Sept. 16, 1958 S. E. ROSE 2,851,866

ROOM COOLER

Filed May 18, 1956

FIG. 1

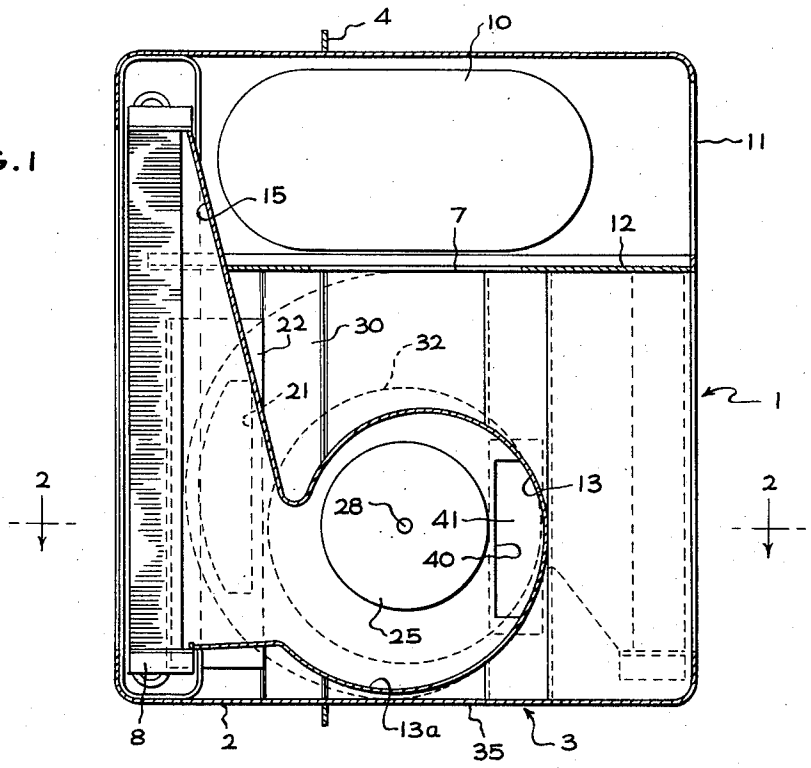
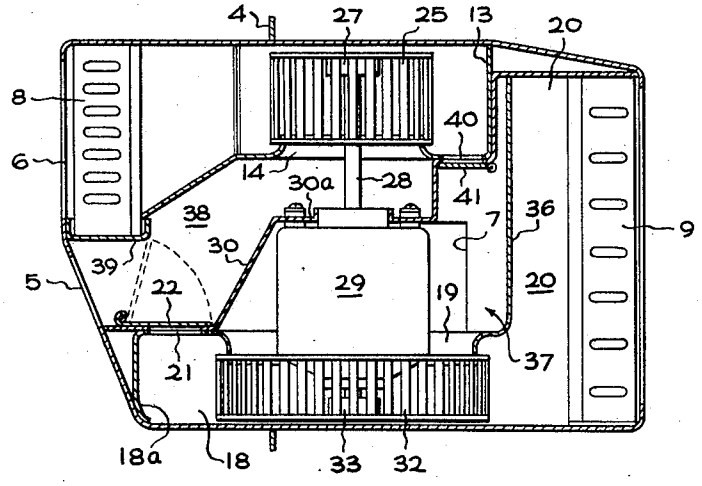


FIG. 2



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ROOM COOLER

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2 Claims. (Cl. 62—427)

The present invention relates to a self-contained air conditioning apparatus and more particularly to an improved air circulation arrangement within such apparatus.

A self-contained type of air conditioning unit for conditioning the air within an enclosure, located within a window of the enclosure comprises an indoor section or compartment and an outdoor section or compartment. A mechanical refrigeration system for the unit includes an evaporator disposed in the indoor compartment and a condenser disposed in the outdoor compartment. Heat in the room air is extracted by circulating the room air over the evaporator while outside air is circulated over the condenser in order to reject the heat extracted from the room air to the outside atmosphere. Air moving means are associated with the evaporator and condenser for moving the indoor and outdoor air streams over the surfaces of the evaporator and condenser respectively. In addition, damper means are usually provided whereby the unit may be used for ventilation in which outside air is moved directly into the enclosure. When the unit is to be used on ventilation, it is highly desirable that a relatively large volume of outside air be moved into the enclosure. However, in previous designs, full advantage has not been taken during ventilation of the air moving capacity of both of the fans due to the fact that the arrangements of the partitions and other elements designed for effective operation of the apparatus as a room cooling means could not, by the use of one or more dampers be readily modified for most efficient operation on a ventilating cycle.

Accordingly, it is an object of my invention to provide a new and improved air circulation arrangement for a self-contained air conditioning unit.

It is another object of my invention to provide a compact, self-contained, air conditioner including an improved partition and fan arrangement whereby the two air circulating fans can selectively move a single ventilating air stream together or two air streams individually.

It is a still further object of my invention to provide an improved arrangement utilizing dual fans so arranged that they can be employed for proportioning the room air and outside air passing through a self-contained, air conditioning unit or can both be employed for pumping outside air only through the unit for ventilation.

In carrying out the objects of the present invention, I provide a self-contained, air conditioning unit containing a conventional refrigeration system including an evaporator and a condenser. Air moving means arranged in one portion of the unit cabinet are provided for moving room air over the evaporator. Air moving means arranged adjacent the evaporator air moving means provided for moving outside air over the condenser. At least a portion of the air circulated over either the condenser or evaporator may be directed into the air moving means associated with the other of these heat exchangers by adjustable means provided within the air conditioning unit. The adjustable means are also arranged so

that if desired the room air may be excluded from the unit and outside air pumped serially through the condenser and evaporator air moving means to increase the outside air available for ventilation purposes.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention, however, both as to its organization and method of operation may be best understood by reference to the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a horizontal sectional view of a self-contained, air conditioning unit incorporating my invention; and

Fig. 2 is a vertical view partially in section taken through the air conditioner of Fig. 1 substantially along lines 2—2 of Fig. 1.

Referring now to the drawing, I have shown therein a self-contained, air conditioning unit 1 adapted to be mounted in a window of the enclosure or room to be conditioned. The conditioner 1 includes a front portion 2 projecting into the room and a rear portion 3 projecting without the room. Means including a flange 4 is provided intermediate the two portions to prevent leakage of outdoor air around the unit and into the room.

Referring now to Fig. 2, I provide in my air conditioning unit 1 a conventional mechanical refrigeration system including a condenser 9, an evaporator 8, and a compressor 10 connected in a series flow relationship. The closed refrigeration system in which they are connected, is, however, not completely shown since it will be understood that any of the well-known refrigeration systems may be used.

Room air is drawn into the unit through the opening 5 and moved over the evaporator 8 where its heat is extracted by the refrigerant flowing through the evaporator coil. The cooled room air is then discharged back into the room through the discharge opening 6. Outside air is drawn into the outdoor portion 3 of the unit through opening 11, over the compressor 10, through the opening 7 in partition 12 and then through the condenser 9 where the heat extracted from the room air is transferred to the outside air. As shown in Fig. 1, the baffle or partition 12 is arranged within the unit 1 between the compressor 10 and the condenser 9.

In order to provide for the circulation of room air over the evaporator 8, I have provided within the upper portion of the air conditioning unit 1 an air distribution chamber or plenum 13 suitably secured to the top wall of the unit. The plenum 13 is shaped as a scroll and contains a circular portion 13a having an opening 14 within the bottom wall. The plenum flares outwardly to an open end 15 which is arranged to accommodate the evaporator coil 8 of the conventional fin and tube type.

In order to provide for the circulation of outside air through the unit 1 and over the condenser 9, a second air distribution chamber or plenum 18 is located within the lower portion of the unit 1 below the evaporator plenum 13 is also shaped generally as a scroll and contains a circular portion 18a having an opening 19 in its upper wall. The plenum 18 flares outwardly to an open end 20 at the rear opening 11 of portion 3 of the unit. The condenser 9 is positioned within the end opening 20 of the plenum 18.

The plenum 18 is also provided with an air opening 21 within the upper wall of its circular portion 18a as shown best in Fig. 2. This opening 21 may be closed by suitable adjustable means such as a damper 22 pivotably mounted on the scroll wall.

In order to provide for the circulation of room air over the evaporator 8 and the circulation of outside air over the condenser 9, I provide a pair of coaxially arranged, vertically aligned air moving means arranged so that

one moves air through the evaporator plenum **13** and the other moves air through the condenser plenum **18**. More specifically, I provide a centrifugal blower **25** arranged on a vertical axis within the evaporator plenum **13** having an axial intake directly over the air opening **14** in the plenum lower wall. The blower **25** is suitably attached by means such as hub **27** to the upper end of a shaft **28** of a vertically mounted motor **29**. The motor **29** is suitably mounted on a vertical axis to partitioning means **30** having a centrally located horizontal portion **30***a* to which the motor is anchored. At lower end of the motor shaft, another centrifugal blower **32** is similarly attached by means such as hub **33** and so positioned within the condenser plenum **18** that its axial intake is directly below the air opening **19**.

It will be seen that the partition **30**, portions of the side wall **35**, partition **12** and wall **36** of the plenum **18** form an air passageway **37** for outdoor air entering the unit through openings **7** and **11** and the compartment housing compressor **10**. The same partition **30** which is disposed between the upper plenum **13** and the lower plenum **18** also cooperates with the plenum **13** and partition **12** to form an air passageway **38** for room air drawn into the unit through inlet **5** by the fan **25**.

In the operation of my invention, when the damper **22** is in a position of Fig. 2 closing opening **21**, room air is drawn into the passageway **5** in the front of portion **2** of the unit **1** under the action of the blower **25**. The room air then moves into the axial intake of the centrifugal blower **25** through the air intake opening **14** in the plenum **13**. As the blower **25** rotates, the room air is discharged radially outwardly in the evaporator plenum circular portion **13***a* and through the plenum **13** passing over the evaporator **8**. Heat is extracted from the room air by the refrigerant flowing through the coils of the evaporator **8** and the cooled room air passes back into the room through the air discharge opening **6**. As the lower centrifugal blower **32** is also being driven by the motor **29**, outside air is drawn into the unit through openings **11** and **7** and into the axial intake of the blower through the air intake opening **19** in the condenser plenum **18**. The outside air then moves radially outwardly into the circular portion **18***a* of the plenum **18** and over the coil surfaces of the condenser **9** where the heat extracted from the room air by the refrigerant flowing in the evaporator **8** is transferred to the outside air by the refrigerant flowing in the condenser **9**.

If it is desirable to mix a portion of the outside air flowing within the plenum **18** with the room air, the damper **22** may be pivoted a selected distance from the dotted line position of Fig. 2 so as to open or partially open the opening **21**. Thus a portion of the outside air within the plenum **18** will flow from the plenum into passageway **38** through opening **21** where it unites with the room air stream entering through opening **5** and moving towards the intake of the evaporator blower **25**. The position of the damper **22** thus determines the quantity of outside air which is mixed with the room air.

In many cases it is desirable to operate the unit so as to completely shut off the re-circulation of room air within the unit and ventilate by moving only outside air through the unit into the enclosure. I therefore provide an arrangement whereby the two blowers **25** and **32** may be serially connected in air flow relationship so that a single air stream is moved under the pumping action of both blowers from the outside into the interior of the room. More specifically if the damper **22** is rotated upwardly into the dotted line position of Fig. 2 where the damper end abuts the lower wall **39** of the plenum **13**, room air can no longer move into the evaporator plenum **13** as the passageway **38** has been sealed off from the air opening **5** in the front of portion **2** and now communicates only with the opening **21** in the lower plenum **18**. Thus the outside air entering the passageway **38** under the influence of the blower **32** and through the opening **21** is moved in greater quantities than in any other position of the damper **22**. This outside air passes directly into the evaporator blower **25** through the plenum opening **14** where it is subsequently moved over the surfaces of evaporator **8** and into the room through the discharge opening **6**.

It should be well understood however that although the damper position is such that only a single air stream to the evaporator plenum **13** is established there is still a partial flow of outside air over the condenser **9** from the blower **32** so as to continually provide for the transfer of heat extracted from the condenser coil refrigerant to the outside air.

Under some conditions, it is desirable to employ a room air conditioning unit for exhausting air from the room. For that purpose, there is also provided an opening **40** in the lower wall of scroll portion of plenum **13** communicating with passage **37** and a pivoted damper **41** controlled by a suitable operating mechanism (not shown) for closing the opening **40**. Damper **41** is kept closed for operation of the unit on the cooling or ventilating cycles. However with damper **22** in a closed position and damper **41** open, room air is exhausted under the combined action of both blowers **25** and **32**. On exhaust with damper **41** open, room air flowing through inlet **5** and passage **38** into scroll **13**, passes through the opening **40** into passage **37** where it is picked up by blower **32** and discharged through scroll **18** and condenser **9** to the outside.

From the foregoing, it will be seen that I have provided a self-contained, air conditioning unit for an enclosure which is arranged not only to cool the air within an enclosure while transferring the heat extracted from the room air to the outside air but additionally provides for a controlled flow of outside air through the unit during ventilation or exhaust by connecting in series air flow relationship the air moving means for the evaporator and the air moving means for the condenser. This has been accomplished by my novel arrangement where a pair of coaxially arranged, vertically aligned centrifugal blowers or fans in combination with adjustable damper means are arranged to permit each blower to move an air stream independently of the other blower or to operate the two blowers in such a manner that air moved by one blower is conducted to the intake of the other blower forming substantially a single air stream utilizing the pumping characteristics of both blowers. By my blower arrangement and partitioning means, I am also able to reduce substantially the size of the self-contained, air conditioning unit and provide a construction within the unit which is greatly simplified while resulting in increased efficency in the operation of the unit.

While in accordance with the Patent Statutes, I have described what at present is considered to be the preferred embodiment of my invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

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

1. In a self-contained, air conditioning unit for an enclosure comprising a housing, a refrigeration system within said housing including an evaporator and a condenser, an air distribution chamber having an air opening associated with said evaporator, a second air distribution chamber having an air opening associated with said condenser and spaced from said first chamber, a partition between said chambers, a pair of coaxially arranged, vertically mounted, centrifugal blowers within said housing, means for driving said blowers mounted on said partition, one of said centrifugal blowers arranged within said air distribution chamber for moving air within said enclosure through its air opening and over said evaporator, said other centrifugal blower arranged within said con-

denser chamber for moving air through its air opening and over said condenser, a ventilating air opening within said condenser air chamber, damper means associated with said condenser chamber for directing a portion of said outside air from said condenser air chamber to said evaporator air chamber opening, said damper means movable to admit only said outside air to said evaporator chamber opening, an exhaust air opening in said evaporator chamber and damper means for controlling the flow of air through said exhaust air opening.

2. In a self-contained, air conditioning unit for an enclosure comprising a housing, a refrigeration system within said housing including an evaporator and a condenser, an air scroll chamber having an air outlet opening associated with said evaporator, an air scroll chamber having an air outlet opening associated with said condenser, partitioning means between said evaporator scroll and said condenser scroll, a pair of coaxially arranged, vertically aligned centrifugal blowers within said housing, one of said blowers being disposed in said condenser scroll and the other in said evaporator scroll, means mounted on said partitioning means for driving said blowers, said partitioning means defining together with said evaporator scroll an upper air passageway for circulating the air from within said enclosure to said evaporator blower, said partitioning means also defining together with said condenser scroll a lower air passageway for circulating outside air to said condenser blower, a ventilating air opening within said condenser scroll chamber, damper means associated with said ventilating air opening for directing a portion of the outside air from said condenser air chamber opening through said upper air passageway, said damper means movable into contact with said evaporator scroll walls to admit only outside air to said evaporator chamber air opening, an exhaust air opening in said evaporator scroll between said evaporator fan and said lower air passageway and damper means controlling the flow of air through said exhaust air opening.

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