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J. A. GALAZZI

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AIR CONDITIONING APPARATUS

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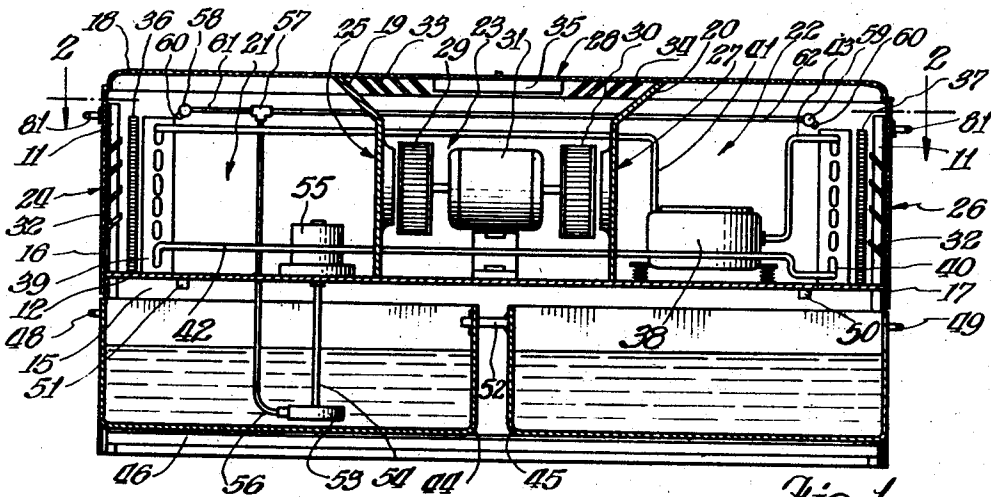


Fig. 1

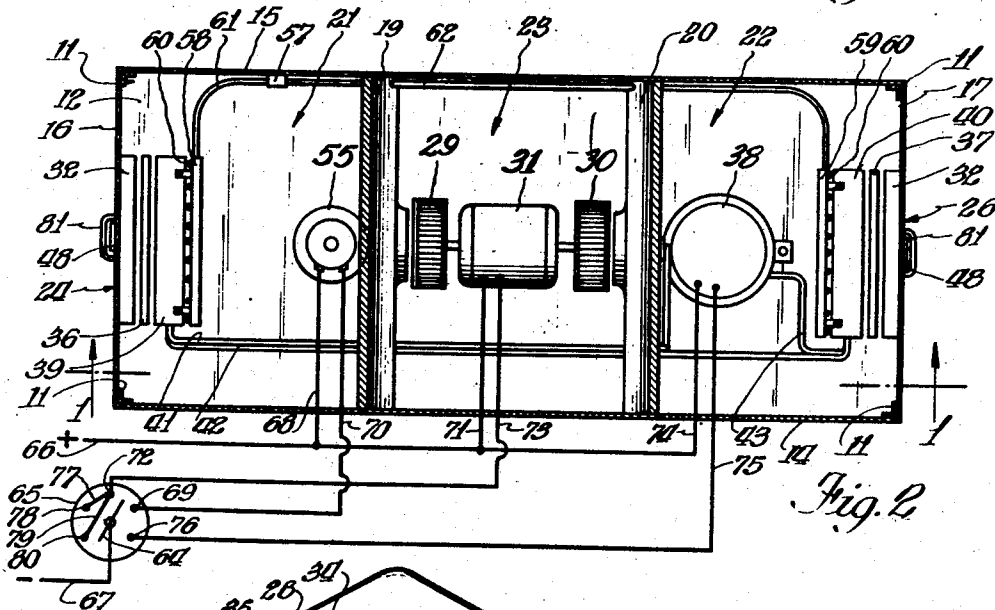


Fig. 2

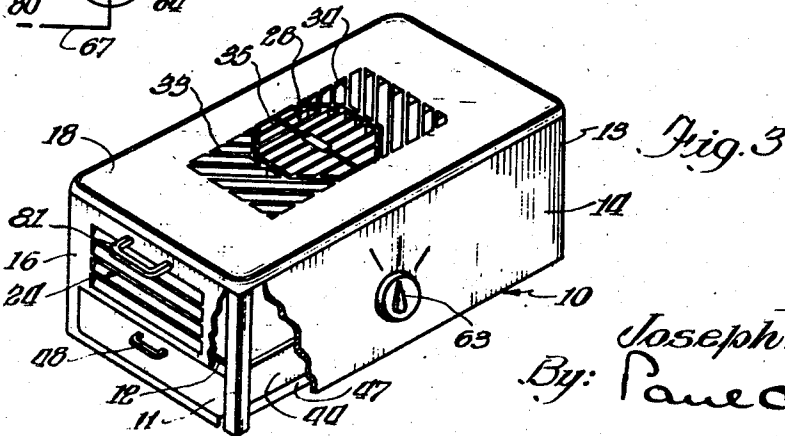


Fig. 3

Inventor:
Joseph A. Galazzi
By: Paul O. Rippe
Atty.

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AIR CONDITIONING APPARATUS

Joseph A. Galazzi, Evansville, Ind., assignor to
International Harvester Company, a corpora-
tion of New Jersey

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This invention relates generally to air conditioning apparatus and more particularly to air conditioning apparatus of the type which controls the moisture content of the air within enclosed spaces.

There are many types of air conditioning units on the market today but most of these operate to cool and de-humidify the air within homes and offices and are usually quite large and heavy and, after once being installed, are seldom moved about. In many instances excessive moisture content of the air within closets, basements, shops and other enclosed places is encountered where there is no need for cooling the air. Therefore, a small portable de-humidifier unit is desirable which will operate to reduce the moisture content of the air within these enclosed places without lowering the temperature of the air. A unit of this type would also be valuable during the winter months if it were equipped with means for humidifying the air in rooms, offices and the like which are heated by artificial means so that there is a deficiency of moisture in the air.

One object of the present invention is to provide a light-weight portable unit which can be easily installed and moved about in houses and offices by a single person and which is so constructed and arranged that it will operate to circulate and filter the air, or circulate and humidify the air, or circulate and de-humidify the air.

Another object is to provide a novel means of de-humidifying the air by passing part of the air to be conditioned into contact with the condenser of a compressor-condenser-evaporator refrigerating system and another part into contact with the evaporator. The evaporator will cool the air and condense moisture therefrom while the condenser will heat the air. The overall effect to the air will be a very slight rise in dry bulb temperature with a substantial decrease in moisture content.

Still another object is to provide novel means of humidifying the air to be conditioned by spraying water over the surfaces of a condenser and evaporator and circulating the air over said surfaces.

A further object is to provide an air conditioning unit with removable water receptacles which will act as water collectors during de-humidification of the air and as water suppliers during the humidification of the air, thus providing a simple and inexpensive construction which obviates the need for plumbing connections.

Further objects and advantages of the invention will be apparent from a consideration of the

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following specifications taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a sectional view taken along line 1-1 of Fig. 2.

Fig. 2 is a sectional view taken along line 2-2 of Fig. 1.

Fig. 3 is a perspective view of the unit with a portion of the outer casing broken away.

Referring to the drawing the unit is generally designated by reference figure 10 and comprises a suitable frame consisting of vertical L-shaped angle members 11 secured to the corners of a flat horizontal plate or base 12. A decorative outer casing 13 having side walls 14 and 15 and end walls 16 and 17 is secured to the vertical members 11, and a removable cover or top 18 fits over the top edges of the walls. The frame and casing may be made from a light-weight metal, such as aluminum, so as to provide a compact light-weight unit which may be moved about easily by one person. Handles 81 are provided on each end wall to facilitate lifting the unit.

Two vertical partitions 19 and 20 are secured to base 12 and divide the space above base 12 into two air passageways 21 and 22 and a mixing chamber 23. Passageway 21 is provided with an air inlet 24 in end wall 16 and an air outlet 25 in partition 19 into mixing chamber 23. Passageway 22 is provided with an air inlet 26 in end wall 17 and an air outlet 27 in partition 20 into mixing chamber 23. Mixing chamber 23 is provided with an air outlet 28 and blower wheels 29 and 30 positioned adjacent the air outlets 25 and 27 respectively which are driven by an electric motor 31. When this electric motor is operating, the blower wheels will pull air through inlets 24 and 26, passageways 21 and 22, into mixing chamber 23 and out the air outlet 28. Air inlets 24 and 26 are provided with horizontal vanes 32 which direct the incoming air in substantially horizontal streams into the interior of the casing. The air outlet is provided with vanes 33, 34 and 35 arranged at angles to each other so as to direct the outgoing air in several directions. Filters 36 and 37 are placed adjacent air inlets 24 and 26 respectively in order to filter out dust, pollen and other impurities in the air.

A refrigerant circulating system comprising a motor-compressor unit 38, a condenser 39 and evaporator 40 is provided within casing 13. The condenser is positioned within passageway 21 adjacent air inlet 24 and is secured to base 12. The evaporator is positioned within passageway 22 adjacent air inlet 26 and is secured to base 12. The motor-compressor unit is also positioned in passageway 22 between the evaporator and condenser

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and is spring mounted on base 12. The system is charged with a suitable refrigerant which is compressed by the motor-compressor 38, then forwarded through conduit 41 to the condenser 39 where it is cooled and condensed by losing its heat to the air circulating into contact with the condenser. The liquid refrigerant then flows through conduit 42 to the evaporator 40 where it is vaporized by the heat from the air flowing over the evaporator surface. From the evaporator, the refrigerant gas is returned through conduit 43 to the motor-compressor 38.

Below base 12 are positioned receptacles or pans 44 and 45 which are slidably mounted on L-shaped horizontally extending channels 46 and 47. Channel 46 is secured to vertical member 11 adjacent wall 15. Channel 47 is secured to the vertical members 11 adjacent wall 14. Pan 44 extends through an opening in end wall 16 and is provided with handle 48 to facilitate sliding the pan out. Pan 45 extends through an opening in end wall 17 and is provided with handle 49 to facilitate sliding the pan out. Positioned adjacent evaporator 40 is a drain pipe 50 which extends through base 12 and through which water will drain into pan 45. A similar drain pipe 51 is provided adjacent condenser 39 through which water will drain into pan 44. An overflow pipe 52 is secured near the top of pan 45 and extends into pan 44. A water pump 53 is positioned near the bottom of pan 44 and is secured to a flexible drive shaft 54 which is driven by an electric motor 55 mounted on base 12 in passageway 21. A flexible tubing 56 runs from the pump 53 to an elbow 57. Spray headers 58 and 59 are located above condenser 39 and evaporator 40 respectively and have nozzles 60 which are directed toward the condenser and evaporator surfaces. Conduits 61 and 62 connect the spray headers to elbow 57. When the electric motor 55 is running it will drive pump 53 which supplies water to the spray headers 58 and 59. The nozzles 60 of these spray headers will direct streams of water onto the surfaces of the condenser 39 and evaporator 40. Since the drive shaft 54 and tubing 56 are flexible, the pump 53 can be lifted in order to allow removal of pan 44.

For controlling the operation of the unit, a knob 63 is located on the exterior of the casing 13. This knob is mechanically connected to the conductor arm 64 of selector switch 65. Conductors 66 and 67 supply current to the unit from a suitable power source (not shown). Conductor 67 is electrically connected with conductor arm 64. One terminal of pump motor 55 is connected to conductor 66 by conductor 68 and the other terminal is connected to contact point 69 by conductor 70. One terminal of fan motor 31 is connected to conductor 66 by conductor 71 and the other terminal is connected to contact point 72 by conductor 73. One terminal of compressor motor 38 is connected to conductor 66 by conductor 74 and the other terminal is connected by conductor 75 to contact point 76. Jumper lead 77 connects contact points 72 and 78, and jumper lead 79 connects contact points 72 and 80. When conductor arm 64 is positioned to engage contact point 72, the fan motor 31 will be energized. When conductor arm 64 is positioned to engage contact points 69 and 80, the fan motor 31 and pump motor 55 will be energized. When conductor arm 64 is positioned to engage contact points 76 and 78, the fan motor 31 and compressor motor 38 will be energized.

The unit may either be placed in the enclosed

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space which is to be conditioned or may be located outside the space with suitable means for connecting air inlet 24 and 26 and air outlets 28 to the enclosed space. The operation of the unit will be controlled by knob 63. When the conductor arm is positioned in engagement with contact 72, the fan motor alone will operate and air will be circulated through both air inlet 24 and air inlet 26, through filtering elements 36 and 37, into mixing chamber 23 and then out through air outlet 28. In this operation, the unit will serve to circulate the air in the room and filter out pollen, dust and like impurities.

When conductor arm 64 is positioned in engagement with contact points 76 and 78, the compressor motor and fan motor will operate and the unit will de-humidify the air to be conditioned. Part of the air will be circulated through inlet 26 and over the evaporator 40 where it will be cooled below its dew point thus causing some of the moisture of the air to be condensed out. This condensate is drained through drain pipe 50 into pan 45. After passing over the evaporator, the air flows over the compressor 38 and into mixing chamber 23. This cooled air will cool the compressor so as to maintain the compressor's temperature within a desirable range. Another part of the air will pass through air inlet 24 and over the condenser 39 where it will be heated. This air will then flow into mixing chamber 23 where it will be mixed with the air which was circulated over the evaporator and then forced out through air outlet 28. In this operation a considerable amount of moisture will be removed from the air. The temperature of the air will also be raised slightly due to the heat generated by the refrigerant circulating system which will cause further de-humidification of the air.

When conductor arm 64 is positioned in engagement with contact points 69 and 80, the unit will operate to humidify the air. Fan motor 31 and pump motor 55 will operate. Pump 53 will force water from pan 44 through spray headers 58 and 59 into the surfaces of condenser 39 and evaporator 40. Blower wheels 29 and 30 will pull air through air inlets 24 and 26 respectively and over the condenser and evaporator. Some of the water will be vaporized into the air thus causing an increase in relative humidity. Pan 44 may be removed for filling or any other suitable means may be used for supplying water to the pan.

From the foregoing it will be seen that a unit is provided in which the air to be conditioned is circulated in contact with the evaporator and condenser of a refrigerant circulating system in a novel manner. The unit will operate to circulate and filter the air, circulate and de-humidify the air or circulate and humidify the air. The unit is small, compact and light so that it can be economically and conveniently installed in offices and dwelling houses and can be easily moved about by a single person.

It is to be understood that the invention is not limited to the specific structure herein shown and described, but that it may be varied in many ways within the scope of the appended claims.

What is claimed is:

1. In an air conditioning unit for controlling the moisture content of air within an enclosure, refrigerant evaporating means, refrigerant condensing means, means for circulating part of the air into contact with said refrigerant evaporating means and part of the air into contact with said refrigerant condensing means, means for collecting the moisture which condenses from the air

which passes over said refrigerant evaporating means, and means for spraying water over the surfaces of said refrigerant evaporating means and said refrigerant condensing means.

2. In an air conditioning unit for controlling the moisture content of air within an enclosure, a casing having separate passageways there-through, each passageway having an inlet and an outlet connected to said enclosure, a refrigerant circulating system including a compressor, condenser and evaporator, said condenser positioned in one of said passageways, said evaporator positioned in another of said passageways, means for circulating air from said enclosure through said passageways into contact with said condenser and said evaporator, means for collecting the water which condenses from the air as it is cooled by said evaporator, and means for spraying water over the surfaces of said condenser and said evaporator.

3. In an air conditioning unit for controlling the moisture content of air within an enclosure, a casing having separate passageways there-through, each passageway having an inlet and an outlet connected to an enclosure which is to be conditioned, a refrigerant circulating system including a compressor, condenser and evaporator, said condenser positioned in one of said passageways, said evaporator positioned in another of said passageways, fan means for circulating air from said enclosure through said passageways into contact with said condenser and said evaporator, a receptacle for collecting water condensed from the air when cooled by the evaporator, pump means for spraying water over the condenser and evaporator, and control means for selectively operating the fan means alone, the fan means and pump means simultaneously or the fan means and refrigerant circulating system simultaneously.

4. In an air conditioning unit for controlling the moisture content of air within an enclosure, a refrigerant circulating system including a compressor, condenser and evaporator, means for circulating the air into contact with the condenser and evaporator, pump means located in a receptacle, means for supplying water to said receptacle, and spray headers connected to said pump means and positioned so as to spray water over the surfaces of said condenser and evaporator.

5. In an air conditioning unit for controlling the moisture content of air within an enclosure, a refrigerant circulating system including a compressor, condenser and evaporator, means for circulating the air into contact with the condenser and evaporator, receptacle means located under said evaporator and said condenser, drain means from said evaporator and condenser into said receptacle means, means for supplying water to said receptacle means, nozzles directed toward said condenser and evaporator, and means for pumping water from said receptacle through said nozzles onto said condenser and evaporator.

6. In an air conditioning unit for controlling the moisture content of air within an enclosure, a casing having a first passageway, second passageway and third passageway, a refrigerant condenser secured in said first passageway, a refrigerant evaporator secured in said third passageway, said first passageway having an inlet into said enclosure adjacent said condenser and an outlet into said second passageway, said third passageway having an inlet into said enclosure adjacent said evaporator and an outlet into said second passageway, said second passageway

having fan means secured therein and an outlet connected to said enclosure, said fan means operating to pull air through both inlets into contact with said evaporator and condenser and into said second passageway, and then exhausting it into said enclosure through said outlet, means for draining water from said first passageway and said second passageway, and means for spraying water onto the surfaces of the evaporator and condenser.

7. In air conditioning unit construction a rectangularly shaped casing, two substantially vertical walls mounted to divide said casing into three horizontally aligned chambers, each of said vertical walls having an opening therein, each side of the sides of said casing in horizontal alignment with said vertical walls having an opening therein, one of the end chambers of said three chambers being a condenser chamber having a condenser therein mounted between said openings therein, the other of the end chambers of said three chambers being an evaporator chamber having an evaporator therein mounted between said openings therein, the middle of said three chambers being a mixing chamber having an opening disposed in the top thereof, fan means mounted within said mixing chamber adjacent said openings in said vertical walls for drawing air from said condenser chamber and said evaporator chamber simultaneously into said mixing chamber, whereby said air may be mixed after being drawn into said mixing chamber, whereby additional air may be simultaneously drawn into said condenser chamber and said evaporator chamber through said openings in said sides of said casing, and whereby the air mixed in said mixing chamber is forced therefrom.

8. In a construction as claimed in claim 7, said casing including compressor means interconnecting said condenser and said evaporator, motor means for the operation of said compressor means and said fan means, and a pair of handles mounted to the outer surface of said casing, whereby said construction is portable as a complete air conditioning unit exclusive of power for said motor means.

9. In a construction as claimed in claim 7, air filters mounted within said end chambers between said openings in said sides of said casing and said condenser and said compressor, whereby any air drawn through said openings in said sides of said casing will be filtered.

10. In a construction as claimed in claim 7, an open ended chamber mounted as an extension of said casing beneath said casing, a drain opening disposed in the bottom of said condenser chamber, and a removable pan mounted within said open ended chamber, whereby any condensate forming on said condenser will drain from said condenser, through said drain opening and into said removable pan.

JOSEPH A. GALAZZI.

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