and the other end of the pipe extending through the side wall of and into the chamber to adjacent the bottom thereof and below the said one end of the pipe, means for securing the pipe to the pan in water-tight relation therewith, a valve in the chamber for controlling the flow of water thereinto, and adjustable means responsive to the water level in the chamber for controlling the operation of the valve.

2. In a humidifier for use with an encased furnace of the hot air type, a pan adapted to be positioned within the furnace casing for evaporation of water therefrom, the pan having an aperture in the side wall thereof between the bottom of the pan and the minimum water level to be maintained in the pan, a chamber outside of the furnace casing for receiving water from a source of supply, a pipe extending through the pan aperture and through the chamber side wall for conducting water from the chamber to the pan, the one end of the pipe extending through the pan aperture being substantially perpendicular with the water level in the pan, the other end of the pipe extending below the said one end of the pipe, means for securing the pipe to the pan in water-tight relation therewith, a valve in the chamber for controlling the flow of water thereinto, and adjustable means responsive to the water level in the chamber for controlling the operation of the valve.

3. In a humidifier for use with an encased furnace of the hot air type, a pan adapted to be positioned within the furnace casing for evaporating water therefrom, a chamber outside of the furnace casing for receiving water from a source of supply, a pipe connecting the pan and the chamber for conducting water from the chamber to the pan, a valve in the chamber for controlling the flow of water thereinto, the valve being adjacent one end of and on the longitudinal axis of the chamber, the valve discharging the water flowing therethrough adjacent the chamber side wall, and adjustable means responsive to the water level in the chamber for controlling the operation of the valve.

4. In a humidifier for use with an encased furnace of the hot air type, a pan adapted to be positioned within the furnace casing for

evaporating water therefrom, a chamber outside of the furnace casing for receiving water from a source of supply, a pipe connecting the pan and the chamber for conducting water from the chamber to the pan, a valve in the chamber for controlling the flow of water thereinto, the valve being adjacent one end of and on the longitudinal axis of the chamber, the valve having a plurality of water discharge openings adjacent the chamber side wall and adjacent to the bottom of the chamber, the pipe extending through the pan side wall from below the water level in the pan to adjacent the bottom of the chamber and below the water level in the pan, and adjustable means responsive to the water level in the

chamber for controlling the operation of the valve.

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