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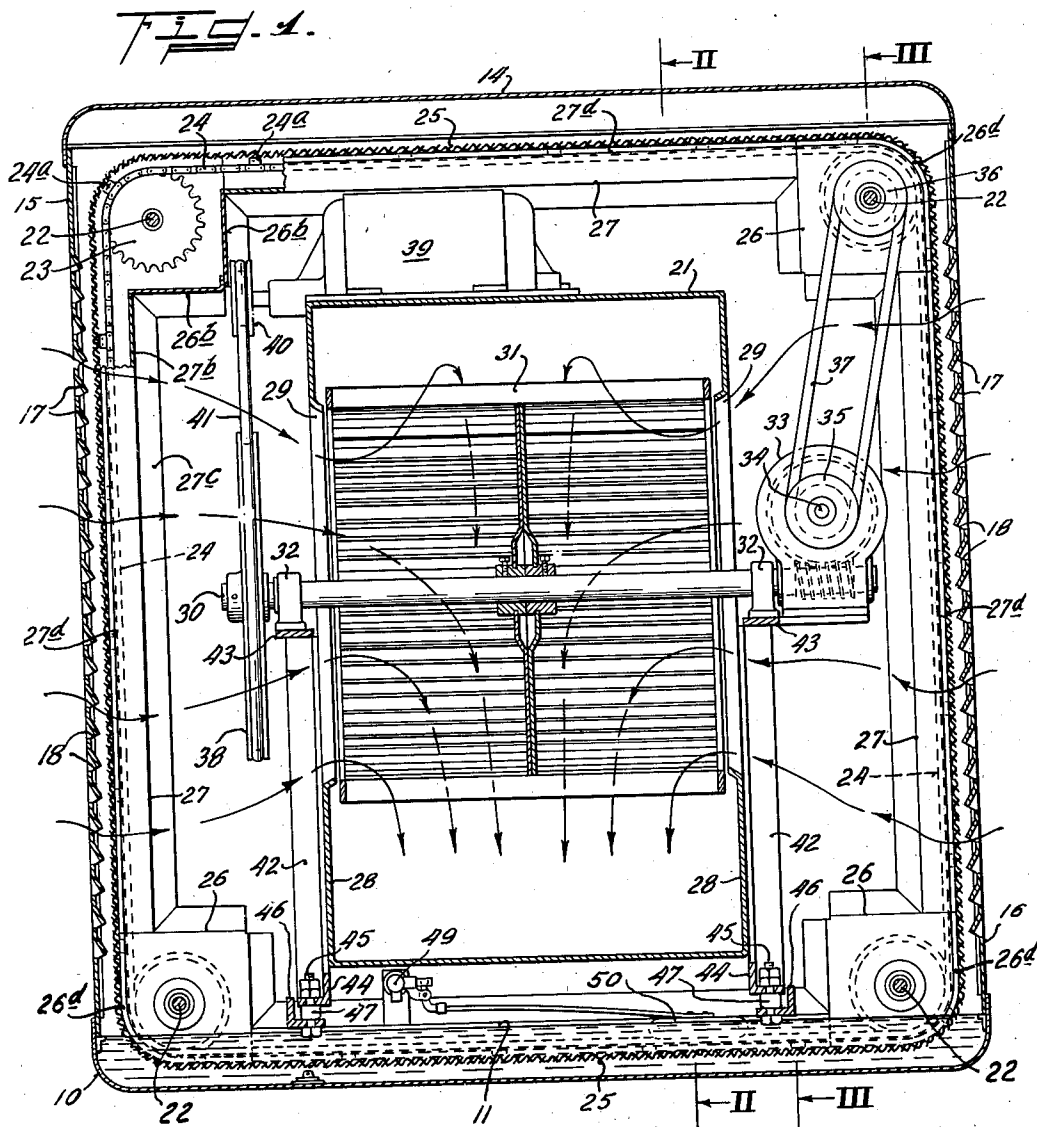
T. I. MOSELEY

2,249,159

AIR CONDITIONING APPARATUS

Filed March 18, 1940

3 Sheets-Sheet 1



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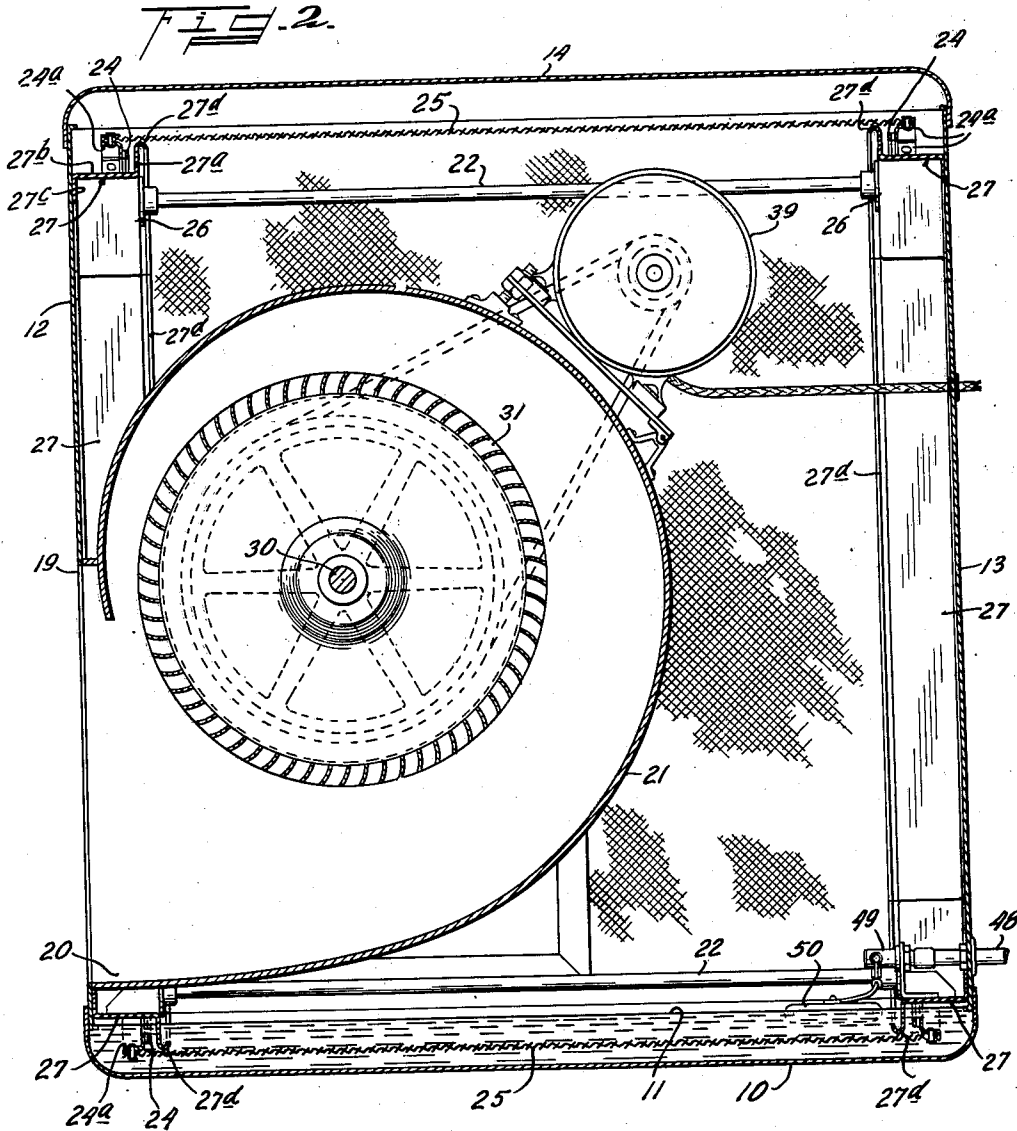
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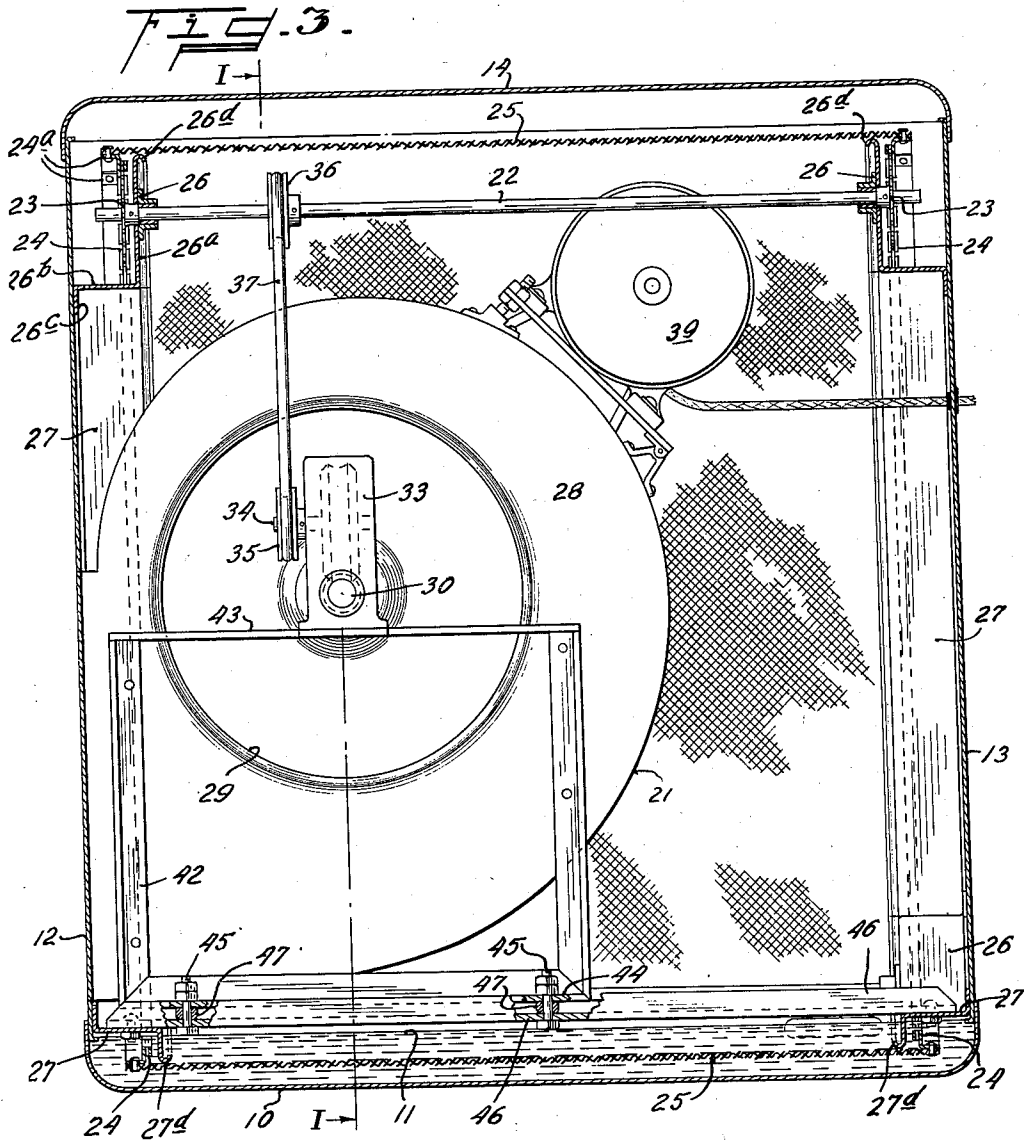
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,249,159

AIR CONDITIONING APPARATUS

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Application March 18, 1940, Serial No. 324,552

4 Claims. (Cl. 261—80)

This invention relates to air conditioning apparatus and is more particularly directed to that general character of apparatus in which the air is passed through a moistened air-pervious medium.

The principal object of the present invention is to provide an improved air conditioning apparatus in which an endless belt of air-pervious material is continuously driven in a cyclic path into and out of a pool of air conditioning liquid to progressively moisten said belt as it is submerged in the liquid pool and in which the air is circulated through the moistened belt web during its travel above the liquid level of the pool, the apparatus thus effecting a continuous and uniform moistening of the traveling belt without the necessity of circulating the liquid through the use of a pump or other similar means, and the constant travel of the belt through the liquid pool during its submergence therein tending to rinse said belt free of dust and other foreign matter filtered thereby from the circulated air.

Various apparatus for air conditioning have heretofore been designed to employ stationary curtain members that are moistened by water dripped or sprayed thereon from an overhead reservoir or spray means, the dripped or sprayed water slowly passing downwardly in the curtain material by gravity and capillary action to more or less saturate the curtain material, and the surplus water draining from the lower ends of such stationary curtain members into a drip pan or catch basin from which it is returned by a pump or other similar means to the overhead reservoir or spray means. In apparatus of this character the downward flow of the circulated water through the curtain material is so exceptionally slow and no appreciable rinsing action is effected thereby, and for this reason the stationary curtain members are particularly susceptible of becoming clogged by the dust, lint and other foreign matter which they filter from the circulated air. Also the very fine discharge orifices which must be employed in such drip or spray arrangements may, and often do, become clogged by such dust and dirt as may be entrained by the circulating water.

The improved apparatus herein disclosed overcomes these detrimental characteristics of such prior apparatus by providing a simplified arrangement involving an endless belt element constantly driven to dip into a substantially static pool of liquid and thus become progressively rinsed and moistened thereby, this improved arrangement rendering unnecessary the employ-

ment of water circulating drip or spray systems and stationary curtain members which may be, and frequently are, rendered ineffective by becoming clogged.

The invention is exemplified in the following description and illustrated by way of example in the accompanying drawings, in which:

Fig. 1 is a vertical section taken on the line I—I of Fig. 3.

Fig. 2 is a vertical section taken on the line II—II of Fig. 1.

Fig. 3 is a vertical section taken on the line III—III of Fig. 1.

Referring particularly to Figs. 1 to 3 of the drawings, the housing or cabinet in which the mechanism is supported is preferably formed of sheet metal, the various parts thereof being connected by welding or by other suitable means. Such housing comprises a pan-like base 10 which forms a reservoir adapted to contain a pool 11 of water or other air conditioning liquid, front and rear walls 12 and 13, respectively, which are preferably welded to the front and rear marginal walls of said base 10 and extend upwardly therefrom, a dished top wall 14 whose front and rear flange portions extend downwardly and are preferably welded to the upper edges of the respective front and rear walls 12 and 13, and opposed upright side walls 15 and 16, respectively, which may be removably associated with the adjacent housing walls. The side walls 15 and 16 are each stamped to form louvers 17 which define a series of air intake openings 18, and the front wall 12 is provided with a rectangular air discharge opening 19 registering with the discharge throat 20 of a blower 21.

As shown in Fig. 1, four horizontal shafts 22 are rotatably mounted in the four horizontal corner portions of the housing in parallel relation to the front and rear housing walls and to each other. To the opposite ends of these shafts 22 are secured chain sprockets 23, the four sprockets adjacent the front housing wall 12 being vertically aligned to comprise one set thereof and the four sprockets adjacent the rear housing wall 13 being similarly vertically aligned to comprise a second set thereof.

Rove around and meshing with the four aligned sprockets 23 of each set is an endless chain 24, and closely surrounding both of these chains is an endless air-pervious belt 25 which is of sufficient width to substantially span the space between the front and rear walls of the housing and thus divide the interior of the housing into an outer chamber between the belt and the hous-

ing walls and an inner chamber within the endless web of the belt.

The opposite marginal edge portions of the belt 25 are secured to the adjacent chains 24 so that the belt will be driven by and travel in unison with said chains. The preferable method of attaching the belt to the chains is to incorporate in said chains, at relatively spaced intervals, attachment links each provided with a lateral flange or tang 24a which is riveted or otherwise secured to the belt web.

By this arrangement the belt 25 is disposed in the housing to surround the blower 21 with its upper horizontal flight above the blower and spaced from the top housing wall 14, with its opposite vertical flights closely adjacent the respective side walls 15 and 16 to pass the air intake openings 18 thereof and with its lower horizontal flight disposed below the blower 21 and submerged in the liquid pool 11.

As shown in Figs. 1 and 3, duplicate means are employed for rotatably supporting the opposite ends of each of the sprocket shafts 22. In each instance such means comprises a box-like journal bracket 26 having a vertical end wall 26a and connecting side walls 26b provided with flanges 26c which are welded or otherwise secured to the adjacent front and rear housing wall, as the case may be.

The outer edge of the wall 26a of each of the brackets 26 is rounded to conform with the curvature of the belt 25 as it travels around the respective sprockets and is turned inwardly to provide a bead 26d disposed to be slidably engaged by the inner surface of the belt.

These brackets form the corner portions of duplicate sealing means between the housing walls and the opposite edge portions of the belt, such sealing means at each side of the belt being completed by intermediate sealing strips 27 extending from each bracket to the next adjacent bracket. Each of said sealing strips 27 is of general Z-shape in cross-section, as shown in Fig. 2, and provides a vertical wall 27a and a lateral wall 27b which is provided with a flange 27c by means of which said strip is welded or otherwise secured to the adjacent housing wall. It will be noted that the outer edge of the vertical wall 27a of each sealing strip 27 is turned inwardly to provide a bead 27d of the same shape as is the beads 26d of the several brackets 26.

With particular reference to Fig. 1 of the drawings it will be observed that the lateral walls 27b of the sealing strips 27 form continuations of the connecting side walls 26b of the associated journal brackets, and that the vertical walls 27a and beads 27d thereof align with and form continuations of the vertical walls 26a and beads 26d of said brackets.

These brackets 26 and strips 27 thus form endless sealing means with which the opposed edge portions of the belt 25 slidably engage to seal the inner chamber so as to compel the incoming air to first pass through the belt web before entering the inner chamber.

The blower 21 is disposed within the belt 25 which defines the perimeter of the inner chamber, and although other types of blower or air circulating means may be employed to produce the desired circulation, it has been found that the more or less standard type of "squirrel-cage" blower illustrated in the drawings is particularly efficient in this situation.

The opposite side walls 28 of the blower cas-

ing are provided with circular air inlet openings 29 axially aligned with the horizontal impeller shaft 30 which has secured thereto the "squirrel-cage" impeller or blower wheel 31. The shaft 30 is journaled in pillow blocks 32 and in a speed reduction gear unit 33 of the worm and pinion type, transmitting rotary motion to a shaft 34 carrying on its outer end a pulley 35. Rove around this pulley and a similar pulley 36 on one of the sprocket shafts 22 is an endless belt 37. By this means the blower shaft 30 drives one of the shafts 22 which will, through the endless chains 24, drive the other three shafts 22 in unison therewith. The opposite end of the impeller shaft 30 carries a belt wheel 38 and is driven by an electric motor 39 through a pulley and belt 41.

It will be understood that other forms of driving means may be employed to drive the four sprocket shafts in unison and at the proper speed in relation to the speed of the blower impeller, and that the motor may be mounted on the blower casing as shown or may be otherwise supported.

For the purpose of supporting the blower 21, angle iron side frames 42 are secured to the opposite side walls 28 of the blower casing and are provided with upper plates 43 which support the respective pillow blocks 32 and the speed reduction gear unit 33. The lower rail 44 of each side frame is secured by bolts 45 to a horizontal angle iron beam 46 disposed above the level of the liquid pool 11 with its opposite ends resting upon and secured to the lateral walls 27b of the opposite sealing strips 27, as shown in Figs. 1 and 3. It is preferable to dispose between said side frames and said beams rubber or other resilient means which will absorb vibrations and tend to produce a substantially quiet operation of the blower, and in the present instance such means are disclosed as being rubber washers 47 which surround the respective bolts 45.

To maintain the liquid pool 11 at the proper level a supply pipe 48 leads to a valve 49 which is actuated by a float 50 disposed in said pool above the lower submerged flight of the belt 25.

The endless belt 25 is herein illustrated as being constructed of fabric, and while a somewhat coarsely woven absorbent fabric will prove efficient for the purpose intended, such belt may be formed of other material capable of picking up the amount of liquid required to moisten the belt to the degree required to effect the air conditioning operation for which the apparatus is designed.

If constructed of absorbent fabric, such fabric, in one or more layers, will provide a belt of substantial thickness and of such character as to permit passage of air therethrough without producing any appreciable cavitating or drag effect upon the blower or such other air circulating means as may be employed.

In the operation of the above described apparatus, the absorbent belt will be driven at a very slow speed relative to the speed of the blower impeller, and in its cyclic travel will be submerged in the liquid pool to pass therethrough and be progressively rinsed and moistened. As the belt leaves the static pool, it will be translated upwardly adjacent one side wall of the housing past the intake openings thereof, horizontally in the upper portion of said housing and downwardly adjacent the opposite side wall and past its intake openings to again enter and be submerged in the liquid pool, such cyclic travel of

the belt being uniform and continuous throughout the operation of the apparatus.

Air is circulated through the apparatus in the manner indicated by the flow arrows in Fig. 1, the blower 21 drawing such air inwardly through the intake openings 18 of the housing side walls and into the outer chamber, thence through the moistened web of the belt 25 and into the inner chamber from which the conditioned air will enter the blower to be discharged thereby through the discharge opening 19 of the housing.

From the foregoing it will be understood by those skilled in the art that the present invention involves the circulation of air through a continuously traveling air-pervious belt which is continuously rinsed and uniformly moistened through its cyclic travel into and out of a pool of air conditioning liquid, and that the disclosed apparatus provides means compelling all of the circulated air to pass through the moistened air-pervious belt web and also provides automatic means for maintaining the liquid pool at a substantially constant level.

It will also be understood that while water may be employed as the belt moistening liquid in the use of the apparatus for ordinary air conditioning purposes, other liquids or solutions may be used to scent or disinfect the conditioned air or to otherwise treat such air for specific purposes, and that, in view of such uses, the term "air conditioning liquid" as herein employed is intended to embrace in its scope the several types of liquids and solutions which may be used in the disclosed apparatus.

While I have disclosed the preferred form of the present invention, it is to be understood that various changes may be made in the construction without departing from the spirit of the invention as defined in the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In air conditioning apparatus, a housing formed to contain a pool of air conditioning liquid, a moisture conveying air-pervious endless belt mounted in said housing for cyclic travel into and out of said pool to progressively submerge therein and moisten successive portions of said belt and translate the moistened belt web in its cyclic path above said pool, said belt dividing the interior of the housing above said pool into an outer air chamber surrounding the belt web and an inner air chamber within said belt web and the housing walls being provided with air intake openings communicating with said outer chamber and an air discharge opening communicating with said inner chamber, belt driving means for continuously driving said belt, and air circulating means for continuously drawing air through said air intake openings, said outer chamber and said moistened belt web into said inner chamber and for discharging said air from said inner chamber through said discharge opening.

2. In air conditioning apparatus, a housing formed to contain a pool of air conditioning liquid, a moisture conveying air-pervious endless belt mounted in said housing for cyclic travel into and out of said pool to progressively submerge therein and moisten successive portions of said belt and translate the moistened belt web in its cyclic path above said pool, said belt dividing the interior of the housing above said pool into an outer air chamber surrounding the belt web and an inner air chamber within said belt web and

the housing walls being provided with air intake openings communicating with said outer chamber and an air discharge opening communicating with said inner chamber, belt driving means for continuously driving said belt, air circulating means for continuously drawing air through said air intake openings, said outer chamber and said moistened belt web into said inner chamber and for discharging said air from said inner chamber through said discharge opening, and sealing means on the housing walls adjacent the opposite edges of said belt and formed to be slidably engaged by the edge portions of the belt to prevent communication between said chambers except through the air-pervious belt.

3. In air conditioning apparatus, a housing formed to contain a pool of air conditioning liquid, a moisture conveying air-pervious endless belt mounted in said housing for cyclic travel into and out of said pool to progressively submerge therein and moisten successive portions of said belt and translate the moistened belt web in its cyclic path above said pool, said belt dividing the interior of the housing above said pool into an outer air chamber surrounding the belt web and an inner air chamber within said belt web and the housing walls being provided with air intake openings communicating with said outer chamber and an air discharge opening communicating with said inner chamber, belt driving means for continuously driving said belt, and an air circulating blower disposed within said inner chamber for continuously drawing air through said air intake openings, said outer chamber and said moistened belt web into said inner chamber and for discharging said air from said inner chamber through said discharge opening.

4. In air conditioning apparatus, a housing formed to contain in its base portion a pool of air conditioning liquid, a plurality of relatively spaced horizontally disposed sprocket shafts rotatably journaled on opposed vertical walls of said housing, sprockets secured on the opposite end portions of each of said shafts to provide axially spaced vertically aligned sets thereof, an endless sprocket chain rove around and meshing with the several sprockets of each aligned set thereof, a moisture conveying air-pervious endless belt surrounding both of said chains and secured thereto for unitary travel therewith, said sprocket shafts being disposed in said housing to position said belt for cyclic travel into and out of said pool to progressively submerge therein and moisten successive portions of said belt and translate the moistened belt web in its cyclic path above said pool, means for driving at least one of said sprocket shafts to effect simultaneous rotation of all of said sprocket shafts and sprockets and unitary cyclic travel of said sprocket chains and said belt, said belt dividing the interior of the housing above said pool into an outer air chamber surrounding said belt and an inner air chamber within said belt web and the housing walls being provided with air intake openings communicating with said outer chamber and an air discharge opening communicating with said inner chamber, and air circulating means for continuously drawing air through said intake openings, said outer chamber and said moistened belt web into said inner chamber and for discharging said air from said inner chamber through said discharge opening.

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