Aug. 22, 1939. J. B. SHAVER 2,170,576

AIR CONDITIONING APPARATUS

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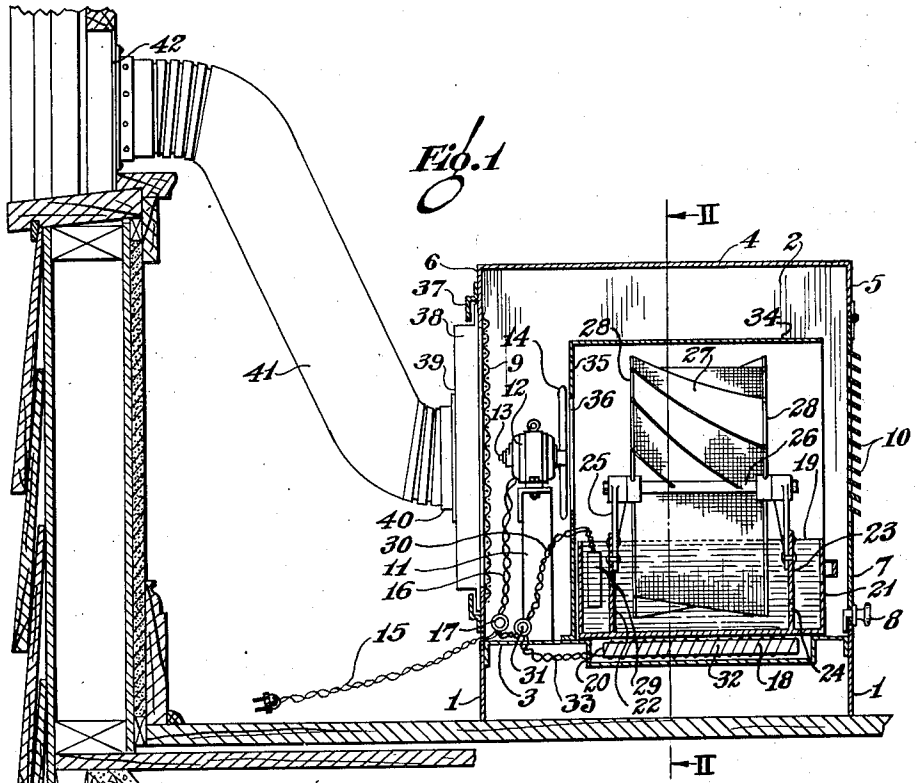


Fig. 1

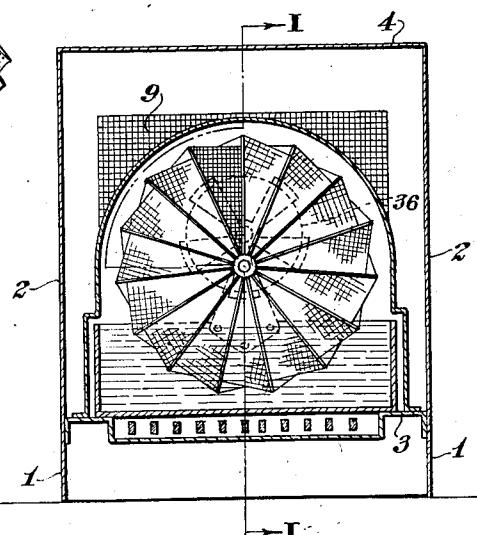


Fig. 2

INVENTOR.
James B. Shaver

BY
Hawgood and Van Horn
ATTORNEYS

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AIR CONDITIONING APPARATUS

James B. Shaver, East Cleveland, Ohio

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3 Claims. (Cl. 261—92)

This invention relates to apparatus for treating air.

The apparatus to which it relates is especially adapted to the removal of dust, dirt and the like from the air and to its humidification or dehumidification, as well as to modifying its temperature.

An object of the invention is to provide an improved air conditioning apparatus.

Another object is to provide an improved air conditioning apparatus which will be simple in construction.

Another object is to provide an improved air conditioning apparatus which will be compact in size.

Another object is to provide an improved air conditioning apparatus which will be neat and attractive in appearance.

Another object is to provide an improved air conditioning apparatus which will operate on relatively little power.

Another object is to provide an improved air conditioning apparatus in which air will be effectively cleaned.

Another object is to provide an improved air conditioning apparatus which may be caused to either supply humidity to or extract it from air passing therethrough.

Another object is to provide an improved air conditioning apparatus which may be used to either raise or lower the temperature of the air passing therethrough.

Other objects will hereinafter appear.

The invention will be better understood from the description of one practical embodiment thereof illustrated in the accompanying drawing, in which;

Figure 1 is a longitudinal sectional view of an air conditioning apparatus of relatively small size for use in rooms of dwelling houses or the like taken on line I—I of Figure 2; and

Figure 2 is a transverse sectional view taken on the line II—II of Figure 1.

The apparatus shown consists of a supporting framework and casing having supporting legs or feet 1, sides 2, an internal bottom wall or floor 3, and a top 4. The space between the floor and top is closed at the ends by a front wall 5 and a rear wall 6, the former of which has hinged to it a door 7 which may be retained in position or opened by means of a knob and latch 8 or the like, while the rear wall has a large opening formed therethrough covered by a screen or grill 9.

The door hinged to the front wall is provided with adjustable louvres 10. Rigidly attached to the floor and within the enclosed space within the casing is an upwardly extending bracket 11 which supports a motor 12, as by clamping it through rubber or other resilient material, in a position slightly above the center of the interior of the casing and with the axis of the motor extending in the direction from the front to the back thereof.

On the motor shaft 13 is mounted a fan 14. Power is supplied the motor through electric conductors 15 and 16, the former of which may be plugged into an ordinary lighting circuit, and is controlled by means of a switch 17 mounted on the casing.

Between the fan and door and within the casing is positioned a tank or pan, having a bottom 18, sides 19, ends 20 and 21, and open at its top. It also has two transversely extending baffles 22 and 23, one of which is continuous and sealed to the sides and bottom of the tank and the other of which is provided with apertures 24 through which liquid in the tank may circulate.

Supported by these baffles are two brackets 25 provided with bearings supporting a shaft 26 extending generally parallel to that of the fan and motor, but below the same, and on this shaft are mounted a plurality of helically disposed blades, each of which consists of wire mesh 27 or other foraminous material supported by rods 28 at their edges.

These blades are of considerable extent, in a unit such as above disclosed (having a 1/20 horsepower motor for driving the fan) being approximately 15 inches in a radial direction by 10 inches in an axial direction with respect to shaft 26. In such a unit, 12, 15 or more blades would be used. The helix angle at which the blades are disposed is sufficient to cause a substantial overlap between the foremost edge of one blade and the rearmost edge of the successive blade.

Arranged to be positioned, when desired, within the space between either end of the tank and the adjacent baffle, is an electrical heating element 29 connected by a conductor 30, through a switch 31, to the conductor 15 supplying current to the motor, and by the use of this heater the temperature of a liquid within the tank may be raised as and when desired.

An electrical heating element 32 is shown mounted in the floor 3 below the bottom 18 of the tank, and connected by means of a conductor 33 to switch 31 and so to the current supply conductor 15.

This heating element may be used either in

conjunction with or in lieu of heating element 29 within the tank.

Secured to the floor 3 is a tubular covering or shroud 34 which rises at the sides of the tank, extends inwardly slightly at the upper edges of the same, and then curves over closely adjacent the sides of the foraminous bladed wheel formed by the parts associated with shaft 26. Closely fitting within the covering or shroud adjacent the fan is a baffle 35 having a circular aperture 36 of just about the same diameter as the fan, so that all air projected toward the forward part of the casing by the same is caused to pass through the blades of the wheel.

Upon the outer surface of the back of the casing are formed channel shaped supporting guides 37 in which may be slid a filter 38 composed of spun glass, fabric, or any other desired foraminous material, and over this filter is a cover 39 having a projecting sleeve 40 to which is secured the end of a flexible tube 41, conveniently composed of fabric supported against collapse by a helical wire coil on its interior.

The end of this tube is connected to a ventilator 42 which may extend through a window or baffle inserted therein or through a wall of a building to the exterior.

The flexible tube and filter are necessary only when new air is to be introduced from some other point to the apparatus, which new air it is desired shall be cleaned of impurities.

This arrangement has been found particularly satisfactory in cleaning air of pollen or other like finely divided material, as when the air is intended for the use of a person or persons afflicted with hay fever or similar ailment.

For ordinary air conditioning within a room or building, the filter and its associated parts may conveniently be omitted, these being easily removed by sliding the filter out of the guideways.

The operation of the device is as follows: The tank or pan is nearly filled with water, into which the blades of the wheel dip. If the weather is hot and humid so that it is desired to cool the air, and precipitate the moisture therefrom, the water in the tank should be cold and its temperature may be retained at a low point as by putting ice in the space between baffle 23 and the end 21 of the tank.

The holes on the baffle permit the water to circulate between the space and the tank, but prevent the ice from obstructing the blades of the wheel.

If it is desired instead of ice to use solidified gas, such as is commonly known as dry ice, or other cooling material, this material may be positioned within the space between the imperforate baffle 22 and the end 20 of the tank, as heat will be transmitted from the water through the metal of the tank to the cooling material.

After filling the tank, the switch 17 is closed to supply current to the motor. The blades of the wheel are rotated slowly by the blast of air from the fan passing through them, in the manner of a windmill. These blades, dipping into the water, act as a brake restraining wheel against rapid rotation, so that the air impinging upon each blade must to a considerable extent be deflected and wipe across it, permitting the water upon the blade to receive in suspension any dust or dirt and to deposit the suspended dirt in the water of the tank.

The chilling effect of the cold water likewise precipitates any excessive moisture or humidity from the air and permits it to be delivered in a condition which is much more pleasant than would be undehumidified air under the circumstances above outlined. For this result, it is only necessary to bring the air to a temperature below its dew point.

On the other hand, in dry, cold weather, the water in the tank will be heated both to impart heat to the air passing through the apparatus and to facilitate evaporation of moisture, increasing its humidity. In this event, however, the evaporation is not so rapid but that some water is returned to the tank by each blade on making its revolution, this water carrying with it to the tank the dirt which has been removed from the air.

Very little of the air penetrates the blades, because these, though foraminous, have their interstices filled or covered by drops or films of water, so that the wheel does not so much resemble in its action a screen as it does a means of presenting a moist surface of large extent to the air, causing practically every particle of air to come in contact therewith in passing through the apparatus.

It has been found in practice that the above described apparatus not only removes dust but likewise removes smoke, and, to a considerable extent, odors from the air, and that the size above referred to, having 15" blades and 1/20 horsepower motor, is capable of delivering about 350 cubic feet per minute, reducing its temperature from 6 to 8 degrees. Further, by reducing the humidity, the effect noticed by occupants of a room is a great deal more comfortable than the change in temperature alone would indicate. It has also been found capable of supplying to the air, even without the application of artificial heat, approximately 5½ gallons of water per day and that this amount may be increased by the use of either or both the heaters above described.

While I have described the illustrated embodiment of my invention in some particularity, obviously many others will readily occur to those skilled in this art, and I do not, therefore, limit myself to the precise details shown and described but claim as my invention all embodiments, variations and modifications thereof coming within the scope of the appended claims.

I claim:

1. Air conditioning apparatus comprising a casing, a tank therein, a wheel having foraminous helical blades journalled to rotate with the lower ends of said blades extending into said tank, a fan arranged to propel a stream of air through said blades, the axis of the fan being parallel to and above that of the wheel by a distance substantially equivalent to the radial distance of the axis and the center of pressure of said blades, a cover confining said stream of air to the blades, the cover extending to the walls of said casing and forming an enclosed chamber surrounding said fan, said casing being provided with an aperture opening into said chamber, a filter positioned over said aperture, and a conduit connected to said filter.

2. Air conditioning apparatus comprising a casing, a tank therein, a wheel having foraminous helical blades journalled to rotate with the lower ends of said blades extending into said tank, a fan arranged to propel a stream of air through said blades, the axis of the fan being parallel to and above that of the wheel by a distance substantially equivalent to the radial dis-

tance of the axis and the center of pressure of said blades, a cover confining said stream of air to the blades, the cover extending to the walls of said casing and forming an enclosed chamber surrounding said fan, said casing being provided with an aperture opening into said chamber, a filter positioned over said aperture, a conduit connected to said filter, and adjustable louvers in the path of said stream of air.

3. Air conditioning apparatus comprising a casing, a tank therein, a wheel having foraminous helical blades journalled to rotate with the lower ends of said blades extending into said tank, heat exchanging means associated with said tank, a fan arranged to propel a stream of air through said blades, the axis of the fan being parallel to and above that of the wheel by a distance substantially equivalent to the radial distance of the axis and the center of pressure of said blades, a cover confining said stream of air to the blades, the cover extending to the walls of said casing and forming an enclosed chamber surrounding said fan, said casing being provided with an aperture opening into said chamber, a filter positioned over said aperture, and a conduit connected to said filter.

JAMES B. SHAVER.