

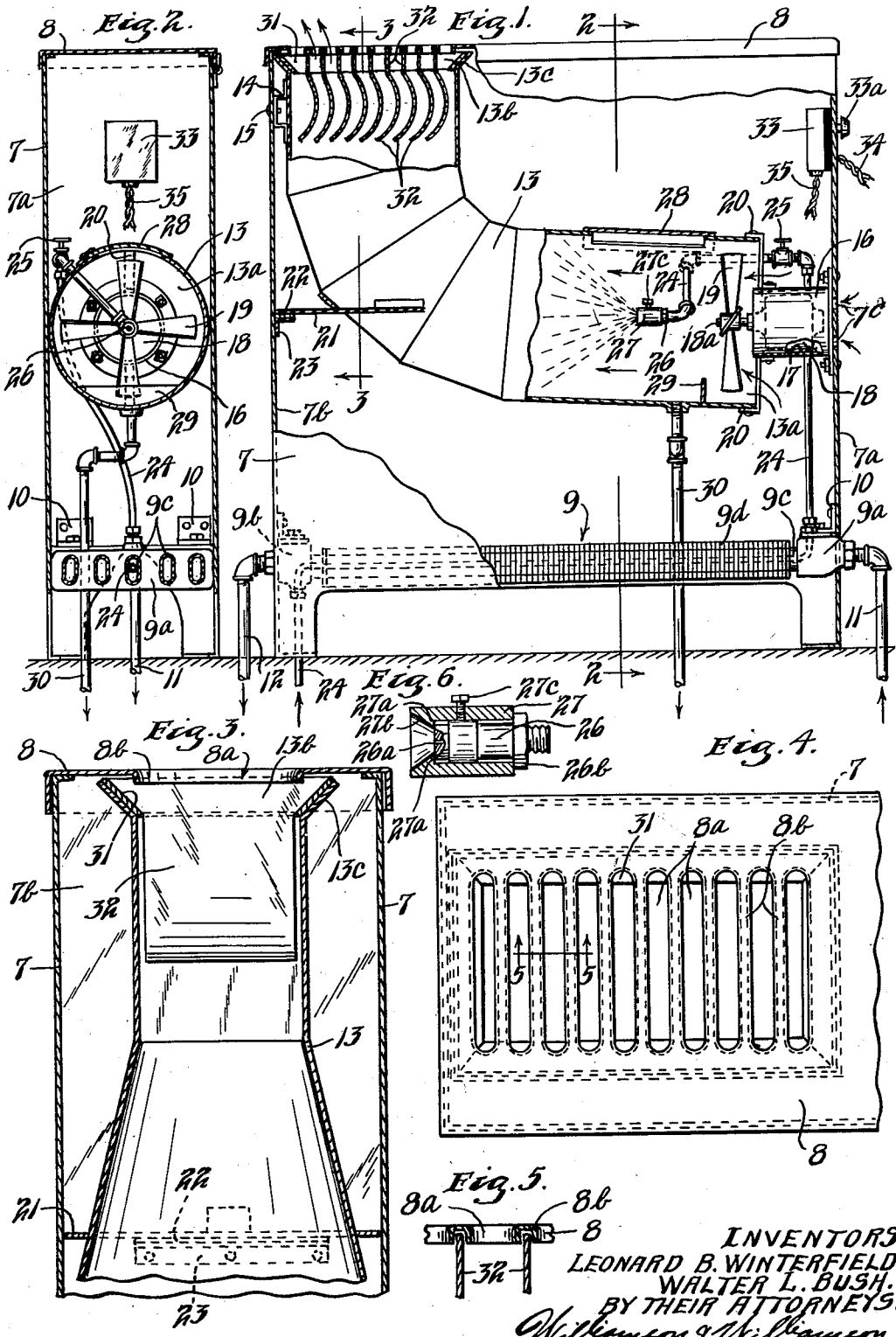
March 5, 1935.

L. B. WINTERFIELD ET AL

1,993,498

HUMIDIFIER

Filed April 22, 1933



INVENTORS.
LEONARD B. WINTERFIELD.
WALTER L. BUSH.
BY THEIR ATTORNEYS.
Williamson & Williamson

UNITED STATES PATENT OFFICE

1,993,498

HUMIDIFIER

Leonard B. Winterfield, St. Paul, and Walter L. Bush, Minneapolis, Minn., assignors, by direct and mesne assignments, to said Bush

Application April 22, 1933, Serial No. 667,402

10 Claims. (Cl. 257-138)

This invention relates to humidifiers.

It is the general object of this invention to provide a novel and improved humidifier of cheap and simple construction, which can be substituted for the ordinary house radiator and which will operate with great efficiency to supply moist, warm air.

It is a more detailed object of the invention to provide a humidifier in combination with what is now commonly known to the trade as a convector type radiator, which consists of a cabinet and a tubular radiator equipped with a multiplicity of narrow fins, the radiator being mounted in the lower part of the cabinet.

To these ends, generally stated, the invention consists in the novel parts and novel combination of parts hereinafter defined in the claims and described in the following specification, made in connection with the accompanying drawing, wherein like reference characters refer to the same or similar parts throughout the various views, and, in which,

Fig. 1 is a view partly in side elevation and partly in vertical section through a humidifier embodying the invention;

Fig. 2 is a vertical section taken on the line 2-2 of Fig. 1, as indicated by the arrows;

Fig. 3 is a vertical section taken on the line 3-3 of Fig. 1, as indicated by the arrows;

Fig. 4 is a plan view of one end of the humidifier;

Fig. 5 is a vertical section taken on the line 5-5 of Fig. 4, as indicated by the arrows; and

Fig. 6 is a view illustrating the sound deadener of the invention applied to the spray nozzle shown in vertical section and the spray nozzle being shown chiefly in side elevation.

In accordance with the invention, there is provided a cabinet 7 preferably of rectangular shape in horizontal cross section and having downwardly projecting legs below the lower edges of its side and end walls. The cabinet 7 is open at its bottom and is normally closed at its top by means of a hinged cover 8. A radiator 9 is mounted in the lower part of the cabinet 7 and this radiator preferably includes a pair of headers 9a and 9b respectively secured to the end walls 7a and 7b of the cabinet as by angular brackets 10. Extending between and communicating with the two headers 9a and 9b are a plurality of tubes 9c preferably of ellipse-shape in vertical cross section. A multiplicity of thin fins 9d are connected to the tubes 9c to extend transversely of the tubes. Two head-

ers 9a and 9b have tapped portions extending through openings in the end walls 7a and 7b respectively and connected to the tapped portion of the header 9a is a fluid supply conduit 11, while connected to the tapped portion of the header 9b is a fluid discharge conduit 12. Hot water or steam may be supplied to the radiator 9 through the conduit 11 and may be discharged from the radiator through the conduit 12. The cabinet 7 and the radiator 9 together form what is now commonly known on the market as a convector type radiator.

A drum 13 is mounted in the cabinet 7 above the radiator 9. This drum has an open lower and rear end forming an air inlet 13a spaced a short distance from the end wall 7a. The drum 13 extends from the open inlet end toward the end wall 7b of the cabinet for some little distance in a plane tipped upwardly slightly from the horizontal, whereupon the drum is provided with a right angular bend and turns upwardly to form an outlet 13b. Preferably the lower part of the drum 13 is cylindrical in contour and the diameter of this lower part of the drum is approximately equal to the spacing between the side walls of the cabinet 7. The upper part of the drum is formed into rectangular shape in horizontal cross section and the walls of the extreme upper end portion of the drum are flared outwardly to form a rectangular flaring mouth 13c.

A small bracket 14 is secured to the upper part of the drum 13 adjacent the end wall 7b and the drum 13 is secured near its upper end to the cabinet 7 as by means of a single screw 15 which runs through the bracket 14. Secured to the end wall 7a of the cabinet is a cylindrical motor casing 16, this casing being concentrically placed relative to the inlet opening 13a of the drum and having a flange which is bolted to the end wall 7a. A number of air draft openings 7c are provided in the wall 7a for supplying small quantities of air to the interior of the motor casing 16. This casing 16 is preferably insulated on its exterior surface and carries within it a resilient cushion 17 upon which an electric motor 18 is mounted. This motor 18 has a motor shaft 18a which projects into the rear end of the drum 13 and has mounted thereon a fan 19. A spider 20 secured to the motor casing 16 is connected to the rear end of the drum 13 and serves to anchor this rear end of the drum. Secured to the drum 13 at the lower portion of the elbow thereof is a plate 21 shaped to receive the said portion of the drum and filling the cabinet

between the drum and the end wall 7b. This plate rests on a pad 22 carried by an angular bracket 23 secured to the end wall 7b. The plate 21 together with the drum 13 prevent the travel of air upwardly beyond the level of the plate 21 except between the end wall 7a and the rear end of the drum where the air inlet opening 13a is located.

A water conduit 24 running from any suitable source of water supply extends into the header 9b of the radiator 9 and thence projects through one of the tubes 9c to the header 9a from whence the pipe extends upwardly to lead into the drum 13 forward of the fan 19. A control valve 25 is provided in this water conduit for convenient access when the cover 8 of the cabinet is raised. Secured to the end of the water conduit 24 within the drum 13 and disposed preferably axially in the central longitudinal axis of the lower part of the drum is a spray nozzle 26 having a small aperture 26a from which water may be sprayed. This nozzle may be of any approved design but is preferably of a type which will not clog under continued usage. Applied to the spray nozzle 26 is a spray silencer 27 which we have developed to dampen the hiss of the water as it issues from the spray nozzle. This silencer 27, as best shown in Fig. 6, is formed as a heavy sleeve which embraces the outer portion of the nozzle and bears against a projecting nut 26b at the inner end of the nozzle. The sleeve is provided with a shoulder 27a near its outer end which bears against the forward end of the nozzle and from the shoulder 27a forwardly the silencer flares forwardly and outwardly in cone shape to provide the conical surface 27b. The sleeve may be conveniently held in place on the nozzle as by means of a set screw 27c.

Above the spray nozzle 26, an opening is provided in the drum 13 and this opening is normally closed by a plate 28 hinged or otherwise attached to the drum. A dike 29 is provided across the lower part of the drum 13 rearwardly from the spray nozzle 26 to prevent any water accumulating in the drum from running rearwardly to the rear end of the drum and a drain pipe 30 is mounted in the lower part of the drum forwardly of the dike 29. The drain pipe runs downwardly from the drum 13 through the radiator 9 and, in practice, will be connected to a sewer.

Removably mounted within the upper rectangular flaring mouth of the drum 13 is a rectangular frame 31, the sides of which are inclined to form the sides of a truncated rectangular pyramid. Secured to and extending between opposite sides of this frame are a plurality of spaced condenser plates 32 which preferably have their lower portions arcuately curved as shown or angularly bent to condense any particles of free moisture that may be carried between the same by the air. The upper ends of these plates project slightly above the upper edge of the frame 31. The cover 8 above the upper end of the drum 13 is provided with a plurality of spaced parallel openings 8a and these openings are preferably provided by pressing downwardly portions of the metal forming the cover 8, so that each rib 8b between adjacent openings 8a will be of substantially channel shape in vertical cross section as best shown in Fig. 5. The upwardly projecting ends of the different condenser plates 32 are received within

the channels of the ribs 8b when the cover 8 is closed, as shown in the drawing.

The motor 17 used for driving the fan 19 is a variable speed motor and the speed of this motor may be controlled by means of a rheostat switch 33 mounted on the end wall 7a of the cabinet and having a knob 33a controlled from outside the cabinet. Wires 34 running from any suitable source of electrical supply are connected to the rheostat switch 33 and other wires 35 run from the switch to the electric motor 17.

Operation

The entire humidifier can be installed in a house or elsewhere to take the place of an ordinary heating radiator. To set the humidifier in operation, steam, hot water or other heating fluid is supplied to the radiator 9 and the valve 25 is turned on to cause water to be sprayed from the spray nozzle 26. The rheostat switch 33 will also be turned on to set the fan 19 in operation. When the radiator 9 is heated up, the air above the radiator will naturally rise by convection to cause fresh air to be drawn into the cabinet from below the radiator. As the hot air rises from the radiator 9, it will strike the lower part of the drum 13 to impart heat to the drum whereupon the air will travel upwardly between the open rear end of the drum 13 and the end wall 7a of the cabinet. The fan 19 will draw this heated air into the drum 13 through the inlet opening 13a, whereupon the air will be driven forwardly by the fan to pass through the water spray running from the nozzle 26. The air will, of course, pick up large quantities of moisture from the spray and will pass on forwardly and upwardly through the drum 13 and between the condenser plates 32 to discharge from the cabinet through the openings 8a in the cover 8. Any particles of moisture not absorbed by the air will condense out onto the condenser plates 32 and will drop back into the drum 33. This water together with whatever water from the spray that is not absorbed by the air will drain from the drum 13 through the drain pipe 30, the dike 29 preventing this water from running rearwardly to interfere with the action of the fan.

As the moist air is discharged from the humidifier the condenser plates 32 will cause the moist air to take the path indicated by the curved arrows Fig. 1, so as to be deflected outwardly from the left end of the humidifier, as viewed in Fig. 1. If it is desired to cause the moist air to move towards the right end of the humidifier, as viewed in Fig. 1, this may be easily done by raising the frame through 180° and reinserting the frame in place. It will be understood that if desired, the plates 32 may be set longitudinally of the cabinet instead of transversely thereof, whereby the moist air from the humidifier may be thrown away from a wall against which the humidifier is placed or toward the wall as desired.

By varying the speed of the motor 17 through operation of the rheostat switch 33, the humidifier may be regulated to supply more or less moisture to the space being humidified. When the motor 18 is in operation, small quantities of air will be drawn into the fan casing 16 to cool the motor. It will be seen that by reason of the mounting of the motor, no moisture can get to the same to interfere with the action thereof. The resilient cushion 17 effectively pre-

vents the motor from transmitting vibrations to the casing 16 and to the cabinet and thus the motor runs practically noiselessly.

The silencer 27 effectively eliminates the hissing sound which is commonly found when a spray nozzle, such as the spray nozzle 26, is used. The water emitted from the aperture 26a of the spray nozzle runs forwardly and outwardly therefrom in a cone-shaped spray and the conical shaped portion 27b of the silencer 27 projects forwardly from the aperture 26a and prevents air from being drawn inwardly to a point adjacent the aperture 26a. This, we believe, is the reason why the hiss is eliminated. However, the silencing action occasioned by use of the sleeve 27 may be partly due to the fact that the sleeve is of quite heavy, dense material and not subject to ready vibration.

By locating the drum 13 above the radiator 9, the heated convection currents from the radiator striking the lower part of the drum 13 act to materially raise the temperature of the air within the drum, so that the drop in temperature of air admitted to the drum occasioned by reason of the evaporation of moisture within the drum is materially reduced beyond what it would be if the drum 13 were not subjected to the heat of these convection currents. There is of course also considerable heat transmitted to the drum 13 from the radiator 9 through radiation.

The humidifier of the invention has been amply demonstrated in actual practice and has been found to be successful for the purposes intended and efficient for operation. If desired, suitable automatic control mechanisms of standard construction can be used in connection with the humidifier to control the water spray to the spray nozzle, to control the speed of the motor driving the fan and also to control the supply of heat to the radiator. By running the water conduit 24 through one of the tubes 9c of the radiator 9, the water discharged from the spray nozzle is quite highly heated which reduces the temperature drop that would be occasioned if cold water were used. It may be found desirable on some installations to run the conduit 24 through two or more tubes 9c of the radiator.

The parts of the humidifier are few and simple and ready access for repair of all parts may be had.

Although the present invention is primarily intended for use in supplying humidity to the air of an enclosed space during cold weather, the device can also be successfully used for cooling the air of an enclosed space during warm weather. When used for cooling purposes, the radiator 9 will, of course, not be operated.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the various parts without departing from the scope of the present invention.

What we claim is:—

1. A humidifier having in combination a cabinet closed except at its bottom, a radiator mounted in the lower part of said cabinet, a drum mounted within said cabinet above said radiator and having an outlet through one wall of said cabinet and having an inlet within said cabinet, means for driving air from within said cabinet through said inlet into said drum and thence through said outlet, spray means mounted within said drum and water supply means running to said spray means.

2. A humidifier having in combination a cabi-

net closed except at its bottom, a radiator mounted in the lower part of said cabinet, a drum mounted in said cabinet above said radiator, said drum having an air inlet within said cabinet and having an outlet through one wall of said cabinet, a fan mounted for rotation within said drum adjacent the inlet thereof, spray means mounted within said drum forward of said fan and means for supplying water to said spray means.

3. A humidifier having in combination a cabinet closed except at its bottom, a radiator mounted in the lower part of said cabinet, a drum mounted in said cabinet above said radiator and having an inlet opening within said cabinet spaced from one wall thereof, said drum having an outlet through one wall of said cabinet, said drum confining the travel of air upwardly from said radiator to a point between said inlet and the adjacent spaced wall of said cabinet, a fan mounted within said cabinet adjacent said inlet opening, spray means mounted within said drum forward of said fan, and means for supplying water to said spray means.

4. A humidifier comprising a cabinet closed except at its bottom, a radiator mounted in the lower part of said cabinet, a drum mounted in said cabinet above said radiator and having an open end closely spaced from one wall of said cabinet, said drum extending forwardly from its rear end and having an outlet through said cabinet, a motor mounted on said cabinet outside of said drum adjacent said open rear end of said drum and having a motor shaft projecting into said drum, a fan mounted on said shaft and disposed within said drum adjacent the open end of the same, spray means mounted in said drum forward of said fan and means for supplying water to said spray means.

5. A humidifier having in combination a cabinet closed except at its bottom a radiator mounted in the lower part of said cabinet and extending completely across the opening therein, a drum mounted within said cabinet above said radiator and having an inlet end spaced from one wall of the cabinet and located therein, said drum having an outlet through one wall of the cabinet, said drum together with the walls of said cabinet forming a chamber above said radiator closed at its upper end except between the inlet of said drum and the wall of said cabinet spaced therefrom whereby said drum will be heated by convection currents from said radiator and also by radiation therefrom, a fan mounted within said drum adjacent the open end thereof for drawing air into said drum through said open end, spray means mounted within said drum forward of said fan and water supply means running to said spray means.

6. A humidifier having in combination a cabinet closed except at its bottom, a tubular radiator mounted in the lower part of said cabinet, a drum mounted within said cabinet above said radiator and having an outlet through one wall of the cabinet and having an inlet within the cabinet, means for driving air from within said cabinet through said inlet into said drum and thence through said outlet, a spray head mounted within said drum and a water supply conduit running first through one of the tubes of said radiator and thence to said spray head.

7. A humidifier having in combination a cabinet closed except at its bottom, a radiator mounted in the lower part of said cabinet, a drum mounted within said cabinet above said

- radiator and having an outlet through one wall of said cabinet and having an inlet within said cabinet, a motor mounted on said cabinet and having a motor shaft extending into said drum through said inlet, a fan mounted on said motor shaft, means for varying the speed of said motor, spray means mounted within said drum forward of said fan, and water supply means running to said spray means.
8. A humidifier having in combination a cabinet closed except at its bottom, a radiator mounted in the lower part of said cabinet, a drum mounted within said cabinet above said radiator and having an inlet within said cabinet and an outlet mouth, said cabinet having an apertured wall adjacent said mouth, a frame fitting said mouth, a plurality of spaced condenser plates fitting within said frame, said condenser plates being bent to cause a discharge of air laterally as well as upwardly therefrom, means for driving air from within said cabinet through said inlet into said drum and thence through said outlet mouth, spray means within said drum and water supply means running to said spray means.
9. The combination with a convector type radiator including a cabinet and a tubular finned radiator, of a drum mounted within said cabinet above the tubular finned radiator and having an inlet within said cabinet and an outlet through one wall of said cabinet, means for moving air from within said cabinet through said drum and means for spraying water into said drum.
10. A humidifier having in combination a cabinet closed except at its bottom, a radiator mounted in the lower part of said cabinet, a drum mounted within said cabinet above said radiator and having an outlet through one wall of said cabinet and having an inlet within said cabinet spaced from one wall thereof, an open ended motor casing mounted on said spaced wall adjacent said inlet, said spaced wall having apertures therein leading into said motor casing, a motor mounted within said casing and having a motor shaft extending into said drum through said inlet, a fan mounted on said motor shaft, spray means mounted within said drum forward of said fan, a water supply means running to said spray means, said fan acting to draw air through said apertures into said casing to cool said motor.

LEONARD B. WINTERFIELD.
 WALTER L. BUSH.