Dec. 9, 1941. J. L. DITZLER 2,265,272

AIR CONDITIONING APPARATUS

Filed Oct. 12, 1938 2 Sheets-Sheet 1

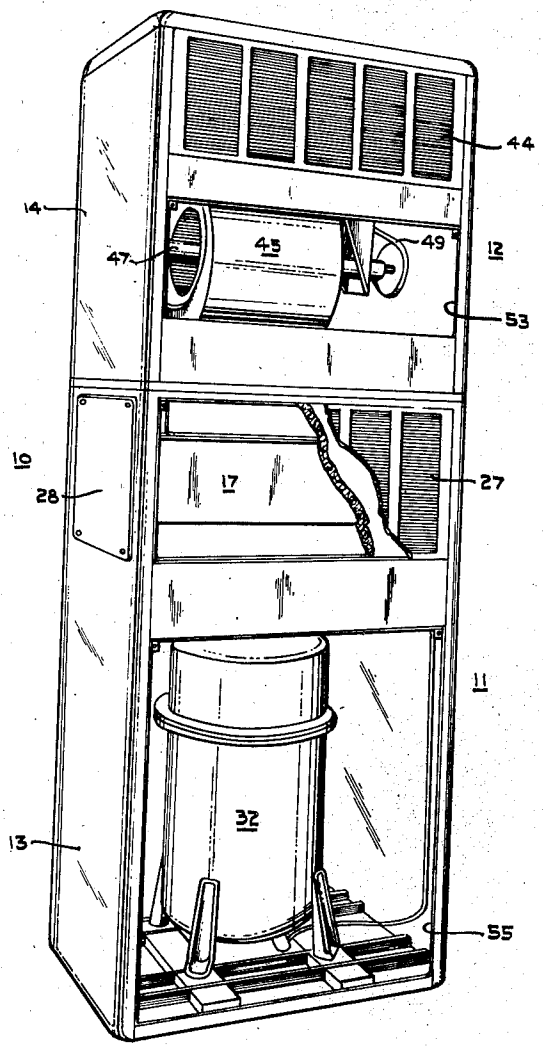

FIG. 1.

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AIR CONDITIONING APPARATUS

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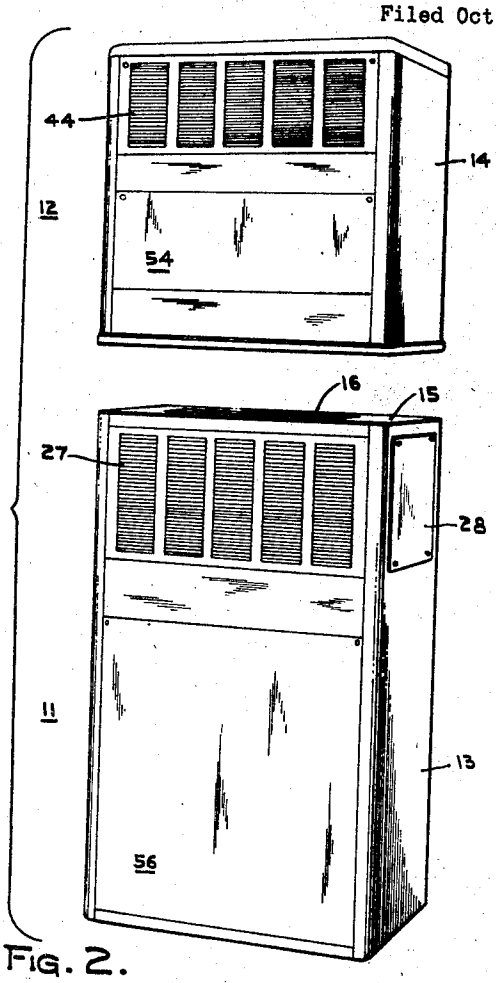

FIG. 2.

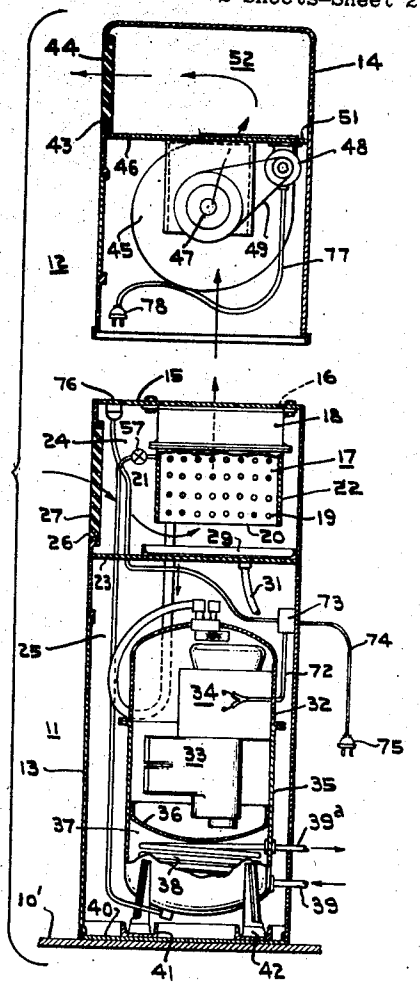

FIG. 3.

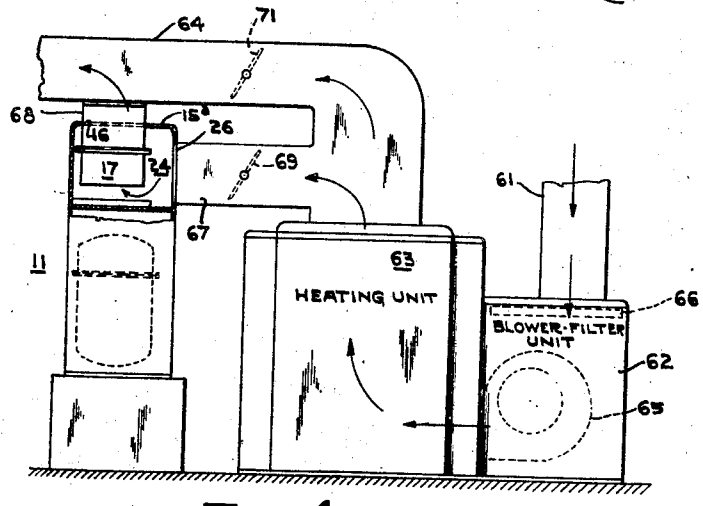

FIG. 4.

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AIR CONDITIONING APPARATUS

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4 Claims. (Cl. 62—140)

My invention relates to air conditioning apparatus, more particularly to a self-contained unit air cooler of the type that rests on the floor and is relatively tall, and it has for an object to provide an improved unit air cooler.

Another object of my invention is to provide a self-contained unit air cooler which may be completely manufactured and assembled at the factory, shipped in sections, and installed with a minimum amount of adjustment and other servicing.

A more particular object is to provide a complete unit air cooler including a fully charged refrigerating system and which may be shipped in sections without breaking any refrigerant connections.

These and other objects are effected by my invention as will be apparent from the following description and claims taken in connection with the accompanying drawings forming a part of this application, in which:

Fig. 1 is a perspective view of a self-contained unit air cooler embodying my invention, parts being removed or broken away to show the construction more fully;

Fig. 2 is a perspective view showing the two sections of the air cooler;

Fig. 3 is a vertical sectional view showing the two sections of the air cooler; and,

Fig. 4 is a diagrammatic view showing the application of the cooling unit or section of the air cooler to a complete year-round air conditioning system for a residence or other enclosure.

Referring to the drawings in detail, I show a self-contained unit air cooler or conditioner 10 of the type that is adapted to rest on the floor 10' of the enclosure to be cooled or conditioned, and which is relatively tall but of small depth in order to occupy a minimum of floor space. In order to facilitate shipment and handling of the air cooler, which is usually of considerable size and weight, it is divided on a horizontal plane into a lower cooling unit or section 11 and an upper fan unit or section 12. The air cooler is provided with a cabinet of generally rectangular form, which is divided on said horizontal plane into a lower cabinet section 13 and an upper cabinet section 14, which are associated with and house the lower cooling unit and the upper fan unit, respectively. In the preferred embodiment illustrated and described herein, the operating mechanisms are mounted on and disposed within the cabinet sections, the latter serving the purpose of a frame or chassis therefor.

Each of the cabinet sections 13 and 14 comprises four substantially flat vertical walls arranged in rectangular form and including a front wall, two side walls, and a rear wall. The corresponding vertical walls of the two sections are continuations of each other so as to provide a cabinet for the complete air cooler which is unitary in appearance and character.

The entire cooling or refrigerating system is carried by the lower cooling unit 11, and is disposed entirely within the lower cabinet section 13. The latter has a top wall 15 in which there is an air outlet opening 16. An evaporator 17 is removably suspended from the top wall 15 by a shroud or duct member 18 attached to the top wall 15 and disposed in registry with the opening 16. The evaporator 17 is disposed horizontally and comprises horizontal tubes 19 and plates or fins 20 extending vertically and transversely of the tubes 19, and arranged in good heat conducting relation to the tubes in order to provide extended heat transfer surfaces therefor. Plates 21 and 22 are preferably provided at the front and rear sides of the evaporator in order to form, together with the fins 20 at the ends of the evaporator, a passage for flow of air over the surfaces of the tubes and the fins.

A horizontal partition 23 may be provided to divide the lower cabinet section into an upper cooling chamber 24 in which the evaporator is disposed and a lower machine or unit compartment 25. The front wall of the chamber 24 has an inlet opening 26 for admission of air to be cooled. A grill 27 is removably mounted so as to extend across the inlet opening 26. The opening 26 and the grill 27 are of sufficient capacity to pass the entire air stream flowing over the evaporator 17. However, in order to provide for admission of outdoor air or for other arrangements, the chamber 24 may be provided with additional air inlet openings in the side walls, these openings being adapted to be closed by removable closure plates 28.

A drain pan 29, which may rest on the partition 23, is disposed beneath the evaporator 17 in order to collect the condensate formed on the evaporator by the condensation of moisture from the atmosphere. The condensate is removed in any suitable manner, as by gravity flow through a conduit 31.

Within the machine compartment 25 there is disposed a refrigerant liquefying or condensing unit 32 for supplying liquid refrigerant to the evaporator 17 and for removing vaporized refrigerant therefrom. The unit 32 includes a motor compressor unit comprising a compressor

33 and a motor 34 for driving the compressor. The motor compressor unit is enclosed within a fluid-tight casing 35, the latter having a partition 36 for forming a condensing chamber 37 in the bottom portion thereof. Water cooling coils 38 are disposed within the condenser chamber 37 for condensing the compressed refrigerant gas. Cooling water is supplied to the coils 38 through a pipe 39 and discharged through a pipe 39a. The condensing unit 32 is removably mounted on the bottom wall 40 of the lower cabinet section, the wall 40 being preferably reinforced by channel irons 41. Rubber mountings 42 may be interposed for minimizing transmission of noise or vibration.

The upper fan unit 12 is associated with or is connected to the lower cooling unit 11 in any suitable manner, for example, it may simply rest on the top of the lower unit. The upper cabinet section 14 is provided with an outlet opening 43 in the front wall thereof, and preferably, a grill 44 is removably mounted in the outlet opening. The lower end of the upper cabinet section 14 is open so as to communicate with the opening 16 of the lower section.

A suitable type of fan for effecting flow of air over the evaporator is mounted on the upper fan unit 14 in any suitable manner. For example, a centrifugal fan 45 may be mounted on a horizontal wall or partition 46. As shown in Fig. 1, the fan 45 is mounted with its shaft 47 extending horizontally. The fan 45 is driven by an electric motor 48 through a belt 49. Both the fan 45 and the motor 48 are mounted on and disposed entirely within the upper cabinet section 14. The fan 45 draws air from the space below the partition 46 and discharges the same through an opening 51 in said partition to a passage 52 in the upper portion of the cabinet.

The lower cabinet section 13 is formed with an opening 55 in the front wall thereof to provide access to the condensing unit 32. A removable panel 56 is provided for closing the opening 55. Similarly, the upper cabinet section 14 is provided with an opening 53 to provide access to the fan 45 and the fan motor 48. A removable panel 54 is provided for closing the opening 53.

The electrical connections for supplying electric current to the compressor motor 34 include an electrical cord or cable 72, comprising the required number of electrical conductors, a junction box 73, a second cord or cable 74 and a plug 75 of any suitable known type for connection with any suitable electrical receptacle that may be provided in the wall of the room or enclosure in which the air cooler is placed. Electric current is supplied to the fan motor 48 in a novel and advantageous manner. An electric receptacle 76 is carried by the lower unit 11, being preferably mounted in an opening in the top wall 15, and is connected, at the junction box 73, to the cord or cable 74 that supplies current to the compressor motor 34. The upper unit 12 is provided with a cord or cable 77 connected at one end to the motor 48 and at its other end to an electrical plug 78 which is adapted to be readily plugged into the receptacle 76 when the upper unit 12 is assembled upon the lower unit 11, and to be readily disconnected therefrom. Suitable control mechanism for the compressor motor and the fan motor may be interconnected in the electrical circuit at the junction box 73. It will be seen, therefore, that only one connection from the unit air cooler to a source of electric current need be made.

To install the above-described unit air cooler, the lower unit 11 is first placed in the desired position, resting directly on the floor, and the required electrical connections, water supply and discharge connections and the drain connection from the drain pan 29 are made. The upper unit 12 is merely placed on the lower unit 11 to form a complete unit air cooler as shown in Fig. 1.

The refrigerating system operates in the usual manner of such apparatus. The expanded refrigerant gas is compressed by the compressor 33, conveyed to and condensed in the condensing chamber 37, conveyed through and expanded in the expansion valve 57, then conveyed through the tubes of the evaporator 17, in which it is vaporized by the heat absorbed from the air passing over the surfaces of the tubes and the fins of the evaporator. It is then returned to the compressor to be recirculated.

The air to be cooled, which may be air from the enclosure in which the air cooler is disposed, enters through the inlet grill 27 disposed in the inlet opening 26 and flows underneath the evaporator 17, then upwardly over the surfaces of the tubes and the fins of the evaporator, through the shroud or duct member 18, then passes from the lower section to the upper section, thence to the fan 45, from which it is discharged through the passage 52 in the top of the cabinet section 14 and through the grill 44 positioned across the outlet opening 43.

It will be apparent that each of the units or sections of the air cooler may be shipped as a complete unitary structure, all of the parts carried by each unit being disposed entirely within the associated cabinet section. The entire refrigerating system being carried by one unit, it is possible to fully charge the system at the factory where suitable facilities for accurately and properly charging the system are available. It is not necessary, therefore, to break any refrigerant connections in order to ship the air cooler in separate units or sections. This is of great advantage in installing the air cooler inasmuch as it is only necessary to make the plumbing and electrical connections, which may be more readily done. It is not necessary to charge the system nor to make refrigerant connections, both of which involve danger of getting air or other non-condensable gases into the refrigerating system and of losing refrigerant.

An important advantage of the present construction is that the cooling unit may be utilized in various other applications. For example, it is ideally suited for addition to a previously installed heating system which already includes a fan or blower. Referring to Fig. 4, there is shown a heating installation including a return air duct 61, a blower and filter unit 62, a heating unit 63 and an air supply duct 64. The heating unit 63 may be of any suitable type and may include humidifying apparatus. The blower and filter unit 62 includes a fan 65 adapted to effect flow of air from the return duct 61 through the unit 62 and the heating unit 63 to the air supply duct 64. The unit 62 preferably also includes a filter 66.

This existing installation may be readily adapted to aid cooling and dehumidification of the air by adding a cooling unit 11 constructed as described above. Only very minor changes are required. The inlet grill 27 is omitted and a branch duct 67 is connected between the supply duct 64 and the inlet opening 26. A branch duct 68 provides communication between the dis-

charge opening 16 and the supply duct 64 at a point further downstream. For this purpose, a modified form of top cover 15a may be substituted if desired. A damper 69 is provided in the branch duct 67, and a damper 71 is provided in the portion of the air supply duct 64 that is in parallel with the cooling unit 11.

To provide cooling, the damper 71 is moved to closed position and the damper 69 to open position. The operation of the refrigerating system incorporated in the cooling unit 11 is effected while the heating mechanism of the unit 63 remains inactive. The blower 65 operates to draw air from the return duct 61, through the heating unit 63 without changing the temperature thereof, thence through the branch duct 67, through the cooling chamber 24 of the cooling unit 11, through the branch duct 68 to the air supply duct 64 at a point beyond the damper 71. As the air passes over the surfaces of the evaporator 17 in the cooling chamber 24, it is cooled and dehumidified thereby.

To provide heating, the damper 69 is closed and the damper 71 is opened. Operation of the heating mechanism in the unit 63 is effected, while the refrigerating system of the cooling unit 11 is rendered inactive. In this case, the air is heated as it passes through the heating unit and flows entirely through the air supply duct 64, the flow through the chamber 24 of the cooling unit 11 being prevented by the closed damper 69.

It is to be understood that, in any respect not dealt with in the specification and drawings, the apparatus may be constructed similarly to apparatus of the same general character heretofore known. For example, heat and sound insulation may be provided wherever needed, the refrigerating apparatus and the fan may be controlled in any suitable manner, and the several component parts may be of any suitable construction.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. A self-contained unit air cooler comprising a vertically elongated cabinet divided into separate lower and upper sections, refrigerating apparatus including an evaporator, a compressor and a condenser connected to form a complete refrigerant circuit mounted in said lower section, a fan mounted in said upper section, a motor connected to the fan for driving the same, said motor being mounted in one of said sections, said lower section having an air inlet and said upper section having an air outlet, said sections, evaporator and fan being constructed and arranged for flow of air from said inlet, over the evaporator, from said lower to said upper section to said fan and thence to said outlet, all of the parts carried by each of said sections being disposed entirely within the section, whereby said sections with the parts mounted therein may be readily shipped as separate unitary structures without breaking refrigerant connections.

2. A self-contained unit air cooler as set forth in claim 1, wherein the fan and the driving motor are mounted in the upper section with their shafts disposed horizontally.

3. A self-contained unit air cooler as set forth in claim 1 wherein each of said sections is of substantially rectangular form and the corresponding vertical walls of the respective sections are aligned to form substantially continuous vertical walls of the cabinet.

4. A self-contained unit air cooler as set forth in claim 1 wherein the lower section is provided with a horizontal partition dividing the same into an upper compartment and a lower compartment, the compressor and the condenser being mounted in the lower compartment and the evaporator being mounted in the upper compartment, said air inlet communicating with said upper compartment.

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