Aug. 17, 1965 L. GLICKMAN 3,200,608

APPARATUS FOR UTILIZING AND DISPENSING AIR CONDITIONER CONDENSATE

Filed Oct. 16, 1961 2 Sheets-Sheet 1

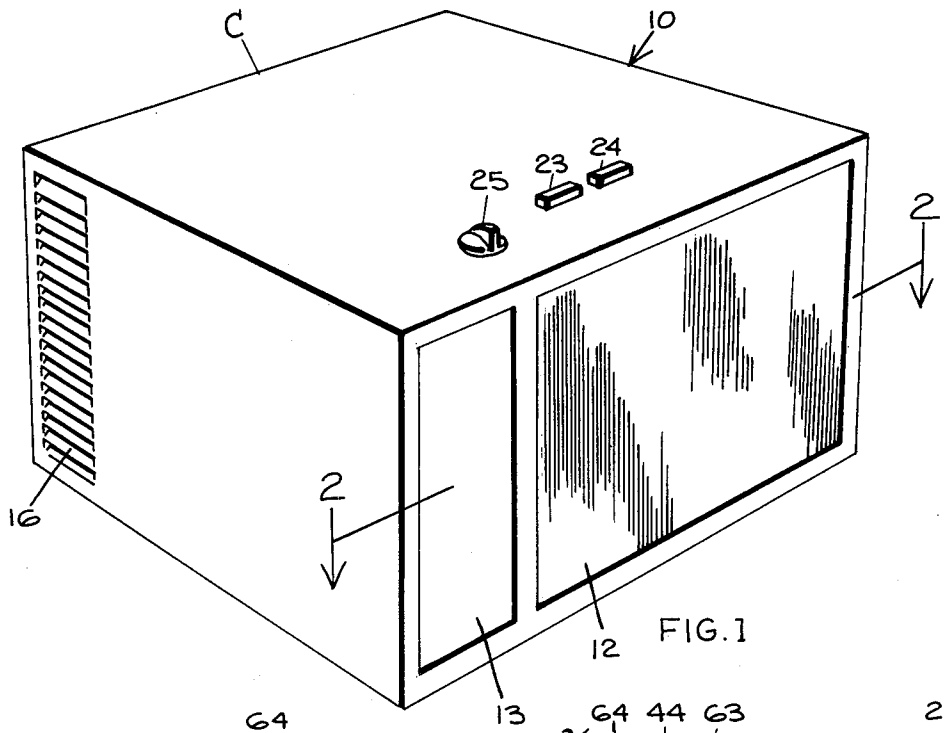


FIG. 1

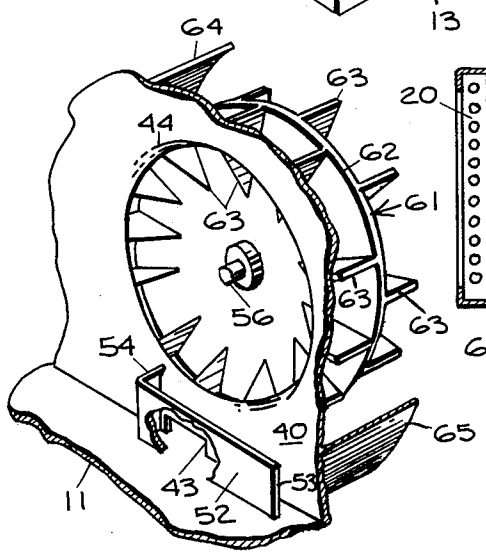


FIG. 5

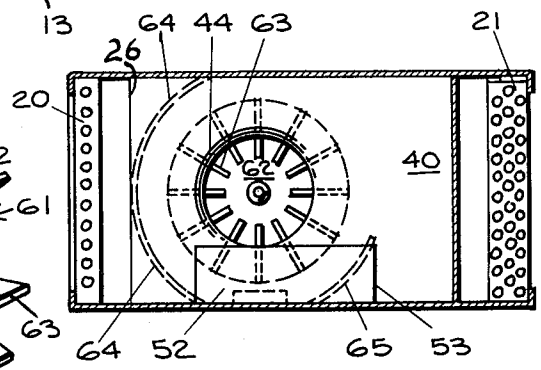


FIG. 4

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APPARATUS FOR UTILIZING AND DISPENSING AIR CONDITIONER CONDENSATE

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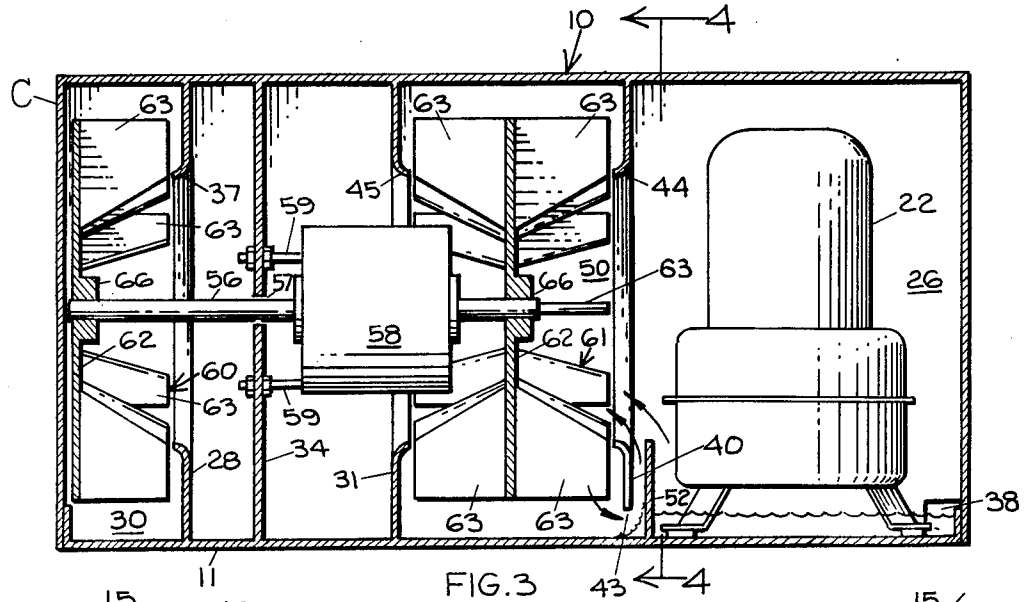


FIG. 3

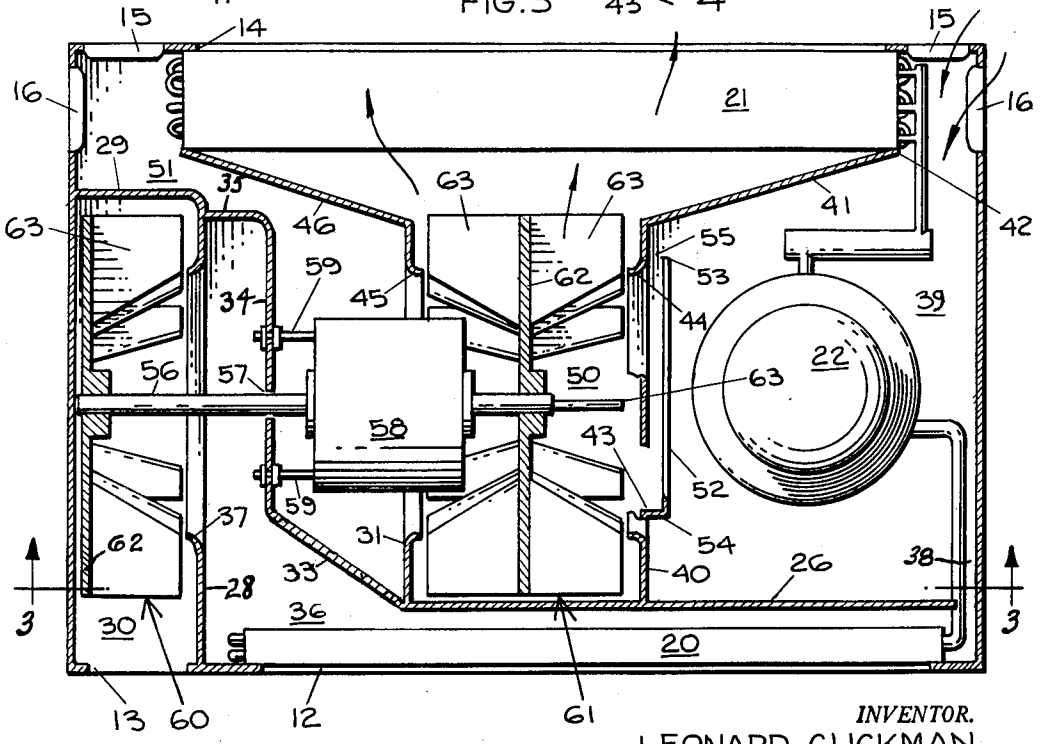


FIG. 2

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APPARATUS FOR UTILIZING AND DISPENSING AIR CONDITIONER CONDENSATE

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8 Claims. (Cl. 62—279)

This invention relates to air conditioners and is more particularly directed to the utilization and disposal of condensate of an air conditioner.

Attempts have been made to correct the intolerable situation of condensate which collects in the pan or sump of an air conditioner from dripping therefrom and causing an unsightly discoloration of the building wall on which it is mounted as well as wetting the area below the units. It is a common sight to see a building with a number of air conditioners mounted on an outside wall with steady streams of water leaking from the units downwardly on the building wall and on a sidewalk that extends along the building as well as wetting people who might be walking on the sidewalk.

A permanent water piping system to drain off water collecting in the air conditioners due to the condensation of water in the atmosphere would solve the problem. However, due to the high cost of such a system, as well as to the unsightly labrinth of piping that would be necessary, to drain off the condensate from each room air conditioner, this system has not been universally adopted.

Individual condensate disposal systems have been attempted, but none has been successful in the disposal of condensate. There are those systems which use a pump and nozzle for creating fine droplets of moisture out of the condensate and directing these droplets against the condenser coils. This method of disposing the condensate is expensive in cost and ineffective when the nozzle becomes clogged which occurs very often since dust, chemicals, etc., become dissolved in the condensate.

Some systems utilize a fan or blower to form a stream of air directed at the body of condensate for the purpose of creating fine droplets that will evaporate in the air stream or impinge on the evaporator to become vaporized and be carried by the air stream into the atmosphere from the air conditioner. None of these systems have been successful in their attempt to convert the condensate into fine droplets of air, since the jet of air directed against the condensate did nothing more than disperse the water to other parts of the sump or pan.

The present invention contemplates the creating of an air stream by a blower having a centrally disposed venturi through which the air is suctioned into the blower. The air is ejected at the periphery of the blower radially therefrom with a portion of the high pressure air confined by a casing. The casing has a baffled opening below the level of the body of condensate whereby air forced through the opening at this position of high pressure forces droplets of water to be carried along the baffle to the venturi where the fine droplets of water are carried by the suctioned air into the central portion of the blower to be ejected radially from the blower through the uncovered portion. The fine droplets of water are directed onto the condenser whose heat causes the evaporation of the moisture into water vapor that is absorbed by the atmosphere. This water in converting into steam absorbs and carries off with it a tremendous amount of heat, far more than could be dissipated by the movement of air alone. Moreover, this condensate may be used to increase the efficiency of the air conditioning unit by spraying the condensate on the condenser thereby achieving the function of not only eliminating the nuisance of the accumulated condensate but also utilizing the condensate

to a tremendous advantage in the cooling cycle, and increasing the overall efficiency of the air conditioner.

Therefore, a principal object of the present invention is to provide a method and apparatus for the disposal of condensate in an air conditioner in a thoroughly effective manner and which results in a more efficient operation of the air conditioner.

Another object of the present invention is to provide an air conditioner with a blower for normally directing a jet of air against the condenser, which blower directs a portion of the jet of air against the body of condensate, creates fine droplets of water, directs the droplets of water to the suction portion of the blower to enter the main stream of suctioned air and be ejected by the blower along with the main jet of air against the condenser.

A further object of the present invention is to provide an air conditioner with means for utilizing the condensate in cooling the condenser whereby the condensate is removed completely from the air conditioner and the efficiency thereof increased to an extremely high degree and water may be added to the condensate if the latter is insufficient to maintain the air conditioner at its increased efficiency.

A further object of the present invention is to provide a blower for an air conditioner, mounted for rotation about an axis and having a wall portion with blades extending radially on either side or both of the wall portions.

With these and other objects in view, the invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming a part of this specification, with the understanding, however, that the invention is not confined to any strict conformity with the showing of the drawings but may be changed or modified so long as such changes or modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:

FIGURE 1 is a perspective view of an air conditioning unit embodying my invention.

FIGURE 2 is a horizontal cross sectional view taken along the line 2—2 of FIGURE 1.

FIGURE 3 is a vertical cross sectional view taken along the line 3—3 of FIGURE 2.

FIGURE 4 is a similar view taken along the line 4—4 of FIGURE 3.

FIGURE 5 is a fragmentary perspective view of the blower and casing at the position of the venturi.

Referring to the drawings wherein like numerals are used to designate similar parts throughout the several views, the numeral 10 refers to my air conditioner of the reversible type consisting of an outer casing C positioned over a pan 11 on which are mounted the various parts forming my air conditioning unit 10. The casing C is provided with a plurality of openings 12 and 13 on its front wall, openings 14, 15, 15 in the rear wall and louvered openings 16 along the rear edge of the side walls.

The various components constituting my air conditioning unit are conventional in construction and operation and are only shown by way of illustrating their juxtaposition. Mounted on the pan 11 at the opening 12 is an evaporator 20, while at the opening 14 is a condenser 21. Both the evaporator 20 and condenser 21 are provided with the usual coils and fins with necessary piping interconnecting a compressor 22, the evaporator 20, condenser 21 and the usual valves found in air conditioning systems. Positioned at the top portion of the air conditioner 10 and extending through openings in the top cover of the casing C are starting buttons 23 and 24 for heating and cooling cycles, respectively and a temperature control switch 25.

A plurality of upstanding walls are provided and mounted on the pan 11 for baffling and controlling the flow of air within the device 10 as well as the flow of condensate as will be explained in detail hereinafter. Spaced from the evaporator 20 is a wall 26 which extends from one side wall to adjacent the other side wall to form an evaporator chamber 36.

The wall 26 extends diagonally as along 33 where it joins the wall 34 that terminates at a wall 28 as at 35. The wall 28, extends in spaced parallel relation with the side wall casing C at the position of the opening 13 and joins an end wall 29 to form a blower chamber 30. A wall 31 joins the end of the wall 26 and extends substantially parallel with the wall 34. The walls 26, 33, 34 and 35 form an evaporator chamber 36 which is isolated from the remainder of the air conditioner 10 except for a venturi 37 in the wall 28 that permits air to flow, from the evaporator chamber 36 to the blower chamber 30. There is also a small opening 38 at the other side of the air conditioner 10 adjacent the bottom wall of the pan 11 that permits the condensate formed at the evaporator 20 and collecting in the chamber 36 to flow by gravity to the compressor side of the unit 10 and flow through the opening 38 into the compressor chamber 39.

The compressor chamber 39 is provided with a wall 40 parallel with the wall 31 and extending to a position adjacent the condenser 21 then extends diagonally as along 41 to the edge of the condenser 21 as at 42 where the wall 41 is soldered to the condenser 21 to isolate the compressor chamber 39 from the remainder of the unit 10 except for a baffled water aspirating opening 43 whose function is explained in detail hereinafter. The wall 40 is provided with a centrally disposed venturi 44. Likewise, the wall 31 is provided with a similarly positioned venturi 45 and extends to a diagonally disposed wall 46 that is joined as at 47 to the inner edge of the condenser 21, thus forming a condensate removal chamber 50 and an ante chamber 51. The opening 43 is provided with a baffle plate 52 joined at one end to an end wall 54 to block off flow of water to the opening 43 at that side. The other end 53 terminates adjacent the wall 41 to form a passageway 55 for the flow of water to the opening 43. The aforesaid walls 31, 40, 41 and 46 permit the flow of air through the openings 15 on each side of the opening 21 in the rear wall of the casing C into compressor chamber 39 at one side and the ante chamber 51 at the other side, through the venturis 44 and 45 and into the condensate removal chamber 50 where means are provided for directing the mixture of air and fine droplets of water to the condenser 21 where moisture leaves the air conditioning unit 10 as water vapor intermixed with air by the opening 21.

Coaxially aligned with the venturis 37, 44 and 45 is a motor shaft 56 extending through an opening 37 in the wall 34. The shaft 56 extends beyond both sides of an electric motor 58 which is positioned in the venturi 45 partially within the chamber 50 and in the air flow chamber 51 whereby during the operation of the air conditioning unit 10 air flowing through the opening 15 into the chamber 51 will flow past the electric motor 58 to maintain same cool as the air flows through the venturi 45 into the chamber 50. The electric motor 58 is held rigidly in position by a plurality of bolts 59 secured to the wall 34. On one end of the shaft 56 is an air circulating fan or blower 60 positioned in the chamber 30 and at the other end of the shaft 56 there is secured a combination air circulating and condensation removal blower 61.

The air circulating blower 60 is provided with a circular disk 62 having a hub 66 mounted at its center axis for securing the blower 60 to the shaft 56. Mounted radially on the inner surface of the disk 62 is a plurality of vanes or blades 63 whose outer edges are aligned with the periphery of the disk 62 and whose inner edges extend diagonally toward the disk 62 in space relation with the hub 66. In the normal operation of the blower 60, as

the blower 60 rotates rapidly air enters the chamber 30 through the venturi 37 to the low pressure area at the mid portion of the disk 62. Air then flows between the vanes or blades 63 and is ejected radially outwardly by the vanes 63 of the disk 62 at the periphery of which the pressure of air is at its maximum.

The blower 61 is substantially the same in construction as the blower 60 except that the latter has only one set of vanes or blades 63 mounted on only one surface of the disk 62 while the blower 61 is provided with a set of vanes or blades mounted on both surfaces of the disk 62 making the blower 61 in effect a double blower while the blower 60 may be termed a single blower. There is an arcuate baffle member 64 which is positioned in spaced relation to the outer periphery of the disk 62 and extending between the walls 40 and 31 from one end of the opening 43 to the cover of the casing C and a second arcuate baffle member 65 extending from the other end of the opening 43 to the top edge of the baffle wall 52. See FIGURE 5.

During the normal operation of the air conditioning unit 10, air will pass through the evaporator 20 to be cooled or heated determined by whether the cooling or heating cycle is in effect and pass between walls 32, 33 and 28 where the air will enter the venturi 37 and the chamber 30. The rapidly rotating blower 60 will eject the air through the opening 13 into the area or room being conditioned. At the same time, the double blower 61 will be rotating rapidly suctioning air from the outside atmosphere through the openings 16 into the compressor chamber 39 and the ante chamber 51. The air passing through the compressor chamber assists in removing heat from the compressor and then passes through the venturi 44 into one side of the chamber 50 and this air is ejected by the vanes 63 on the right side of the disk 62 as viewed in FIGURE 3 in the direction of the condenser 21 where it absorbs the heat (cold) of the condenser 21 and then passes into the atmosphere.

After the air conditioning unit has been operating a relatively short time as determined by the percentage humidity then existing in the atmosphere, condensate will begin to accumulate in the pan 11.

If the unit 10 is operating as a cooling cycle, the air passing through the evaporator will become cooled and deposit its excess moisture in the chamber 36. The condensate will flow through the opening 38 and flow into the chamber 39 and in seeking its own level will flow through the passageway 55 and move in the direction of the opening 43. However, the jet of air being ejected at the periphery of the rapidly rotating blower 61 will impinge on the water, and force it against the inner surface of the baffle plate 52 as shown by FIGURE 3. The rapidly moving air is confined between the walls 31, 40 and the arcuate baffles 64 and 65 so that the air can leave the confines of the chamber 50 by the portion between the walls 31 and 40 which is not baffled. This air leaves the chamber 50 and passes through the condenser 21. Also, air can leave the chamber 50 via the opening 43 which now has condensate therein and is at the position of the highest pressure of air being propelled by the blower 61. Air that is forced through the opening 43 will carry along with it condensate formed in droplets and pass upwardly along the baffle member 52 into the low pressure or suction area at the mid-portion of the blower 61. The large volume of air being suctioned by the blower 61 will aspirate the droplets of condensate which will be struck by the rapidly moving vanes 63 and be reduced to minute particles of moisture. These minute particles of moisture are ejected onto the condenser 21 where contact is made with the hot fins and coils causing the particles of moisture to be converted to water vapor. This results in cooling the condenser and thereby rendering it more efficient to convert the hot gaseous highly compressed refrigerant to a liquid refrigerant. It would appear that the greater the amount of moisture being deposited as

condensate by the air condtioning unit, the more efficient will the unit operate.

It is readily noted that the condensate which enters the chamber 50 from one side of the chamber 50, namely through the opening 43 will be atomized by the (right) vanes 63 which are on the same side of the chamber 50 as the opening 43 while the (left) vanes on the other side of the chamber 50 will not impinge on any water or moisture. Therefore, there will be no moisture flying about in the vicinity of the motor 53 which moisture would normally lower the efficiency of the motor 53.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. Apparatus for disposing and utilizing air conditioner condensate comprising a blower, means rotatably mounting said blower about an axis, wall means having an outside surface, said wall means substantially enshrouding said blower, baffle means extending between said wall means and about said blower, said wall means having a first opening at a suction portion of said blower to permit the flow of air to said blower, a second opening in said baffle means at a discharge portion of said blower, and a condensate dispersing opening at a lower portion of said wall means at a position of high air pressure and further baffle means positioned in spaced relation to the outside surface of said wall means at said condensate dispersing opening and extending to proximity of said first opening, said further baffle means forming a passageway for the flow of condensate toward said condensate dispersing opening whereby air under pressure is directed against said condensate and forces droplets of condensate in the path of air entering the first opening to become intermixed with said air and be ejected by said blower through said second opening.

2. Apparatus for utilizing and disposing air conditioner condensate comprising a blower, a heat exchanger mounted in proximity of said blower, shaft means rotatably mounting said blower about an axis, wall means having an outside surface, said wall means substantially enshrouding said blower, baffle means extending between said wall means and about said blower, said wall means having a first opening at a suction portion of said blower to permit the flow of air to said blower, a second opening in said baffle means at a discharge portion of said blower in alignment with said heat exchanger whereby the discharge from said blower is directed at said heat exchanger and a condensate dispersing opening at a lower portion of said wall means at a position of high pressure air and further baffle means positioned in spaced relation to the outside surface of said wall means at said condensate receiving opening and extending to proximity of said first opening, said further baffle means forming a passageway for the flow of condensate toward said condensate dispersing opening whereby air under pressure is directed against said condensate and forces droplets of condensate in the path of air entering the first opening to become intermixed with said air and be ejected by said blower through said second opening.

3. The structure as recited by claim 2 wherein said blower comprises a disk mounted at an axis to said shaft means and a plurality of radially disposed vanes mounted on one side of said disk.

4. Apparatus for utilizing and disposing air conditioner condensate comprising a blower having a disk portion, a shaft rotatably mounting said disk portion at an axis, a plurality of radially disposed vanes mounted on each side of said disk, wall means having an outside surface, said wall means substantially enshrouding said blower, said baffle means extending between said wall means and about said blower wall means having a pair of aligned openings at a suction portion at said axis, a second opening in said baffle means at a discharge portion of said blower, a condensate dispersing opening at a lower portion of said wall means at a position of high air pressure and a further baffle positioned in spaced relation to the outside surface of said wall means at said condensate dispersing opening and extending to proximity of said first opening, said further baffle member forming a passageway for the flow of condensate to said condensate dispersing opening whereby air under pressure is directed against said condensate and forces droplets of condensate in the path of air entering the first opening to become intermixed with said air and be ejected by said blower through said second opening.

5. Apparatus for utilizing and disposing air conditioner condensate comprising a blower, a heat exchanger mounted in proximity of said blower, said blower having a substantially circular disk, a shaft rotatably mounting said disk at its axis, a plurality of radially disposed vanes mounted on each side of said disk, said vanes extending from substantially the periphery of said disk, wall means having an outside surface, said wall means substantially enshrouding said blower, baffle means extending between said wall means and about said blower said wall means having a pair of aligned openings at a suction portion at said axis, a second opening in said baffle means at a discharge portion of said blower in alignment with said heat exchanger whereby the discharge from said blower is directed at said heat exchanger, a condensate dispering opening at a lower portion of said wall means at a position of high pressure air and a further baffle mounted in spaced relation to the outside surface of said wall means at said condensate dispersing opening and extending to proximity of said first opening, said further baffle member forming a passageway for the flow of condensate to said condensate opening whereby air under pressure is directed against said condensate and forces droplets of condensate in the path of air entering the first opening to become intermixed with said air and be ejected by said blower through said second opening.

6. Apparatus for utilizing and disposing air conditioner condensate comprising a pan, an evaporator mounted along a front edge of said pan, a condenser mounted along a rear edge of said pan, a wall member mounted on said pan in spaced relation to said evaporator forming an evaporator chamber, a second wall member mounted in spaced relation to a side edge of said pan forming a blower chamber, a third wall joining said first two walls to form an air passageway whereby air is compelled to flow from said blower chamber to said evaporator chamber, a compressor mounted adjacent the other of the side edges of said pan, a pair of spaced apart walls extending from said evaporator wall and adjacent to said condenser forming a condenser chamber and a condensate removal chamber, a motor mounted on said third wall, a motor shaft extending into said blower chamber and said condensate disposal chamber, a blower mounted on said shaft and positioned in said blower chamber and said condensate disposal chamber, said second wall and said pair of spaced apart walls having a centuri opening substantially coaxially disposed with said motor shaft, an opening in said first wall communicating with said evaporator chamber for the flow of condensate therethrough, a second opening in one of said pair of spaced apart walls in proximity of said pan, a baffle member mounted in said condensate removal chamber at said second opening in spaced relation to said one of said pair of spaced apart walls and extending to proximity of said venturi opening, said baffle member forming a passageway for condensate to flow from said condensate removal chamber toward said second opening, and an arcuate baffle member joining said pair of spaced apart walls at the periphery of said blower and extending from said second opening to a top portion of said spaced apart walls and adjacent to said first wall whereby a mixture of air and droplets of condensate are impelled in the direction of the condenser.

7. The structure as recited by claim 6 wherein said blower mounted in said condensate disposal chamber comprises a substantially circular disk mounted on said

motor shaft and a plurality of radially disposed vanes mounted on each side of said disk.

8. A self contained air conditioner unit for conditioning the air within an enclosure comprising a casing adapted for mounting in an outer wall of said enclosure, a barrier dividing said casing into an inner compartment having openings communicating with the enclosure air and an outer compartment having openings communicating with the outdoor air, inner and outer heat exchangers mounted respectively in said inner and outer compartments, blower means positioned in said outer compartment, deflector means mounted in close proximity to said blower means for circulating outside air from said outer compartment over said outer heat exchanger, a partition including an opening for directing outside air into said blower means, means for collecting condensate water from said heat exchangers on the upstream side of said partition, a hole in a bottom portion of said partition in proximity of said opening, and baffle means mounted on said upstream side of said partition in spaced relation to said partition at said hole whereby air under pressure passing through said hole agitates said condensate water and breaks said water into small droplets that are carried upwardly and into the air stream flowing through said opening into said blower means to be atomized and directed against said heat exchanger.

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