Nov. 5, 1968 R. C. BEHNKE 3,409,219

HUMIDIFIER

Filed Feb. 1, 1967 3 Sheets-Sheet 1

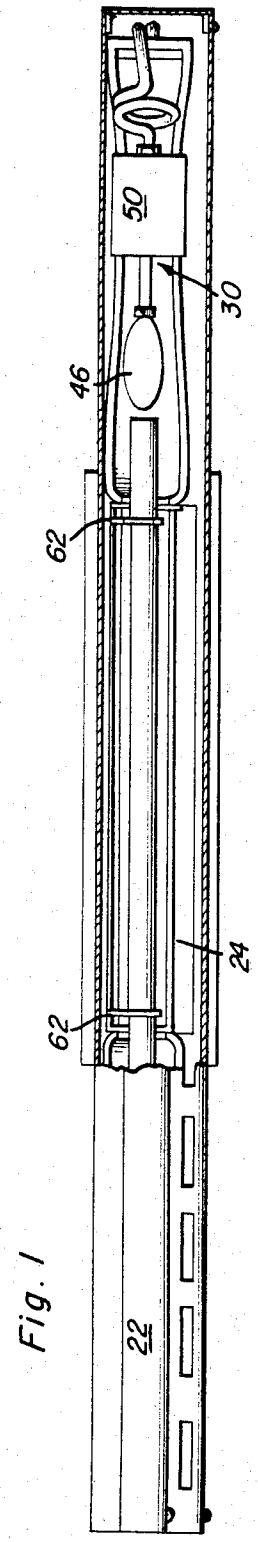


Fig. 1

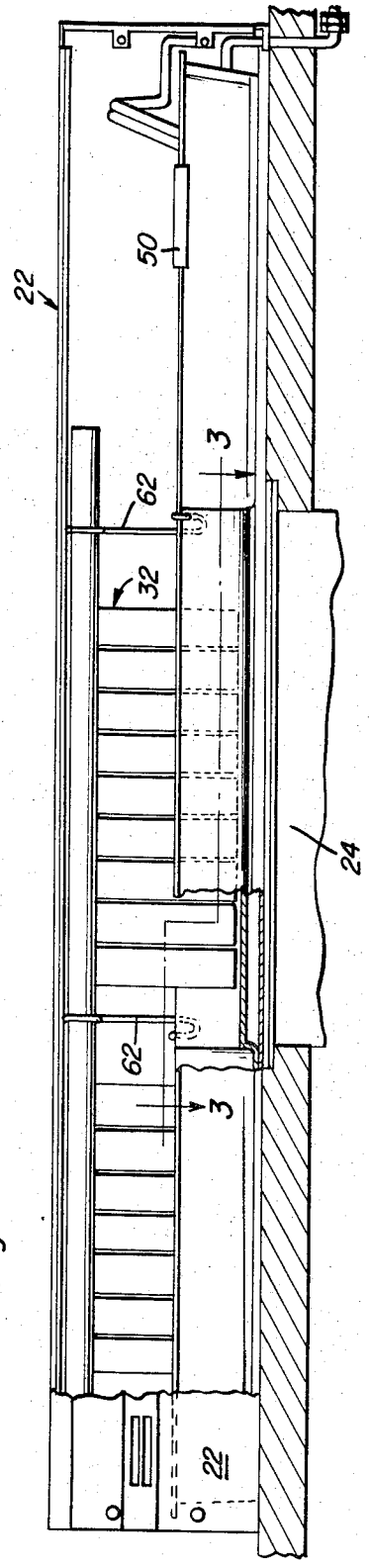


Fig. 2

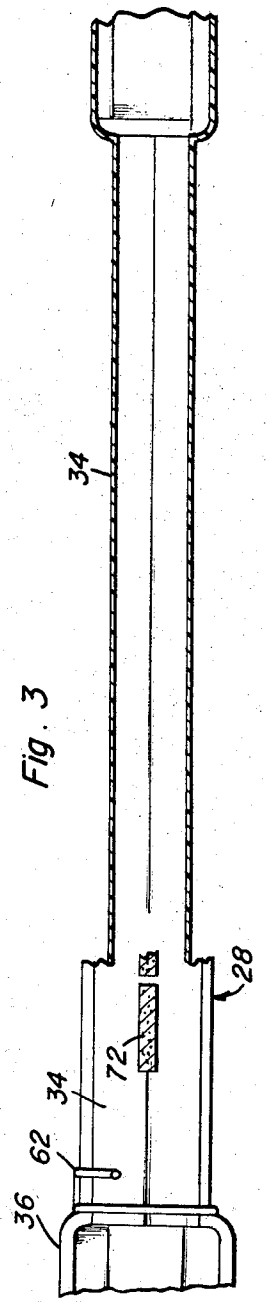


Fig. 3

Robert C. Behnke
INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

Nov. 5, 1968 R. C. BEHNKE 3,409,219

HUMIDIFIER

Filed Feb. 1, 1967 3 Sheets-Sheet 2

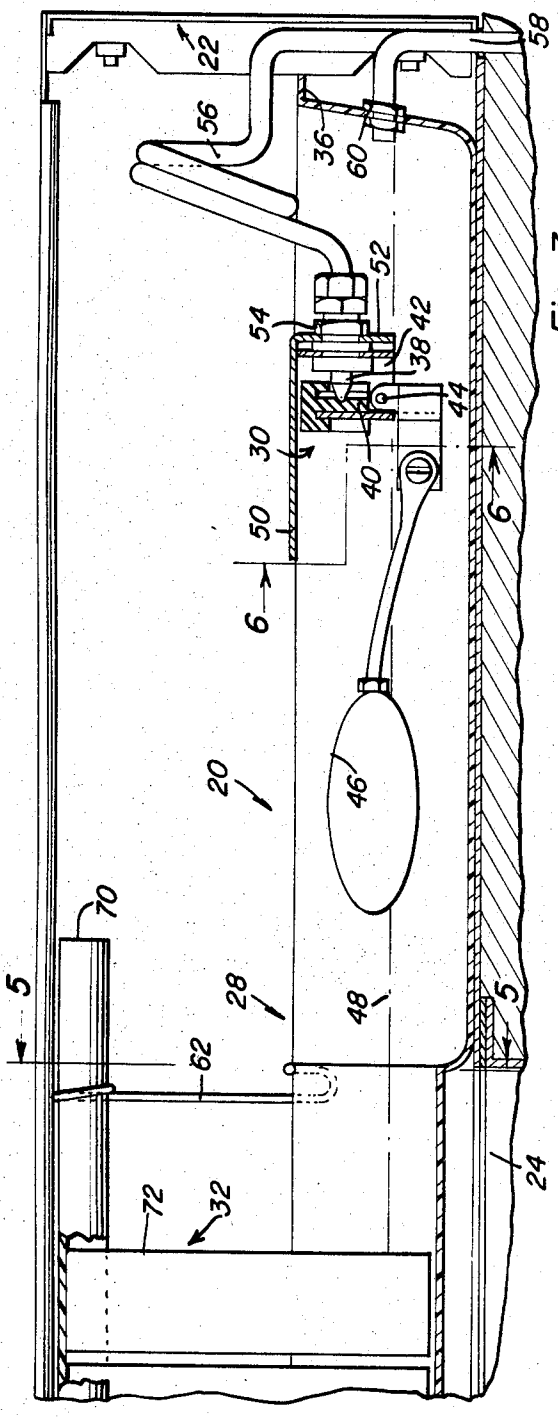


Fig. 4

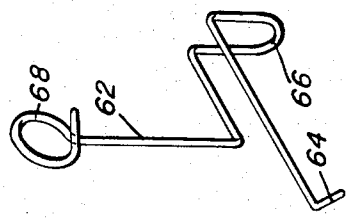


Fig. 7

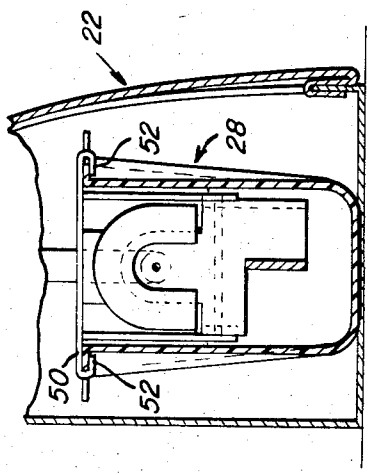


Fig. 6

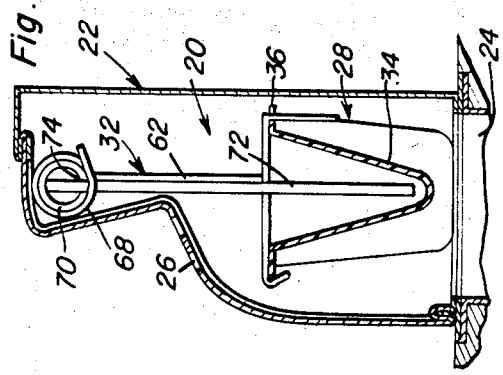


Fig. 5

Robert C. Behnke
INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

Nov. 5, 1968 R. C. BEHNKE 3,409,219

HUMIDIFIER

Filed Feb. 1, 1967 3 Sheets-Sheet 3

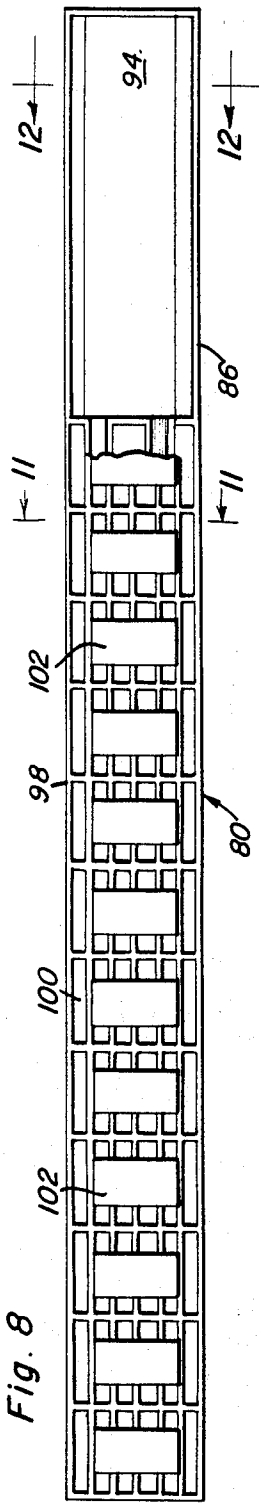


Fig. 8

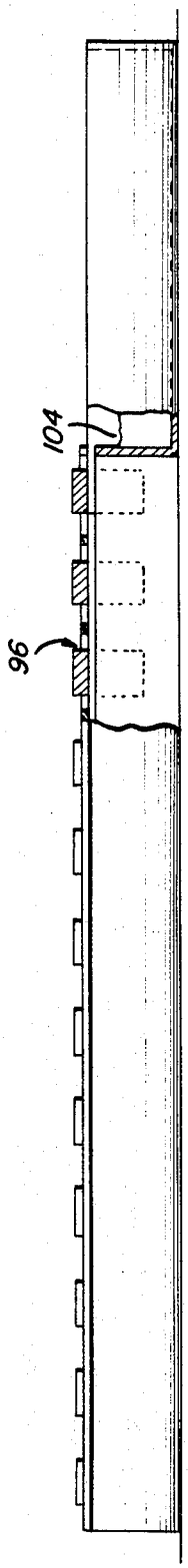


Fig. 9

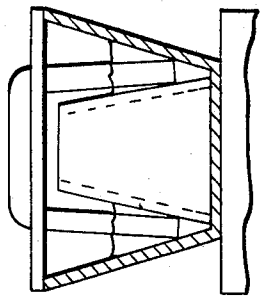


Fig. 12

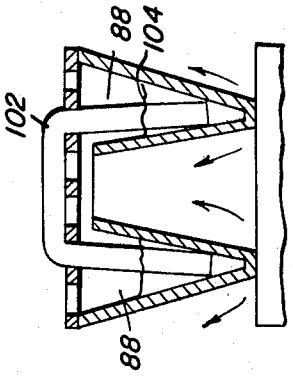


Fig. 11

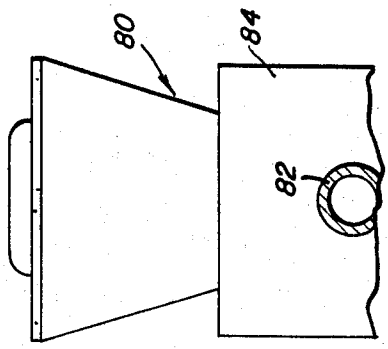


Fig. 10

Robert C. Behnke
INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

United States Patent Office 3,409,219 Patented Nov. 5, 1968

3,409,219

HUMIDIFIER

Robert C. Behnke, Oshkosh, Wis., assignor to Springaire Corporation, a corporation of Wisconsin

Filed Feb. 1, 1967, Ser. No. 613,360
9 Claims. (Cl. 237—78)

ABSTRACT OF THE DISCLOSURE

A humidifier to be utilized in conjunction with baseboard heat registers operatively connected to either hot water radiant heating or forced hot air heating systems which humidifier includes elongated trough means constructed so as to be directly positionable in the path of convection or forced hot air currents rising vertically from the source of heat. The cross-sectional configuration of the trough is such that the velocity of air passing upwardly thereabout is accelerated so as to enhanve the evaporation of water from absorbent pads suspended above the trough with the lower ends thereof immersed in the trough.

This invention relates generally to apparatus for humidifying air and more particularly to humidifiers used in combination with baseboard registers such as used in forced hot air or hot water radiant heating units such as conventionally having registers mounted around the periphery of a room at the juncture of the outside wall and the floor.

Numerous humidifier constructions have been proposed heretofore. However, many are primarily intended to be mounted within, or in close proximity to a hot air furnace thereby humidifying substantially all the air passing therethrough. Such a system is satisfactory under certain circumstances, however, it will be apparent that in certain rooms of a home further humidification of the air is not only unnecessary but undesirable. Accordingly, it may be appreiated that further humidification of the air in a bathroom, or kitchen, for example, where a reasonable amount of moisture is normally present in the air, would be unwarranted and possibly detrimental to both the occupants of the room and the furniture or appointments therein.

It is therefore an object of this invention to provide a humidifying means which may be utilized with both forced hot air and hot water radiant baseboard heating systems for the selective humidification of the air in selected portions of a building enclosure as desired in that portion of the structure rather than requiring a substantially uniform humidification of all the air within the structure as is normally the case with many humidifiers proposed heretofore.

It is another object of this invention to provide a baseboard register mounted or located humidifier which is constructed in such a manner so as to preclude the necessity of any complex, or troublesome, moisture atomizing fan or blower without sacrificing the ability of the unit of the present invention to humidfy the air passing therethrough.

A further object of this invention is to provide a humidifier which utilizes an evaporator means comprising one or more absorptive pads which are positioned so as to absorb water from a supply trough by capillary action and are adapted to be so postioned in the path of the airflow through the register so as to increase the evaporation of water from the water supply trough.

Still another object of this invention is to provide a humidifier to be utilized in connection with a baseboard register which includes an elongated water trough extending along a substantial portion of the baseboard register.

Still a further object of this invention is to provide a means of supporting a float operated valve within a water supply trough of the nature described above thereby assuring that if the connections to the water supply float valve inadvertently leak the leakage will be caught within the water trough rather than flowing into the register proper and onto the floor of a room.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a top plan view of a portion of an exemplary embodiment of a humidifier comprising the present invention illustrated as operatively positioned within a baseboard register of a forced hot air system;

FIGURE 2 is a side elevational view of the humidifier of FIGURE 1 further illustrating a portion of a forced hot air conduit leading from a hot air furnace to the baseboard register within which the humidifier is mounted;

FIGURE 3 is an enlarged fragmentary top plan view of the water trough of the humidifier assembly of FIGURE 1 with portions thereof shown in horizontal section taken substantially along the plane of the line **3—3** of FIGURE 2;

FIGURE 4 is an enlarged longitudinal vertical cross-sectional view of a portion of the exemplary embodiment of the humidifier of the present invention shown in FIGURE 1 further illustrating certain details of the float controlled valve and valve mounting means;

FIGURE 5 is a transverse vertical sectional view taken substantially along the plane of the line **5—5** of FIGURE 4;

FIGURE 6 is a fragmentary enlarged transverse vertical sectional view taken substantially along a plane of the line **6—6** of FIGURE 4;

FIGURE 7 is an enlarged perspective view of the clip means used to support an evaporation enhancing means from the water trough of the humidifier of the present invention;

FIGURE 8 is a top plan view of another embodiment of a humidifier constructed in accordance with the present invention;

FIGURE 9 is a side elevational view of the humidifier of FIGURE 8 with portions broken away to illustrate interior details;

FIGURE 10 is an enlarged end plan view of the humidifier of FIGS. 8 and 9 illustrated as operatively positioned upon the heat radiating fins of a hot water heating system;

FIGURE 11 is an enlarged transverse vertical sectional view taken substantially along the plane of the line **11—11** of FIGURE 8; and

FIGURE 12 is an enlarged transverse vertical sectional view taken substantially along the plane of the line **12—12** of FIGURE 8.

Referring now to the drawings and FIGURES 1 through 7, an exemplary embodiment of a humidifier constructed in accordance with the present invention is indicated generally at **20** and as seen best in FIGURES 2 and 5 is illustrated as being operatively positioned within a forced hot air baseboard register indicated generally at **22**, which register is adapted to receive a fan forced flow of hot air through a conduit such as at **24** which is connected to a hot air furnace, not shown.

The hot air flowing upwardly to the interior of the register **22** from the conduit **24** flows outwardly from the register **22** through the apertures **26** in the wall thereof into the structural enclosure to be heated. Although for purposes of clarity the humidifier **20** is illustrated as being operatively positioned within a baseboard hot air register, it will be understood that the baseboard hot air register per se is of conventional construction and is not

a part of the present invention. Accordingly, it will be understood that the humidifier **20** may be operatively positioned within hot air registers other than a register of the specific construction illustrated.

Briefly, the humidifier **20** includes a water reservoir or trough indicated generally at **28**, a constant level float controlled water valve means indicated generally at **30** and an evaporation enhancing means indicated generally at **32** which is adapted to substantially increase the evaporative surface area subjected to the forced flow of air passing upwardly through the baseboard register **22**.

The water reservoir trough means **28** is of a generally elongated rectangular configuration and is characterized by a central portion of reduced width such as at **34** which portion is preferably of a V-shaped configuration. The V-shaped portion **34** is adapted to overlie the inlet conduit **24** along substantially the entire length thereof so as to "split" the airflow passing upwardly from the conduit **24** in a manner illustrated by the broken line arrows in FIGURE 5.

The reservoir or trough **28** is preferably formed by molding or stamping, for example, from the suitable non-corrosive material such as plastic, resin impregnated glass fiber, copper or the like, and is preferably provided with an outwardly flaring peripheral lip **36** for reasons which will become clear.

The float controlled water valve means **30** utilizes a conventional float controlled valve means which includes a valve body **38**, a renewable resilient valve seat **40**, which resilient valve seat **40** is pivotally secured to a yoke **42** by means of a pin **44**. A float **46** is operatively connected to the pivotally secured resilient valve seat **40** so as to move the resilient seat **40** in and out of sealing engagement with the valve body **38** in response to the level of the water in the trough **28**, which level is indicated at **48**.

The float controlled water valve means **30** further includes a novel valve support member or clip **50** which is a generally elongated flat member having portions **52** bent back upon itself so as to engage the lip **36** of the trough **28**. The clip **50** further includes an integral downwardly depending portion **54** provided with a suitable aperture within which is secured the yoke **42** and valve body **28** by means of a locknut **54** threadably received on the valve body **38**. As seen best in FIGURE 4 a suitable conduit **56**, connected by means of a saddle valve, not shown, to a source of water under line pressure, is coupled to the valve body **38** of the float valve means **30**.

The humidifier **20** is preferably, although not necessarily, provided with an overflow line **58** which passes through a suitable aperture in a side wall of the trough **28** in approximate alignment with the high water mark and is secured to the trough in a suitable manner such as schematically shown at **60**.

The evaporation enhancing means **32** includes two or more upstanding supporting brackets **62** which are preferably formed from a single length of relatively rigid wire or the like in a configuration seen best in FIGURE 7 wherein the bracket **62** is formed with trough engaging portions **64** and **66** adapted to frictionally engage the lip **36** of the trough **28**, and an upstanding eye **68** adapted to frictionally retain an elongated tubular member **70** which is adapted to frictionally retain one or more absorptive pads **72** by virtue of the fact that the tube **70** is longitudinally slit at **74** so as to frictionally retain the absorptive pad, or pads **72** therein.

Accordingly, it will be understood that the elongated tube **70** is preferably formed of a rigid yet somewhat resilient material such as a high impact plastic for example so as to permit spreading of the split tube **70** to permit insertion of the absorptive pads **72** into the slot **74** prior to inserting the tube **70** within the eye **68** of the upstanding support bracket **62**.

It will be further understood that the manner in which the evaporation enhancing means **32** is supported from the lip **52** of the trough **28** permits its ready removal from the trough **28** to enable replacement or cleaning of the absorptive pads **72** should they become clogged with mineral salt deposits from the water being evaporated. The trough **28** is preferably formed of plastic which is somewhat resilient and accordingly may be pinched inwardly to release the clip **50** thereby permitting the trough **28** to be withdrawn from the baseboard register **22** should cleaning of the trough **28** be required.

In operation, the float controlled water valve means **30** maintains the water within the trough **28** at a desired level such as indicated at **48**. The absorptive pads **72** are of such length so as to have their lower ends immersed in the water within the trough **28** and are accordingly maintained in a saturated condition by capillary action thereby greatly increasing the evaporative surface presented to the airflow passing upwardly through the conduit **24** and into the interior of the baseboard register **22**.

The airflow then passes upwardly around the V-shaped portion **34** of the trough **28** and into evaporative contact with the pads **72** thus picking up moisture from the pads **72** and subsequently flowing out of the register **22** through the apertures **26** into the structural enclosure within which it is desired to humidify the air.

Referring now particularly to FIGURES 8 through 12 a further embodiment of a humidifier constructed in accordance with the present invention is indicated generally at **80**. Although not shown, it will be understood that the embodiment **80** may be utilized in conjunction with a baseboard register of a hot water heating system such as provided with a hot water conduit **82**, as seen best in FIGURE 10, which hot water conduit **82** is provided with a plurality of radiating fins, one of which is shown at **84**, upon which the embodiment **80** rests.

The embodiment **80** includes a generally elongated trough **86** having a generally double V-shaped or divided W configuration as seen best in FIGURES 11 and 12 along generally its entire length with the exception of an undivided end chamber portion **94** which is adapted to receive a float controlled valve means substantially identical to the valve means **30** utilized in conjunction with the humidifier embodiment **20**. The trough **86** is preferably formed from sheet metal or the like of a generally non-corrodible alloy or sheet metal protected with a generally non-corrodible plating such as zinc for example. An evaporation enhancing means indicated generally at **96** includes an evaporator pad support rack **98** which is adapted to be supported by the trough **86** in overlying relationship to the V-shaped trough **88**. As seen best in FIGURE 8, the pad support rack **98** is preferably provided with a plurality of longitudinally disposed rectangular apertures **100** which are adapted to support a plurality of absorptive fiber evaporator pads **102** which are inserted down through appropriate rectangular apertures **100** into the V-shaped trough **88** in the manner seen best in FIGURES 11 and 12 wherein the opposed ends of the pad or pads **102** extend beneath the surface of the water **104** thereby wetting the pad **102** along its entire length by capillary action so as to substantially increase the evaporative surface presented to the convection current of air flowing upwardly from the radiant heating fins **84** as shown schematically by the arrows in FIGURE 11.

It will further be understood that the float control valve means, not shown, which is operatively positioned within the portion **94** of the trough **86** will automatically maintain the water level such as at **104**.

The utilization or operation of the humidifier **80** is substantially identical to the utilization of the embodiment **20** except that as indicated supra, the embodiment **80** is intended to be utilized in conjunction with a hot water baseboard register and accordingly the airflow up around the V-shaped portions **88** of the trough **86** will be by virtue of convection currents as opposed to forced airflow

such as in the baseboard register 22 of a forced hot air system.

It may therefore be seen that there has been provided a relatively simple but efficient means of providing a baseboard register of either the forced hot air or the hot water heated type with a humidifier which facilitates the humidification of the structural enclosure within which the baseboard register is installed thereby permitting the selective humidification of various portions of a structure in accordance with the varying humidity requirements within such a structure accordingly overcoming the inherent disadvantage associated with a humidifying system which humidifies substantially all the air within a structural enclosure to a substantially uniform relative humidity regardless of the varying requirements within certain regions of the structural enclosure.

What is claimed as new is as follows:

1. In a humidifier adapted to be operatively positioned within a baseboard heat register the combination comprising an elongated water trough means having side walls, end walls and a coextending bottom wall, said side walls being provided with an outwardly flaring peripheral lip, means engageable on said peripheral lip for removably supporting a float controlled water valve means from said side walls, a float controlled valve means positioned within said trough and normally connected to a source of water under pressure, said trough being formed of resilient material and being withdrawable from within a baseboard heat register within which it is normally operatively positioned without requiring disconnection of said valve means from the source of water to which it is normally connected, a rack means supported in overlying relationship to said trough, said rack means supporting an evaporation enhancing means, said evaporation enhancing means including at least one absorbent pad having at least one end contacting the water within said trough, said trough having a region of reduced lateral cross-sectional dimension to facilitate and accelerate the flow of air upwardly around said evaporation enhancing means, said region of reduced area of said trough being defined by opposed longitudinally extending portions of said side walls converging inwardly and defining a trough bottom portion of lesser lateral dimension than that of said bottom wall.

2. The combination of claim 1 wherein said rack means includes a plurality of rack support brackets individually frictionally retained by said trough on the upper edge of said side walls, each support bracket being formed from a single length of rigid resilient wire, said rack support brackets including opposed downturned trough engaging portions, and a rack supporting said evaporation enhancing means in overlying relationship to said trough, said rack comprising a rigid yet resilient tubular member supported by said rack support brackets, said tubular rack being provided with a normally downwardly disposed longitudinally extending slot through the wall thereof, said at least one absorbent pad having one end frictionally engaged within said slot for partial immersion in said water trough.

3. The combination of claim 1 wherein said rack means includes an elongated open mesh planar rack supported by said trough in overlying relationship to said trough, said absorbent pad being retained by the open mesh of said rack.

4. In a humidifier adapted to be operatively positioned within a forced hot air system baseboard heat register, the combination comprising an elongated water trough means having side walls, end walls and a coextending bottom wall, said trough having a longitudinally extending region of reduced effective transverse width normally being operatively positioned in overlying relationship to a warm air inlet in the bottom of a baseboard register, within which said humidifier is operatively positioned, means engageable on the upper edges of said side walls for removably supporting a float controlled water valve means from said side walls, a float controlled valve means being positioned within said trough and normally connected to a source of water under pressure, said trough being formed of resilient material and being withdrawable from a baseboard heat register within which it is normally positioned without disconnection of the valve means from a source of water to which it is normally connected, an evaporation enhancing means including a plurality of support brackets each formed from a single length of rigid resilient wire, said support brackets including opposed downturned trough-engaging portions, said downturned portions of said support brackets frictionally engaging the upper edges of the side walls of said trough and extending upwardly therefrom, an evaporative pad holding means supported by said upstanding brackets, at least one absorptive pad frictionally retained by said pad holding means, said pad depending downwardly therefrom and normally partially immersed in water within said trough, said trough having a central region of effectively reduced width adapted to overlie the warm air inlet to a baseboard register to facilitate the flow of warm air upwardly past said trough by presenting a minimum of resistance to air flow thereabout in absorptive contact with said at least one evaporator pad, said region of effectively reduced width of said trough being defined by opposed longitudinally extending portions of said side walls converging downwardly and inwardly to define a trough bottom portion of lesser lateral dimension than that of said bottom wall.

5. The combination of claim 4 wherein said pad holding means comprises a rigid yet resilient tubular member, said tubular member being provided with a longitudinally extending slot through the wall thereof, said slot frictionally retaining at least one evaporative pad placed therein.

6. The combination of claim 5 including overflow drain means passing through the wall of said trough adjacent the normal water level therein.

7. The combination of claim 2 wherein said trough is integrally formed from a single piece of plastic.

8. In combination with a baseboard heat register a humidifier operatively positionable within the baseboard heat register in overlying relation to a heat radiating means therein, comprising an elongated water trough means having side walls, end walls and a coextending bottom wall, said side walls being provided with an outwardly flaring peripheral lip, means engageable on said peripheral lip for removably supporting a float controlled water valve means from said side walls, a float controlled valve means positioned within said trough and connected to a source of water under pressure, said trough being formed of resilient material and being withdrawable from said baseboard heat register without disconnection of said valve means from its source of water, a rack means supported in overlying relationship to said trough, said rack means supporting an evaporation enhancing means, said evaporation enhancing means including at least one absorbent pad having at least one end contacting the water within said trough, said trough having a region of effectively reduced lateral cross-sectional dimension to facilitate and accelerate the flow of air upwardly around and in contact with said evaporation enhancing means, said region of reduced area of said trough being defined by opposed longitudinally extending portions of at least a pair of said side walls converging downwardly and inwardly to define a trough bottom portion of lesser lateral dimension than that of said coextending bottom wall.

9. The combination of claim 3 wherein said trough means includes a bifurcated portion defining parallel trough portions of effectively reduced lateral cross-sectional dimensions defining an air flow accelerating passage therebetween.

(References on following page)

References Cited

UNITED STATES PATENTS

1,589,428	6/1926	Rosenow.	
1,725,005	8/1929	Kelly	261—104
2,002,273	5/1935	Parker et al.	261—104
2,171,088	8/1939	Griffiths	261—104 X
2,276,135	3/1942	Woolley.	
2,557,042	6/1951	Woolley	261—104 X

2,854,993	10/1958	Duncan et al.	261—104 X
3,092,708	6/1963	Walther	261—104 X
3,265,305	8/1966	Johnson.	
3,314,662	4/1967	Ticknor	261—92 X

FOREIGN PATENTS

497,805	12/1938	Great Britain.

RONALD R. WEAVER, *Primary Examiner.*