

April 7, 1942.

J. M. GRUITCH

2,278,989

MOISTURE DISPOSAL SYSTEM FOR AIR COOLED AIR CONDITIONING UNITS

Filed Nov. 13, 1939

3 Sheets-Sheet 1

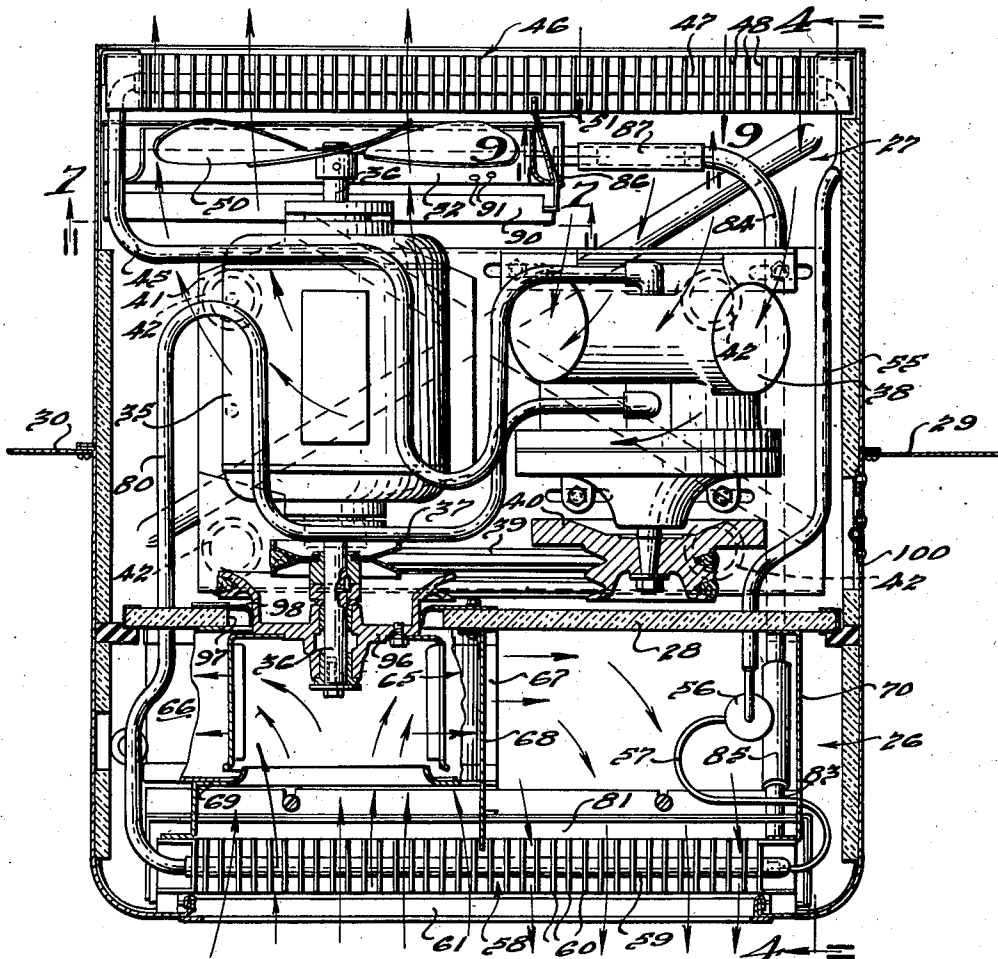
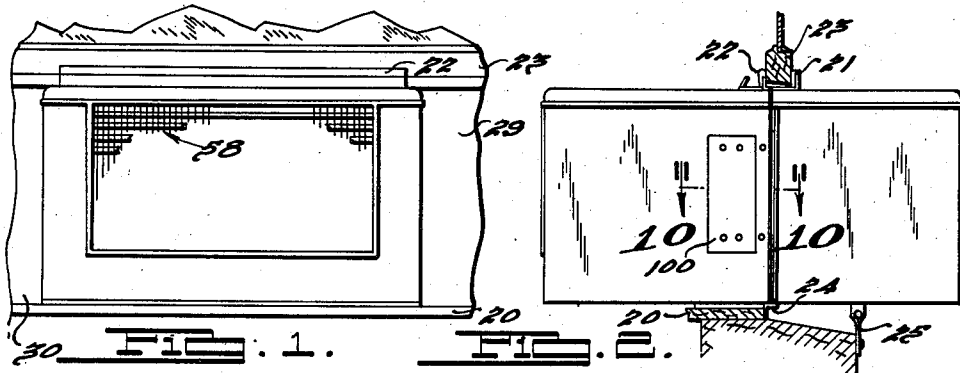


FIG. 3.

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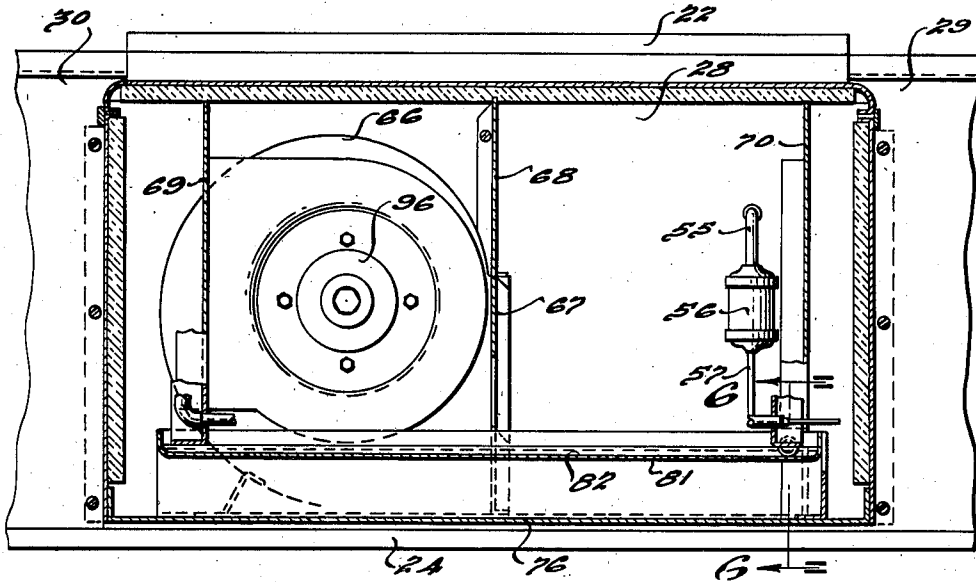
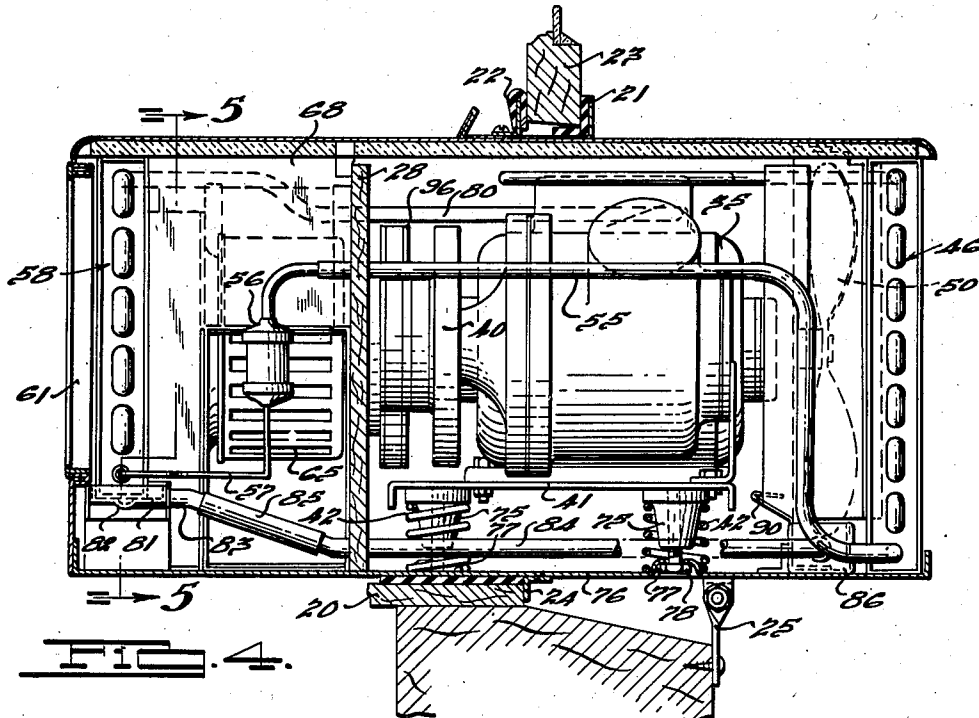
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MOISTURE DISPOSAL SYSTEM FOR AIR COOLED AIR CONDITIONING UNITS

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3 Sheets-Sheet 2



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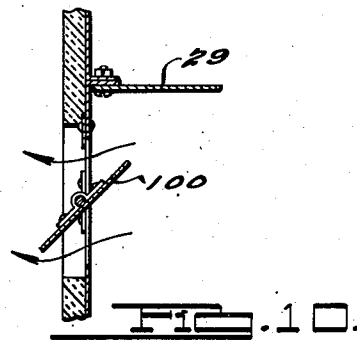
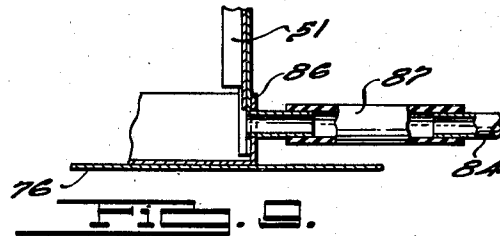
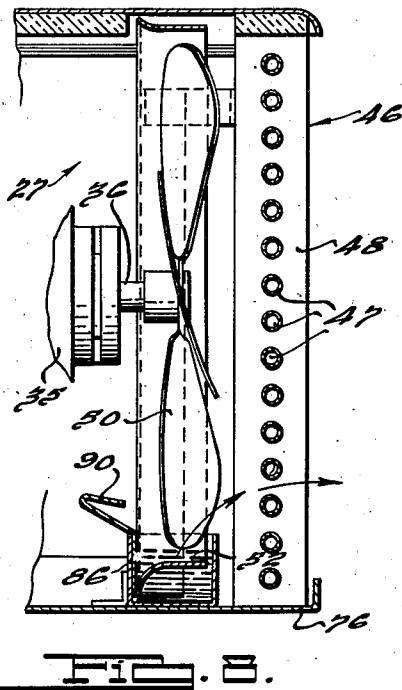
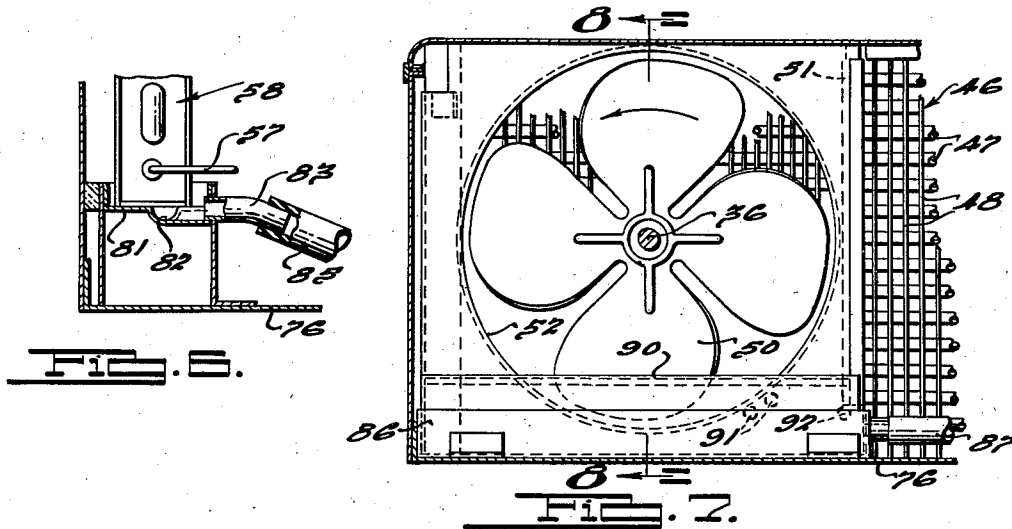
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MOISTURE DISPOSAL SYSTEM FOR AIR COOLED AIR CONDITIONING UNITS

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,278,989

MOISTURE DISPOSAL SYSTEM FOR AIR
COOLED AIR CONDITIONING UNITSJerry M. Gruitch, Dayton, Ohio, assignor to
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ration of Delaware

Application November 13, 1939, Serial No. 304,018

1 Claim. (Cl. 62—149)

The present invention relates to an improve-
ment in air conditioning units of the type where-
in a stream of outside air is used to condense
refrigerant in a condenser coil, thereby elim-
inating the necessity for piping connections be-
tween the unit and the water supply and drain-
age systems, so that the unit may be tempo-
rarily mounted in any portion of a building. In
the use of portable units of this character the
lack of permanent water connections involves a
problem occasioned by the condensation of mois-
ture from the air being conditioned, there being
no permanent drainage facilities provided for the
disposal of such condensed moisture. Many sys-
tems for disposing of condensed moisture have
been suggested, including apparatus for blowing
it away with the stream of air cooling the con-
denser. All such systems must, in order to be
satisfactory, break up the condensed moisture
into such fine droplets that the air stream will
either evaporate the moisture or carry the drop-
lets far enough away from the building so that
they do not collect and run down the outside
surface thereof. This problem is acute since a
slowly forming drop of water on an outside sur-
face of a building collects rust, organic salts,
and wind-borne dust with the result that the
outer surface of the building becomes streaked
and stained in spots. Many systems have been
devised whereby the moisture is supposed to be
evaporated solely by the heated stream of air
leaving the condenser compartment, but such
systems are likely to fail on days when the tem-
perature is moderate but the relative humidity
is very high so that the ability of the heated air
to absorb moisture is very slight. Some sys-
tems have been devised whereby the moisture is
supposed to be evaporated by causing the same
to run or trickle over the surface of the con-
denser, but when it is appreciated that the usual
condensing temperature is much less than the
boiling temperature of water and that the con-
densed moisture is usually at a temperature only
slightly above the freezing temperature it will be
appreciated that such a system is not very effec-
tive. Some units have been created wherein the
moisture is pumped through a nozzle in the form
of fine droplets, the spray being directed against
the surface of the condenser coils, but such units
are unsatisfactory as a rule and expensive if
successful since the pump for creating the spray
is usually expensive and because the spray must
be so fine that all moisture will be evaporated
or blown away from the building so that the
nozzle becomes clogged in a short time, or else

means must be provided for collecting and re-
spraying again and again the droplets which are
too large to be evaporated or blown away with
the result that the water finally becomes a con-
centrated solution of various salts bearing dust
and rust particles so that the nozzle and/or the
pump might become permanently clogged or
corroded.

The present invention contemplates overcom-
ing all of the foregoing obstacles by providing
means for whipping the moisture into a stream of
fine spray droplets by light air pressure, such
whipping being accomplished in an atmosphere
heated above the outside temperature, and the
spray being blown against a portion of the con-
denser coil located in an outgoing stream of
air whereby the particles may be evaporated if
too large to be blown away from the building
and may be dispersed if small enough to be borne
with the stream of air created by the condenser
blower.

These objects of my invention are achieved in
a preferred embodiment by the mechanism dis-
closed in the accompanying drawings wherein
like numerals refer to like parts throughout.

In the drawings, Fig. 1 is a front elevation of a
portable air conditioning unit made in accord-
ance with my invention and located in the place
of use;

Fig. 2 is a side elevation of the unit located
in the place of use;

Fig. 3 is a top plan view of the unit with the
cover and parts broken away for the purpose
of showing details;

Fig. 4 is a vertical section of the unit taken
substantially along line 4—4 of Fig. 3;

Fig. 5 is a vertical section of the unit taken
at right angles to the section of Fig. 4 and sub-
stantially along line 5—5 of Fig. 4;

Fig. 6 is a partial vertical section showing
details and taken substantially along line 6—6 of
Fig. 5;

Fig. 7 is a partial vertical section taken sub-
stantially along line 7—7 of Fig. 3;

Fig. 8 is a vertical section of Fig. 7 taken sub-
stantially along line 8—8 of Fig. 7;

Fig. 9 is a partial vertical section showing de-
tails and taken substantially along line 9—9 of
Fig. 3; and,

Fig. 10 is a partial horizontal section taken
substantially along line 10—10 of Fig. 2.

The type of unit to which the present inven-
tion is preferably applied comprises a window
unit which may be mounted upon the window
sill 20 and which is provided with adjustable

clamping means 21 and 22 upon the top surface thereof adapted to receive and grip the window sash 23 to hold the unit in position, there being also preferably supplied a bracket 24 fixed to the lower surface and adapted to be abutted or fastened against the outer surface of the window sill 20, and a brace 25 which may be fastened to a portion of the building. The unit comprises an evaporator compartment 26 jutting into the room to be conditioned and a condenser compartment 27 extending out of the room to be conditioned, the two compartments being divided by an insulated wall 28. Since the unit is designed for universal use it is preferably made narrow enough to fit a narrow window opening, hence side wings 29 and 30 of different widths may be fastened to the sides of the unit for completely blocking the opening between the window sill 20 and the window sash 23.

The air conditioning mechanism is of a mechanical nature comprising a motor 35 provided with an armature shaft 36 to which is keyed a fixed diameter pulley 37, by means of which a compressor 38 is driven through belt 39 and flywheel pulley 40 fastened to the crankshaft of the compressor. The motor 35 and compressor 38 are preferably adjustably fixed to a supporting plate 41 mounted upon coil springs 42 suitably guided and retained in the condenser compartment as will be presently explained. The hot, compressed, gaseous refrigerant is discharged from the compressor into a discharge line 45 which leads to the condenser coil 46, the coil preferably comprising a plurality of horizontally disposed tubes 47 having vertically disposed metallic fins 48 associated therewith. The condenser coil 46 is preferably thin, substantially as wide as the unit and practically as deep as the unit so as to form a grid across the entire outer end thereof. A propeller type blower 50, fixed to the outer end of shaft 36, is so mounted and driven as to draw air into the unit through the right end of the condenser and to blow air out of the condenser compartment through the left end thereof, the two streams of air being divided by a partition 51 formed integrally with the propeller shroud 52. Cooled and liquefied refrigerant is led from the condenser coil 46 through a liquid pipe 55 passing through the wall 28 and into a dryer chamber 56 containing hygroscopic material of any suitable sort and from which a capillary tube expansion device 57 leads to the evaporator coil 58 wherein the refrigerant is expanded. The evaporator coil 58 preferably comprises a plurality of horizontally disposed tubes 59 having a plurality of vertically disposed metallic fins 60 therewith and forming a grid across the front of the unit, which grid may be covered by any suitable form of ornamental grill 61. The air to be conditioned is preferably drawn through the left end of the coil from the room by a multi-blade, cup-shaped blower 65 mounted in an involute housing 66 having its open outlet end 67 so positioned as to direct the partially conditioned stream of air transversely across the unit into the right end of the evaporator compartment, the air being then ejected into the room through the right end of the evaporator coil whereby it is further cooled and dehumidified before returning to the room. A baffle 68 may be provided adjacent the outlet 67 so as to divide the incoming and outgoing air stream and an inlet shroud 69 may be provided to confine the partially conditioned incoming air and so as to cause all of it to enter the inlet of

the blower wheel. A second baffle 70 may be provided in order to form a small plenum chamber into which the blower ejects the partially conditioned air, the inlet shroud 69, casing 66, and baffle 70 preventing cooled air from striking the side walls of the unit so as not to have condensed moisture form thereon.

As described in the copending application of Bernard W. Jewell, Ser. No. 303,969, filed concurrently herewith, and now Patent No. 2,240,784, issued May 6, 1941, the mounting plate 41 upon which the motor and compressor are mounted is preferably provided with downwardly depending legs 75 so shaped as to provide retaining supports for the coil springs 42 which support the mechanism when in use, and the bottom of the unit which is formed as a water tight pan 76 is provided with inwardly struck projections 77 which form retaining lugs for the lower ends of the springs 42. Any moisture which might drip into the bottom of the unit is retained in the pan 76 and eventually evaporated therefrom. A bolt 78 is passed through a hole drilled in the innermost extremity of each lug 77 and screwed into an axial, threaded opening in the leg 75 so that tightening of the bolts 78 draws the legs 75 against the lugs 77 in order that the unit may be supported without damage thereto during shipment or handling. For this purpose as well as for eliminating vibration during use the liquid pipe 55 and the suction pipe 80 through which expanded refrigerant is returned to the compressor from the coil 58 are provided with return bends or loops so that movement of the unit may be accommodated. When the unit is installed the bolts 78 may be removed or loosened so that the weight of the condensing unit is supported by the springs 42.

In Fig. 4 it is apparent that the coil 58 is not as deep as the condenser coil 46 so that its bottom edge is elevated slightly above the bottom edge of the condenser coil, the bottom of the evaporator coil 58 being supported in a condensed moisture collecting pan 81 provided with a depressed central drain 82 connecting with an outlet tube 83 through which moisture which drips from the evaporator coil may be led into a tube 84 through a flexible joint 85. The tube 84 passes through the wall 28 and is connected to a disposal pan 86 through a second flexible connection 87. The lower portion of the propeller shroud 52 is mounted in the pan 86 and the tips of the blades of propeller 50 extend into the pan 86, there being sufficient space between the surface of the shroud and the tips of the propeller plates to accommodate the tightening of bolts 78 during shipment of the unit. The outer edge of the shroud 52 is slightly spaced from the outer edge of the pan 86 so that condensed moisture may fill the pan and flow onto the inner surface of the lowermost segment of the circular shroud 52.

The purpose of a circular shroud surrounding such a propeller as disclosed is not only to reduce noises and to streamline the air flow, thus reducing losses due to friction, but is also to prevent the formation of radially directed air currents. The air currents which would normally tend to flow radially from the blade tips are deflected forward in a spiral manner so that water which has accumulated in the lower segment of the shroud is forced upward in the direction of rotation of the blower and along the surface of the shroud, eventually flying off the forward edge of the shroud in a series of minute

droplets, and only as minute droplets since the low pressure of the air is insufficient to create large drops. The air in which this takes place has been previously heated by travelling through the left side of the condenser and across the heated surfaces of the compressor and the motor so that the agitation thereof and the temperature of the air tend to evaporate most of the moisture before it leaves the unit. However, some droplets will strike the horizontal tubes 47 or the vertical fins 48 and will be further evaporated by absorption of heat therefrom, and some will be carried far away from the building by the outgoing air stream. Any moisture which might happen to trickle down the surface of the condenser coil is retained in the bottom pan 76 and evaporated therefrom.

As the water is forced upward along the inner surface of the shroud 52 most of it will be dissipated in the form of spray flying from the forward edge of the shroud as previously described. Some of the moisture tends to accumulate on the curved inlet edge of the shroud and might drain back into the bottom pan, for the purpose of preventing which I provide an inlet baffle 90 extending partially across the bottom of the shroud and a plurality of openings 91 in the inlet edge of the shroud through which moisture is drained back into the disposal pan 86. I may also provide an opening 92 in the lower end of the baffle 51 so as to permit moisture to return to the pan 86 from between the corner of the baffle 90 and the baffle 51.

Features of the present disclosure which are more fully explained and claimed in the aforementioned copending application of Bernard W. Jewell, now Patent No. 2,240,784, are as follows:

The driving of blower 65 is accomplished at a low speed through the use of a belt 95 driven by the flywheel pulley 40 on the compressor shaft, and a pulley 96 loosely mounted on the shaft 36 of motor 35, the pulley being so shaped as to extend through an opening 97 in the wall 28 which is provided with a flexible seal 98. It is to be noted that the blower 65 is driven at low speed due to the pulley ratios and that the propeller 50, which is directly connected to the motor shaft 36, is driven at high speed, the low speed blower 65 producing sufficient air volume without objectionable noises and the high speed propeller 50 providing considerable agitation of the condensed moisture. A further feature is that a side wall of the unit may be provided with a ventilating door 100 which is located in the portion of the side wall between the insulating wall 28 and the side wing 29. Since the blower 50 is directed outward it produces a partial vacuum in the condensing compartment 27 so that room air may be ejected in order to ventilate the room when desired, as shown in Fig. 10. Since opening of the door 100 reduces the inward flow of air through the right end of condenser coil 46 it might be

supposed that the capacity of the unit would be reduced; however, the size of the door 100 is purposely small so that the volume of air traversing the right end of coil 46 is not reduced more than approximately fifty percent, and since the room air is colder than the outside air the effect of the outgoing stream of air across the left end of coil 46 is increased to make up for the lessened volume of outside air traversing the right side of the coil.

Having described a preferred embodiment of my invention it should be apparent to those skilled in the art that the same permits of modifications in arrangement and detail, which modifications when covered by the following claim is considered to be a part of my invention.

I claim:

An air cooled air conditioning unit comprising air conditioning surfaces upon which moisture is condensed from the air being conditioned, collecting means in which to collect such condensed moisture, a condenser coil in which refrigerant is condensed by causing a stream of air to traverse the same, a compressor in refrigerant flow relationship with said surfaces and said condenser coil, a motor connected to said compressor, a propeller for producing the condenser-cooling stream of air, said propeller being positioned adjacent a portion of said condenser coil and being so arranged as to blow outward through said portion and to draw air through another portion of said coil to be heated thereby and to be further heated by cooling said motor and said compressor, a circular shroud surrounding said propeller, a moisture disposal pan beneath said propeller and in which said circular shroud is mounted with a segment thereof below the edge of the pan, said pan being below said collecting means for the condensed moisture, and a connection between said collecting means and said disposal pan for draining condensed moisture into said pan, whereby condensed moisture is collected on the inner surface of said segment, agitated by said propeller and blown upward along said shroud and away from the forward edge of said shroud in the form of fine droplets, some of which lodge on the surfaces of the condenser coil through which the outwardly directed stream of heated air is passing to be evaporated by the heat thereof, some of which are evaporated in the heated air, and some of which are carried away in the outgoing air stream, and means associated with said shroud for returning to said pan any drops of water forced back toward the interior of said unit off the inlet end of said shroud comprising a plurality of holes in the inlet end of said shroud, spaced above the portion thereof within said pan in the direction of rotation of said propeller whereby any drops of water which might otherwise fall back into the unit are trapped and returned to said pan.

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