

May 19, 1953

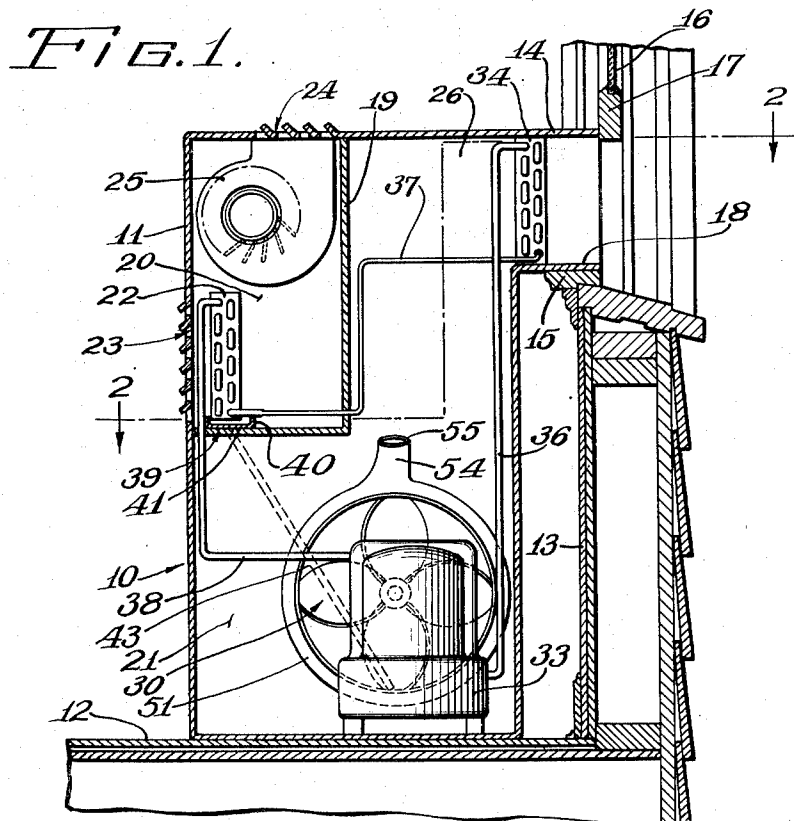
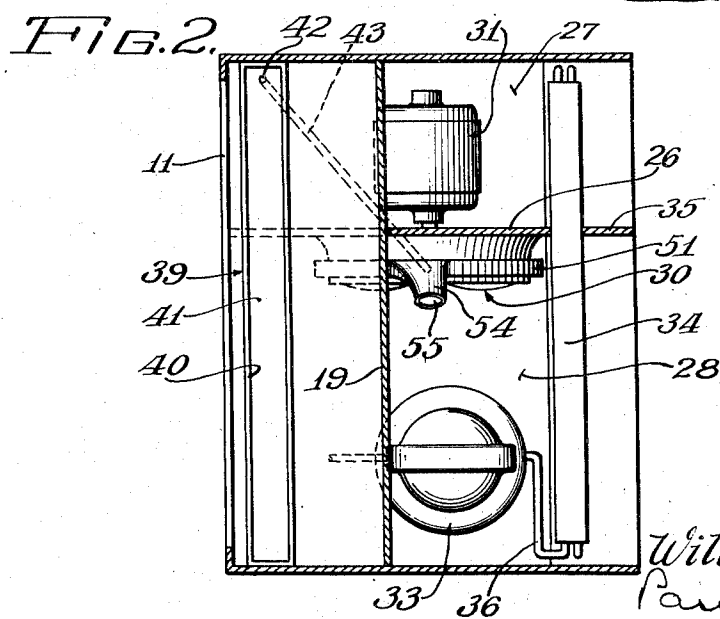
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2,638,756

CONDENSATE REMOVAL MEANS

Filed May 5, 1951

2 Sheets-Sheet 1



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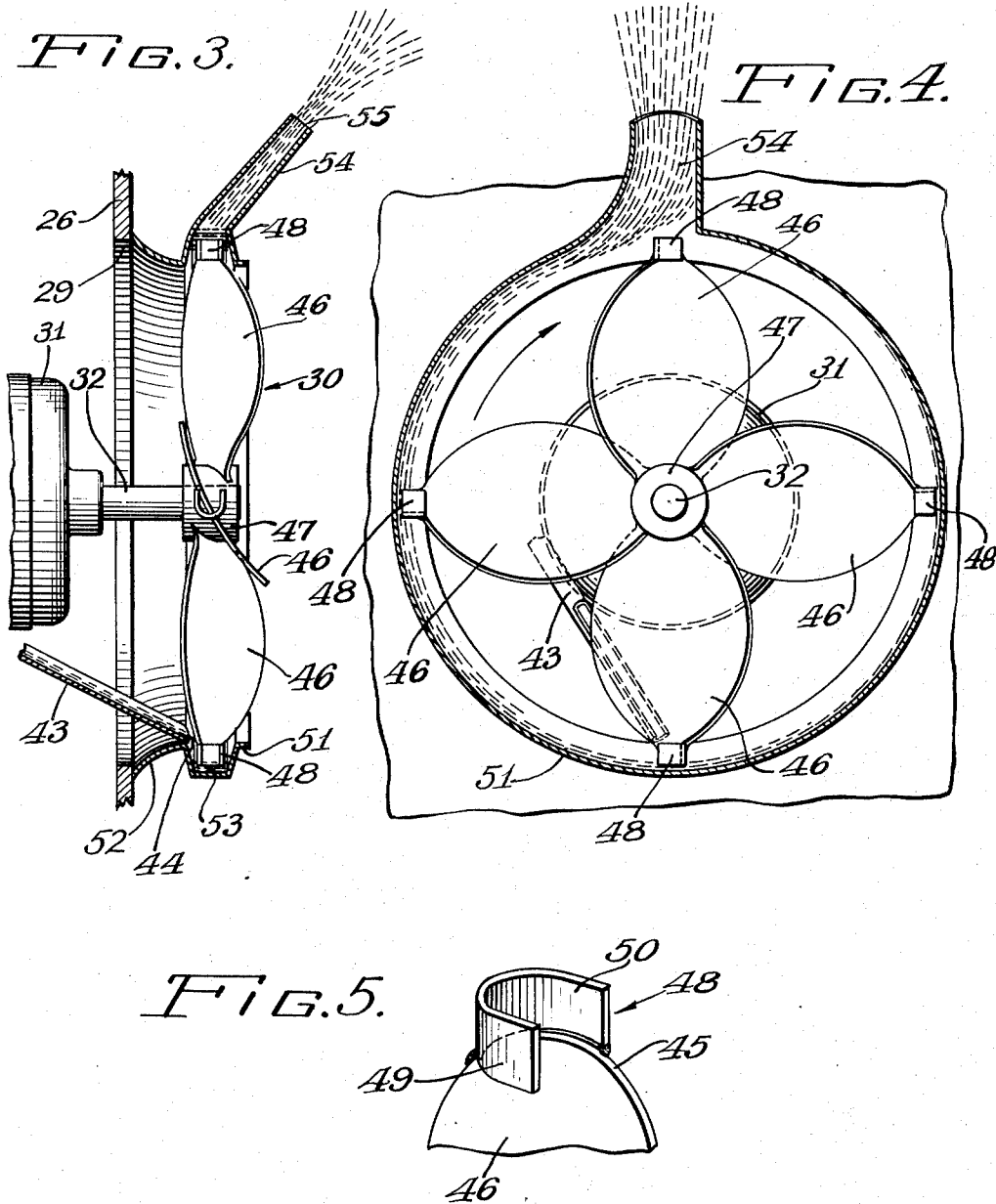
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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CONDENSATE REMOVAL MEANS

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5 Claims. (Cl. 62—140)

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This invention relates generally to condensate removal means and more particularly to means for removing condensate from the cooling element of an air conditioning unit.

As air which is being cooled strikes the cold surface of the evaporator of an air conditioning unit, some moisture contained in the air will condense on the evaporator. A considerable quantity of water will collect during the operation of the unit so that it is necessary to provide means for removing the water. One satisfactory way to remove the water is to spray it onto the hot surfaces of the condenser where it will be evaporated and passed outside the room being cooled. The water is usually collected in a tray located under the evaporator and then passed into the air stream of the condenser fan where it is atomized before being carried into contact with the condenser. However, in many air conditioning units, particularly the console type room conditioner, the fan is usually located below the condenser and the air stream from the fan to the condenser must pass through a passageway having several turns and a considerable lift. This presents the problem of forcing the mixture of water mist and air through the passageway without having a considerable quantity of water drop out. The present invention provides simple and novel means for lifting the water to the condenser in a manner which overcomes the above mentioned problem.

One object of the present invention is to provide an air conditioning unit with means for removing water which condenses on the surface of the cooling unit.

Another object of the invention is to provide an air circulating fan with means for spraying condensate over the hot surfaces of a condenser.

Another object of the invention is to provide means for removing condensate from an evaporator and giving it a positive lift so that it will reach a condenser spaced thereabove.

Another object of the invention is to provide a fan having dippers and a fan shroud having an opening so that water drained into the shroud will be rotated by said dippers and discharged through said opening by centrifugal force.

Another object of the invention is to provide the opening in the fan shroud with a nozzle whereby the direction in which the condensate is discharged from the fan may be controlled.

Another object of the invention is to provide condensate removal means which is simple and inexpensive in construction and operation.

The above and other objects will appear more

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clearly from the following detailed description when taken in connection with the accompanying drawings, which illustrate a preferred embodiment of the invention.

5 In the drawing:

Figure 1 is a side elevational view of an air conditioning unit with the end wall of the cabinet removed.

10 Figure 2 is a sectional view taken on line 2—2 of Figure 1.

Figure 3 is an enlarged side elevational view of the fan and shroud of Figure 1 with the shroud and related parts shown in section.

15 Figure 4 is an enlarged front elevational view of the fan and shroud of Figure 1.

Figure 5 is an enlarged perspective view of a fan blade tip and a dipper mounted thereon.

Referring to the drawings for a detailed description of the invention, a console type air conditioning unit 10 is enclosed by a cabinet 11 which rests upon the floor 12 of the room which is to be cooled. The cabinet 11 is spaced from an outside wall 13 and has an elbow portion 14 which extends over the window sill 15. The window 16 is raised with the lower edge 17 of the sash secured adjacent the top edge of elbow portion 14. The elbow portion 14 of the cabinet has an open end 18 which provides a passageway for air from outdoors into the interior of the cabinet. An insulated partition 19 divides the interior of the cabinet 11 into an evaporator chamber 20 and a condenser chamber 21.

30 Secured in the lower portion of the evaporator compartment 20 is a finned type evaporator 22 which extends across the width of the cabinet 11. An air inlet 23 and an air outlet 24 are provided in evaporator compartment 20 and a blower fan 25 is positioned in the upper portion of the chamber. The blower 25, when operating, pulls air from the room through inlet 23, passes it over the surface of evaporator 22 and then discharges it into the room through outlet 24.

The condenser compartment 21 is provided with a dividing wall 26 which divides the compartment into an inlet passageway 27 and an outlet passageway 28. A circular shaped opening 29 is provided in the lower portion of the dividing wall 26 through which air is circulated from inlet passageway 27 into outlet passageway 28 by fan 30. The fan 30 is positioned in the lower portion of outlet passageway 28 adjacent opening 29 and in axial alignment thereto. An electric motor 31 for driving the fan is secured in inlet passageway 27 and is provided with driving shaft 32 which extends through opening 29 and to which fan 30

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is secured. A motor-compressor unit 33 is secured in the lower portion of outlet passageway 28 and a finned type condenser 34 is secured in elbow portion 14. The condenser extends across the width of the cabinet 11 and a second dividing wall 35 is secured in elbow portion 14 in vertical alignment with dividing wall 26 so that the inlet passageway 27 and outlet passageway 28 are completed.

The motor-compressor unit 33 compresses the refrigerant within the system in the usual manner and forwards it through conduit 36 to condenser 34 where the refrigerant is cooled and condensed by air circulated over the surface of the condenser by fan 30. This air is drawn from outdoors by fan 30 through inlet passageway 27 where it passes over part of condenser 34, then is passed through opening 29 and discharged to the outdoors through outlet passageway 28. As the air circulates through outlet passageway 28 it flows over the motor-compressor unit 33 and through the other part of condenser 34 whereby it removes heat from both members. The refrigerant is passed from condenser 34 by capillary tube 37 to evaporator 22 where it is heated by room air circulated thereover, and then returned to the motor-compressor unit 33 by conduit 38 to complete the refrigeration cycle. The room air is circulated over the evaporator 22 by blower 25 and will be cooled and conditioned to the comfort zone. Suitable controls and switches for automatically controlling the unit may be provided but are not shown or described since such controls are well known in the art and a detailed description would complicate the drawings.

As the room air is passed over the evaporator 22, moisture in the air will condense upon the surfaces of the evaporator. To provide means for collecting this moisture, a drip trough or tray 39 is positioned under the evaporator. The tray is generally rectangular shaped having upstanding short walls 40 and a bottom 41 which slopes downwardly toward one end having a water outlet 42 extending therethrough. Connected to the outlet 42 is a trough 43 which extends downwardly through partition 19 into inlet passageway 27 with the lower end 44 extending through opening 29 and terminating adjacent the tips 45 of fan blades 46. The blades 46 are secured to collar 47 which fits on the end of shaft 32 of motor 31. Secured to the tip 45 of each blade is a U-shaped dipper 48 having curved walls 49 and 50 secured to blade tip by welding or other suitable means. The top, bottom and front of the dippers are open in order to provide a dipper for picking up and throwing water as hereinafter described. A bottom wall could be provided for the dippers 48 if so desired.

Secured to cabinet 11 is a circular shaped shroud 51 which encircles the fan blades 46. The intake side 52 of the shroud 51 is flared outwardly in order to provide less friction for the air flowing therethrough. The inner surface of the shroud is provided with a groove 53 into which the dippers 48 extend. The end 44 of trough 43 terminates within shroud 51 adjacent groove 53 so that condensate will drip into the groove from the trough. Groove 53 is large enough in cross-section to allow fan 30 to rotate without dippers 48 contacting the sides or bottom of the groove. The upper portion of shroud 51 is provided with a nozzle 54 which communicates with groove 53 and is inclined

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outwardly from the shroud with an open end 55 pointing upwardly toward the condenser 34.

As mentioned above, water will condense on the surface of evaporator 22 and will drip therefrom into the tray 39 from where it drains through outlet 42 and flows down trough 43 into groove 53. As the fan 30 is rotated in a clockwise direction by motor 31, dippers 48 will dip into the water in the bottom portion of groove and will force it around the shroud 51 to nozzle 54 through which it will be discharged upwardly by centrifugal force as indicated by the shaded lines in Figures 3 and 4. Since the fan 30 will operate at several hundred revolutions per minute, the dippers 48 will impart a high velocity to the water in groove 53 so that the centrifugal force will be great enough to lift the water a considerable distance after it passes through nozzle 54. In the illustrated embodiment, the nozzle is shown tilted slightly forwardly so that the water discharged therefrom will be thrown upwardly and slightly forwardly. The air stream from fan 30 will mix with the water as it passes through outlet passageway 28 and will aid in distributing the water over the condenser. The nozzle could be pointed directly upwardly if desired in order to discharge the water in a vertical plane, or it could be located at some other point on the shroud 53 if the condenser 34 were located in a different relationship to the fan 30. Since the normal direction of water discharged would be at a tangent to groove 51, the nozzle 54 could be tangent to the shroud instead of radial as shown.

As the water strikes the condenser 34 it will be evaporated and then discharged outdoors through outlet passageway 28. In this manner the condensate is effectively removed and is utilized in cooling condenser 34 since considerable heat will be removed from the condenser in evaporating the condensate. The condensate is given a very positive lift by centrifugal force so that it will reach the condenser and will not drop back and collect on the bottom of cabinet 11. By changing the angle and position of nozzle 54, the direction of water discharged from groove 53 can be controlled. The illustrated embodiment discloses a console type air conditioning unit but it is to be understood that the condensate removal means could be used in any other type of refrigeration unit where water is to be sprayed over a heat exchange element.

Although an exemplary form of the invention has been illustrated in the drawings and described in detail in the foregoing specification, it should be understood that the invention is capable of embodying various modifications in detail construction and arrangement of parts without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. Condensate removal means comprising a cylindrical shroud having an internal annular channel-shaped groove formed therein, said groove being adapted to receive condensate therein and having an opening for discharging condensate therefrom; a rotatable propeller type air circulating fan having a plurality of blades enclosed by said shroud; and means carried by said blades and extending radially into said groove for sweeping condensate received in said groove to said opening.

2. The combination as set forth in claim 1, in which said means includes a dipper member

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attached to the tip of each blade, the radial height of said dipper members being substantially equal to the radial depth of said groove.

3. The combination as set forth in claim 2, in which the axial width of said dipper members is substantially equal to the axial width of the bottom of said groove.

4. Condensate removal means comprising a cylindrical shroud having an internal annular channel-shaped groove formed therein; means for conducting condensate to said groove; means for receiving condensate from said groove and conducting same exteriorly of said shroud, said means including a nozzle in liquid communication with said groove; a rotatable propeller type air circulating fan having a plurality of blades enclosed by said shroud; and means carried by said blades and extending radially into said groove for sweeping condensate received in said groove to said nozzle, said means including a U-shaped dipper member attached to the tip of each blade, the radial height of said dipper members being substantially equal to the radial depth of said groove and the axial width thereof being substantially equal to the axial width of the bottom of said groove, the legs of said dipper member extending tangentially in the direction of rotation of said fan.

5. In an air conditioning unit; an evaporator for cooling air; a condenser for cooling refrigerant;

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a compressor for compressing the refrigerant; a fan for circulating air over said condenser; a cylindrical shroud enclosing said fan having an internal annular channel-shaped groove formed therein; conduit means for conducting condensate from said evaporator to said groove; means for conducting fluid from said groove upon said condenser, said means including a nozzle in liquid communication with said groove; and means carried by the tip of the blades of said fan and extending radially into said groove for sweeping condensate received in said groove to said nozzle, said means including U-shaped dipper members, the radial height of said dipper members being substantially equal to the radial depth of said groove and the axial width thereof being substantially equal to the axial width of the bottom of said groove, the legs of said dipper member extending tangentially in the direction of rotation of said fan.

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