ABSTRACT

Condensate disposal apparatus for an air conditioner is shown wherein the air conditioner includes an evaporator disposed above a cylindrical condenser. A fan for forcing air through the condenser is mounted on a vertical shaft generally common to the axis of the condenser. A condensate impeller member is mounted to rotate with the fan or shaft and receives condensate directed to it from a drain tube communicating with a condensate collecting trough immediately below the evaporator. The path of the expelled condensate is intercepted by either a collar member attached to the condenser or the condenser fins themselves to transfer the condensate to the surface of the condenser generally adjacent one side of the condenser for a downwardly traversing flow to the opposite side of the condenser as urged by the airflow therethrough to increase exposure of the condensate to the condenser surface and promote its vaporization therefrom.

10 Claims, 2 Drawing Figures
1 CONDENSATE DISPOSAL APPARATUS FOR AN AIR CONDITIONER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to air conditioners of the type generally self-contained for mounting in a window or the like and more particularly to structure within the air conditioner for disposing of condensate through vaporization.

2. Description of the Prior Art

Air conditioning units of the type particularly adapted for mounting in windows or other suitable openings, as opposed to being contained in a central heating system, to be independent of any requirement for exterior drain pipes or plumbing, must dispose of the condensate accumulated on the evaporator of the contained refrigerator unit. This problem has been well recognized and the subject of many forms of condensate disposal apparatus. Such apparatus can broadly be characterized as either employing flowing air to pass over collected condensate and entrain some of the moisture, as through aspiration, for subsequent deposition on a condenser and vaporization therefrom (see U.S. Pat. No. 3,766,751) or, contacting the collected condensate with a rotating member such as a slinger ring on a fan, to atomize the water for entrainment in the air stream flowing to the condenser for vaporization therefrom. (See U.S. Pat. Nos. 3,289,433 or 2,613,514).

In either arrangement, it is possible that the rate of condensate collection could exceed its disposal in that the ability of the airflow to carry the atomized mist to the hot condenser is limited and the condensate carried in the air stream may well be redeposited and subsequently recollected before ultimately reaching the condenser. Thus, for this and various other reasons, condensate disposal has heretofore not been entirely satisfactory.

SUMMARY OF THE INVENTION

The present invention provides an evaporator disposed above a generally cylindrically configured condenser with a fan for circulating air through the condenser mounted on a vertical shaft in axial alignment with the condenser. The fan can be positioned relatively near the top of the condenser to draw air upwardly, inwardly. In this arrangement, the condensate slinger ring is attached to the fan and condensate deposited thereon by a drain hose is centrifugally expelled to a collar member encircling the outside of the condenser and intercepting the path of the expelled condensate so that the condensate is deposited on the upper outside surface of the condenser. From there it flows downwardly due to gravity and inwardly due to air circulation to traverse the condenser fins and promote vaporization. On the other hand, the fan may be positioned lower within the cylindrical configuration of the condenser to blow air upwardly, outwardly, in which instance the slinger ring is mounted on the shaft above the fan but within the confines of the cylindrical condenser to expel condensate directly onto the inside surface of the condenser from whence it flows downwardly due to gravity and outwardly due to the air circulation to again increase the traversing path of the condensate across the condenser. In either embodiment, condensate is centrifugally delivered to the condenser irrespective of airflow so that all condensate collected is communicated to the condenser for disposal by vaporization.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an air conditioner with portions broken away to show the condensate disposal apparatus therein; and

FIG. 2 is a schematic elevational view of another embodiment of the disposal apparatus of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Although the air conditioner 10 of the present invention utilizes the well-known refrigeration system for cooling air flowing therethrough, only those components particularly adapted for the condensate disposal of the present invention are shown with the other components being well documented in the prior art.

At the outset it is seen that the air conditioner 10 is seen in a housing 12 partitioned by a horizontal wall 14 into an upper compartment 16 and a lower compartment 18. The housing contains appropriate louvers or slots for permitting airflow into and out of each compartment as generally indicated by arrows.

The upper compartment 16 houses the evaporator 20 which, in this instance, has an arcuate or a semicylindric configuration and is disposed above a concentric trough-like depression 12 within the wall 14. An upper dividing wall 24 is disposed adjacent the upper surface of the evaporator with the perimeter thereof contiguously with the interior walls of the housing to divide the upper compartment into a generally high-velocity discharge side and a low pressure or suction side. The central portion of wall 24 is generally open and bounded by an upturned lip 26 to provide the fan ring.

A motor 28 is mounted within the lower compartment supported from wall 14 in any convenient manner such as supporting webs 30 screwed to brackets 32 on the motor casing. The shaft 34 driven by the motor 28 extends upwardly to drive a fan 36 disposed generally within the fan ring 26 so as to draw air into the upper compartment through the evaporator 20, and discharge it through the upper louvers. As the air is cooled by the evaporator 20 it deposits water vapor thereon which collects in the trough-like depression 22.

The lower compartment 18 houses the condenser 38, which is seen to have an upright substantially cylindrical configuration concentric with the axis of the lower vertical shaft 40 of the motor 28. The lower compartment is also divided into a high pressure or discharge side and a low pressure or suction side by a dividing wall 42. In the preferred embodiment shown in FIG. 1, the dividing wall is generally adjacent the top of the cylindrical condenser and terminates in a central opening bounded by a generally vertically upstanding annular wall member 44 terminating in an inwardly contoured top 46 forming the fan ring for fan 48 mounted on shaft 40 and disposed above the condenser and generally adjacent the ring 46.

The lower edge of wall member 44 provides an inwardly projecting annular foot portion 48 which is in intimate contact with the outside surfaces of the fins of the condenser generally adjacent their top for a purpose to be explained later.
An annular slinger ring 50 is attached to the blades of the fan 48 generally at their lower outermost portion to provide a condensate impeller and, for this purpose, has an outwardly extending annular lip or shelf portion 52 which is disposed generally intermediate the height of the annular wall 44.

A drain tube 54 extends from an aperture in the lowermost portion of the condensate drain trough 22 to just above the shelf portion 52 to direct the condensate from the trough to the shelf. Thus, as the fan 48 rotates, air is drawn across the condenser from the outside to the inside surface and upwardly through the fan 48 and fan ring 46 to be discharged through the upper louvers as shown. The water vapor precipitated by the evaporator and collected as condensate is directed by the drain tube 54, to be discharged just above the shelf of the impeller ring 50 to prevent premature scattering of it by the air stream prior to it being centrifugally expelled by the ring 50.

The condensate deposited on the ring 50 is thus impelled outwardly by virtue of the centrifugal force and deposited on wall 44, which is in the normal path of such outwardly impelled condensate. From there the condensate flows downwardly across the foot portion 52 to the upper outside surface of the condenser where, because of the intimate contact between the foot portion and the condenser fins, it is transferred to the condenser to flow down the fins. Because the air passing through the spaces between the fins is flowing inwardly, the condensate is forced inwardly thereby as it also flows downwardly, resulting in a general diagonal flow path giving the condensate sufficient exposure to the warm surface of the condenser and the air passing therethrough to be vaporized.

The above arrangement is termed "draw through" in that the fan is positioned to draw air through the condenser. Referring now to FIG. 2, the same principle is shown in what is referred to as a "blow through" arrangement wherein the condenser is on the discharge or downstream side of the condenser fan. In the schematic drawing of FIG. 2, it is seen that the fan ring 56 is disposed generally adjacent the lower end of the condenser 38 so the fan 58 flows air upwardly, outwardly through the condenser.

In this embodiment, a disk 60 is mounted on the motor shaft 40 at some intermediate position and the drain tube 54 is directed to discharge the condensate onto the disk. As the disk is disposed interiorly of the cylindrical condenser, the condenser itself is in the normal path of the expelled condensate to intercept it whereupon at least most of the condensate will be deposited on the inside surface of the fins of the condenser. However, in that the condensate will have an outward velocity assisted by the outward airflow, some of the condensate may be carried through the condenser without being deposited thereon. To prevent this condensate from being deposited on the interior walls of the housing or other components, an outer annular ring 62 of a generally porous material such as foamed polyurethane, is attached to the outside face of the condenser 38 along the height generally subjected to the expelled condensate. Such a material preferably permits air passage through a relatively tortuous path that traps any mist carried therein, which as it accumulates is ultimately deposited on the condenser.

However, in the above instance, the majority of the condensate would be deposited on the condenser 38 at or adjacent the inside surface and would flow downwardly, outwardly in the direction of airflow to again traverse the fins in substantially a diagonal path to increase the exposure of the condensate to the condenser surface and promote vaporization therefrom.

To accommodate those few instances when the rate of condensate accumulation exceeds the rate of its vaporization from the condenser, each embodiment discloses the condenser disposed within a sump area or depression 64 to accumulate the condensate not vaporized therefrom and maintains it in intimate heat transfer relationship with the condenser for subcooling the condenser. In that such instances are infrequent, the accumulated condensate would also eventually be vaporized therefrom.

The above described condensate disposal apparatus arrangement for air conditioners, in addition to mechanically distributing the condensate for efficient vaporization from the condenser, thereby increasing the capacity of the condenser, also distributes sufficient moisture of a distilled nature to the condenser surface to provide some waterflow thereover which tends to wash the surface of the condenser and retard corrosive action thereon, thereby permitting the use of a relatively inexpensive material such as aluminum in the condenser. However, above all, it provides an efficient condensate distribution that will expose all collected condensate to the condenser fins for evaporation of the condensate to obviate the requirement of any outside drain tubes for elimination of the condensate.

What is claimed is:

1. An improved air conditioning unit including a housing having a first compartment enclosing a condenser and a second compartment enclosing an evaporator, said second compartment being disposed generally above said first compartment and including means for collecting condensate from said evaporator, a motor for rotating a shaft coupled to fan means disposed within said first compartment for moving air from one side of said condenser to the other side and wherein the improvement comprises means for depositing said collected condensate on said one side of said condenser including:

said condenser having a cylindrical configuration and disposed within said first compartment on a vertical axis generally common to the axis of rotation of said fan means;

means for draining said collected condensate, said drain means leading from said collecting means into said first compartment;

means drivingly coupled to said shaft and fan means within said first compartment for receiving said condensate from said drain means and centrifugally expelling said condensate therefrom as said shaft rotates; and,

means in the normal path of said centrifugally expelled condensate to intercept said condensate for deposition on the surface of said one side of said condenser whereupon, due to the airflow through said condenser said condensate is generally moved towards said other side of said condenser as it flows downwardly to traverse said condenser for vaporization therefrom.
2. An improved air conditioner according to claim 1 wherein said fan is disposed generally above said condenser and said expelling means comprises:
a ring member attached to the blades of said fan adjacent their outer end for rotation therewith and having
an annular shelf portion extending outwardly beyond the blade ends with said drain disposed so as to deposit said condensate on said shelf portion to be centrifugally expelled therefrom when said fan rotates.

3. An improved air conditioner according to claim 1 wherein said one side of said condenser in intimate contact with said annular condensate intercepting means is the outside face and said annular condensate intercepting means extends therefrom above said condenser to at least a position in horizontal alignment with said shelf portion.

4. An improved air conditioner according to claim 1 wherein said fan is disposed within the cylindrical configuration of said condenser generally adjacent the lowermost end and said expelling means comprises:
disk means drivingly coupled to said shaft and disposed above said fan generally intermediate the top and bottom of said cylindrical condenser.

5. An improved air conditioner according to claim 4 wherein said means in the normal path of said centrifugally expelled condensate comprises the inside surface of said condenser.

6. Condensate disposal apparatus for an air conditioning unit having a housing enclosing an evaporator disposed in one compartment of said housing above a condenser disposed in a second compartment of said housing wherein said condenser has a cylindrical configuration disposed on a substantially vertical axis generally common to the rotational axis of fan means for forcing air across said condenser from one side to the other side, said disposed apparatus cooperatively associated with a shaft of a motor housed within one of said compartments with said apparatus comprising:
means in said one compartment and subadjacent said evaporator for collecting condensate from said evaporator;
drain means communicating with said collecting means and extending therefrom into said second compartment for draining said condensate from said collecting means;
means drivingly coupled to said shaft and fan assembly in said second compartment for receiving the condensate from said drain means and expelling said condensate outwardly by centrifugal force when said shaft is rotating; and,
ing ring-like means including an annular portion in general horizontal alignment with said receiving means and stationarily mounted in liquid flow communication with said condenser for intercepting the normal path of said centrifugally expelled condensate and directing it to said condenser for subsequent vaporization therefrom.

7. Condensate disposal apparatus according to claim 6 wherein said fan means is positioned above said condenser and said means for receiving and expelling said condensate comprises a collar member attached to the bottom of the blades of said fan adjacent their outer ends for rotation therewith and having an annular lip portion extending outwardly beyond the blade ends; and
said drain means disposed so as to deposit condensate on said lip.

8. Condensate disposal apparatus according to claim 6 wherein said ring-like intercepting means is in intimate engagement with said one side of said condenser generally adjacent the top with said annular portion extending upwardly to above said condenser.

9. Condensate disposal apparatus according to claim 6 wherein said fan means is disposed within the cylindrical configuration of said condenser generally adjacent the lowermost end and said condensate receiving and expelling means comprises:
disk means drivingly coupled to said shaft and disposed above said fan intermediate the ends of said cylindrical condenser.

10. Condensate disposal apparatus according to claim 9 wherein said ring-like intercepting means is in intimate contact with the outside portion of said cylindrical condenser in general horizontal alignment with the periphery of said disk-shaped condensate receiving means, and is of a generally open nature so as to permit the passage of air therethrough in sufficiently tortuous paths to prevent direct flowthrough of said condensate.