July 28, 1959 S. E. ROSE 2,896,424

CONDENSATE DISPOSAL ARRANGEMENT FOR AIR CONDITIONER

Filed July 28, 1958 2 Sheets-Sheet 1

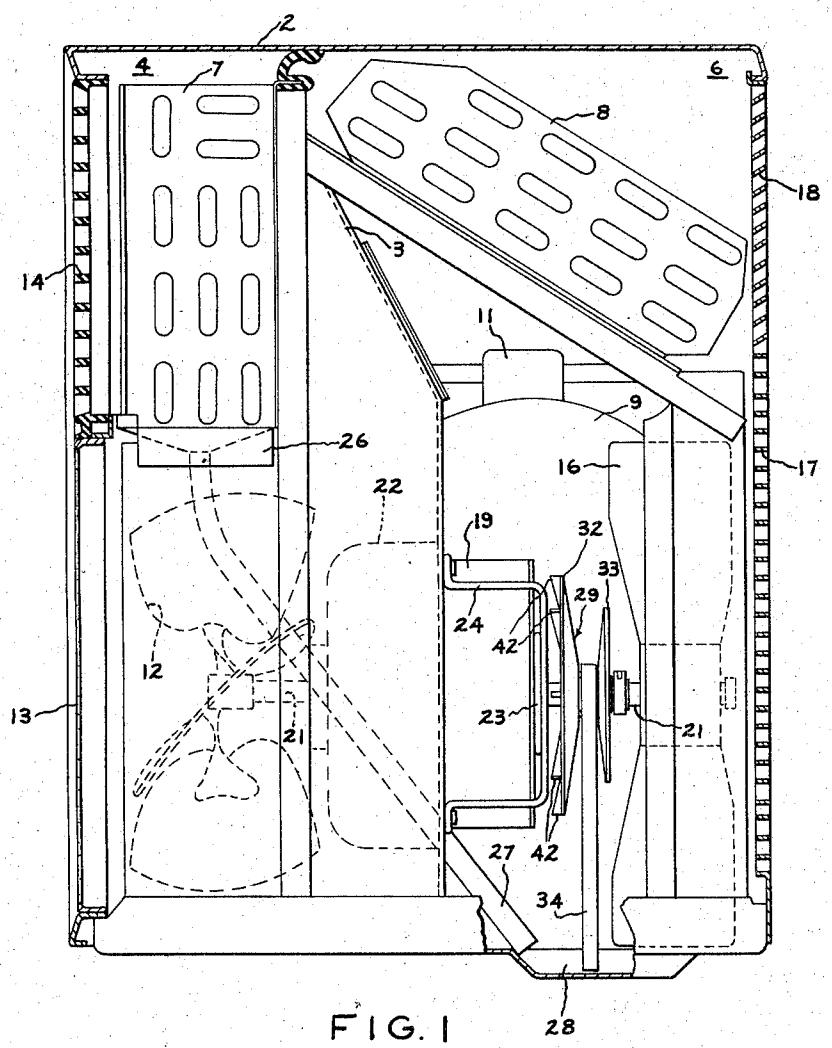


FIG. 1

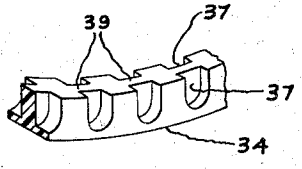


FIG. 2

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CONDENSATE DISPOSAL ARRANGEMENT FOR AIR CONDITIONER

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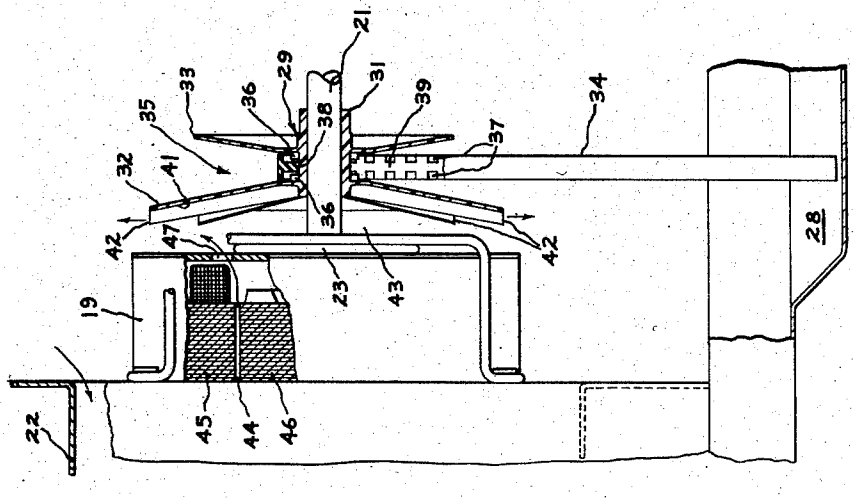


FIG. 3

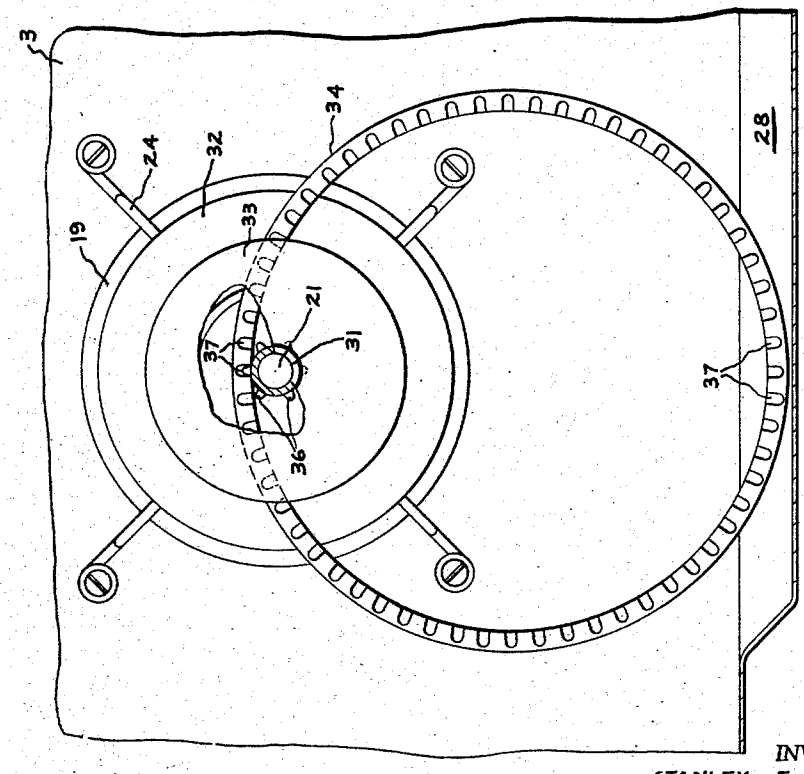


FIG. 4

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CONDENSATE DISPOSAL ARRANGEMENT FOR AIR CONDITIONER

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Application July 28, 1958, Serial No. 751,216

6 Claims. (Cl. 62—280)

The present invention relates to and has for its principal object an improved arrangement in a self-contained air conditioner unit for disposing of condensate water which accumulates within such a unit.

In accordance with the present invention there is provided a self-contained air conditioning apparatus including a refrigeration system having a pair of heat exchangers mounted within a casing and connected in refrigerant flow relationship. A fan, driven by a shaft extended from a motor mounted within the casing, is arranged within the casing for circulating a stream of outside air through one of the heat exchangers. In the lower portion of the casing there is provided a sump for collecting condensate water forming on the heat exchangers and means are employed within the casing for delivering the condensate water to the sump. In order to dispose of condensate water within the sump there is provided a centrifugal water slinger mounted on the shaft for rotation therewith. In order to deliver water to the slinger from the sump there is provided a resilient belt which hangs downwardly into the sump from the slinger. Upon rotation of the shaft, and thereby the slinger, the resilient belt lifts condensate water out of the sump and deposits it on the slinger wherein the water is thrown outwardly by the slinger onto other components within the casing.

For a better understanding of the invention, reference may be had to the accompanying drawings in which:

Fig. 1 is a cross-sectional elevation view of a self-contained air conditioning unit incorporating the present invention;

Fig. 2 is a perspective view showing a portion of the resilient belt;

Fig. 3 is a side elevational view showing in greater detail the arrangement of the slinger belt within the groove between the slinger disks; and

Fig. 4 is an elevational view showing the arrangement of the resilient slinger belt and the driving knobs on the water slinger hub.

Referring now to the drawings, in Fig. 1 there is shown a self-contained air conditioner having the condensate water disposal arrangement of the present invention embodied therein. The conditioner includes a housing or casing 2 having a barrier or partition 3 dividing the housing into two separate compartments. The compartments are hereinafter designated the inner compartment 4 and the outer compartment 6 according to their relative positions with respect to the enclosure when the conditioner is mounted within an aperture of the enclosure wall for conditioning the air within the enclosure. The conditioner is provided with a pair of heat exchangers 7 and 8 mounted respectively in the inner compartment 4 and the outer compartment 6. These heat exchangers are connected in refrigerant flow relationship with a compressor 9 which is also mounted in the outer compartment 6. The system is provided with a reversing valve 11 for reversing the flow of refrigerant through the system, thereby permitting each of the heat exchangers to be used alternatively as a condenser or as an evaporator

in order to heat or cool the enclosure. Thus, with the heat exchanger 7 operating as an evaporator and the heat exchanger 8 operating as a condenser, the air from within the enclosure is cooled upon being circulated through the inner compartment 4. Conversely, when the heat exchanger 7 is used as a condenser and the heat exchanger 8 is used as an evaporator, the air circulated through the inner compartment 4 from the enclosure is heated.

Within the inner compartment 4, in the lower regions of the compartment and below the heat exchanger 7 is a propeller type fan 12 which pulls air from within the enclosure through the inlet grille 13 and circulates it through the inner compartment. The air is circulated upward through the heat exchanger 7 and discharged back into the enclosure through the outlet grille 14. Within the outer compartment 6, there is provided a fan 16 which draws outdoor air through the inlet grille 17 and moves the air stream rearwardly against the barrier 3 whereupon it is diverted in an upward direction through the heat exchanger 8 and discharged to the outdoors through the outlet grille 18. In the illustrated embodiment of the invention, both of the fans 12 and 16 are driven by a motor 19 having a horizontal shaft 21 upon which the fans are mounted for rotation therewith. The motor 19 is mounted through the barrier 3 with one end of the motor supported in the cup-shaped member 22 while the other end of the motor is supported within the outer compartment 6 by means of a clamping ring 23. The clamping ring 23 in turn is supported in spaced relationship with respect to the barrier 3 by a plurality of spider-shaped arms 24 extending around the outer portion of the motor and secured to the barrier 3.

Positioned underneath the heat exchanger 7 within the inner compartment there is provided a drip tray 26 which catches condensate water dripping from the heat exchanger 7 when it is utilized as an evaporator. In order to dispose of condensate collecting in the drip tray 26, an insulated drain tube 27 is provided which transfers condensate water to a sump 28 positioned in the outer compartment. The sump 28, in the illustrated embodiment of the invention, is formed as an integral part of the bottom of the casing 2. When the conditioner is operated on the heat cycle, and the heat exchanger 8 is being utilized as an evaporator, condensate water which forms on the heat exchanger 8 drops from this heat exchanger directly into the bottom of the outer compartment 6 and from there flows into the sump 28.

As thus far described, this particular air conditioner is not considered essential to the invention, insofar as the structure is concerned, but is intended only to be illustrative of the type of air conditioner to which the invention may be adapted. It should also be noted that the invention can be applied to those types of air conditioners which are permanently mounted within an aperture of an enclosure and which contain no reversible refrigeration system but which are used in the winter season to provide ventilation for the enclosure. As will now be explained, the present invention deals with the elimination or disposal of condensate water which collects in the sump 28 and the arrangement for disposing of this condensate water which is associated with the rotation of the fan motor shaft but which does not prevent rotation of the shaft if the condensate water in the sump becomes frozen solid.

Mounted on the shaft 21 within the outer compartment 6 is a centrifugal water slinger 29 which is so arranged on the shaft that it is positioned directly above at least a portion of the sump 28. Referring now to Fig. 3, it can be seen that the water slinger 29 is pulley shaped and includes a hub 31 which slides onto the shaft 21 and is fastened thereto for rotation with the shaft. Extending from the

hub 31 are first and second water slinger disks 32 and 33 respectively. As may be seen in Fig. 3, the disks 32 and 33 have a much greater diameter than that of the hub 31, and during rotation of the shaft, the disks cause water which is applied to the water slinger in a manner to be hereinafter described, to be thrown outwardly from the disks due to the centrifugal force created by the speed of rotation of the disks. The disks 32 and 33 connect with the hub 31 and are spaced a short distance apart to form a groove 35 therebetween.

A belt 34 rides in the groove between the slinger disks 32 and 33 and suspends downwardly into the condensate sump 28 and dips into the water within the sump. The belt 34 loosely engages the hub 31 which has a comparatively small diameter when compared to the overall diameter of the belt 34. Due to the short radius of the hub 31 and the exceedingly greater radius of the belt 34 there is very little contacting surface between the hub and the belt and therefore little friction developed between these two members for driving the belt. In order to provide a direct drive for the belt there are provided a plurality of spaced driving knobs 36 (best seen in Fig. 4) on the hub 31 positioned at the junction points of the slinger disks with the hub 31 on opposite sides of the groove. The knobs 36 fit into mating slots 37 formed in the belt and drive the belt somewhat in the same manner as an inner pinion gear drives an outer ring gear. As may be seen in Fig. 3, the driving knobs 36 do not extend entirely across the hub between the slinger disks 32 and 33. Between the knobs 36, there is provided a running surface 38 on the outer periphery of the hub. As shown in the enlarged section of the belt of Fig. 2, the belt is formed with a continuous middle section 39 which rides on the running surface 38 of the water slinger. During rotation, the belt 34 dips into the condensate water within the sump 28 and the slots 37 on both sides of the belt, which form natural pockets for carrying water, lift the water upwardly. The water within the slots 37 is then deposited on the water slinger 29 as the belt 34 runs over the top of the hub. The provision of the slots 37 in the belt 34 greatly enhances the water carrying characteristics of the belt and greatly increases the amount of water actually lifted by the belt to the water slinger 29 over the amount of water which could be lifted by an ordinary type belt containing no slots 37.

As the belt 34 passes over the driving knobs 36, the driving knobs, which extend upwardly into the slots 37, squeeze the water out from within the slots thereby causing even greater flow of water from the belt onto the water slinger 29. After water has once been raised to the water slinger 29, it flows outwardly along the slinger disks 32 and 33 whereupon centrifugal forces cause the water to be slung off into the other portions in the condenser compartment 6. As may be seen in Fig. 1, the slinger disk 32 is arranged directly below a portion of the heat exchanger 8 and water thrown upward by this disk accumulates on this heat exchanger. When the heat exchanger 8 is utilized as a condenser this water is quickly evaporated by the heat of the condenser and the air flowing over it. When the heater exchanger 8 is utilized as an evaporator then this water is either evaporated by the air stream flowing over the evaporator or is carried on through the evaporator and out of the unit by the air stream flowing through the evaporator. Also, as will be noted in Fig. 1, the compressor 9 is directly in line with the water slinger 29. At least a portion of the water thrown outwardly by the disks 32 and 33 collects on the surface of the compressor case and helps cool this component of the air conditioning unit.

As a further aspect of the present invention, means associated with the water slinger are provided for promoting air flow over the fan motor 19 for cooling purposes. Referring to Figs. 1 and 3, it can be seen that a plurality of radial vanes or blades 42 are provided on the side 41 of the slinger disk 32 facing the motor. These vanes 42 serve to promote a radial flow of air outwardly from the area or space designated 43 adjacent the rear face 41 of the slinger disk 32. Thus, the disk 32 serves as a blower for creating a flow of air outwardly from between the water slinger and the motor and for creating a low pressure area in the space 43. Due to this low pressure area 43, air is circulated through the motor for dissipating the heat within the motor. Air from the fan is blown into the cup shaped member 22, as indicated by the arrow in Fig. 3 and this air passes around the end of the motor and is pulled back through the spaces and openings in the motor toward the low pressure area 43. As indicated by the arrows in Fig. 3, air is circulated through the air gap 44 between the stator 45 and rotor 46, and flows out of the motor into the low pressure area 43 through air holes 47 formed in the end of the motor. In a tested embodiment of this invention, it has been found that, by the provision of radial blades 42 on the rear surface of the disk 32, there is a reduction in fan motor temperature of nearly 10° over that of an arrangement containing no radial blades 42 on the first slinger disk 32.

During operation of the air conditioner of this type in the winter time, there is a possibility that condensate water which has collected in the sump 28 might freeze and solidly secure the slinger belt 34 into the ice formed within the sump. For this reason it is important that the slinger belt be made of some sort of resilient material such as rubber, neoprene or other resilient material. As may be seen in Fig. 4, the driving knobs are rounded at their outer extremities in order to permit the knobs to slide from within the slots 37 of the belt when the belt is frozen into the sump 28 and, for this reason, cannot rotate. The combination of the rounded configuration of the driving knobs 36 and the resiliency of the belt permits the shaft and water slinger to rotate while the belt remains stationary. Thus, even though the belt 34 becomes frozen solidly into ice within the sump 28, the fan shaft can still drive the fan 16 and provide an air stream which passes through the outer compartment 6.

By the present invention there has been provided an improved condensate removal arrangement of the slinger type which is associated with the rotation of a fan motor and which will not prevent operation of the fan motor when the condensate water in the air conditioner freezes.

While in accordance with the Patent Statutes there has been described what at present is considered to be the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention and it is, therefore, the aim of the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A condensate water slinger for slinging water within the casing of an air conditioning apparatus comprising a fan mounted in the lower portion of said casing for circulating a stream of outside air through said casing for heat exchange purposes, a motor mounted in the lower portion of said casing and having a shaft for driving said fan, a sump in said casing for collecting condensate water from said air conditioning apparatus, a water slinger disk mounted on said shaft for rotation therewith, a belt depending into said sump and arranged for rotation through said sump by said fan shaft, said belt being disposed closely adjacent said water slinger disk to deposit condensate water carried from said sump by said belt during rotation thereof by said shaft wherein said water is thrown outwardly by said slinger disk into said casing.

2. A condensate water slinger for slinging water within the casing of an air conditioning apparatus comprising a fan mounted in the lower portion of said casing for circulating a stream of outside air through said casing for

heat exchange purposes, a motor mounted in the lower portion of said casing and having a shaft for driving said fan, a sump in said casing for collecting condensate water from said air conditioning apparatus, a water slinger mounted on said shaft for rotation therewith, said slinger comprising a hub and a pair of outwardly extending slinger disks connecting with said hub and forming a groove therebetween, a plurality of spaced driving knobs arranged around the circumference of said hub within said groove between said slinger disks, a resilient belt arranged on said hub in said groove between said slinger disks and depending into said sump, said belt having a plurality of slots mating with said driving knobs on said hub whereby said belt is driven by said hub to carry water from said sump up to said hub wherein said water is thrown outwardly by said slinger disks into said casing.

3. A condensate water slinger for slinging water within the casing of an air conditioning apparatus comprising a fan mounted in the lower portion of said casing for circulating a stream of outside air through said casing for heat exchange purposes, a motor mounted in the lower portion of said casing and having a shaft for driving said fan, a sump in said casing for collecting condensate water from said air conditioning apparatus, a water slinger mounted on said shaft for rotation therewith, said slinger comprising a hub and a pair of outwardly extending slinger disks connecting with said hub and forming a groove therebetween, a plurality of spaced driving knobs arranged around the circumference of said hub within said groove between said slinger disks, said spaced driving knobs being rounded on their outer extremities, a resilient belt arranged around said hub in said groove between said slinger disks and depending into said sump, said belt having a plurality of slots mating with said driving knobs on said hub whereby said belt is driven by said hub thereby to carry water from said sump up to said hub to be thrown outwardly by said slinger disks into said casing, said resiliency of said belt permitting said rounded driving knobs to slip from within said slots during rotation of said water slinger when said belt is frozen into water into said sump.

4. A condensate water slinger for slinging water within the casing of an air conditioning apparatus comprising a fan mounted in the lower portion of said casing for circulating a stream of outside air through said casing for heat exchange purposes, a motor mounted in the lower portion of said casing and having a shaft for driving said fan, a sump in said casing for collecting condensate water from said air conditioning apparatus, a water slinger mounted on said shaft for rotation therewith, said slinger comprising a hub and a pair of outwardly extending slinger disks connecting with said hub and forming a groove therebetween, spaced driving knobs arranged around the circumference of said hub adjacent the connecting point of said slinger disks on opposite sides of said groove, a resilient belt arranged on said hub in said groove between said slinger disks and depending into said sump, said belt having a plurality of slots on its inner diameter mating with the driving knobs on said hub, said slots being on opposite sides of a continuous central portion of said belt which rides continuously on the part of said hub between said driving knobs whereby said belt is driven by the rotation of said hub to carry water from said sump up to said hub to be thrown outwardly by said slinger disks into said casing.

5. A condensate water slinger for slinging water within the casing of an air conditioning apparatus comprising a fan mounted in the lower portion of said casing for circulating a stream of outside air through said casing for heat exchange purposes, a motor mounted in the lower portion of said casing and having a shaft for driving said fan, a sump in said casing for collecting condensate water from said air conditioning apparatus, a water slinger mounted on said shaft for rotation therewith, said slinger comprising a hub and first and second outwardly extending slinger disks connecting with said hub and forming a groove therebetween, a plurality of spaced driving knobs arranged around the circumference of said hub within said groove between said slinger disks, a resilient belt arranged on said hub in said groove between said slinger disks and depending into said sump, said belt having a plurality of slots mating with said driving knobs on said hub whereby said belt is driven by said hub to carry water from said sump up to said water slinger to be thrown outwardly by said slinger disks, said first disk having a side facing said motor, a plurality of radially extending blades on said side of said first slinger disk facing said motor arranged to form a centrifugal fan for producing air flow from said motor toward said slinger disk whereby said motor is cooled by the flow of said air stream toward said slinger disk.

6. A condensate water slinger for slinging water within the casing of an air conditioning apparatus comprising a fan mounted in the lower portion of said casing for circulating a stream of outside air through said casing for heat exchange purposes, a motor mounted in the lower portion of said casing and having a shaft for driving said fan, a sump in said casing for collecting condensate water from said air conditioning apparatus, a water slinger mounted on said shaft for rotation therewith and arranged beneath said air conditioning apparatus, said slinger comprising a hub and a pair of outwardly extending slinger disks connecting with said hub and forming a groove therebetween, a plurality of spaced driving knobs arranged around the circumference of said hub within said groove between said slinger disks, a resilient belt arranged on said hub in said groove between said slinger disks and depending into said sump, said belt having a plurality of slots mating with said driving knobs on said hub whereby said belt is driven by said hub to carry water from said sump to said water slinger wherein said water is thrown upwardly by said slinger disks onto said air conditioning apparatus.

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