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MOVABLE DRAIN CONNECTION FOR HUMIDIFIER SUMP

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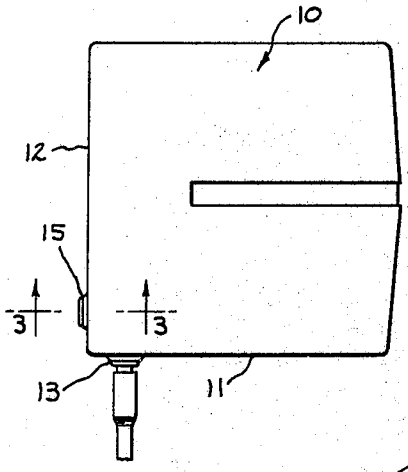


FIG. 2

FIG. 3

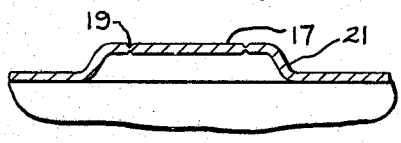


FIG. 1

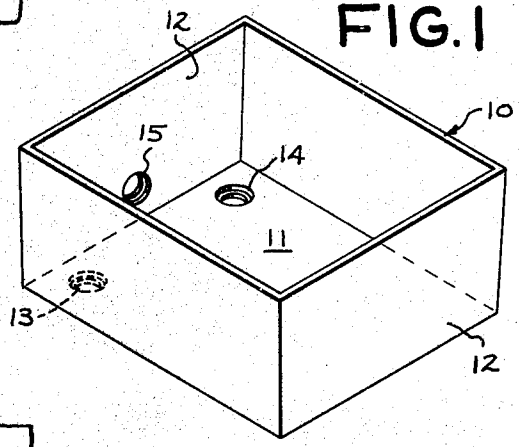


FIG. 4

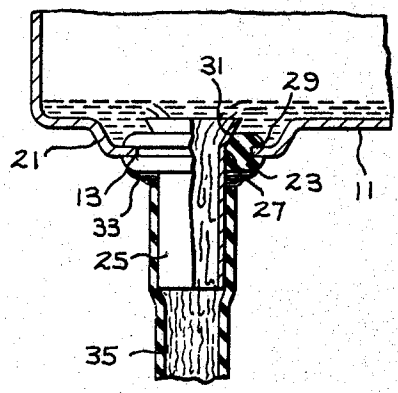
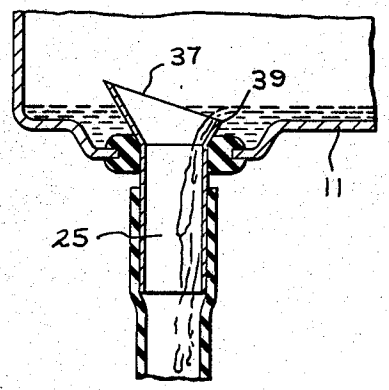


FIG. 5



INVENTOR.
DONALD M. MULLINGS

BY Richard L. Caslin

HIS ATTORNEY

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MOVABLE DRAIN CONNECTION FOR HUMIDIFIER SUMP

Donald M. Mullings, Yardley, Pa., assignor to General Electric Company, a corporation of New York

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ABSTRACT OF THE DISCLOSURE

A container or sump of a humidifier for use in the hot air duct of a hot air up-flow furnace heating system where the sump is provided with alternate drain holes in the bottom and side walls thereof. The installer of the humidifier is given the opportunity of mounting the humidifier either to the underside of the duct or to the vertical side of the duct, as well as to make an over flow drain connection through one of several, alternate drain holes. This invention relates to an easily assembled and disassembled drain connection comprising a resilient grommet located in and sealed to the edge of one of the holes of the walls of the sump, and a tubular member extending through and in sealed relationship with the grommet. A further improvement is forming the inlet edge of the tubular member at an upwardly inclined angle so that the flow will be concentrated at the lowest point of the inlet edge and the velocity of the flow will be at a maximum.

BACKGROUND OF THE INVENTION

There are many deleterious effects resulting from heating occupied spaces or buildings with forced hot air that has not been humidified. For example, dry, heated air recirculating through the furnace system absorbs moisture from the nose and throat areas of the occupants of the building resulting in discomfort, restricted breathing passages, chronic coughing and insomnia. In addition, dry air evaporates moisture from the human body causing the body to feel cool and chilly even through the temperature is relatively high. Since dry air requires higher temperatures for comfort than does humidified air, there is also a substantial increase in expenditures for fuel required to heat comfortably with non-humidified air.

These deleterious effects are avoided by installing a humidifier in the hot air distribution duct or furance plenum of the heating system. The main elements of a furnace humidifier are a power driven air handling device, and evaporating elements means for wetting the element so that the hot air is caused to pass through the element and pick up a percentage of the moisture from the element before the hot air proceeds through the distribution duct. A humidifier is customarily wired from a source of electrical power in a manner to operate only when the arm air furnace blower is running. A humidistat is furnished with the humidifier and it controls an electrically operated water valve that supplies water to the humidifier. This water is fed to a water distributor for an evaporating element. This element is a wettable filter pad having high surface area through which the hot furnace air can

be drawn. An electric fan or blower provides the air moving function through the evaporating element. A slight amount of excess water is allowed to drain from the element and accumulate in a sump and to be removed through the drain connection of the present invention. This continuous draining or flushing action tends to keep mineral concentrations down by allowing them to be washed away by the flow instead of collecting on the internal parts of the humidifier.

Difficulties have been experienced during the installation of these humidifiers due to the cramped working conditions in certain furnace areas which makes it difficult to make a universal design of humidifier for many sets of conditions for bringing in the electrical power, the water supply as well as making the drain connection for accommodating the water overflow. Sometimes the humidifier can only be mounted on the underside of the duct and other times it has to be mounted on the vertical side of the duct and these conditions require special consideration.

SUMMARY OF THE INVENTION

The present invention, is accordance with one form thereof, relates to the sump of a humidifier or broadly a liquid container having a bottom wall and raised side walls. There are alternate drain holes formed in the walls of the sump as well as means for closing the drain holes. A drain connection is formed through one of the holes and it includes a resilient grommet fastened in the hole and a tubular member extending through the grommet and sealed with respect to the grommet while the grommet is sealed with respect to the edge of the hole. A further improvement is to form the upper end of the tubular member with a funnel shape which has an inlet edge formed at an inclined angle whereby the drain flow will be concentrated at the lowest point of the inlet edge and the velocity of the water flow will be at a maximum.

BRIEF DESCRIPTION OF THE DRAWINGS

My invention will be better understood from the following description taken in conjunction with the accompanying drawing and its scope will be pointed out in the appended claims.

FIGURE 1 is a perspective view of a liquid container such as the sump of a furnace humidifier showing alternate drain holes in the bottom wall and the side wall of the sump.

FIGURE 2 is an elevational view of a humidifier housing containing the alternate drain hole arrangement of FIGURE 1.

FIGURE 3 is a fragmentary detailed view taken on the line 3—3 of FIGURE 2 and showing the means for closing the drain holes until one of them is chosen, by using knock-outs which are formed by scoring the housing wall.

FIGURE 4 is a fragmentary, cross-sectional, elevational view on an enlarged scale taken through the center of one of the drain holes in the bottom wall of the container having a drain connection of the present invention mounted therein.

FIGURE 5 is a view similar to FIGURE 4 of a second modification of the present invention showing the upper end of the tubular member of the drain connection with an inlet edge formed at an upwardly inclined angle so that

the flow is concentrated at the lowest portion of the inlet edge.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to a consideration of the drawings and in particular to FIGURE 1 there is shown a box-like container **10** of metal or plastic material for forming a drain pan or sump of a furnace humidifier and it has a bottom wall **11** and raised side walls **12**. A plurality of alternate drain holes **13**, **14** and **15** are formed in the walls of the container for ease in making a drain connection with the container depending on how the humidifier is mounted to a hot air distribution duct. In some installations the drain can extend from the bottom wall **11**, but in others the humidifier must be turned on its side and the drain extend through side hole **15**. These drain holes **13**, **14** and **15** are normally closed by a knock-out **17** as is best seen in FIGURE 3. Of course, an alternative would be to close the holes with rubber caps or plugs. Each knock-out is formed by scoring the wall of the container in a circular pattern as at **19**. This scoring substantially outlines the configuration of the knock-out, and a slight blow with a hammer or chisel will cause the knock-out to become disengaged from the wall and thereby create the proper drain hole.

Turning now to a consideration of FIGURE 4, it is noticed that the drain hole **13** is indented in the bottom wall **11** of the drain pan by means of an embossment **21**. Many local plumbing codes require a metal tube or nipple for making fixed plumbing connections. The drain connection comprises a resilient grommet **23** that is adapted to be fastened in the drain hole **13**, as well as a tubular member **25** that is adapted to extend through the grommet. The grommet is made of a rubber material such as neoprene or the like, and it is formed with a central opening **27** and a peripheral groove **29** which is adapted to receive the peripheral edge of the drain hole **13**. The relative size of the groove **29** and the resiliency of the grommet is such that the groove embraces the peripheral edge of the hole **13** and provides a water tight seal.

The central opening **27** in the grommet is of a diameter slightly smaller than the diameter of the tubular member **25** so that there is a force fit between the tubular member and the opening which likewise creates a sealing action therebetween. The upper end of the tubular member **25** is formed in a conical or funnel shape **31** which is seated against the top of the grommet. The modification of FIGURE 4 shows a push nut **33** of spring material forced over the lower end of tubular member **25** and into engagement with the underside of the grommet to cooperate with the enlarged upper end **31** of the tubular member and exert a compressive force against the grommet to provide a liquid sealing action as well as to prevent relative displacement of the parts during the use of the humidifier when vibrations might be set up by the furnace blower or humidifier fan and tend to cause the tubular member to become dislocated in the grommet. Notice that a drain hose **35** of flexible material is installed over the lower end of the tubular member **25** for carrying off the drain flow.

Although distilled water would be ideal, or any water containing no mineral deposits, tap water is naturally used in a furnace humidifier because of its convenience and economy. Furthermore, the water being circulated over the evaporating element may remove additional foreign matter from the air so that during the heating season several pounds of scale-forming material may collect in the humidifier system.

Since the drain connection of the present invention is a low water flow device calcium deposits accumulate on the evaporating element as well as on the walls forming the sump and they tend to clog the passageways especially in the vicinity of the drain connection. The

reason for this clogging is the tendency for sediment and residues of the evaporation process to collect in a slime-like material around the inlet to the drain connection. The runoff is slow when the inlet edge of the tubular member **25** is cut square in a horizontal plane since the flow extends completely around the inlet edge for 360°. Slime or scale will build up at this point of low velocity, possibly to the extent eventually clogging the entire drain inlet.

One important way to reduce this accumulation of slime and scale is to increase the velocity of flow. This can be done without changing the volume of flow by making the change shown in the second modification of FIGURE 5, where the inlet edge **37** of the funnel-shaped upper end **31** of the tubular member **25** is cut at a raised angle of 10° to 40° above the horizontal, and preferably of approximately 20° to 30° above the horizontal, so as to cause all of the flow to occur at the lowest point; namely, at point **39** as shown in FIGURE 5. This technique is much better than cutting a small notch in the inlet edgeof the drain tube because this notch would be subject to clogging by small floating particles. If foreign material should accumulate at the low point **39**, the flow would split and proceed around the sides of the foreign material tending to undercut and free the offending particles.

Having described above my invention of a drain connection for a liquid container having a low flow characteristic it will readily be apparent to those skilled in this art that I have provided an easy field selection of alternate drain points for the convenience of the installer, plus a vibration isolating system has been formed between the container **10** and the drain tube **35** by means of the resilient grommet, as well as providing a successful liquid sealing arrangement between the container and the grommet and the grommet and the tubular member **25** so that the flow is confined by the drain connection, and finally means are provided to increase the velocity of the flow through the drain connection without increasing the volume of the flow so as to provide a proper flushing action and reduce the rate of sediment, scale and slime buildup within the humidifier system.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a liquid container having a bottom wall and raised side walls, a drain connection formed in said bottom wall and comprising a hole formed in the bottom wall, a resilient grommet fastened in said hole, the grommet having a central opening as well as a pheripheral groove for receiving the peripheral edge of the hole, and a tubular member of slightly larger size than the grommet opening extending through said opening, the upper end of the tubular member being of funnel shape and in engagement with the grommet, said funnel shaped upper end of the tubular member having an inlet edge formed at a raised inclined plane of between about 10° and about 40° whereby the inlet flow will be at the lowest point of the inlet edge and the velocity of the liquid flow into the tubular member will be at a maximum.

2. A humidifier sump having a bottom wall and raised side walls for containing water therein, alternate drain holes formed in the bottom wall and in the side walls, means for closing the drain holes, a drain connection formed through one of the holes and comprising a resilient grommet fastened in a hole through the bottom wall, the grommet having a central opening therethrough and peripheral means for sealing the grommet to the peripheral edge of the hole, a tubular member extending through the grommet opening, the upper end of the tubular member being enlarged and seated on said grommet, and a push nut forced over the lower end of the tubular member and against the grommet to exert in cooperation with the enlarged upper end of the tubular member a compressive force on the grommet.

3. A humidifier sump as recited in claim **2** wherein the

enlarged upper end of the tubular member is of funnel shape which has an inlet edge formed at an inclined angle whereby the drain flow will be concentrated at the lowest point of the inlet edge and the velocity of the water flow will be at a maximum.

4. A humidifier sump as recited in claim 3 wherein the peripheral means for sealing the grommet comprises a continuous groove extending around the grommet for receiving the peripheral edge of the hole.

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M. CARY NELSON, Primary Examiner

R. J. MILLER, Assistant Examiner

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