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ATOMIZING FAN

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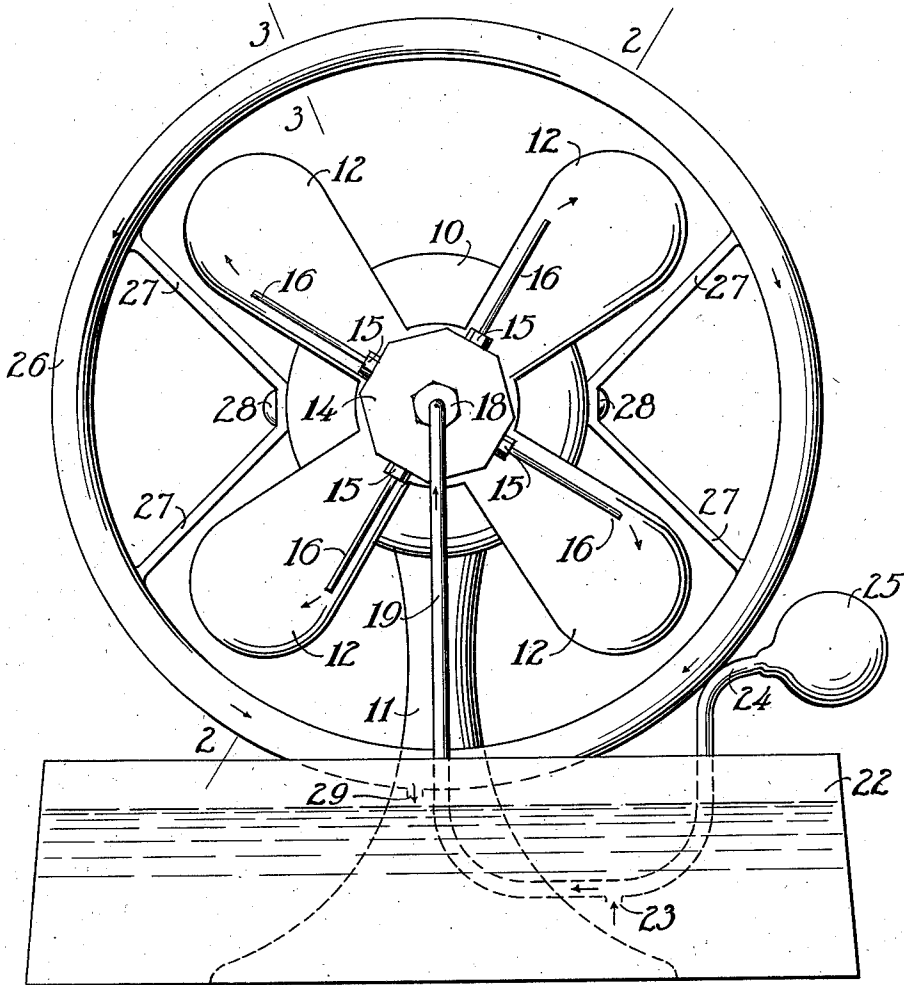


Fig. 1

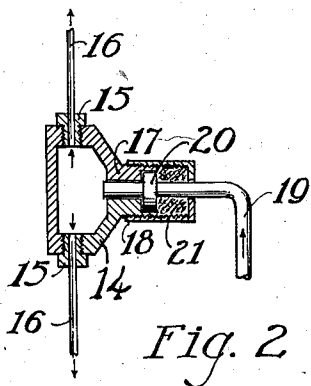


Fig. 2

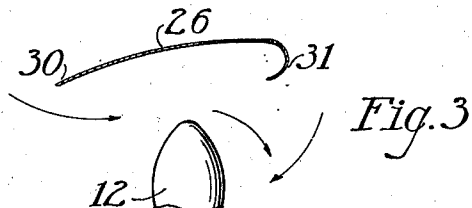


Fig. 3

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ATOMIZING FAN

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5 Claims. (Cl. 261—30)

This invention relates to atomizing devices for air conditioning apparatus.

It has for an object the provision of a centrifugal pump integral to a radial fan and serving to deliver a constant stream of water or other liquid to the blades of the fan.

Another object is the provision of a novel spray ring for a fan having a film of liquid traveling radially across its blades, this ring being so disposed as to permit a free flow of air through the fan and at the same time to adequately drain off unatomized liquid impinging against it irrespective of the position of the fan.

Yet another object is the provision of a mechanism for circulating liquid across the blades of a vertically positioned radial fan, of simple construction and of such lightness that it can be utilized with a conventional oscillating fan.

Still another object is the provision of a novel priming device for a centrifugal suction pump such as is incorporated in this invention.

Ancillary objects such as the correct positioning and proportioning of parts to vary the size of the fluid particles, and the design of detailed parts to permit easy assembly and disassembly will become apparent from reading the following description in conjunction with the accompanying drawing in which:

Figure 1 is a front elevational view of a radial fan equipped with an atomizing device such as is embodied in this invention.

Figure 2 is a sectional view of the centrifugal suction pump taken along the line 2—2 of Fig. 1, and,

Figure 3 is a sectional view along the line 3—3 of Fig. 1 showing a cross-section of the spray ring, the tip of a blade, and the direction of the airflow between the two.

Referring to the drawing in detail, an electric motor 10 held by a stand 11, carries a radial fan having blades 12. A small metal chamber 14 is solidly secured to the center of the fan and carries symmetrically disposed plugs 15 fitted with jet tubes 16 disposed along the leading edges of the fan blades 12, the tips of the jet tubes being bent in toward the blades in such a manner that liquid thrown out from them will flow out smoothly across the pressure side of the blades and to the tips of the blades before being expelled.

The outer face of the chamber 14 projects to form a threaded portion 17 the center of which is aligned with the shaft of the motor 10 and carries the inflow tube 19 near the end of which a shoulder 20 rides smoothly in the indented end of the threaded portion 17, being secured in this

position and the connection rendered airtight by the packing 21 in the slip nut or packing nut 18 during rotation of the chamber 14 about the inflow tube.

The extending end of the tube 19 is bent downward and soldered to the bottom and outer face of the spray ring 26, and continues downward into the liquid held by the supply pan 22. A straight section of the tube beneath the surface of the liquid has a disaligned opening 23, after which the tube is bent up to contact the ring 26 again, rigidly secured there, and the outwardly projecting end 24 fitted with a small rubber priming bulb 25.

The spray ring 26 is held by brackets 27 solidly secured by screws 28 to the housing of the motor 10, the ring being equidistantly spaced from the tips of the fan blades 12 and when seen in cross-section, Fig. 3, presents a slightly curved and oblique surface with a hooked flange 31 at the edge lying rearwardly to the direction of airflow through the fan. A hole 29 in the bottom of the spray ring permits any liquid collecting in the ring to drain back into the supply tank 22.

In operation, when the fan has attained its normal speed, the bulb 25 is depressed and upon being released draws up water from the supply pan 22 through the hole 23. Sudden pressure on the bulb ejects the water into the tube 19 with considerable velocity with the result that the hole 23 being out of alignment with the direction of the flow, the water is carried on up the tube 19 and into the chamber 14. Here, due to the centrifugal forces effective through rotation of the fan it is hurled out radially and into the jet tubes 16, thereby creating a suction which pulls more water up the tube 19 and thus keeps the pump in operation.

Since the tips of the jets 16 contact the surface of the blades 12, it follows that the water hurled outwardly and downwardly from the tips will spread most effectively across the pressure side of the blades, meanwhile traveling radially with increasing velocity until hurled from the edges of the blade in the form of tiny drops. These drops impinge against the spray ring thereby producing an atomized spray, the excess of water forming a rivulet which drains back into the supply tank 22.

Inasmuch as the liquid stream spreads in traveling across the blade, it follows that the distance of this travel in conjunction with the diameter of the jets 16, will be determining factors controlling the size of the drops thrown from the blade tips; since needle like deposits of

sediment left from vaporization of the water soon build up on the blade tips and render any variation in the thickness of the blade edge ineffective for determining the size of these drops. Furthermore, due to rearward travel of the water film during contact with the airstream, at which time direct vaporization occurs, it is desirable that the jets be forwardly disposed relative to the lift line of the blades; since otherwise unvaporized liquid would leave the trailing edge of the blade rather than its tip, with a resultant decrease in velocity and tangential impinging against the spray ring 26.

The fact that the spray ring has a smaller periphery at its forward edge 30 than at its back edge, serves the double purpose of producing a minimum of air resistance and of deflecting any forwardly moving spray into the active air stream. The hooked section 31 at the rear of the spray ring 26 acts to prevent spray flying outside the active airstream, and also prevents excess water draining off the ring before it is returned to the supply pan 22. The depth of the curvature of the spray ring 26, of course, determines the size of the fluid particles thrown into the air stream from it, and it can be given such depth that very little more than saturated air enters the airstream.

However, a definite object of this invention is the throwing of spray into the air stream as contrasted with direct humidifiers which throw out only saturated air; since it has been found that such spray is effectively taken up in traveling with the air stream with the result that the humidifying effect or efficiency of the system is greatly increased. In keeping with this aim, it is to be noted that the airflow, Fig. 3, at the blade tips is reversed in direction to the main air stream to an effective distance of approximately one third the chord of the blade at its maximum width, and that the spray from the spray ring 26 carried by this tip flow passes down and through the fan to be carried near the center of the resultant air stream.

Because of this economy in introducing spray into the air stream, it is obvious that the atomizing device described is equally applicable to all types of cooling fans whether they be direct circulating fans or fans used in air conditioning apparatus. Also, because of the unity and lightness of parts, such an atomizing attachment is particularly applicable to conventional oscillating fans. Therefore, what I claim is:

1. An atomizing attachment for a radial fan of the character described comprising a supply tank, a chamber rotatable with said fan and located near the fan axis, radial tubes extending from said chamber to the surface of the fan blades, a supply tube establishing communication between said supply tank and said chamber whereby rotation of the fan draws water from said tank to said fan blades, and a priming device including an extension of the supply tube carrying means for expelling a jet of fluid into the supply tube and up into said chamber at the center of the fan.

2. An atomizing attachment for a radial fan of the character described comprising a supply

tank, a chamber rotatable with said fan and located near the fan axis, radial tubes extending from said chamber to the surface of the fan blades, a supply tube establishing communication between said supply tank and said chamber whereby rotation of the fan draws fluid from said tank to said blades, and a priming device including an aligned extension of the supply tube past the disaligned opening into the supply tank, a bulb on the extending end of the supply tube whereby water is forced into the supply tube at such velocity as to carry up into the chamber carried at the center of the fan.

3. In atomizing apparatus of the character described, a radial fan operated by an electric motor, a spray ring encircling said fan, a supply tank located beneath said spray ring and catching any fluid draining from said spray ring, a centrifugal pump at the center of the fan, jets extending radially from said pump forwardly and along the under working surfaces of the respective blades of the fan, a supply pipe to the center of said centrifugal pump, a shoulder on said supply pipe bearing against a recessed portion of the pump center, a packing behind said shoulder, a packing nut holding said shoulder in alignment with the recessed surface of the pump face, a downward extension of the supply pipe passing beneath the surface of the liquid in the supply tank, an opening in the supply pipe beneath the surface of the fluid, an upwardly extending end beyond said opening made fast to the spray ring and carrying a priming device whereby the centrifugal pump is put into operation.

4. An atomizing attachment for a radial fan of the character described comprising a supply tank, a chamber rotatable with said fan and located near the fan axis, radial tubes extending from said chamber to the surface of the fan blades, a supply tube establishing communication between said supply tank and said chamber whereby rotation of the fan draws fluid from said tank to said blades, a spray ring encircling said fan and providing a drain for returning excess fluid thrown from the fan blades to said supply tank, said spray ring having a smaller periphery outwardly from the fan than in line with the blades and having a hooked drain flange on the opposite edge of said spray ring.

5. An atomizing attachment for a radial fan of the character described comprising a supply tank, a chamber rotatable with said fan and located near the fan axis, radial tubes extending from said chamber to the surface of the fan blades, a supply tube establishing communication between said supply tank and said chamber whereby rotation of the fan draws fluid from said tank to said fan blades, a priming device including an opening in said supply tube beneath the surface of the fluid and a bulb upon an upward extension of said supply tube, said atomizing attachment being independent of and flexibly mounted in relation to said supply tank whereby the fan may oscillate or be readily adjusted to any desired position without interference to its operation by reason of such movement.

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