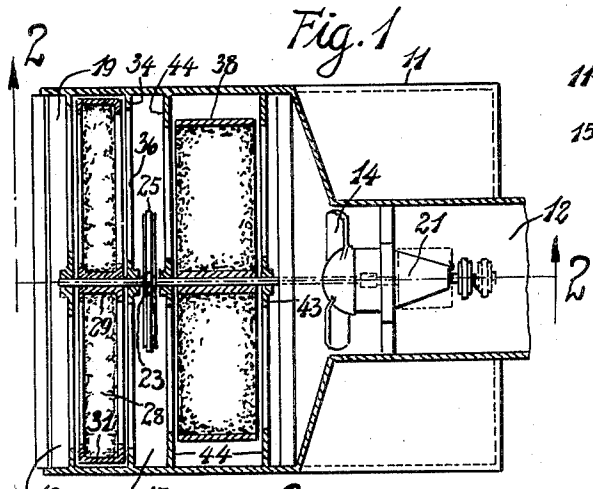
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ROTATABLE EVAPORATIVE COOLER FOR AIR-CONDITIONING

Original Filed Jan. 12, 1946 2 Sheets-Sheet 1

Fig. 1



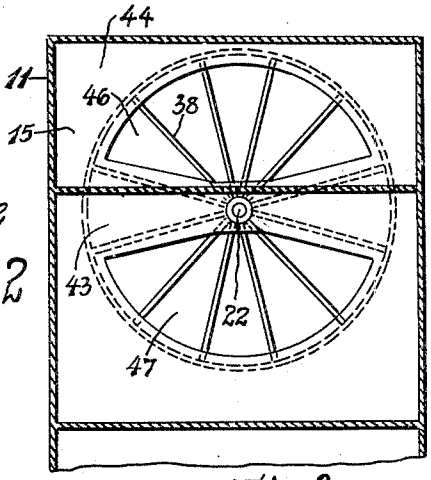


Fig. 3.

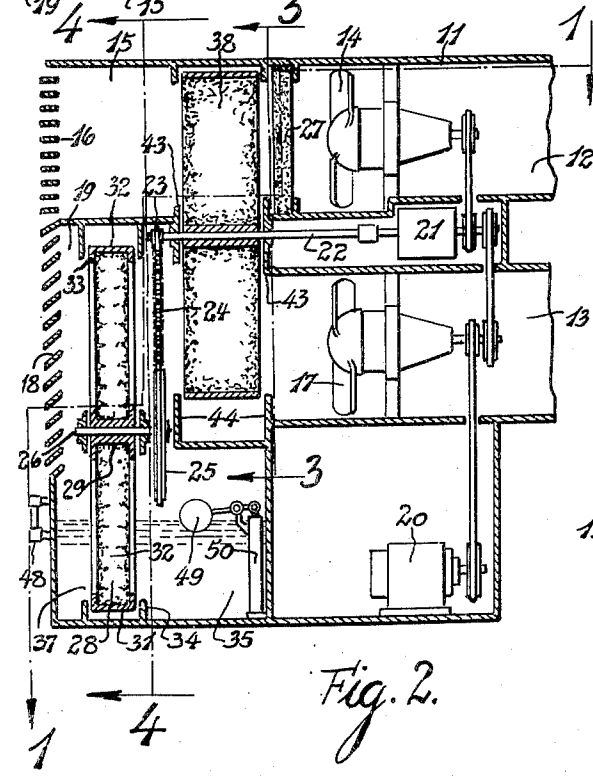


Fig. 2.

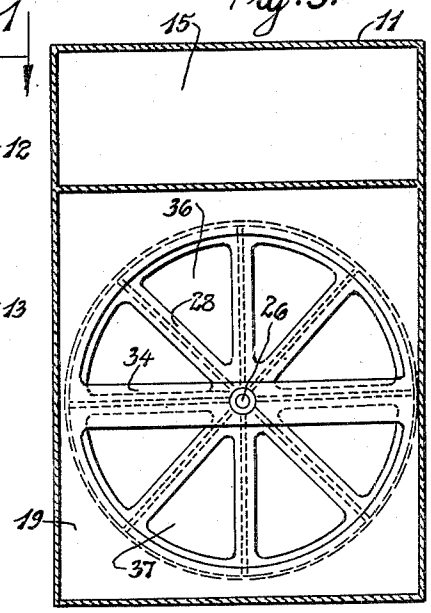


Fig. 4.

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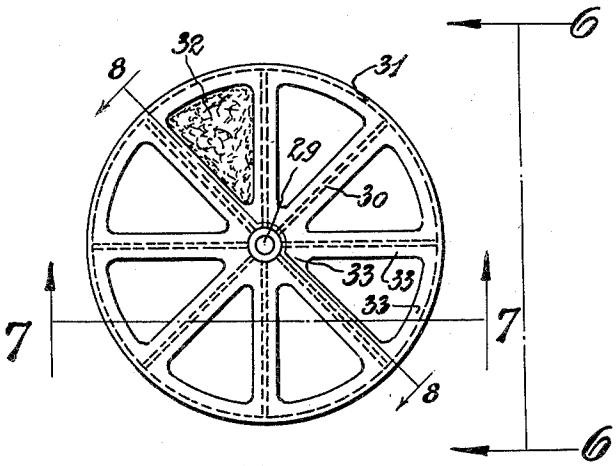


Fig. 5.

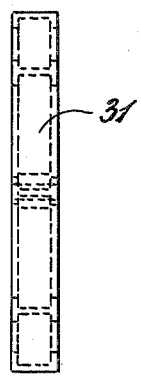


Fig. 6.

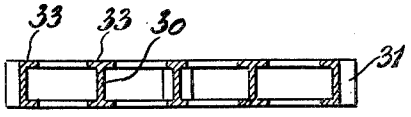


Fig. 7.

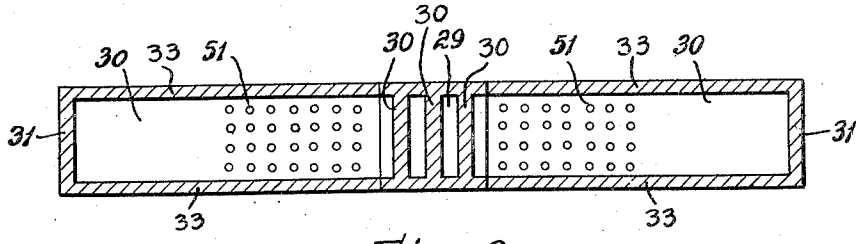


Fig. 8

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ROTATABLE EVAPORATIVE COOLER FOR AIR-CONDITIONING

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Application October 20, 1948, Serial No. 55,594, now Patent No. 2,563,415, dated August 7, 1951, which is a division of application Serial No. 640,792, January 12, 1946, now Patent No. 2,464,766, dated March 15, 1949. Divided and this application March 10, 1950, Serial No. 148,951

7 Claims. (Cl. 261—92)

My invention relates to new and useful improvements in rotatable evaporative coolers for use in air-conditioning apparatus, and more particularly to means for conveying evaporative liquid from a liquid reservoir into an air-passage.

This present application is a divisional of my copending Patent No. 2,563,415, for improvements in heat-exchanger for air-conditioning, which patent in turn is a divisional of my copending Patent No. 2,464,766, issued March 15, 1949, for improvements in air-conditioning apparatus, which copending patent fully describes the type of apparatus in which the present invention is primarily intended to be used.

The principal object of my present invention is to devise efficient evaporative pads for that purpose.

In addition to my principal object, above stated, I have worked out a number of novel and useful details, which will be readily evident as the description progresses.

My invention consists in the novel parts and in the combination and arrangement thereof, which are defined in the appended claims, and of which one embodiment is exemplified in the accompanying drawings, which are hereinafter particularly described and explained.

Throughout the description the same reference number is applied to the same member or to similar members.

Figure 1 is a horizontal section of the apparatus of one type of air-conditioning apparatus in which my evaporative cooler is primarily adapted to be used.

Figure 2 is a vertical longitudinal section of said apparatus, taken along the line 2—2 of Figure 1.

Figure 3 is a vertical transverse section of a portion of said apparatus, taken along the line 3—3 of Figure 2.

Figure 4 is a vertical transverse section of another portion of said apparatus, taken along the line 4—4 of Figure 2.

Figure 5 is an elevation, showing one face of my evaporative cooler.

Figure 6 is a side elevation, showing the rim of my evaporative cooler, taken along the line 6—6 of Figure 5.

Figure 7 is a transverse horizontal section of my evaporative cooler, taken along the line 7—7 of Figure 5.

Figure 8 is a double-size transverse inclined section of my evaporative cooler, taken along the line 8—8 of Figure 5.

Referring now to Figures 1 to 4, we see that 11 is the main container of the apparatus. 12 is an air-inlet from outdoors. 13 is an air-outlet to outdoors, or to the attic space of the building.

In inlet 12, there is a fan 14, the direction of rotation and shape of blades of which is such as to impel air to the left in Figure 2, into passage 15, and thence into the room through louvres 16.

In outlet 13, there is a fan 17, the direction of rotation and shape of blades of which is such as to impel air to the right in Figure 2, sucking exhaust air from the room

through louvres 18 into passage 19, and discharging this air into outlet 13.

A motor 20 drives the two fans through an appropriate set of belts and pulleys, shown but not numbered. Also, through a self-contained gear-reduction 21, this motor drives shaft 22 at a rate of about 30 R. P. M. Shaft 22, in turn, through sprocket-pinion 23 thereon, sprocket chain 24, and sprocket-gear 25, drives shaft 26 at a rate of about 3 R. P. M.

The reasons for these optimum speeds are explained in Patent No. 2,464,766.

27 is a removable dust-filter of any conventional or inventive sort.

Shaft 26 rotates a wheel-like evaporative cooler, which will be hereinafter more particularly described.

The evaporative cooler 28 rotates enclosed between two baffles 34, each of which has two circular-segment orifices 36—37. The lower portion of the evaporative cooler is immersed in water (or other volatile liquid) in tank 35. Baffles 34 serve to support the bearings for shaft 26.

Both orifices connect with passage 19, there being no need to separate the tank 35 from the passage 19.

Heat-transferer 38, which is more particularly described in Patent No. 2,563,415, is rotated by shaft 22, supported on bearings in bridges 43.

This heat-transferer 38 rotates enclosed between two baffles 44, each of which has two sectoral orifices, separated from each other by bridge 43. Upper orifice 46 connects with passage 15. Lower orifice 47 connects with passage 19.

A water-lever gauge 48 serves to inform the occupant of the room whether or not the water is at optimum level. Water can be added or drained through appropriate openings (not shown) and/or a float-valve 49 and water supply-pipe 50 could be employed to maintain the water at the desired level.

The operation of the just-described apparatus is as follows.

Exhaust air, leaving the room through passage 19, passes through the upper portion of evaporative cooler 28; wherein, by the evaporation of the water therein, this air exchanges sensible heat for latent heat in the form of moisture, becoming nearly saturated (about 95%), and its dry-bulb temperature becoming reduced nearly to its wet-bulb temperature, which remains substantially unchanged. If this air be drawn from the room, as contemplated, its initial wet-bulb temperature (which is what determines the final dry-bulb temperature of the adiabatic cooling) will be lower than the wet-bulb temperature of the outdoor air, thus imparting a "regenerative" effect to the operation; hence this source for the outgoing air is generally preferable.

The thus-cooled outgoing air then passes through the lower portion of heat-transferer 38, extracting a large portion of the heat therefrom. The waste air then passes out into the outdoors through outlet 13, or into the attic space.

Fresh outdoor air is meanwhile entering at the same rate through inlet 12, and is filtered by dust-filter 27. It then passes through the upper portion of heat-transferer 38, which has been cooled as already described. This heat-transferer extracts a large portion of the sensible heat from the incoming air, without substituting any latent heat in the form of moisture, i. e. without altering the dew-point of the incoming air.

The thus-cooled, but not humidified, incoming air then passes on through passage 15 into the room which is being air-conditioned.

Now, in order for my machine to operate in a steady state, the heat given to the heat-transferer by the incoming air stream must equal that given up by this heat-

transferer to the outgoing air stream. Hence, if the two streams are of the same magnitude, the incoming stream will decrease in dry-bulb temperature, within the upper portion of this heat-transferer, by the same amount as the outgoing stream increases in dry-bulb temperature, within the lower portion of this heat-transferer.

The above description is a somewhat abbreviated description of the structure and operation of the first variant of my copending Patent No. 2,464,766, already referred to. The invention to be disclosed and claimed in this present application relates to the details of evaporative cooler **28**, already mentioned. This evaporative cooler is equally applicable to other slightly different sorts of air-conditioning apparatus, including the second variant of said patent, and the variants of other copending applications of mine.

The details of my evaporative cooler **28** will now be described, with particular reference to Figures 4, 5, 6, 7, and 8. This evaporative cooler includes a casing, which in turn comprises a hub **29**, spokes **30**, and a rim **31**. Each of the sectors, bounded by the spokes and the rim, is stuffed with excelsior **32**, or any other highly water-absorbing substance, thoroughly permeable to air, and not likely to become matted.

The spokes **30** and the rim **31** are as wide (in a direction parallel to the axis of the casing) as is the casing itself. The spokes **30** are flanged to each side, the rim **31** is flanged radially inwardly, and the hub **29** is flanged radially outwardly, with flanges **33**, which serve to hold the stuffing in place, but especially serve to confine the water which flows downwardly by gravity through the evaporative cooler, as the pad slowly rotates. In order to cooperate with the flanges **33** to produce this confining effect, the rim **31** must be imperforate, and at least the outer portions of spokes **30** must likewise be imperforate. Preferably, but not necessarily, the inner portions of the spokes should contain perforations **51**, as this enables the water to spread fairly evenly throughout the central part of the evaporative cooler as the evaporative cooler rotates. In this connection it should be noted that only about the lower one-quarter (by height) of the evaporative cooler is immersed in the liquid in tank **35**.

Having now described and illustrated one form of my invention, I wish it to be understood that my invention is not to be limited to the specific form or arrangements of parts herein described and shown.

I claim:

1. A rotatable wheel-like casing, divided into sectors, and adapted to hold packing for use as an evaporative cooler for an air-conditioning unit, said casing having

spokes, a hub, and a rim, all of substantially the same width in an axial direction, and all having at each face of the casing flanges projecting into the sectors bounded thereby, the flanges of the spokes projecting in both directions therefrom, and the entire rim being imperforate.

2. A casilng according to claim 1, characterized by the fact that approximately the outer half of each spoke is imperforate.

3. A casing according to claim 2, further characterized by the fact that approximately the inner half of each spoke is perforated.

4. A casing according to claim 3, further characterized by having a packing of filamentous water-absorbing material completely filling each of the sectors of said casing, said packing being packed into each sector with such compactness as to be freely air-permeable and yet be so self-sustaining as to be substantially immovable with repect to the casing during the rotation of the casing even in a vertical plane, thereby constituting with the casing a rotatable evaporative cooler for an air-conditioning unilt.

5. An evaporative cooler according to claim 4, further characterized by the fact that the packing is excelsior.

6. A rotatable evaporative cooler for an air-conditioning unit, comprising: a wheel-like casing, divided into sectors, by having spokes, a hub, and a rim, all of substantially the same width in an axial direction, and all having at each face of the casing flanges projecting into the sectors bounded thereby, the flanges of the spokes projecting in both directions therefrom, and the entire rim being imperforate; and a packing of filamentous water-absorbing material completely filling each of the sectors of said casing, said packing being packed into each sector with such compactness as to be freely air-permeable and yet be so self-sustaining as to be substantially immovable with respect to the casing during the rotation of the casing even in a vertical plane.

7. An evaporative cooler according to claim 6, characterized by the fact that the packing is excelsior.

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