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HUMIDIFIER SPRAY UNIT FOR FURNACE

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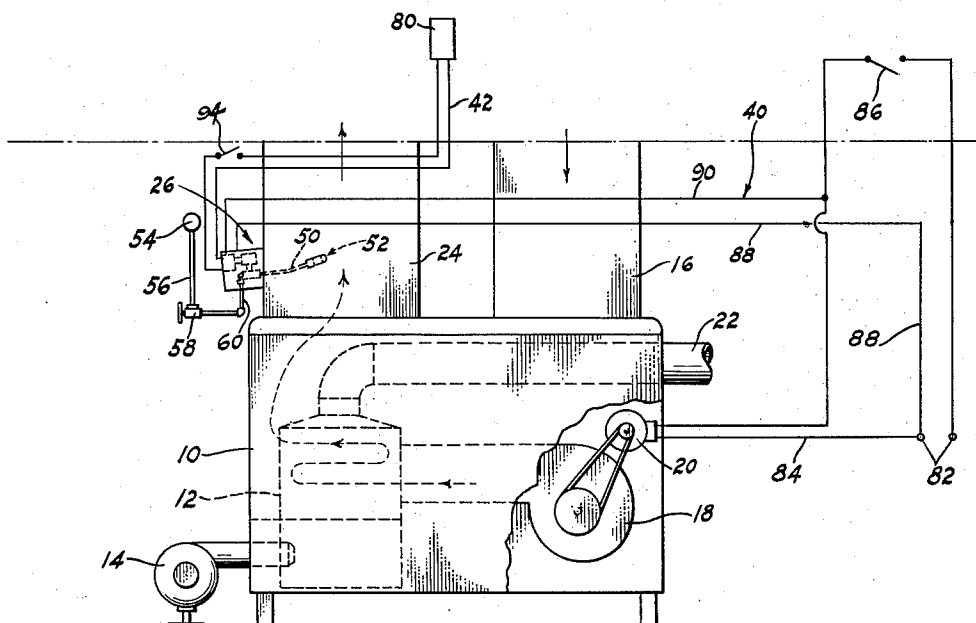


Fig. 1

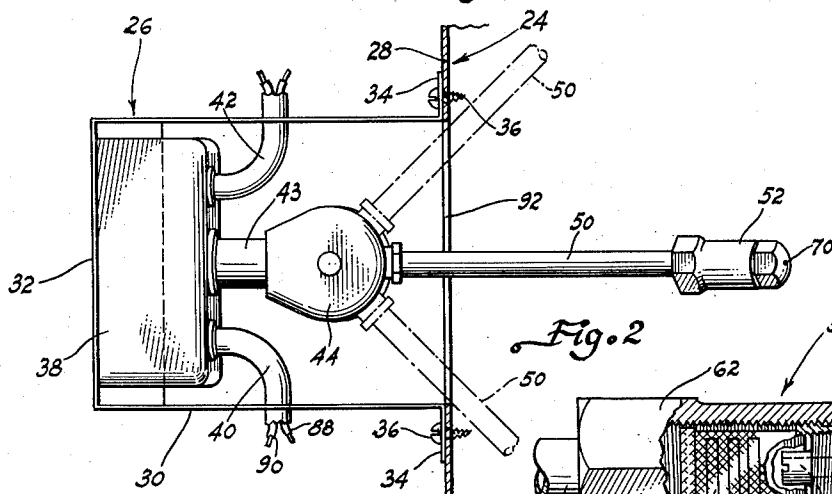


Fig. 2

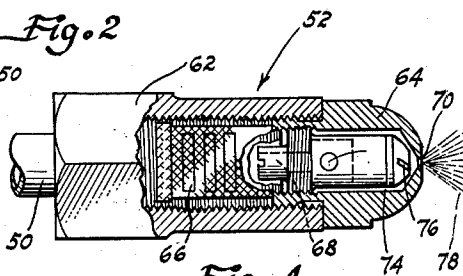


Fig. 4

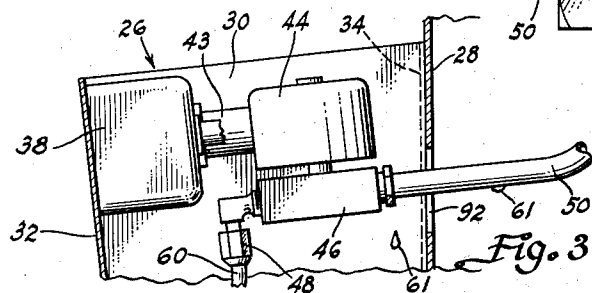


Fig. 3

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HUMIDIFIER SPRAY UNIT FOR FURNACE

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3 Claims. (Cl. 126-113)

This invention relates to a humidifier spray unit for attachment to a furnace, and more particularly for attachment to the warm air riser of a warm air furnace, for purposes of introducing adequate humidity to the warm air prior to its discharge into living space, or the like.

Heretofore, many designs have been made of humidifying devices of various kinds for warm air space heaters, including the well known type employing flash pans onto which water was gradually fed for evaporation at various rates, as well as other types having spray-diffusing nozzles therein. However, it is not uncommon that various difficulties have been found with these previously designed types of humidifiers, including malfunctions of the water control valves, discharge, such as drips, from the spray nozzles being excessive and accumulating in the bottom of the furnace, the rusting and other types of deterioration of certain of the elements of the humidifiers unit, and many other types of malfunctions.

It is the principal object of the present invention to provide an extremely simple humidifier unit which may be manufactured relatively inexpensively, and yet is fool-proof in action, long lasting, easy to install, and obviates many, if not all, of the shortcomings of the presently used humidifiers.

Another object of the invention is to provide, in said humidifier unit, mounting means for the spray nozzle tube which supports the tube at an acute angle to the horizontal, and whereby the tube extends inwardly and upwardly from the exterior of the riser of a warm air furnace, thereby affording means by which any drips from the spray nozzle may drain downwardly and outwardly from the tube to the exterior of the riser, whereby they serve as an indication that the spray nozzle requires adjustment or other servicing and, more importantly, the drips do not accumulate on the interior of the furnace, where they normally are not noticed until rusting beyond repair has occurred, for example.

A further object of the invention is to support the spray nozzle tube for limited arcuate movement, within a substantially horizontal plane, although sloping upwardly and inwardly, as described above relative to the foregoing object, whereby maximum efficiency of humidifying may take place, as a result of being able to direct the nozzle to the most efficient location within the riser after the humidifier unit has been mounted upon the exterior of the riser, such arrangement also facilitating the positioning of the humidifier unit upon the exterior of a riser, at the most convenient location, following which the pivotal positioning of the nozzle may be achieved, so as to direct the spray to the most effective location within the riser, regardless of the position of the humidifier unit upon the exterior of the riser.

Still another object of the invention is to provide a humidifier unit having a minimum number of parts all interrelated to each other for either mutual support or support of one element by another element, not only to facilitate assembly and servicing of the unit, but also to minimize the cost of producing and fabricating the same.

Details of the foregoing objects and of the invention, as well as other objects thereof, are set forth in the following specification and illustrated in the accompanying drawing comprising a part thereof.

In the drawing:

FIG. 1 is a vertical side elevation of an exemplary warm air furnace to which a humidifier unit has been con-

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nected to the warm air riser of the furnace, in accordance with the principles of the invention, said figure also showing an exemplary electrical circuit by which the various electrical elements of the unit and control system therefor are energized.

FIG. 2 is a fragmentary, top plan view of the humidifier unit shown in FIG. 1, but illustrated on a substantially larger scale than in FIG. 1, only a fragmentary portion of one wall of the warm air riser of the furnace being shown to simplify the illustration, and the electrical leads to the junction box of the unit being broken away in customary illustrative manner.

FIG. 3 is a side elevation of the humidifier unit illustrated in FIG. 2.

FIG. 4 is a side elevation, partly in vertical section, of a preferred embodiment of spray nozzle, such as shown included in the humidifier unit in FIGS. 1 and 2.

Referring to the drawing, a warm air furnace 10 is shown in side elevation, the same having an internal heat exchanger 12, of conventional type, to which heat is supplied by a conventional oil burner 14, for example. Air, either from the outside atmosphere, or from return duct 16, is directed to heat exchanger 12 by means of a conventional blower or fan 18 driven by an electric motor 20, for example. Products of combustion from the furnace are discharged to a stack by means of a conventional smoke pipe 22.

Warm air from the heat exchanger 12 passes upwardly through the warm air riser 24 and, in accordance with the specific illustration shown in FIG. 1, the humidifier unit 26 is attached securely and readily to the front face or wall 28 of the riser 24.

The humidifier unit 26 comprises a frame 30, which, for example, may be fabricated inexpensively from relatively heavy gauge sheet metal, the same being substantially U-shaped in plan view, as clearly shown in FIG. 2. Extending between the side plates or legs of the frame 30 is a rear wall 32. The front edges of the opposite sides of frame 30 are provided with laterally extending, connecting flanges 34, which abut the front face of the front wall 28 of the riser and are secured thereto by any suitable means, such as self-tapping screws 36, or the like.

From FIG. 3, it will be seen that the rear wall 32 of frame 30 is at a very acute angle to the plane within which the connecting flanges 34 are disposed. This is for purposes to be described. Preferably connected directly to the rear wall 32 of the frame 30, by any suitable means, is an electrical junction box 38. Suitable electrical conductors 40 and 42, each, preferably, of the two-wire type, extend from the junction box 38, for purposes to be described.

Extending forwardly from junction box 38 is a tubular support and connecting member 43, which is connected to a solenoid-actuated water valve 44, the solenoid of the valve 44 being electrically connected to the conductors of the junction box 38 through suitable conductors in the tubular member 43, said details not being illustrated in order to simplify the views.

Preferably directly below the valve 44 and connected thereto for support is a water head 46, and said head, if desired, may also contain the actual relatively movable valve parts of the solenoid-actuated water valve 44, under which circumstances the element 44 would merely contain the electrical components of the solenoid. Also connected to the water head 46 is coupling 48, by which the water head 46 is connected to a source of water, under pressure. Also projecting forwardly from the water head 46 is a water pipe or tube 50, the opposite or forward end of the pipe or tube 50 having a water spray nozzle 52 connected thereto. If the source of supply is a conventional city supply, the pressure thereof seldom is less than 40 p.s.i., whereas if the supply is from a well and

normal pressure tank, the pressure of the same seldom is less than 20 p.s.i. Even this lower pressure is adequate to cause water issuing from nozzle 52 always to be in spray form unless the nozzle is mal-functioning from dirt or the like offering a partial obstruction.

From FIG. 3 particularly, it will be seen that the junction box 38 and valve 44 extend along a line substantially perpendicular to the rear wall 32 of frame 30. The axis of valve 44 and water head 46 is substantially parallel to rear wall 32 of frame 30. Said axis is that about which the water head 46 is pivotally movable, at least through a limited arc, such as illustrated in exemplary manner in the two broken line positions of the water tube 50 illustrated in FIG. 2, for example. At least part of the water conductor connected by coupling 43 to water head 46 is at least slightly flexible, whereby even though the household water supply line 54, for example, as shown in FIG. 1, is rigid, as well as the branch line 56, by which the shutoff valve 58 is connected between the supply line 54 and water head 46, likewise, may be rigid. The flexibility, for example, of the small supply line 60, as where the same is merely a short length of copper tube, will suffice to permit such limited adjustable, angular positioning of the water tube and spray nozzle thereon, relative to the valve 44.

Further, in view of the fact that the major portion of the water tube 50, comprising the end which is connected to water head 46, is straight and substantially perpendicular to the axis about which the water head 46 rotates, it will be seen that when the flanges 34 of the frame 30 are connected to the substantially vertical front face 28 of the warm air riser 24, and due to the fact that the water tube 50 and spray nozzle 52 thereon extend into said riser when the frame 30 is connected thereto, it will be seen that the tube 50 extends inward and upwardly at a sufficient slope that any water drips 61 discharging from the nozzle 52 will drain along the lower side of tube 50 to the exterior of the riser 24, where they will be noticed to call attention to the fact that the nozzle requires servicing because, normally, the nozzle 52 should not drip when functioning properly.

Referring particularly to FIG. 4, it will be seen that the spray nozzle 52, details of which are shown in longitudinal section, comprises a hollow body 62, into the outer end of which a spray tip head 64 is threaded. A wire mesh strainer 66, or the like, extends over the entrance of the hollow nozzle 63 to prevent extraneous matter from clogging the relatively small spray exit hole 70 in the tip head 64. One or more lateral openings 72 extend through the walls of the hollow nozzle 63 so as to permit the exit of water from the nozzle into the space 74 between the exterior of nozzle 63 and the bore of the tip head 64. The outer end of the nozzle 63, as is readily seen in FIG. 4, also is frusto-conical in shape, and said surface is provided with a plurality of water-directing grooves 76, which are disposed at an angle to the axis of the nozzle 63, whereby as the water, especially under substantial pressure, passes axially along the space 74 to the exit hole 70, at least some of the water will engage and pass through the angularly extending grooves 76, whereby a swirling motion is imparted to the exiting water thereby, said swirl of the exiting water, as it passes through the exit hole 70, being widely dispersed into a pattern approximating the pattern 78 shown in FIG. 4. Such an arrangement also aids in maintaining the exit hole 70 open by the discharging water passing through, at substantial force, and carrying with it at least any fine particles of extraneous matter which are smaller in size than the diameter of the hole 70. Principally, however, the main virtue of this type of spray is that it very finely divides the water and creates substantially a mist, which readily is absorbed in the rising warm air ascending upwardly through the warm air riser 24 of the furnace 10, this mist diffusing widely throughout the rising warm air so as to provide substantially uniform and even

humidity in said warm air as it is discharged into living space, or otherwise being heated by the furnace 10. Most, if not all, of the parts of the spray nozzle assembly 52 are made from durable, corrosion-resisting material, such as bronze, brass, stainless steel, or combinations of parts respectively made from certain of said materials.

Referring particularly to FIG. 1, a conventional humidistat 80 is mounted within the living area, or otherwise where controlled humidity is desired. Said humidistat is of the type which includes an electrical control connected, for example, by conduit 42 to the junction box 38. Appropriate circuitry, not illustrated specifically, between junction box 38 and the solenoid of valve 44 connects the control within humidistat 80 with the solenoid of valve 44. Electrical supply and return from conventional power lines are interconnected, for example, to terminals 82. One of these terminals is connected by conductor 84 to the electric motor 20 and also by conductor 88, to junction box 38. The other terminal 82 leads to a master control switch 86 for the circuit and through another conductor 90, which extends from switch 86 and also leads to junction box 38, the conductors 88 and 90 comprising the two wires of electrical conductor 40, for example. After entering junction box 38, the individual conductors of composite conductor 40 are connected by suitable circuitry to the solenoid of valve 44.

The operation of the electrical circuit is as follows. It will be understood that the solenoid valve 44 will never be opened, unless the furnace is operating and air heated to a predetermined, minimum temperature is rising within riser 24 of the furnace 10. Under such circumstances, and assuming that the master switch 86 is closed, when the humidistat indicates, from ambient atmosphere, that humidity is required in the space controlled by said humidistat, the solenoid valve 44 will be opened to permit water to be sprayed from the nozzle 52, in the form of a fine mist, into the rising warm air in riser 24. When the atmosphere within the space being controlled by humidistat 80 is satisfied as to humidity, due to the discharge of humidified air into said space from the riser 24, the setting of the humidistat 80 will actuate the electrical control therein so as to de-energize the solenoid of valve 44 and thereby cause the supply of water to the spray nozzle 52 to be shut off by the solenoid-actuated valve 44.

Further, in view of the fact that the water tube 50 which supports the spray nozzle 52 is pivotally movable about an axis parallel to the rear wall 32 of frame 30, whereby the tube 50, which extends through opening 92 in the forward wall of riser 24, may be moved within the maximum limits illustrated respectively by two broken line positions at opposite sides of the full line illustration of tube 50 in FIG. 2, it readily will be seen that if because of obstructions or otherwise within the room in which the furnace and particularly the riser 24 is positioned make it impossible or impractical to mount the humidifier unit 26 toward one corner, for example, of the riser 24, nevertheless the nozzle-supporting water tube 50 may be pivotally moved in such a direction as to direct the discharging spray from the spray nozzle 52 substantially to the center of riser 24, thereby affording maximum dispersion of water vapor or mist into the rising warm current of air within riser 24.

From the foregoing, it will be seen that the humidifier unit comprising the present invention and the contemplated use thereof, relative to the warm air riser of a furnace, will afford maximum efficiency in humidifying the warm air ascending said riser until the desired degree of humidity of the air within the space being heated by the furnace is satisfied within the setting provided in a control humidistat within said space being heated. While the amount of water being discharged through said nozzle is controllable by valve 58, which also serves as a shut off cock, it is conceivable that a certain amount of dripping may occur from said nozzle and, to prevent the

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same from dripping into the interior of the furnace, it will be seen that the tube 50, which supports the spray nozzle, extends slopingly upwardly into the riser 24, whereby any drips occurring at the spray nozzle 52 will drain along the lower surface of tube 50 until they pass through the riser opening 92 and will drop, for example, as shown in FIG. 3, into a suitable receptacle or the like. In the meantime, no accumulation of dripping water occurs within the furnace with consequent freedom from rusting conditions occurring within the furnace. Further, inasmuch as dripping should occur only when the nozzle 52 is mal-functioning, and then such dripping serves as a signal of such condition, little dripping onto furnace casing 10 should occur and this readily could be wiped therefrom to prevent any rusting of said housing in the event the line of fall of water drops engages said casing.

In addition, the pivotal mounting of the water tube 50, which supports the spray nozzle 52, permits positioning of the spray nozzle for discharge of water mist or vapor to a position within the warm air riser, which is most conducive to produce maximum efficiency of humidifying the ascending warm air.

For convenience and safety, another control switch 94 is connected in one of the wires of conductor 42 so as to control the circuit between solenoid valve 44 and the switch in humidistat 80, whereby, for example, the switch 94 may be maintained open continuously in summertime, so as to insure that, under no circumstances, will valve 44 open due to any humidity conditions which otherwise might cause humidistat 80 to attempt to open valve 44, such by way of further example, while the fan 18 is being operated for summertime cooling or ventilating.

While the invention has been described and illustrated in its several preferred embodiments, and has included certain details, it should be understood that the invention is not to be limited to the precise details herein illustrated and described, since the same may be carried out in other ways falling within the scope of the invention as claimed.

I claim:

1. A humidifier unit for use with a warm air heating system having a warm air riser on a furnace, the riser being arranged to have a hole elongated in a horizontal direction formed in one wall thereof and said unit comprising in combination, supporting bracket means having a front wall connectable to the exterior of a vertical wall of a warm air riser of a furnace with which said unit is to be used and having at least one side member extending from said front wall, said bracket means also having a rear wall connected to and extending transversely to said side member and spaced from and disposed at an acute angle extending upward and outward relative to

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said front wall, a solenoid-actuated valve supported by said rear wall of said supporting bracket means and connectable into an electrical circuit with a humidistat and also connectable to a source of water under pressure, a water tube of small diameter interconnected to said valve and projecting forwardly at an angle substantially perpendicularly to said rear wall and extending throughout its entire length angularly upward and inward and adapted to pass through a hole in spaced relation to the edges thereof directly into a riser when said front wall is connected to a vertical wall of a warm air riser, and a water spray nozzle connected coaxially to the outlet end of said water tube and extending upwardly and inwardly beyond said front wall and adapted to extend a substantial distance into a warm air riser of a furnace when said front wall is connected thereto so as to spray a fine mist of water inwardly and upwardly into the same, said solenoid-actuated valve providing a means controlling the flow of water through said tube and the inclination of the tube providing a means discharging any water drops from said nozzle along said sloping water tube through said aforementioned front wall whereby they discharge exteriorly of a riser.

2. The humidifier unit set forth in claim 1, further characterized by said interconnection between said valve and tube comprising a pivotal means operable to permit said tube to be adjustably moved about an axis parallel to said rear wall of said bracket means and through a limited horizontal arc to enable the water spray nozzle on said tube to be directed substantially to the center area of a warm air riser when said unit is connected thereto.

3. The humidifier unit set forth in claim 1 further including, an electric junction box connected to said rear wall of said bracket means, said solenoid valve being connected to the forward portion of said junction box, and said solenoid valve pivotal means depending therefrom substantially parallel to said rear wall of said bracket means and connected perpendicularly to the inlet end of said water tube to support the same substantially perpendicularly to the plane of the rear wall of said bracket means and angularly upward and forward therefrom when said tube extends directly forwardly from said humidifier unit.

References Cited in the file of this patent

UNITED STATES PATENTS

450,052	Bliss et al.	Apr. 7, 1891
1,819,423	Knowlton et al.	Aug. 18, 1931
2,303,948	Morris	Dec. 1, 1942
2,584,650	Woodruff	Feb. 5, 1952