Nov. 7, 1950 W. W. TURPIN 2,529,203

SELF-CONTAINED AIR CONDITIONING UNIT

Filed Sept. 25, 1947 2 Sheets-Sheet 1

Fig. 1.

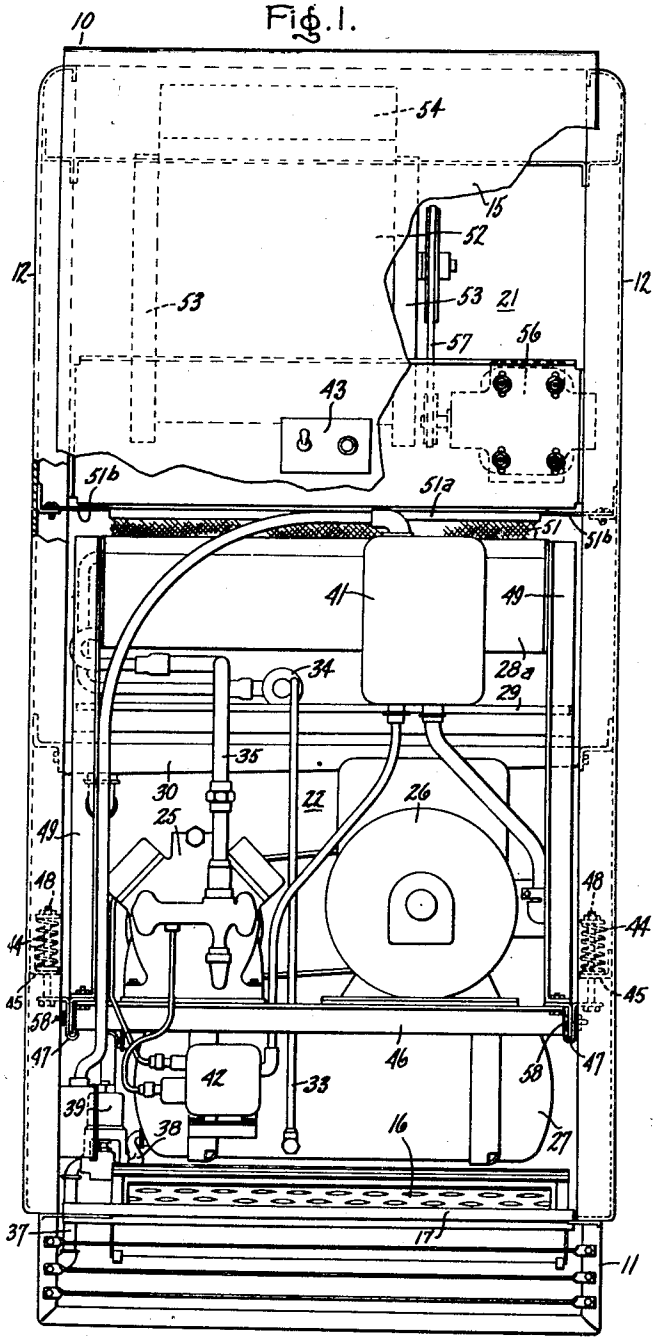
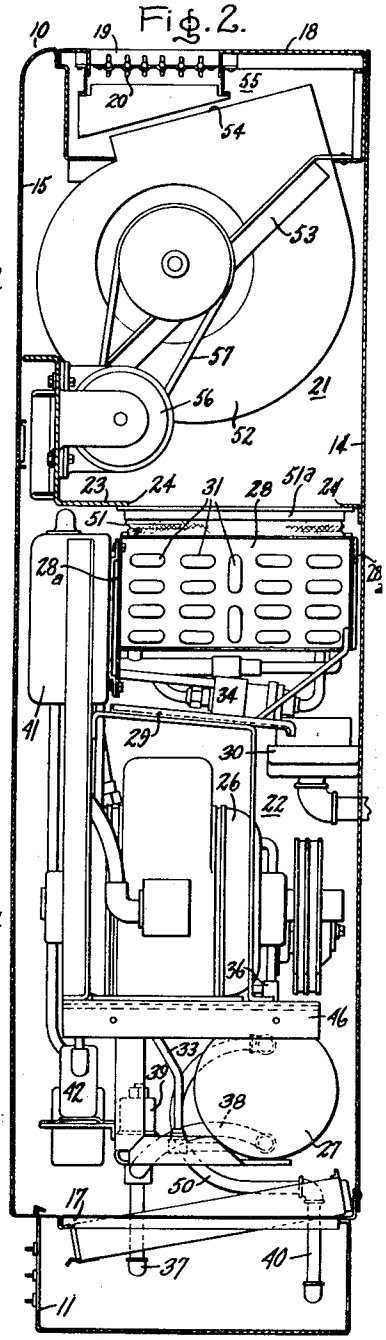


Fig. 2.



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Filed Sept. 25, 1947 2 Sheets-Sheet 2

Fig. 3.

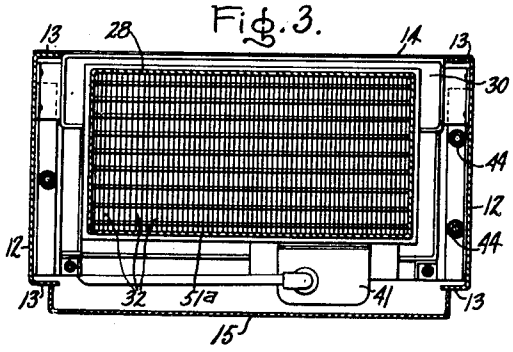
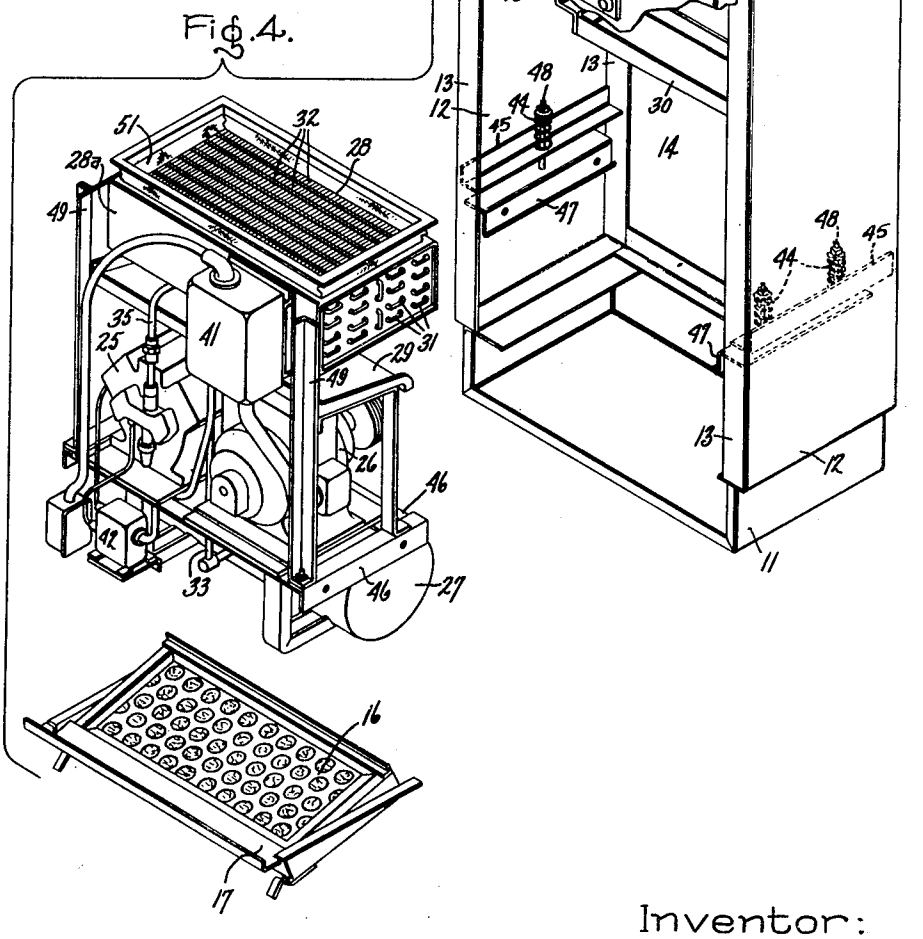


Fig. 4.



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SELF-CONTAINED AIR CONDITIONING UNIT

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6 Claims. (Cl. 62—129)

1

My invention relates to air conditioning apparatus and particularly to self-contained air conditioning units of the type employed for cooling the air in individual rooms.

Self-contained air conditioning units commonly comprise casings or cabinets within which are arranged the air circulating and cooling apparatus including the refrigerant condensing mechanism. These units are usually installed within the room to be conditioned and it is necessary that the transmission of vibration and noise from the mechanism be minimized. In order to reduce the transmitted vibrations, various types of resilient mountings have been employed for the motor compressor units and for the fan motor. In general, the resiliently mounted motor compressor units provided heretofore have required flexible refrigerant piping connections to the other parts of the refrigerating machine and this has involved the possibility of leaks in the connecting pipes due to vibration and bending and has complicated the work of servicing the equipment. Accordingly, it is an object of my invention to provide an air conditioning unit, including an improved arrangement for mounting the refrigerating machine and for facilitating servicing and maintenance of the unit.

It is another object of my invention to provide an air conditioning unit including an improved resilient mounting arrangement for the refrigerating apparatus which does not require flexible refrigerant piping connections.

Further objects and advantages of my invention will become apparent as the following description proceeds, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention, reference may be had to the accompanying drawings, in which Fig. 1 is a front elevation view of an air conditioning unit embodying my invention, partly broken away to show the interior of the unit; Fig. 2 is a sectional slide elevation of the unit of Fig. 1, with the walls removed to show the interior; Fig. 3 is a sectional plan view of the unit taken through the machinery compartment; and Fig. 4 is a perspective view of the unit with the refrigerating machine and filter assembly moved outside the machinery compartment.

Referring now to the drawings, the air conditioning unit shown in Figs. 1, 2 and 3 comprises a cabinet 10 mounted on a stand or framework 11. The cabinet comprises side panels 12 having

2

their edges bent to form angle members, indicated at 13, which act as frame members of the unit. A rear panel 14 is secured to the rear angle members 13, and a front panel 15 is removably attached to the front channels 13. The bottom of the casing is open and serves as the air inlet, a filter 16 being detachably supported in a slide frame 17 to cover the bottom opening. The top of the cabinet is closed by a panel or cover 18 which is provided with a discharge opening 19 having suitable air directing louvers 20. The interior of the cabinet is divided generally into an upper or blower compartment 21 and a lower or machinery compartment 22, the compartments being divided generally by a partition wall 23 within which is formed an inlet opening 24 for the blower compartment. Within the machinery compartment there is mounted a refrigerating machine including a compressor 25 driven by an electric motor 26 and arranged to supply hot compressed refrigerant to a water cooled condenser 27. The refrigerating machine also includes an evaporator 28 mounted immediately below the opening 24 in the partition and with a drip collecting baffle 29 for conducting moisture condensed on the coil into a drip pan 30 which is secured to the walls of the casing 10 in the rear thereof. Air entering the machinery compartment through the filter 16 passes upwardly and around both longitudinal edges of the baffle 29 and thence over the surface of the evaporator 28 and into the blower compartment. The evaporator 28 comprises a plurality of turns or runs of tubing 31 on which are secured heat transfer fins 32. Liquid refrigerant is supplied from the condenser 27 through a liquid line 33 under control of a thermostatic expansion valve 34, and refrigerant vaporized by the absorption of heat in the evaporator is returned to the compressor through a suction line 35. The hot compressed refrigerant discharged from the compressor enters the condenser 27 through a connection 36. In order to cool and liquefy the hot compressed refrigerant, cooling water is supplied from a suitable source through a conduit 37 and is delivered to the condenser through a connection 38 under control of a suitable water regulating valve 39. The water is discharged from the condenser through a suitable drain connection 40. The motor 26 is controlled in the usual manner in accordance with the temperature or humidity in a room to be conditioned, the controller 41 being provided for this purpose together with the usual compressor head pressure and suction pressure controls 42. A switch panel 43 in front of the

blower compartment is provided for controlling the conditioner.

During the operation of the refrigerant condensing unit the motor 26 and the compressor 25 produce noise and vibration and it is desirable to minimize the transmission of this noise and virbation to the cabinet. For this purpose the entire refrigerating machine including the condensing unit and the evaporator 28 is mounted on three springs 44 seated on brackets 45 secured to the side panels 12. One of the springs 44 is provided on the left-hand side of the unit adjacent the compressor and two springs on the right-hand side adjacent the motor. The refrigerating machine includes a main horizontal supporting frame 46 which is hung from the springs 44 on brackets 47 and bolts 48. The compressor 25 and motor 26 are rigidly bolted to the frame 46 of the upper side thereof and the condenser 27 and other portions of the apparatus including the control box 42 are rigidly secured to the underside of the frame 46. The springs 44 thus minimize the transmission of vibrations from the frame 46 to the cabinet. The evaporator 28 is also rigidly secured to the frame 46, it being bolted to upright frame members 49 which are rigidly bolted to the frame 46. Because all the elements of the refrigerating machine are rigidly mounted with respect to one another the refrigerant tubing including the liquid line 33 and the suction line 35 may be rigidly mounted and are not subject to movement or vibration which would be produced in separate mounting arrangements due to relative movement of the evaporator and compressor. Flexible connections are provided for conducting the cooling water to the condenser, the section 38 of the supply conduit being flexible and a curved section 50 of the drain also being flexible. Flexible electrical leads (not shown) are provided in the usual manner.

In order to direct the air from the inlet through the filter 16 at the bottom of the unit and over the mechanism of the machinery compartment and thence over the evaporator and into the blower compartment, a canvas or other readily flexible duct section or partition 51 is attached at its upper end to the walls of the cabinet about the opening 24 and its lower end fits in a recess (not shown) about the edge of the frame of the evaporator 28. The partition 51 includes a rigid flanged frame 51*a* and having its flange held against the wall 23 by clamps 51*b*. The end plates of the evaporator, together with the baffle 28*a* on either side, direct the air out of the machinery compartment through the opening 24. The flexible wall allows the refrigerating mechanism to move or vibrate on its spring mounting without disturbing the air flow passages, and since the partition 51 may be made of a material such as canvas it effectively prevents the transmission of noise from the evaporator to the walls of the cabinet.

The flow of air through the cabinet is produced by operation of a blower 52 mounted on a pair of diagonal cross members 53 in the upper portion of the blower compartment. The blower is provided with a discharge opening 54 directed into a plenum chamber 55 from which the air is discharged through the opening 19. The blower 52 is driven by an electric motor 56 mounted on the wall 23 of the casing and connected to drive the blower through a belt 57. During the operation of the air conditioning unit all the air passing through the cabinet must pass through the filter 16 at the bottom inlet of the machinery compartment. This air then picks up heat from the motor and compressor and is directed upwardly over the evaporator and thence into the blower compartment. The heat of the condenser is, of course, removed by the cooling water circulated under control of the valve 39 so that the air to be conditioned is required to remove only the heat of the motor and compressor before it is cooled by the evaporator 28.

The entire refrigerating machine may be readily removed from the cabinet as a unit, as shown in Fig. 4, the lower portion of the front panel having been shown broken away and the flexible partition 51 having been detached from the partition 23. After removal of bolts 58 by which the frame 46 is attached to the brackets 47 the frame may be slid out along the brackets and the unit withdrawn from the front of the cabinet. Electrical connections are, of course, also detached as well as the cooling water connections, whereupon the entire unit may be removed for servicing or testing. During the manufacture of the air conditioning unit, it is thus possible to test the refrigerating machine completely before it is installed in the cabinet and no refrigerant connections need be made after installation so that the refrigerating machine may be evacuated and charged with refrigerant and completely tested without requiring it to be first mounted in the cabinet. Thus the manufacture of the units on a production basis is facilitated by making it unnecessary to perform the various factory connections and adjustments after the machine has been mounted in the cabinet and is relatively inaccessible. Furthermore, since the refrigerant connections can all be made rigidly, the danger of leakage of refrigerant in the field is minimized and the need for servicing is therefore reduced.

The construction of an air conditioning unit as described above thus provides a simple and effective arrangement for facilitating both the manufacture and the servicing of portable air conditioning units.

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

1. An air conditioning unit comprising a casing having a blower compartment and a machinery compartment, said blower compartment having an inlet communicating with said machinery compartment and an outlet for discharging air into a space to be conditioned, said machinery compartment having an inlet for receiving air from outside said casing, a refrigerating machine including an evaporator and a compressor and a condenser connected in a closed refrigerant circuit, a supporting frame for said machine, means resiliently mounting said frame within said casing for suspending said refrigerating machine on said casing for movement with respect thereto within said machinery compartment, and means including flexible air duct walls between said machine and said casing for directing air from the inlet of said machinery compartment over said evaporator and into said blower compartment.

2. An air conditioning unit comprising a casing having a blower compartment and a machinery compartment, said blower compartment having an inlet communicating with said machinery compartment and an outlet for discharging air into a space to be conditioned, a blower in said blower compartment for moving air from said inlet to said outlet, said machinery compartment having an inlet for receiving air from outside said casing, a refrigerating machine including an

evaporator and a compressor and a condenser connected in a closed refrigerant circuit, a supporting frame for said machine, means resiliently mounting said frame within said casing for suspending said refrigerating machine on said casing for movement with respect thereto within said machinery compartment, said evaporator comprising a bank of finned tubing and having end plates and sidewall members defining a section of air duct, and a readily flexible partition secured betwen said air duct section and the interior side of the walls of said casing for directing air from said machinery compartment over said evaporator and into said blower.

3. An air conditioning unit comprising a casing having a blower compartment in the upper portion thereof and a machinery compartment in the lower portion, said blower compartment having an inlet communicating with said machinery compartment and an outlet for discharging air into a space to be conditioned, said machinery compartment having an inlet for receiving air from outside said casing, a horizontal supporting frame resiliently mounted on said casing for movement with respect thereto and arranged within said machinery compartment, a condensing unit including a compressor and a condenser and rigidly mounted on said frame, a vertical supporting frame extending upwardly from said horizontal frame and rigidly secured thereto, an evaporator rigidly attached to said vertical frame and connected in a closed refrigerant circuit with said compressor and said condenser, and means including flexible air duct walls secured between said evaporator and said casing for directing air from said machinery compartment over said evaporator and into said blower compartment.

4. An air conditioning unit comprising a casing having a blower compartment in the upper portion thereof and a machinery compartment in the lower portion, said blower compartment having an inlet communicating with said machinery compartment and an outlet for discharging air into a space to be conditioned, said machinery compartment having an inlet for receiving air from outside said casing, a horizontal supporting frame resiliently mounted on said casing for movement with respect thereto and arranged within said machinery compartment, a refrigerating machine including an evaporator and a motor driven compressor and a condenser connected in a closed refrigerant circuit and rigidly mounted on said horizontal frame, said compressor and its driving motor being rigidly mounted on the upper side of said frame and said condenser being rigidly mounted on the lower side of said frame and said evaporator being rigidly mounted on said frame above said motor and compressor, and means including flexible air duct walls secured between said evaporator and said casing for directing air from said machinery compartment over said evaporator and into said blower compartment.

5. An air conditioning unit comprising a casing having a blower compartment in the upper portion thereof and a machinery compartment in the lower portion, said blower compartment having an inlet communicating with said machinery compartment and an outlet for discharging air into a space to be conditioned, said machinery compartment having an inlet for receiving air from outside said casing, a horizontal supporting frame resiliently mounted on said casing for movement with respect thereto and arranged within said machinery compartment, a refrigerating machine including an evaporator and a motor driven compressor and a water cooled condenser rigidly mounted on said frame, said evaporator being rigidly secured to said framework above said compressor and said condenser, flexible inlet and outlet conduits for connecting said condenser in a cooling water circuit, means including flexible air duct walls between said evaporator and said casing for directing air from said machinery compartment over said evaporator and into said blower compartment, and a blower in said blower compartment for producing a flow of air from said outlet of said machinery compartment to said outlet of said blower compartment for removing the heat of said motor driven compressor and for supplying cooled air to a space to be conditioned.

6. An air conditioning unit comprising a casing having a blower compartment and a machinery compartment, said blower compartment having an inlet communicating with said machinery compartment and an outlet for discharging air to a space to be conditioned, said machinery compartment having an inlet for receiving air from outside said casing, a refrigerating machine including an evaporator and a compressor and a condenser connected in a closed refrigerant circuit, means including a supporting frame for retaining said evaporator and compressor and condenser in fixed relationship with one another, means including a plurality of springs for suspending said machine on said frame for relatively free movement within said machinery compartment whereby transmission of vibration from said machine to said casing is minimized, and means including flexible air duct walls between said machine and said casing for directing air from the inlet of said machinery compartment over said evaporator and over said blower compartment.

WILLIAM W. TURPIN.

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