Dec. 18, 1945. J. L. GIBSON 2,391,151

REFRIGERATING APPARATUS

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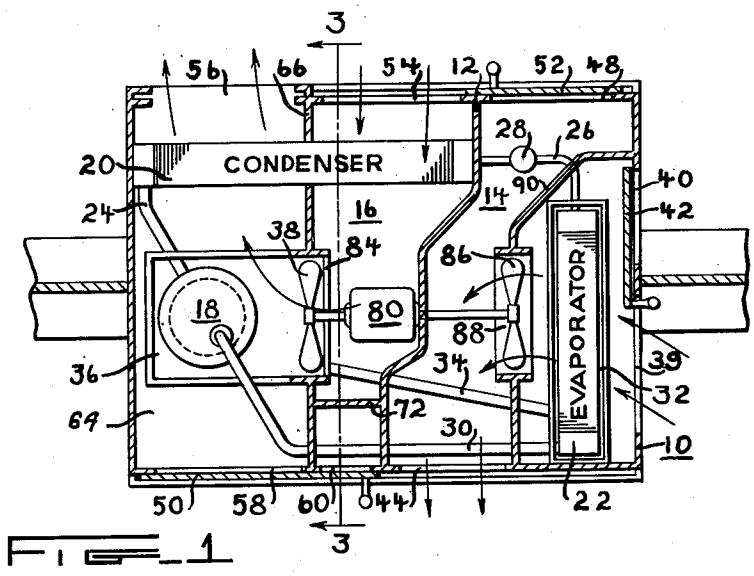


FIG. 1

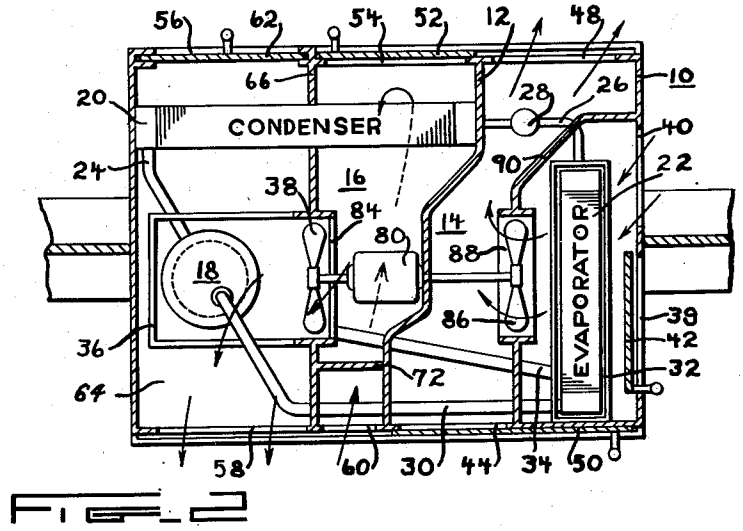


FIG. 2

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FIG. 3

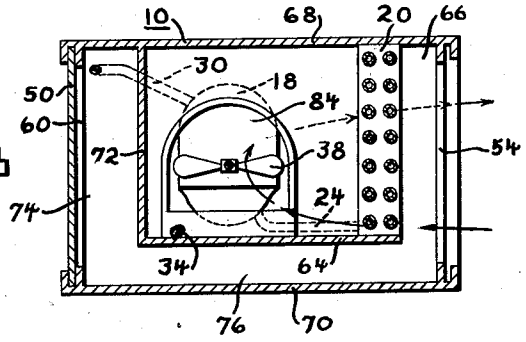


FIG. 4

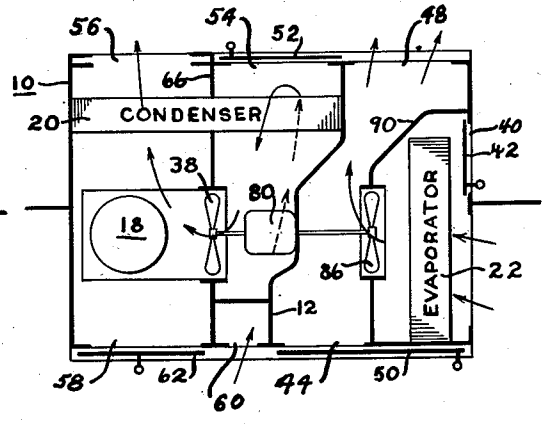
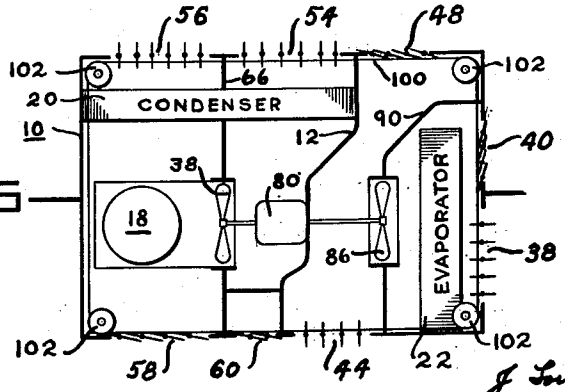


FIG. 5



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UNITED STATES PATENT OFFICE

2,391,151

REFRIGERATING APPARATUS

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Application February 14, 1944, Serial No. 522,211

8 Claims. (Cl. 62—129)

This invention relates to refrigerating apparatus and more particularly to an improved self-contained air conditioning unit.

One of the objects of this invention is to provide a self-contained air conditioning unit of the type which is adapted to be mounted on a window sill and which is capable of either cooling air or heating air for an enclosure.

Another object of this invention is to provide a self-contained air conditioning unit which incorporates means whereby both the evaporator fan and the condenser fan may be used for exhausting air from the room to the outside.

A further object of this invention is to provide an improved damper arrangement for controlling the flow of air through a self-contained air conditioning unit.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a horizontal sectional view showing the arrangement of the evaporator and the condenser within the main casing and also showing one possible arrangement of the dampers when the apparatus is used for cooling purposes;

Fig. 2 is a view similar to Fig. 1 showing the arrangement of the dampers when the unit is used for heating the air;

Fig. 3 is a vertical sectional view taken on line 3—3 of Fig. 1;

Fig. 4 diagrammatically shows a modified damper arrangement which may be substituted for the damper arrangement shown in Figs. 1 and 2; and

Fig. 5 is a view somewhat similar to Fig. 4 showing a modified damper construction.

Referring now to the drawings, reference numeral 10 designates the main casing or cabinet within which the air conditioning apparatus is adapted to be mounted. Reference numeral 12 designates a partition which separates the cabinet into an evaporator compartment 14 and a condenser compartment 16.

A refrigerating apparatus is mounted within the cabinet 10 and includes a conventional motor-compressor unit 18, a condenser 20 and an evaporator 22.

Compressed refrigerant vapor flows from the compressor 18 into the condenser 20 through the line 24. The liquified refrigerant flows from the condenser 20 into the evaporator 22 through the liquid line 26 wherein a refrigerant flow control device 28 is provided as shown. The refrigerant flow control device 28 may be of the fixed restricter type or it may be any suitable type of expansion valve. The vaporized refrigerant leaves the evaporator 22 through the usual suction line 30.

The moisture which condenses on the evaporator 22 collects in the condensate collecting receptacle 32 mounted beneath the evaporator 22. A drain pipe 34 conveys the condensate into the receptacle 36 mounted in the condenser compartment as shown. The receptacle 36 has one portion thereof disposed beneath the condenser fan 38 with the result that if the condensate does not vaporize fast enough on its own accord it will be atomized by the condenser fan 38 which is arranged to dip into the upper portion of the receptacle 36. The motor compressor unit 18 has its lower portion disposed within the receptacle 36 so as to heat the condensate. This form of condensate disposal is shown for purposes of illustration only as other forms of condensate disposal means may be used.

The evaporator compartment is provided with a room air inlet 39 and an outside air inlet 40 which are arranged side by side in the end wall of the cabinet 10 whereby a single damper 42 may be used for controlling the flow of air through both inlets. By virtue of this damper arrangement it is possible to introduce all fresh air, all recirculated air or a mixture of fresh air and recirculated air without ever materially altering the total quantity of air introduced into the evaporator compartment.

The evaporator compartment 14 is provided with two separate outlets whereby the cooled air may be discharged either into the room to be conditioned through the outlet 44 or into the outside atmosphere through the outlet 48. Slide damper 50 controls the flow of air through the outlet 44 and slide damper 52 controls the flow of air through the outlet 48.

The condenser compartment 16 is provided with a pair of openings 54 and 56 which are used when the apparatus is called upon to cool air for the enclosure. A second pair of condenser compartment openings 58 and 60 are provided as shown and serve when the apparatus is used for heating recirculated room air. The openings 58 and 60 are controlled by the slide damper 50 which also controls the evaporator compartment opening 44. The condenser air inlet 54 is controlled by the damper 52 which also controls the evaporator compartment outlet 48. The dampers 42, 50 and 52 slide horizontally within suitable

guides as shown. A vertically slidable damper 62 is used for controlling the flow of air through the condenser outlet 56.

The condenser 20 is mounted on a horizontal platform 64 which extends only part way across the cabinet as shown in Fig. 3. A vertical dividing wall 66 which extends from the top wall 68 of the cabinet 10 to the bottom wall 70 of the cabinet 10 separates the condenser compartment 16 into two sections as shown. A vertical wall 72 extends between the wall 66 and the partition 12 so as to provide a vertically extending duct 74 for conveying air entering the condenser inlet 60 into the horizontal duct 76 which is bounded by the platform 64, the bottom wall 70, the partitions 12 and the wall 66. By virtue of this duct arrangement, room air may be introduced into the condenser compartment via the inlet 60, duct 74 and duct 76 as shown in Fig. 2.

A fan motor 80 is mounted in the condenser compartment 16 as shown. This motor drives the condenser fan 38 and the evaporator fan 86. The fan 38 is disposed within the opening 84 in the wall 66 and the evaporator fan 86 is disposed within an opening 88 in the wall 90 as shown.

Fig. 1 shows the arrangement of the dampers and the air flow when the apparatus is used for cooling 100% recirculated room air. Fig. 2 shows the arrangement of the dampers and the air flow when the apparatus is used for heating recirculated room air. Only the one portion of the condenser 20 is traversed by the air flowing through the condenser compartment 16 when the apparatus is used for heating the air. This serves to increase the temperature at which the condenser is operated. The increased condenser temperature is beneficial not only from the standpoint of raising the temperature of the air discharged into the room but also from the standpoint of increasing the efficiency of the refrigerating apparatus during the heating cycle when the cold outside air circulated over the evaporator will of course be at a temperature much lower than the temperature of the warm room air circulated over the evaporator during the cooling cycle.

By arranging the dampers as shown in Fig. 4, both of the fans serve to pull air from the room 46 and to discharge the air into the outside atmosphere. It will be noted that the damper 62 is placed in front of the opening 58 when the apparatus is used for exhausting air from the room to the outside.

In Fig. 5 I have shown a modified arrangement of dampers which make it possible to change over the apparatus from a heating apparatus to a cooling apparatus without the necessity of manually resetting a large number of manually operated dampers. Since the arrangement of the refrigerating apparatus and the openings in Fig. 5 is the same as in the other figures, the same reference numerals have been used to designate corresponding parts in all of the figures.

In the apparatus shown in Fig. 5, dampers of the shutter type have been substituted for the slide dampers shown in Fig. 1. A damper operating cable 100 simultaneously operates all the dampers. The cable 100 is guided by the rollers 102 located in the corners of the cabinet as shown. It has been found that many users of air conditioning units have difficulty in operating the apparatus if the apparatus requires more than one or two simple adjustments. It is apparent therefore that the provision of a common means for operating all of the dampers in unison avoids the need for making several independent adjustments.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. An air conditioning unit comprising a casing adapted to be positioned in a window of a space to be conditioned, the front wall and at least a portion of the sides, bottom and top of said casing extending into the space to be conditioned, a partition dividing said casing into two chambers, each of the chambers having a pair of openings leading to the outside atmosphere and another pair of openings leading to the space to be conditioned, fan means for flowing air through each of said chambers, a refrigerating system including an evaporator in one of said chambers and a condenser in another of said chambers, and means for rendering certain of said openings ineffective at times including means for blocking the flow of air through one portion of said condenser when condenser air is discharged into the conditioned space.

2. Air conditioning apparatus for conditioning air for an enclosure having a wall opening comprising in combination, a cabinet adapted for mounting in said wall opening with portions exposed on opposite sides of said wall, means dividing said cabinet into an evaporator compartment and a condenser compartment, refrigerating apparatus including an evaporator in said evaporator compartment and a condenser in said condenser compartment, said cabinet having openings for the ingress and egress of air, means for flowing outside air in thermal exchange with said evaporator, means for flowing air from said enclosure in thermal exchange with said condenser and for returning the air heated thereby into said enclosure, and means for blocking off a portion of said condenser when air from said enclosure is circulated in thermal exchange with said condenser.

3. Air conditioning apparatus for conditioning air in an enclosure comprising in combination, a cabinet, refrigerating apparatus including an evaporator and a condenser within said cabinet, means separating said cabinet into an evaporator compartment and a condenser compartment, each of said compartments having openings for the ingress and egress of air, one of said condenser compartment openings communicating with the air in said enclosure, one of said evaporator compartment openings communicating with the air in said enclosure, and a sliding damper means for simultaneously closing one of said last named openings and opening the other.

4. Air conditioning apparatus for conditioning air for an enclosure having a wall opening comprising in combination, a cabinet adapted for mounting in said wall opening with portions projecting on opposite sides of said wall, means dividing said cabinet into an evaporator compartment and a condenser compartment, refrigerating apparatus including an evaporator in said evaporator compartment and a condenser in said condenser compartment, means including a fan for drawing outside air in over one portion of said condenser and discharging said air to the outside over another portion of said condenser, and means including a damper for closing off the flow of outside air over said condenser and for directing air from said enclosure over one portion of said condenser.

5. Air conditioning apparatus for conditioning

air for an enclosure having a wall opening comprising in combination, a cabinet adapted for mounting in said wall opening with portions projecting on opposite sides of said wall, means dividing said cabinet into an evaporator compartment and a condenser compartment, refrigerating apparatus including an evaporator in said evaporator compartment and a condenser in said condenser compartment, means including a fan for drawing outside air in over one portion of said condenser and discharging said air to the outside over another portion of said condenser, and means including a damper for closing off the flow of outside air over said condenser and for directing air from said enclosure over one portion of said condenser, said last named means including means for blocking off the flow of air over another portion of said condenser.

6. Air conditioning apparatus for conditioning air for an enclosure having a wall opening comprising in combination, a cabinet adapted for mounting in said wall opening with portions projecting on opposite sides of said wall, means dividing said cabinet into an evaporator compartment and a condenser compartment, refrigerating apparatus including an evaporator in said evaporator compartment and a condenser in said condenser compartment, means including a fan for drawing outside air in over one portion of said condenser and discharging said air to the outside over another portion of said condenser, and means including a damper for closing off the flow of outside air over said condenser and for directing air from said enclosure over one portion of said condenser, said last named means including a duct leading from the room and passing through said wall opening and leading into the condenser compartment.

7. Air conditioning apparatus for conditioning air for an enclosure having a wall opening comprising in combination, a cabinet adapted for mounting in said wall opening with portions projecting on opposite sides of said wall, means dividing said cabinet into an evaporator compartment and a condenser compartment, refrigerating apparatus including an evaporator in said evaporator compartment and a condenser in said condenser compartment, means including a fan for drawing outside air in over one portion of said condenser and discharging said air to the outside over another portion of said condenser, and means including a damper for closing off the flow of outside air over said condenser and for directing air from said enclosure over one portion of said condenser, said last named means including a duct leading from the room and passing through said wall opening and leading into the condenser compartment, said duct having a vertical portion adjacent the front wall of said cabinet and a horizontal portion extending towards the rear of said cabinet.

8. Air conditioning apparatus for conditioning air for an enclosure having a wall opening comprising in combination, a cabinet adapted for mounting in said wall opening with portions projecting on opposite sides of said wall, means dividing said cabinet into an evaporator compartment and a condenser compartment, refrigerating apparatus including an evaporator in said evaporator compartment and a condenser in said condenser compartment, means including a fan for drawing outside air in over one portion of said condenser and discharging said air to the outside over another portion of said condenser, and means including a damper for closing off the flow of outside air over said condenser and for directing air from said enclosure over one portion of said condenser, said last named means including a duct leading from the room and passing through said wall opening and leading into the condenser compartment, said duct having a vertical portion adjacent the front wall of said cabinet and a horizontal portion extending towards the rear of said cabinet, means for flowing air in thermal exchange with said evaporator, the walls of said evaporator compartment having one opening for discharging air into said enclosure and having another opening for discharging air into the outside atmosphere, said damper serving to control the flow of air through one of said evaporator compartment openings.

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