

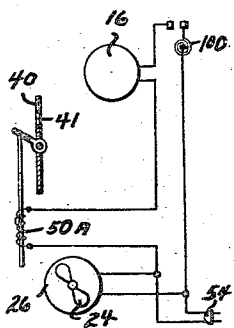
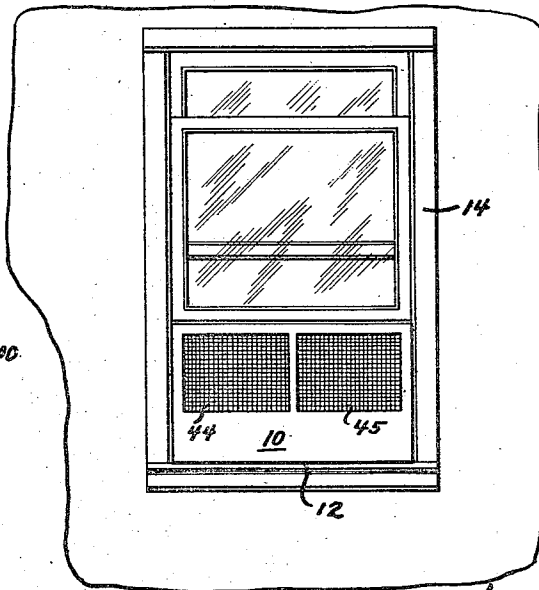
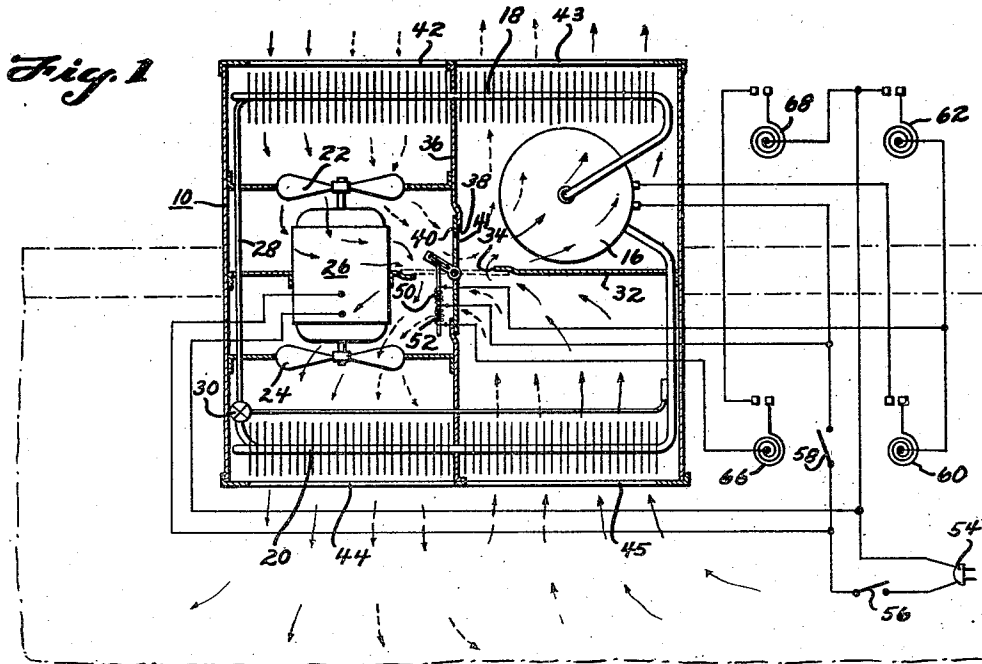
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REFRIGERATING APPARATUS

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REFRIGERATING APPARATUS

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This invention relates to refrigeration and more particularly to a window air conditioning unit and the like which may be used as a simple ventilating unit at such times when refrigeration is not required.

One object of this invention is to provide an improved control system for an air conditioning unit.

A further object of this invention is to provide an air conditioning system which may be used for ventilating purposes when the outside air is sufficiently cool so that it may be introduced into the room without being further cooled.

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

In the drawing:

Fig. 1 is a horizontal sectional view, partly diagrammatic, showing my invention applied to an air conditioning unit of the type adapted to be mounted directly on the window sill;

Fig. 2 is an elevational view showing the unit mounted on the window sill; and

Fig. 3 shows a simplified control arrangement.

The average air conditioning unit now on the market has no utility the major portion of the year and, therefore, the initial cost per hour of use is more than the average person is willing to pay. The purpose of the arrangement shown in the drawing is to provide an air conditioning unit which will have utility a greater portion of the time.

For purposes of illustration, I have shown my invention applied to a conditioning unit which comprises a main casing 10 adapted to be mounted directly on the window sill 12 of the window 14. A conventional refrigerating system is mounted within the casing 10 and comprises a motor-compressor unit 16, a condenser 18, an evaporator 20, a pair of fans 22 and 24 and a motor 26 for operating the fans 22 and 24. The compressed refrigerant discharged by the motor-compressor unit 16 flows into the condenser where it is condensed and the liquid refrigerant condensed therein is supplied to the evaporator through the liquid line 28. The flow of liquid in the liquid line 28 is controlled by a conventional thermostatic expansion valve 30. The interior of the casing 10 is provided with a first wall 32 extending substantially across the full length of the casing 10 midway between the condenser 18 and the evaporator 20. This wall is provided with a large central opening 34. A somewhat

similar wall 36 arranged at right angles to the wall 32 is also provided with a central opening 38. The direction of the flow of air through the cabinet 10 is controlled by a damper 40 which is adapted to close either the opening 34 or the opening 38. In the full line position of the damper as shown in Fig. 1, the unit functions as a ventilating unit and all of the outdoor air entering the cabinet through the inlet 42 is picked up by the fan 22, forced through the left half of the opening 34 and is thereafter picked up by the fan 24 and discharged into the room through the discharge opening 44. Inasmuch as the fans 22 and 24 under these circumstances are sending a large volume of air into the room, a corresponding amount of air must find its way out of the room. Unless this air finds its way out through open doors, windows, or the like, it will return to the outside through the right half of the casing 10. This outgoing air enters the cabinet through the inlet 45, passes through the right half of the opening 34 and discharges to the outside through the outlet 43. The above described flow of air through the casing 10 is illustrated by the solid line arrows.

When the damper 40 is in the dotted line position, the outside air entering the opening 42 passes through the left section of the condenser, is picked up by the fan and is discharged through the opening 38 past the motor-compressor unit 16, through the right section of the condenser and out through the discharge opening 43. The room air to be conditioned enters the cabinet 10 through the inlet opening 45, passes over the right half of the evaporator 20, through the opening 38 and is thereafter picked up by the fan 24 and circulated over the left half of the evaporator before being returned to the room through the discharge outlet 44. The dotted line arrows show the path taken by the air when the damper is in the dotted line position. A small amount of fresh air is introduced into the room during the cooling operation through the opening 41 provided in the damper 40.

A system of controls has been provided whereby the refrigerating system is turned off when the outside air reaches a predetermined temperature. The refrigerating system is made ready for operation by connecting the plug 54 to a suitable source of current and closing the manual switches 56 and 58. Upon closing the switch 56, the fan motor 26 is energized and causes circulation of air through the cabinet 10, the path of the air being determined by the position of the damper 40 as explained hereinabove.

Closing of the switch 58 places the compressor in series circuit relationship with the inside thermostat 60 and the outside thermostat 62. The outside thermostat 62 is designed to close when the outside temperature exceeds a predetermined value such as 75° F., for example. The inside thermostat 60 which is arranged in series with the outside thermostat 62, cycles the compressor in accordance with the inside temperature requirements at all times when the outside thermostat 62 is closed. The outside thermostat 62 also controls the solenoid 50 which, when energized, causes the damper to move into the dotted line position. By virtue of this arrangement, the damper 40 shuts off the main flow of outside air into the conditioned enclosure at all times when the outside air is too warm for comfort.

In order to prevent a large volume of excessively cold outside air from being introduced into the room and in order to prevent introduction of outside air when the inside air is already cooler than required, a solenoid 52 has been provided which is controlled by the inside thermostat 66 and the outside thermostat 68. The outside thermostat 68 closes the circuit to the solenoid 52 whenever the outside air temperature is below a predetermined value such as 70° F., for example. The inside thermostat 66, which is arranged in series with the outside thermostat 68, prevents the solenoid 52 from becoming energized at all times when the inside temperature is below a predetermined value such as 75° F.

In Fig. 3 I have shown a simplified control arrangement by which a single outside thermostat 100 starts and stops a compressor and also controls the operation of the damper 40. The outside thermostat 100 may be adjusted to close the circuit whenever the outside temperature exceeds a predetermined value such as 75° F. It will be noted that closing of the thermostat 100 not only energizes the compressor but also adjusts the damper into the position in which room air is recirculated and no outdoor air is introduced into the room except the small amount which enters through the by-pass opening 41 in the damper 40. When the outdoor air temperature is sufficiently low so that the outdoor air may be introduced into the room without further cooling the circuit to the compressor motor is interrupted and the damper 40 moves into the full line position as shown in Fig. 1 whereby the outdoor air is introduced directly into the room. This modified arrangement is especially meritorious because of its simplicity and its efficient control arrangement.

In order to simplify the disclosure, each control instrument has been shown as a bimetallic thermostat; whereas, it is within the purview of this invention to use other forms of psychrometric instruments such as wet and/or dry bulb thermostats or effective temperature instruments. The temperature values referred to hereinabove have been given for purposes of illustration only.

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, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. Air conditioning apparatus for an enclosure having a window comprising in combination, a casing adapted to be mounted in a window of said enclosure, air circulating means within said casing, an air discharge opening for discharging air into said enclosure, an air intake opening com-

municating with the exterior of said enclosure, an air intake opening communicating with the interior of said enclosure, means for conveying air from either one of said intake openings to said air discharge opening, damper means for selecting either one of said intake openings, means for lowering the wet bulb temperature of the air flowing from one of said intakes to said discharge opening, and means responsive to the outdoor temperature for controlling said wet bulb reducing means.

2. An air conditioning unit for an enclosure; said unit having a partition dividing same into two compartments; refrigeration apparatus including heat rejecting means in one compartment and heat absorbing means in the other compartment; means, including a fan in said one compartment, for moving outside cooling air there-through and in contact with the heat rejecting means; means, including a fan in said other compartment, for moving air to be cooled from the enclosure into said compartment and in contact with the heat absorbing means therein and back to the enclosure; a movable damper in said partition constructed and arranged when open to divert the entire outside air stream flowing in said one compartment through said other compartment into the enclosure; and means for preventing operation of the refrigeration apparatus when said damper is open.

3. An air conditioning unit for an enclosure; said unit comprising a cabinet having a partition dividing the same into two compartments; a damper in said partition; a motor compressor unit and condenser in one of said compartments and an evaporator in the other; fans arranged one in each compartment and having a common drive separate from the drive for the compressor unit; means whereby said motor compressor unit and said fans may be operated simultaneously when said damper is closed to cause air to be cooled to be circulated from the enclosure over the evaporator and back to the enclosure and outside cooling air to be circulated over the compressor and condenser and back to the atmosphere, or said fans may be operated independently of said motor compressor unit and said damper may be moved to open position to cause said condenser fan to discharge all the fresh outside air normally discharged over said condenser through said other compartment into said room; and means for preventing operation of the refrigeration apparatus when said damper is open.

4. A combined room cooler and ventilator comprising a cabinet having separate condenser and evaporator chambers provided with air openings communicating respectively with outside and inside of the room, a fan for each chamber, an electrically controlled cooling unit including a refrigerant condenser and evaporator in said chambers respectively, a damper movable to cause the condenser fan to deliver outside air into the room, and means for stopping operation of said cooling unit upon such movement of the damper.

5. A combined room cooler and ventilator comprising a cabinet having separate refrigerant condenser and evaporator chambers, the condenser chamber having communication with the outside of the room and the evaporator chamber having communication with the inside of the room; a fan for circulating outside air over the condenser, a separate fan for passing inside air over the evaporator and returning cooled air into the room, an adjustable damper normally closed when the apparatus is employed for air cooling, the parts

being so constructed and arranged that adjustment of the damper to a predetermined position operates to deflect outside air drawn in by the condenser fan into the room, and means for enabling outside air to be drawn into the room by one of said fans when said damper is in said normally closed position.

6. A combined room cooler and ventilator comprising a cabinet adapted to be positioned within a window opening with the rear portion extending outside of the window sash, partition means separating said cabinet into a front or evaporator chamber and a rear or refrigerant condenser chamber, said condenser chamber having at its rear end an opening extending substantially across same, an air cooling device within the cabinet including a refrigerant condenser substantially covering said opening and providing a screen therefor, means separating one portion of the opening from the other, a fan having its axis substantially parallel with the air stream through said opening and arranged to draw in outside air through one portion of the opening over the condenser and discharge same through the other portion over the condenser, the front wall of the evaporator chamber having a pair of laterally spaced openings, a propeller type fan juxtaposed to one of said last openings for drawing in room air through the other of said last openings and discharging same through the juxtaposed opening, an evaporator in said evaporator chamber over which room air is circulated by said propeller type fan, a motor independent of said air cooling device and common to said fans, said partition means having an opening affording communication between said chambers, a damper movable between a position closing said last opening and a position for deflecting air from said first named fan into said evaporator chamber, an air inlet adapted to admit air from the outside of the room to said evaporator chamber, and a damper controlled air inlet adapted to admit room air to said condenser chamber.

7. A combined room cooler and ventilator comprising a cabinet adapted to be positioned within a window opening with the rear portion communicating outside of the window sash, partition means separating said cabinet into a front or evaporator chamber and a rear or refrigerant condenser chamber, said condenser chamber having at its rear end an opening extending substantially across same, an air cooling device within the cabinet including a refrigerant condenser substantially covering said opening and providing a screen therefor, means separating one portion of the opening from the other, a fan having its axis substantially parallel with the air stream through said opening and arranged to draw in outside air through one portion of the opening over the condenser and discharge same through the other portion over the condenser, the front wall of the evaporator chamber having a pair of laterally spaced openings, a propeller type fan juxtaposed to one of said last openings for drawing in room air through the other of said last openings and discharging same through the juxtaposed opening, an evaporator in said evaporator chamber over which room air is circulated by said propeller type fan, a motor independent of said air cooling device and common to said fans, said partition means having an opening affording communication between said chambers, a damper movable between a position closing said last opening and a position for deflecting air from said first named fan into said evaporator

chamber, means for stopping operation of said air cooling device, an air inlet adapted to admit air from the outside of the room to said evaporator chamber, and an air inlet adapted to admit room air to said condenser chamber.

8. A combined room cooler and ventilator comprising a cabinet adapted to be positioned within a window opening with the rear portion extending outside the window sash, partition means separating said cabinet into a front or evaporator chamber and a rear or refrigerant condenser chamber, said condenser chamber having at its rear end an opening extending substantially across same, an air cooling device within the cabinet including a refrigerant condenser substantially covering said opening and providing a screen therefor, means separating one portion of the opening from the other, a fan having its axis substantially parallel with the air stream through said opening and arranged to draw in outside air through one portion of the opening over the condenser and discharge same through the other portion over the condenser, the front wall of the evaporator chamber having an air outlet opening leading to the room, a pair of openings in the evaporator chamber, a propeller type fan juxtaposed to said air outlet opening adapted to draw air in from said pair of openings and discharge same through said outlet opening, an evaporator in said evaporator chamber over which the air streams therein are adapted to pass, a motor independent of said air cooling device and common to said fans, means including a damper for deflecting air from said first named fan into said evaporator chamber, means for stopping operation of said air cooling device upon a change in position of said damper.

9. A combined room cooler and ventilator comprising a cabinet having separate condenser and evaporator chambers provided with air openings communicating respectively with outside and inside of the room, a fan for each chamber, an electrically controlled cooling unit including a refrigerant condenser and evaporator in said chambers respectively, a damper movable to cause the condenser fan to deliver outside air into the room, means for conjointly operating said fans, a control for said operating means, means for operating said air cooling unit, and means to insure the discontinuance of said cooling unit operating means when said damper is in position to cause the condenser fan to deliver outside air into the room.

10. An air conditioning unit for an enclosure; said unit having a partition dividing same into two compartments; refrigeration apparatus including heat rejecting means in one compartment and heat absorbing means in the other compartment; means, including a fan in said one compartment, for moving outside cooling air therethrough and in contact with the heat rejecting means; means including a fan in said other compartment, for moving air to be cooled from the enclosure into said compartment and in contact with the heat absorbing means therein and back to the enclosure; damper means constructed and arranged when open to divert all of the outside air flowing in said one compartment through said other compartment into the enclosure.

11. An air conditioning unit for an enclosure; said unit comprising a cabinet having a partition dividing the same into two compartments; damper means; a motor compressor unit and

condenser in one of said compartments and an evaporator in the other; fan means; means whereby said motor compressor unit and said fan means may be operated simultaneously when said damper means is closed to cause air to be cooled to be circulated from the enclosure over the evaporator and back to the enclosure and outside cooling air to be circulated over the compressor and condenser and back to the atmosphere, or said fan means may be operated independently of said motor compressor unit and said damper means may be moved to open position to cause said fan means to discharge all the fresh outside air normally discharged over said condenser through said other compartment into said room; and means for preventing operation of the refrigeration apparatus when said damper means is open.

12. An air conditioning unit for an enclosure; said unit having partition means dividing same into a plurality of compartments; refrigeration apparatus including heat rejecting means in one compartment and heat absorbing means in another compartment; means, including a fan in said one compartment, for moving outside cooling air therethrough and in contact with the heat rejecting means; means including a fan in said other compartment, for moving air to be cooled from the enclosure into said compartment and in contact with the heat absorbing means therein and back to the enclosure; and damper means constructed and arranged when open to divert substantially all of the outside air flowing in said one compartment through said other compartment into the enclosure.

13. An apparatus for conditioning the air within a room comprising a casing having a first outlet for discharging air into the room and a sec-

ond outlet for discharging air outside the room and two inlets one for room air and the other for fresh air, means forming air passages within said casing for providing air circulating paths from said inlets to said outlets, means for producing a circulation of air through said air passages, and a single damper selectively operable to either of two positions for determining the air paths between said inlets and said outlets, said damper in one of said positions directing air from said fresh air inlet to said first outlet and from said room air inlet to said second outlet, said damper in the second of said positions directing air from said fresh air inlet to said second outlet and from said room air inlet to said first outlet.

14. A combined room cooler and ventilator comprising a cabinet having separate refrigerant condenser and evaporator chambers, the condenser chamber having communication with the outside of the room and the evaporator chamber having communication with the inside of the room, a fan arranged to flow air over said condenser at all times when said fan operates, a separate fan for passing inside air over the evaporator and returning cooled air into the room, movable damper means arranged in one position to direct air leaving said condenser to the outside when the apparatus is employed for air cooling, the parts being so constructed and arranged that rearrangement of the damper means operates to deflect outside air drawn in by the condenser fan into the room, and means for enabling outside air to be drawn into the room by one of said fans when said damper means directs the air leaving said condenser to the outside.

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