

Oct. 14, 1952

W. F. BORGERD ET AL
CONDENSATE DISPOSAL MEANS

2,613,514

Filed May 5, 1951

2 SHEETS—SHEET 1

FIG. 1.

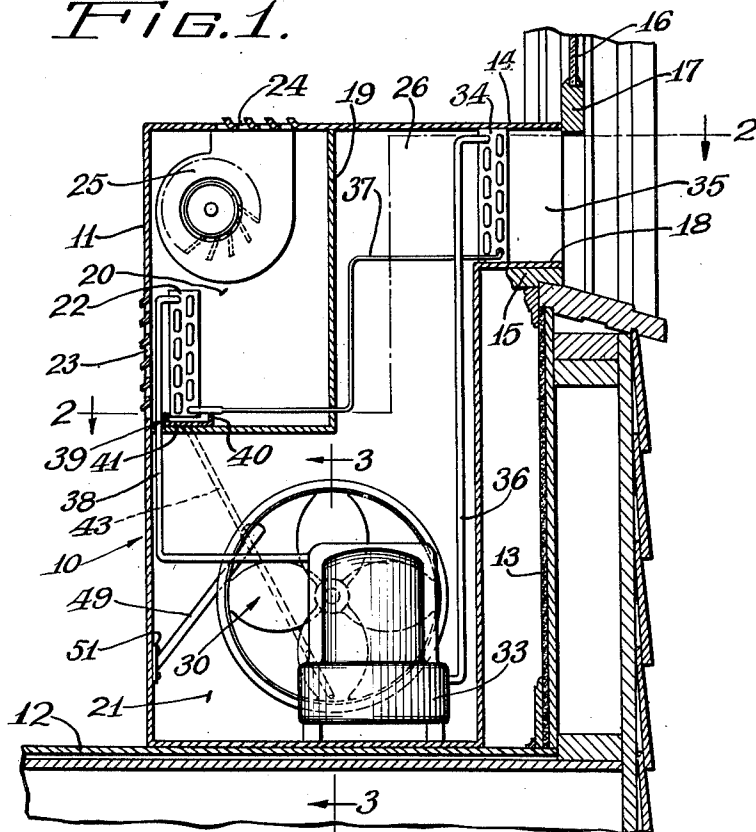
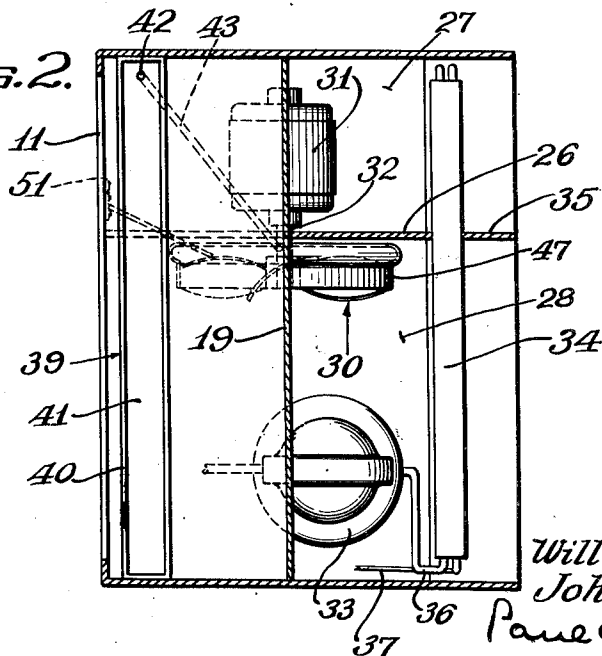


FIG. 2.



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2 SHEETS—SHEET 2

FIG. 3.

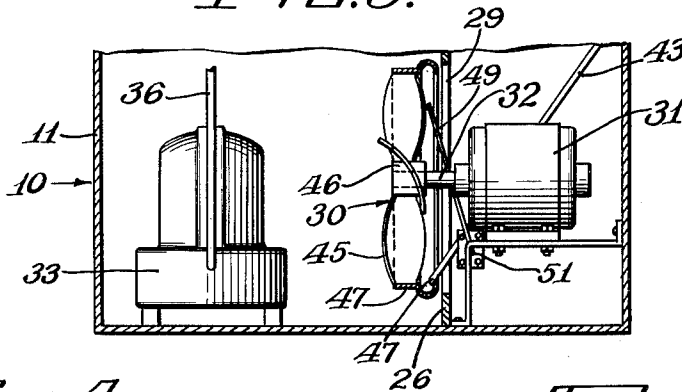


FIG. 4.

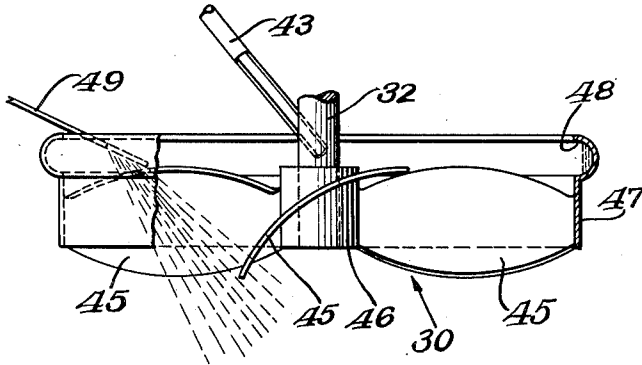


FIG. 6.

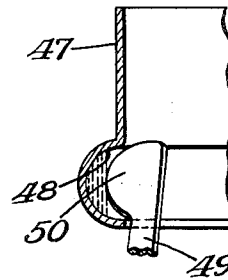


FIG. 5.

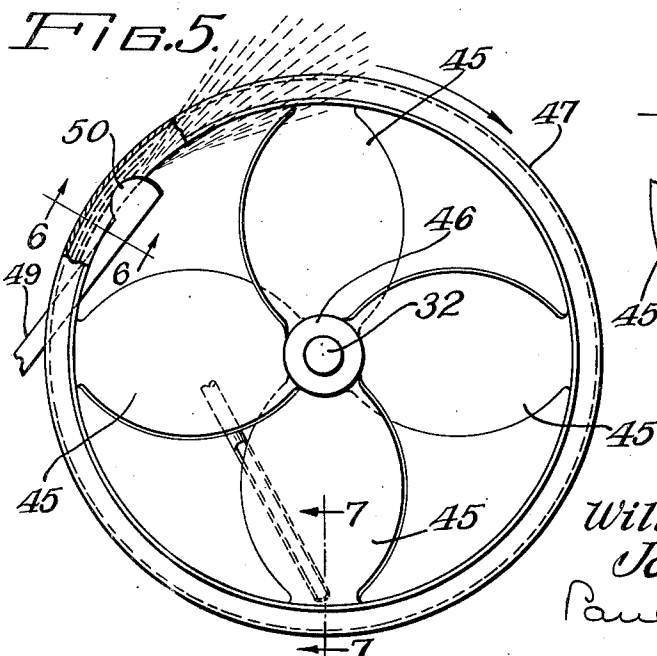
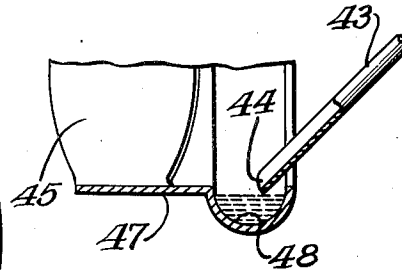


FIG. 7.



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CONDENSATE DISPOSAL MEANS

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8 Claims. (Cl. 62-140)

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This invention relates generally to condensate disposal means and more particularly to refrigeration apparatus having means for removing the water which condenses on the cooling element.

As is well known in the art, water usually condenses on the surface of the cooling element or evaporator of a refrigeration system as the air being cooled is passed into contact with the evaporator. Various means have been advanced for removing this condensate and the most common means is to collect the water in a trough or tray as it drips from the evaporator and then pass it into the air stream of the condenser fan. The fan atomizes the water and sprays it over the hot surface of the condenser so that the water is quickly evaporated and passed into the atmosphere outside the space being cooled. This method has proved quite satisfactory when the fan is positioned close to 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 picking up condensate and spraying it 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 which is spaced thereabove.

Another object of the invention is to provide a fan with condensate disposal means whereby the condensate is fed into a ring mounted on the tips of the fan blades and then discharged therefrom by a scraper member.

Another object of the invention is to provide a fan with means for removing condensate from an evaporator whereby the direction in which the condensate is discharged from the fan may be controlled.

Another object of the invention is to provide

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condensate disposal means which is simple and inexpensive in construction and operation.

The manner in which the foregoing objects and advantages are realized, together with others which will occur to those skilled in the art to which the invention pertains, will be understood from a consideration of the accompanying drawings forming a part of this disclosure, and in which:

Fig. 1 is a side elevational view of an air conditioning unit with some parts shown in section.

Fig. 2 is a sectional view taken on line 2-2 of Fig. 1.

Fig. 3 is a sectional view taken on line 3-3 of Fig. 2.

Fig. 4 is an enlarged plan view of the fan of Fig. 3 with the rim shown in section.

Fig. 5 is a front elevational view of the fan of Fig. 4.

Fig. 6 is an enlarged sectional view taken on line 6-6 of Fig. 5.

Fig. 7 is an enlarged sectional view taken on line 7-7 of Fig. 5.

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.

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 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 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 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. The 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 operation of 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 of blades 45 of fan 30. The fan blades 45 are secured to collar 46 which fits on the end of shaft 32 of motor 31. Secured to the tips of the blades 45 is a circular rim 47 having the inner portion thereof formed into a concave groove 48. The end 44 of trough 43 terminates within the rim 47 above the groove 48 so that water being drained from tray 39 by trough 43 will run into the groove.

Secured to the front wall of the cabinet 11 is a rectangular shaped scraper member 49 having one end provided with a semi-circular shaped projection 50 and the other end provided with a lug 51 which is used in fastening the scraper to the cabinet 11. The scraper 49 extends into the space enclosed by rim 47 with the projection 50 fitting into groove 48 with proper clearance to allow the rim to rotate without striking the scraper. As shown in the drawings, the scraper 49 is held in an inclined relationship to the rim 47 and means may be provided for changing the angle of inclination if desired.

As mentioned above, water will condense on the surface of the evaporator 22 and will drip therefrom into the tray 39. This water then drains through water outlet 42 and flows downwardly through trough 43 from which it drips into groove 48. When the fan 30 and integral rim 47 are being rotated by motor 31 in a clockwise direction, the friction between surfaces of groove 48 and the water therein will impart a velocity to the water. As the water strikes projection 50 of scraper 49, it will be forced from the groove by centrifugal force in the form of a fine mist and thrown forwardly and upwardly in the general direction shown by the shaded lines in Figs. 4 and 5 of the drawings. It is to be understood that the location and inclination of the scraper 49 could be changed in order to change the direction in which the mist will be thrown, and more than one scraper may be used if a wider distribution of condensate is desired. In the illustrated embodiment the water mist is thrown toward the condenser 34 and will be picked up by the air stream from the fan 30 and be carried over the hot surfaces of the condenser 34. 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.

From the foregoing it can be seen that a condensate disposal means is provided which is simple in construction and efficient in operation. 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 position of scraper 49, good directional control of the water mist is possible. The illustrated embodiment discloses a console type air conditioning unit but it is to be understood that the condensate disposal means could be used in any other type of refrigeration unit where water is to be sprayed over a heat exchange element.

While the invention is shown in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and it is desired, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What is claimed is:

1. Refrigerating apparatus comprising an evaporator for cooling air, a condenser for cooling refrigerant, a compressor for compressing refrigerant and delivering it to said condenser, a propeller fan for circulating air over said condenser, a circular rim secured to the blade tips of said fan, said rim having a groove adapted to hold water, a trough for conducting condensate from the evaporator to said groove, said condensate being rotated with said rim when the fan is operating, and means for scraping the condensate from the groove so that it is thrown onto said condenser.

2. Refrigerating apparatus comprising an evaporator for cooling air; a condenser for cooling refrigerant, a compressor for compressing refrigerant, a propeller fan for circulating air over said condenser, a circular rim secured to the blade tips of said fan, said rim having a groove adapted to receive water, a trough for conducting condensate from said evaporator to

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said groove, and a scraper member fixedly secured with a portion fitting into said groove so that as said fan rotates the water will be scraped from said groove by said scraper member and thrown outwardly by centrifugal force.

3. Refrigerating apparatus comprising an evaporator for cooling air, a condenser for cooling refrigerant, a compressor for compressing refrigerant, a fan for circulating air over said condenser, said fan provided with an integral circular rim, means for conducting condensate from said evaporator into said rim, and a stationary member which has a portion located adjacent the inner surface of said rim so that as said fan and rim rotate the condensate will be scraped from said rim and thrown away from said fan by centrifugal force onto the surface of said condenser.

4. Refrigerating apparatus comprising an evaporator for cooling air, a condenser for cooling refrigerant, a compressor for compressing refrigerant, a fan for circulating air over said condenser, a ring secured to said fan into which condensate is drained from said evaporator, and a scraper member fixedly secured with one end terminating adjacent the inner surface of said ring, said scraper member set at an angle so that as said ring is rotated the condensate thereon will be scraped from said ring by said scraper and thrown from the ring at approximately the angle at which said scraper is set.

5. Refrigerating apparatus comprising an evaporator for cooling air, a condenser for cooling refrigerant, a compressor for compressing refrigerant, a propeller fan for circulating air over said condenser, a circular shaped rim secured to the blade tips of said fan, said rim having a grooved portion which overlaps said fan blades on the intake side of said fan, means for conveying condensate from said evaporator into said grooved portion, and a scraper fixedly secured with one end extending within said rim, said end having a projection which fits into said grooved portion so that as said rim is rotated water will be scraped therefrom by the scraper and thrown outwardly by centrifugal force onto said condenser.

6. Refrigerating apparatus comprising an evaporator for cooling air, a condenser for cooling refrigerant, a compressor for compressing refrigerant, a propeller fan for circulating air over said condenser, a circular shaped rim se-

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cured to the blade tips of said fan, said rim having a grooved portion which overlaps said fan blades on the intake side of said fan, a scraper fixedly secured with one end fitting into said grooved portion, a tray for collecting condensate from said evaporator, and a trough for conveying condensate from said tray into said grooved portion, said condensate being scraped therefrom by said scraper as the rim is rotated so that the condensate is thrown therefrom by centrifugal force onto said condenser.

7. In an air conditioning unit, the combination of a cabinet which is divided into two compartments by a partition, an evaporator secured in one compartment with means for passing room air thereover, a condenser and compressor secured in the other compartment with a fan for passing cooling air thereover, said fan located below said condenser and provided with a circular shaped rim having a groove on its inner surface, a scraper fixedly secured to said cabinet with one end projecting into said groove, and means for conveying condensate from said evaporator into said groove, said condensate being scraped from said rim during rotation thereof and thrown upwardly onto said condenser by centrifugal force.

8. In an air conditioning unit, the combination of a cabinet which is divided into two compartments by a partition, an evaporator secured in one compartment, a condenser and compressor secured in the other compartment with a fan for passing cooling air thereover, said fan located below said condenser and provided with a circular shaped rim, means for conveying condensate from said evaporator to the inner surface of said rim, and means fixed to said cabinet for scraping condensate from said rim upon rotation thereof so that the condensate is thrown by centrifugal force onto said condenser.

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45 The following references are of record in the file of this patent:

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