

Feb. 17, 1942.

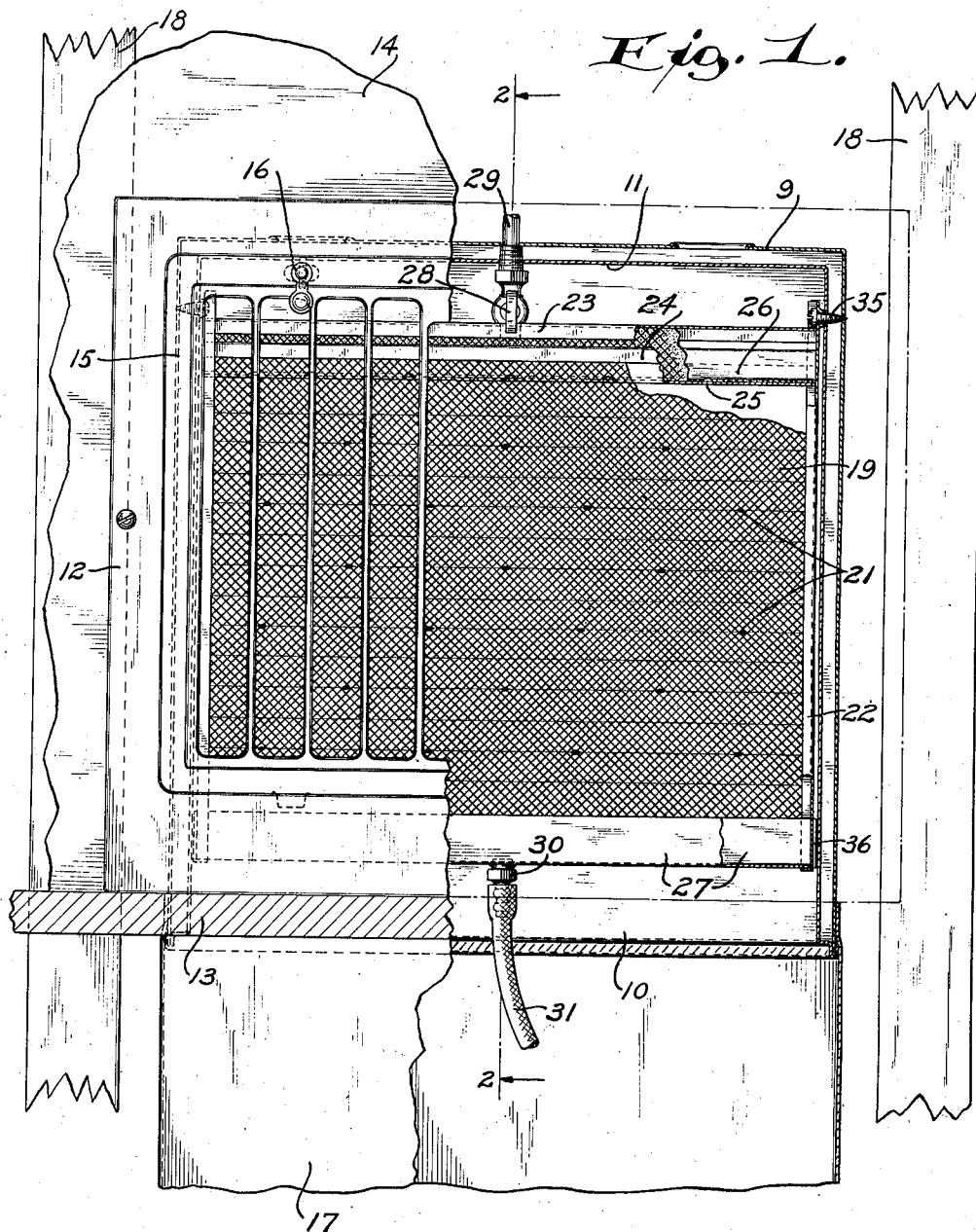
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2,273,587

AIR CONDITIONER

Filed Oct. 26, 1940

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 2.

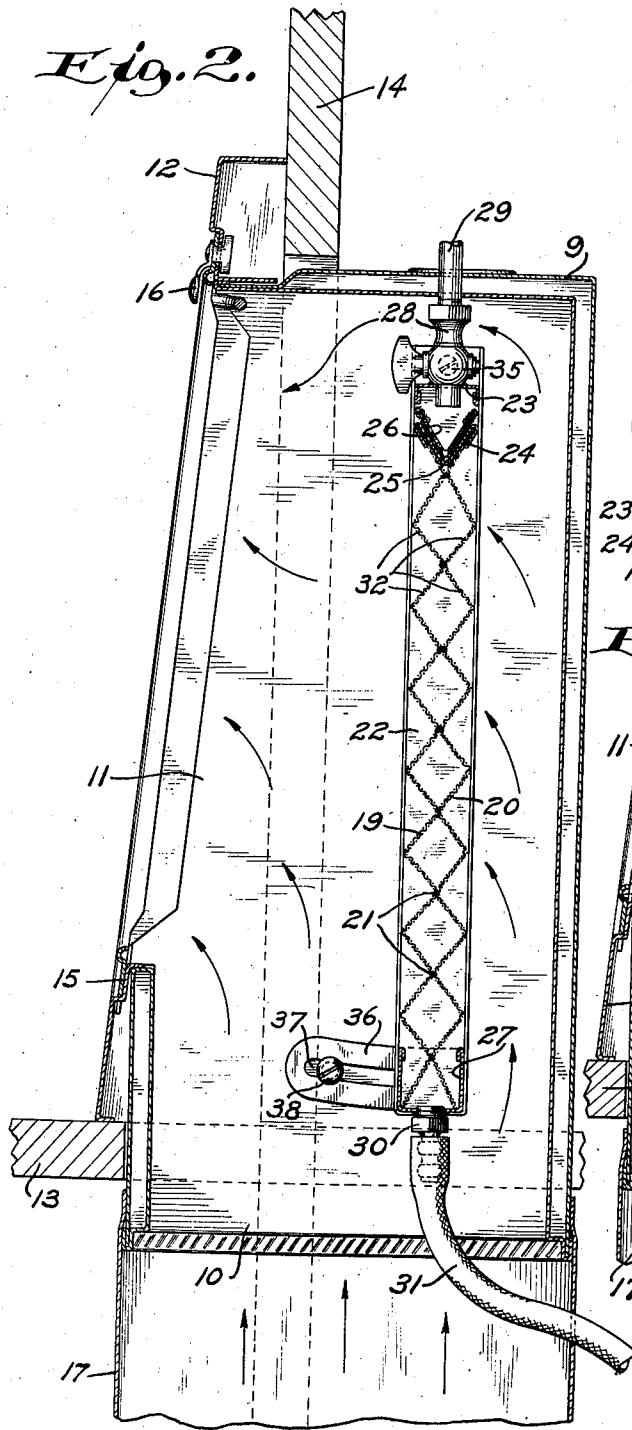


Fig. 6.

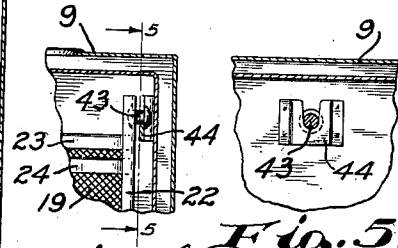
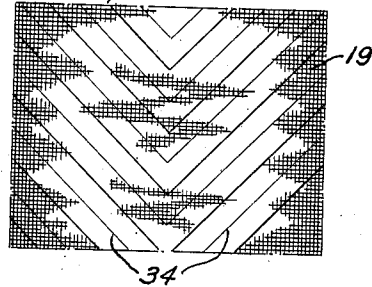


Fig. 4.

Fig. 5.

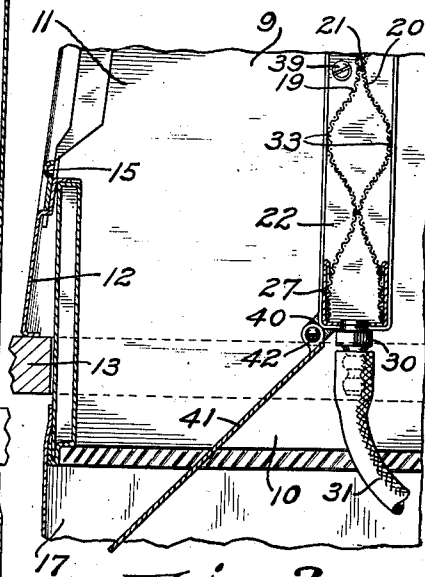


Fig. 3.

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UNITED STATES PATENT OFFICE

2,273,587

AIR CONDITIONER

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Application October 26, 1940, Serial No. 362,984

5 Claims. (Cl. 98—109)

My present invention relates in general to improvements in the art of air conditioning, and relates more specifically to improvements in the construction and operation of apparatus for humidifying the air in a hot air heating system or the like.

An object of the invention is to provide an improved air conditioning assemblage which is simple and compact in construction and highly efficient in use.

Many devices and systems for effecting air conditioning in houses and other buildings have recently been proposed and used with varying degrees of success, and while some of these systems are quite satisfactory in operation, they are also relatively complicated and expensive to install and operate. It is frequently desirable with systems of this kind to be able to embody the same in heating plants which have already been installed and in use, and such embodiment should be readily possible without damaging or rebuilding the existing installations. In many cases, it is also desirable to be able to vary the degree of humidification to which one room of a house is subjected, independently of others, and this cannot be readily accomplished with systems wherein the entire air conditioning is effected at a common zone located near the heater. The prior systems besides being too costly to install, are not sufficiently flexible in use, and cannot be conveniently embodied in existing heating systems of relatively standard design.

It is therefore a more specific object of my present invention to provide an improved humidifying unit adapted to be quickly and effectively installed within the standard air box of an ordinary hot air heating system, either before or after installation of the air box in a building.

Another specific object of the invention is to provide a new and useful air conditioning unit for hot air systems, which can be readily installed within the air box of a hot air circulating system through the ordinary register opening which is usually covered by a removable grille.

A further specific object of this invention is to provide an improved humidifier adapted to be adjustably suspended within an air duct or conduit, so as to permit convenient variation in the magnitude of the air stream sections flowing on opposite sides and through the humidifier.

Still another specific object of my invention is to provide a simple and compact humidifier unit of relatively large capacity, and improved means for controlling the operation of the unit.

An additional specific object of the invention

is to provide an improved moisture supply unit for heated air, or the like, which can be readily inspected and cleaned, and which may be removably suspended within the air duct.

Another additional specific object of this invention is to provide a durable air humidifying assemblage which can be made to fit air ducts of various sizes and shapes and which can moreover be manufactured and sold at moderate cost. These and other objects and advantages of the invention will be apparent from the following detailed description.

A clear conception of the several features constituting my present improvement, and of the mode of constructing and utilizing humidifying units built in accordance with the invention, may be had by referring to the drawings accompanying and forming a part of this specification wherein like reference characters designate the same or similar parts in the various views.

Fig. 1 is a part sectional front view of one of the improved humidifying units installed in a standard hot air box in back of a removable grille register, portions of the latter having been broken away;

Fig. 2 is an enlarged vertical section through the assemblage of Fig. 1, showing the humidifying unit adjustably mounted in the air box, and the section being taken on the line 2—2;

Fig. 3 is a fragmentary vertical section through the lower portion of a fixedly supported modified humidifying unit, provided with modified means for obtaining variable flow of air with respect to the unit, and also showing a modification in the construction of the unit itself;

Fig. 4 is a fragmentary section through a modified removal permitting suspension device for the humidifying unit;

Fig. 5 is a side view of the modified suspension means of Fig. 4; and

Fig. 6 is a diagrammatic front view of a portion of one of the improved units, showing a modified arrangement of the screen and undulations.

While the invention is shown and described herein as being specifically embodied in a humidifying unit especially adapted for application to a standard hot air heating system box and register assembly, it is not the desire or intention to thereby unnecessarily restrict the scope or utility of the improvement.

Referring to the drawings, the ordinary hot air heating system to which the improved humidifying unit is applicable, ordinarily comprises a number of similar hot air boxes 9 each having

a lower inlet opening 10 and a front outlet opening 11; a register frame 12 secured to each box 9 around the outlet opening 11, and ordinarily coacting with the floor 13 and with the adjacent wall 14 of a building; a grille 15 detachably secured to the frame 12 by means of fasteners 16; and a hot air supply conduit or duct 17 communicating with the lower inlet opening 10 of each of the boxes 9 between the building studding 18. There may be one or more of these hot air box and register assemblages in each of the several rooms of a building, and all of these devices may be supplied with heated air from a common furnace or other heating source. The hot air boxes 9, frames 12, grilles 15, and ducts 17 are of relatively standard sheet metal construction, and may assume various shapes and designs.

The improved humidifying unit specifically illustrated in Figs. 1 and 2, comprises in general two oppositely corrugated or undulated screen sections 19, 20 secured to each other as by solder 21; opposite side plates or members 22 to which the opposite ends of the screens 19, 20 are firmly attached; a top bar 23 rigidly uniting the side members 22; an upper V-shaped trough 24 coacting with the upper edges of the screen sections 19, 20 and having a series of bottom perforations 25 normally covered by a porous liner 26 of asbestos or the like; an imperforate lower U-shaped trough 27 spanning the side members 22 below the lower edges of the screen sections 19, 20; an adjustable liquid supply valve 28 and connection 29 for feeding liquid through the bar 23 into the upper trough 24; and a liquid drain fitting 30 and flexible connection 31 for discharging excess liquid from the lower trough 27.

The humidifying screens 19, 20 may be corrugated with angular serrations 32 as shown in Fig. 2, or with curved undulations 33 as illustrated in Fig. 3; and the corrugations or undulations may extend horizontally across the unit as in Fig. 1, or they may be of herring-bone shape 34 as illustrated in the diagram of Fig. 6. Rather fine square mesh metallic wire screening is preferably utilized in producing the pervious distributing screens 19, 20, and the mesh forming wire may be disposed either diagonally as in Figs. 1 and 4, or horizontally as in Fig. 6.

The sheet metal frame comprising the side members 22, top bar 23, and lower trough 27 of each humidifying unit, may be formed of various sizes and shapes adapted to approximately fit within and between the side walls of various standard hot air boxes; and these frames should preferably be of such dimensions that they may be inserted and removed through the central openings in the register frames 12 when the grilles 15 are removed therefrom, and may be secured to or suspended from the side walls of the air boxes 9 in various ways.

As shown in Figs. 1 and 2, the side members 22 of the air conditioning unit, are swingably suspended at their upper ends by means of special screws 35 which are driven through the inner metal wall of the air box 9, and the lower extremities of these members 22 are provided with ears 36 having arcuate slots 37 with which other screws 38 coact. When the lower screws 38 are released, the entire humidifying unit may be swung about the common axes of the upper screws 35, so as to cause more or less air to travel upwardly along the front and rear and through the screen sections 19, 20. By tightening the lower screws 38, the unit will be clamped in adjusted position, and the adjustment may be

effected upon removal of the grille 15 and through the opening 11.

As illustrated in Fig. 3, the side members 22 may be rigidly attached to the side walls of the air box 9 by means of two or more screws 39. In order to regulate the flow of air along the front and rear of and through the screen sections of the rigidly attached unit of Fig. 3, I have provided the frame side members 22 with lugs 40 from which a diverting plate 41 is frictionally adjustably suspended by means of pivot screws 42. This plate 41 can obviously be swingably adjusted about the common axis of the lower fastening screws 42 so as to cause any desired proportions of the warm air stream entering the inlet opening 10, to flow either in front of the screen sections 19, 20, or in back of these sections and through the same.

Because the improved humidifying unit is readily accessible upon removal of the register grille 15, it is possible to utilize an ordinary vacuum cleaner to remove accumulated dust from the screens 19, 20, without necessarily disturbing the mounting of the air conditioning unit itself. However, the improved units may also be detachably suspended as shown in Figs. 4 and 5, by means of rivets 43 secured to the upper ends of the side members 22, and coacting with recessed suspension saddles 44 attached in any suitable manner to the opposite side walls of the air box 9. The lower portions of these removably suspended units may be provided with one or more removable retaining screws 39; and the valve 28 should then be positioned far enough above the bar 23, to permit the rivets 43 to be lifted out of the saddles 44 when the unit is being removed and re-inserted.

The liquid supply valves 28 are accessible for the purpose of controlling the amount of liquid delivered to each humidifying unit, and hence the humidity, by removing the corresponding register grilles 15; and the liquid supply connection 29 for each unit may be a relatively small flexible tube of copper or the like communicating with a water supply. The perforations 25 at the bottom of the upper V-shaped trough 24 may be spaced along this trough so as to insure uniform distribution of the liquid downwardly along screen sections 19, 20, and the porous trough liner 26 causes the liquid passing through the perforations 25 to assume the form of a thin film flowing gradually along the screens and spreading laterally in all directions. The flexible excess liquid discharge tubes 31 which are detachably attached to the fittings 30 of the several air conditioning units, may be formed of rubber or the like so as to permit free adjustment or removal of the units, and may also be directed into the basement or other overflow receptacle. Ordinarily, no excess liquid should reach the lower trough 27, and this trough is merely provided for safety.

During normal use of the improved humidifying units, and assuming that the several units have been properly installed in their respective air boxes 9 and connected to a source of liquid supply, each of the units may be adjusted to produce the desired performance and the control valves 28 may be set to supply the requisite quantities of fresh liquid. The heated air flowing through the ducts 17 will then flow upwardly along both the front and rear surfaces of the screen sections 19, 20, and part of the air will pass through the screens, thereby picking up moisture in quantities dependent upon the set-

ting of the valves 28 and upon the position of the units, or of the distribution plates 41. If a unit or the plate 41 associated therewith, is inclined forwardly so as to cause more air to flow along the rear thereof and through its screens, the evaporation of moisture will be more rapid; and likewise, if the valve 28 is opened to a greater extent, the supply of moisture will be increased and the evaporation will be hastened up to the point of saturation of the air. In this manner, any desired degree of humidification may be effected at any of the individual registers, within the limits of capacity of each unit and to the exclusion of all others.

The position of each air conditioning unit relative to its confining air box 9 may be readily adjusted upon removal of the grille 15, and the control valves 28 are also accessible for convenient manipulation when the grilles are thus removed. The units may also be inspected and cleaned very readily either by merely removing the grilles 15, or by thereafter bodily removing the units themselves, and such removal of the units can be facilitated by utilizing a suspension such as shown in Figs. 4 and 5. The screen sections 19, 20 may also be constructed in various ways, and the installation of the units may be effected by a novice with but a few simple tools.

From the foregoing detailed description it will be apparent that my present invention provides a simple, compact and efficient humidifying unit which is extremely flexible in use. The improved assemblage may be quickly and conveniently installed in any standard hot air heating system, whether new or old, and each unit may obviously be manipulated and adjusted to produce any desired degree of humidification independently of all other similar units in the heating system. These air conditioning units may also be readily produced in various sizes and installed and operated at moderate cost, and are highly efficient and effective in performance.

It should be understood that it is not desired to limit this invention to the exact details of construction or to the precise mode of use, herein shown and described, for various modifications within the scope of the claims may occur to persons skilled in the art.

I claim:

1. In combination with an air distribution box having a lower air inlet opening and an upper laterally directed air outlet opening, a flat air-pervious member having its upper end pivotally suspended in the upper portion of said box while its lower end is swingably adjustable across said inlet opening toward and away from said outlet opening, means for delivering a film of liquid across said member, and means for adjusting the angularity of said member relative to said outlet

opening so as to vary the quantity of air passing therethrough from said inlet to said outlet openings while maintaining the total effective area of said inlet opening constant.

2. In combination with a hot air distribution box having a lower approximately rectangular inlet opening and an upper approximately rectangular laterally directed outlet opening, a flat air-pervious member of approximately the same area as said outlet opening movably suspended within said box so that its lower edge may be adjusted across said inlet opening toward and away from said outlet opening, means for delivering a film of liquid by gravity downwardly across said member, and means for adjusting the position of said member so as to vary the quantity of heated air passing therethrough from said inlet to said outlet openings while maintaining the total effective area of said inlet opening constant.

3. In combination with a hot air distribution box having a lower upwardly directed inlet opening and an upper laterally directed outlet opening, a flat air-pervious member of approximately the same area as said outlet opening suspended in said box for movement toward and away from said outlet opening, means for delivering liquid downwardly across said member, and means for adjusting the position of said member to vary the quantity of heated air passing therethrough from said inlet to said outlet opening while maintaining the total effective area of said inlet opening constant.

4. In combination with an air distribution box having a lower upwardly directed inlet opening and an upper laterally directed outlet opening, a flat air-pervious member detachably pivotally suspended in the upper portion of said box so that its lower edge may be adjusted toward and away from the lower portion of said outlet opening and across said inlet opening without affecting the effective area of the latter, means for adjusting the position of the lower portion of said member about its suspension pivot, and controllable means for delivering liquid downwardly across said member.

5. In combination with a hot air distribution box having a lower inlet opening and an upper laterally directed outlet opening, a flat liquid distribution member pivotally suspended in the upper portion of said box and having its lower edge adjustable toward and away from said outlet opening across said inlet opening without diminishing the effective area of the latter, means for adjusting said member about its suspension pivot, and means for controllably delivering liquid downwardly across said member.

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