

Sept. 24, 1940.

H. F. SMITH

2,215,534

REFRIGERATING APPARATUS

Original Filed April 22, 1936

3 Sheets-Sheet 1

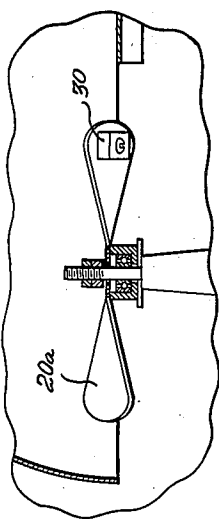


Fig. 3

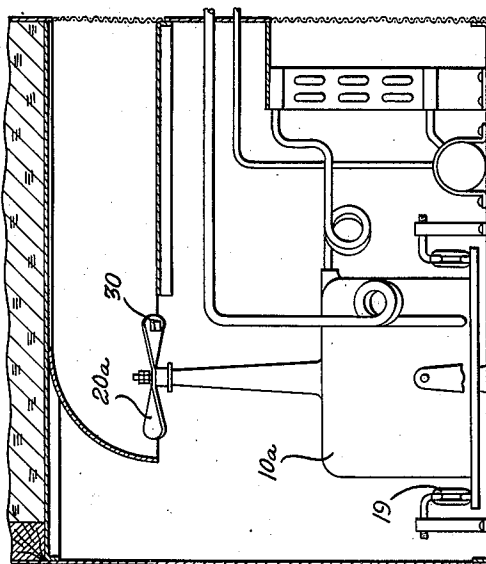


Fig. 2

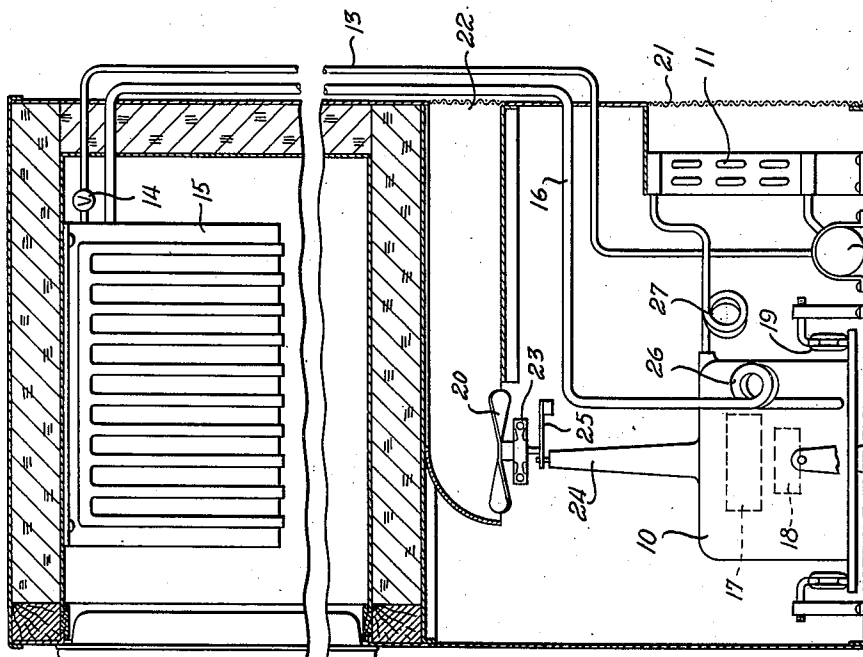


Fig. 1

INVENTOR.
Harry F. Smith

BY
Spencer Hardman & John
ATTORNEYS

Sept. 24, 1940.

H. F. SMITH

2,215,534

REFRIGERATING APPARATUS

Original Filed April 22, 1936

3 Sheets-Sheet 2

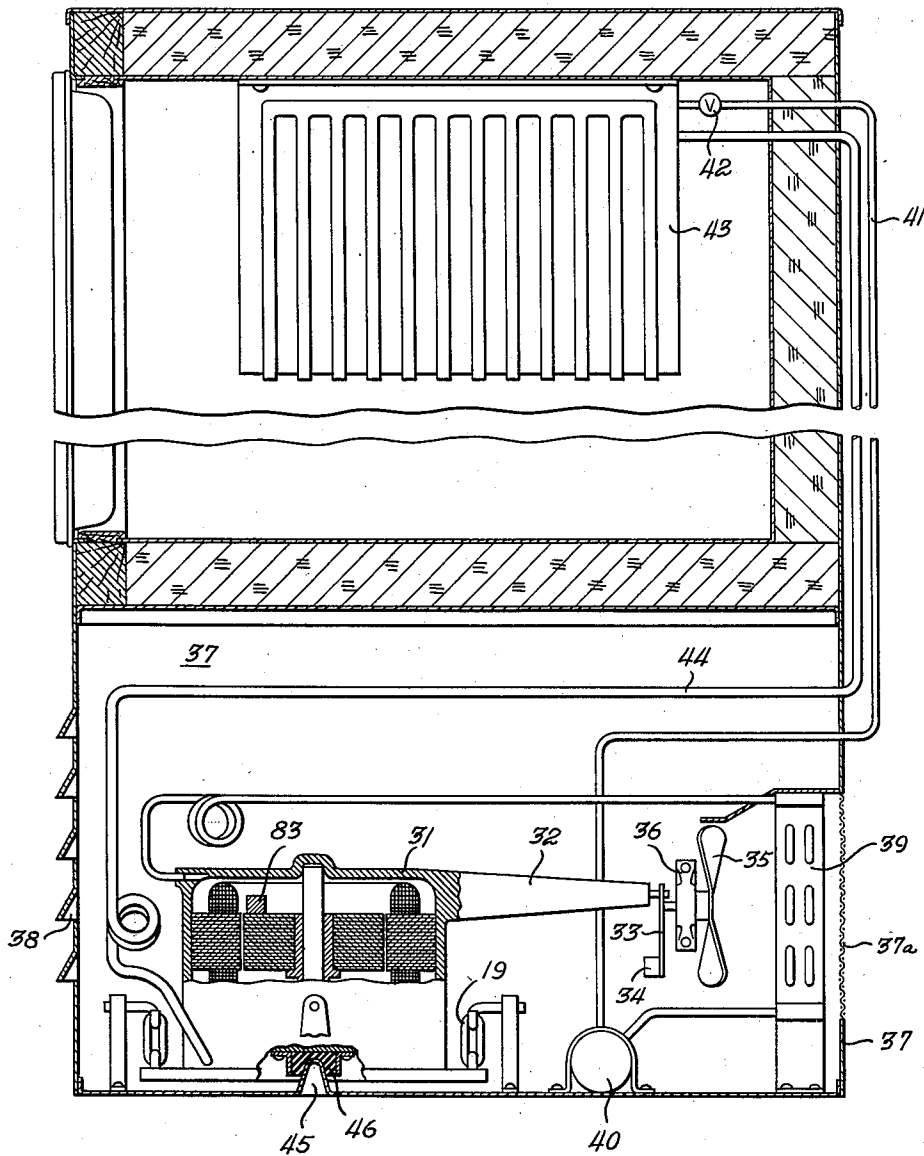


Fig. 4

INVENTOR.
Harry F. Smith,

BY
Spencer Handman & John
ATTORNEYS

Sept. 24, 1940.

H. F. SMITH

2,215,534

REFRIGERATING APPARATUS

Original Filed April 22, 1936

3 Sheets-Sheet 3

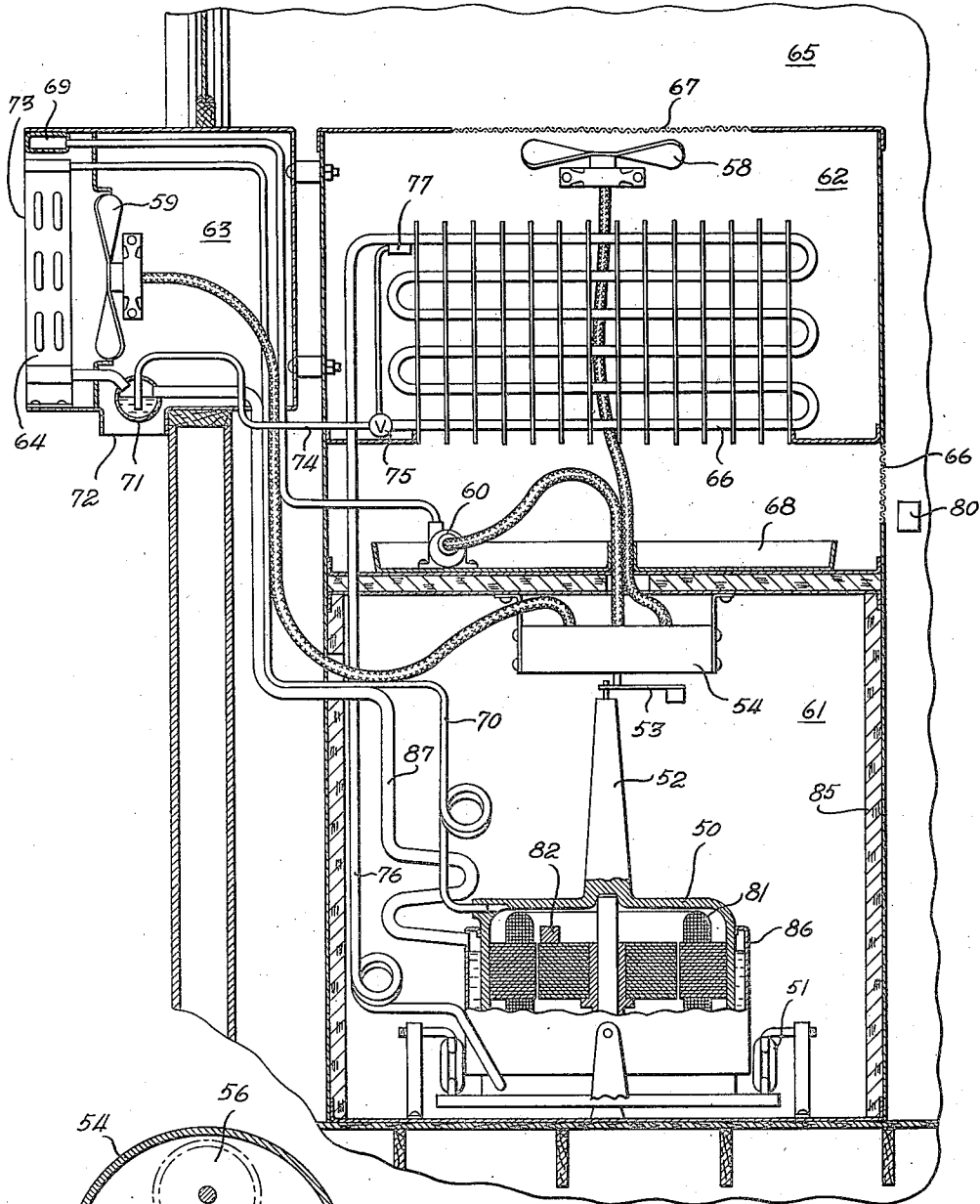


Fig. 5

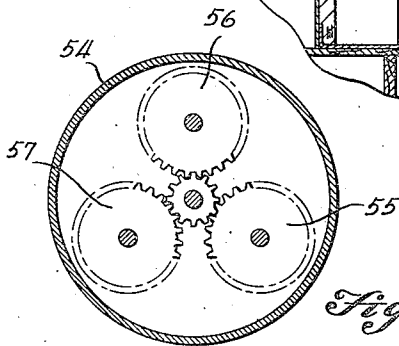


Fig. 6

Harry F. Smith, INVENTOR.

Spencer Hardman & John
ATTORNEYS

UNITED STATES PATENT OFFICE

2,215,534

REFRIGERATING APPARATUS

Harry F. Smith, Dayton, Ohio, assignor to General Motors Corporation, Dayton, Ohio, a corporation of Delaware

Application April 22, 1936, Serial No. 75,795
Renewed December 23, 1937

9 Claims. (Cl. 62—115)

This invention relates to refrigerating apparatus and other apparatus wherein it is desired to drive a fan, or similar member, by means of the vibrations or gyrations of one of the elements of the apparatus.

An object of this invention is to provide a drive for a fan, or similar member, without the necessity of connecting it directly to the prime mover.

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 diagrammatic representation of an apparatus embodying features of my invention;

Fig. 2 is a portion of the apparatus shown in Fig. 1, but showing a modified form of fan drive;

Fig. 3 is an enlarged view of a detail of Fig. 2;

Fig. 4 is a diagrammatic representation of a slightly modified form of the invention;

Fig. 5 is a diagrammatic representation of a further modification; and

Fig. 6 is a cross section of a portion of the apparatus shown in Fig. 5.

An apparatus embodying features of my invention may include, in general, a system in which a member is directly driven by a prime mover, such as an electric motor, in such a manner that vibrations or gyrations are set up in the apparatus. These vibrations or gyrations are utilized to drive a member, such as a fan, for blowing air over parts of the apparatus, or they may be used, in a refrigerating or other apparatus, to drive any other member desired. Thus, in the modifications shown in Figs. 1, 2 and 3, the system may be a refrigerating system which includes the motor-compressor unit 10, discharging compressed refrigerant into a condenser 11 for a receiver 12 from whence the liquid refrigerant flows through the line 13, through an expansion valve 14 to an evaporator 15. The evaporated refrigerant returns through the line 16 to the motor-compressor unit 10. The motor-compressor unit 10 preferably is a sealed casing or frame within which are placed an electric motor 17 and a compressor 18. When the motor and compressor operate, they cause the unit 10 to vibrate or gyrate on the resilient or linked supports 19.

The vibrations or gyrations of the unit 10 are utilized to drive the fan 20 which in turn causes air to flow over the condenser 11 and unit 10, the air entering at 21 and being discharged at 22.

In the modification shown in Fig. 1, the fan 20

is mounted on a bracket 23, carried by the cabinet, and the unit 10 is provided with an extension 24 which has a bearing in the crank 25 and causes the fan 20 to rotate.

In this and other modifications of a refrigerating apparatus, the motor-compressor unit is connected to the other elements of the refrigerating apparatus by resilient tubes so that the motor-compressor unit can vibrate or gyrate freely independently of the other parts of the apparatus. This resilient tubing preferably has coils 26 and 27 to increase the inherent resiliency of the connections.

In the modification shown in Figs. 2 and 3, the motor-compressor unit 10a, which is otherwise connected to a refrigerating apparatus in a manner similar to Fig. 1, has the condenser fan 20a directly mounted thereon. This fan is provided with a centrifugal weight 30 in such a manner that the gyrations of the motor-compressor unit 10a cause the fan to rotate by the centrifugal force created due to the eccentric weight 30.

In the modification shown in Fig. 4, the motor-compressor unit 31 may be similar to the unit 10 of Fig. 1, but the extension 32 is directed laterally rather than upwardly. This extension is connected to the crank 33 having a counter-weight 34, which in turn drives the condenser fan 35 which is mounted on the bracket 36 in the cabinet 37. The gyrations of the unit 31 cause the fan 35 to turn causing air to enter at 37a and to be discharged at 38. The unit 31 discharges refrigerant into the condenser 39 having a receiver 40. The liquid refrigerant flows through the line 41 and through expansion valve 42 into evaporator 43, the evaporated refrigerant returning through the line 44 to the unit 31.

In the modification shown in Fig. 4, and in the other modifications, the motor-compressor unit may be mounted on a central support 45 by means of a rubber cushion 46 placed underneath the unit to induce a circular gyration in the upper part of the unit and thus adapted for driving, by circular motion, the condenser fan or other element desired to be driven. The links 49 and 51 on the side of the unit preferably are resilient, so that the unit can gyrate freely.

In the modification shown in Fig. 5, an arrangement is shown whereby other elements, besides the condenser fan, may be driven by the power derived from the gyrations of the unit. Thus, the motor-compressor unit 50 may be mounted to gyrate on the resilient supports 51 and a central support as shown in Fig. 4. The unit is provided with an extension 52 which

drives the crank 53 extending from the gear box 54. The gear box 54 is provided with a plurality of gears 55, 56 and 57, which are connected by flexible drives to the fans 58 and 59 and the water pump 60.

The motor-compressor unit shown in Fig. 5 may be connected to an air conditioning apparatus of the unitary type which is adapted to be placed in a room. This may include a cabinet having a machinery compartment 61 and an air cooling compartment 62. In addition, a window cabinet 63 is provided which is adapted to rest on the sill of the window and which contains the condenser 64 of the refrigerating apparatus. The air to be conditioned for the room 65 enters either from the room 65 itself at 66 or from outside the room (not shown) or from both inside or outside the room (not shown). This air flows over the evaporator 66 where it is cooled and dehumidified and flows under the impulse of the fan 58 through the outlet 67 into the room. The moisture removed from the air drops into a pan 68 from whence it is pumped by the pump 60 to the distributor head 69 over the condenser 64 where this moisture is evaporated by the heat of the condenser. The refrigerant compressed in the unit 50 is delivered through the line 70 to the condenser 64, from whence it flows in liquid form, into the receiver 71. The condenser 64 is cooled by means of air blown by the fan 59, the air entering the cabinet 63 at 72 and being discharged at 73.

The liquid refrigerant from the receiver 71 flows through the line 74 and through the expansion valve 75 into the evaporator 66 and returns through the line 76 to the unit 50. The valve 75 preferably is of the type which delivers liquid refrigerant to the evaporator 66 whenever the pressure therein is reduced below a predetermined limit. It is also provided with a thermostatic bulb 77 which automatically throttles the valve when the refrigerating effect reaches the outlet of the evaporator. The calibration of the valve 75 is such that the temperature of the evaporator 66 is above the freezing point of water, but is sufficiently cold to dehumidify and properly cool the air.

The unit 50 may be manually or automatically controlled in accordance with conditions created by the apparatus. Thus, a thermostat, humidostat, or an instrument 80 which is responsive to both temperature and relative humidity, may be placed in a position to be influenced by the conditions in the room 65, such as adjacent the inlet 66. This control 80 may start and stop the unit 50 by opening and closing a switch which controls the electric circuit to the motor 81 of the unit 50.

In all of the modifications, the motor-compressor unit is so constructed that it inherently has a gyrating motion. If necessary, a weight 82 in Fig. 5, or 83 in Fig. 4, is provided to impart such gyrations if the other parts of the unit do not inherently produce such vibrations.

In the modification shown in Fig. 5, it may be desirable to cool the compartment 61, since the same is insulated by the insulation 85. This may be accomplished by providing a reservoir 86 around the unit 50. The amount of refrigerant in the refrigerant system is such that a certain amount of liquid in the receiver 71 overflows through the pipe 87 into the reservoir 86. This refrigerant is then evaporated by the heat generated in the unit 50, and the vapors thus formed flow up through the line 87 and are condensed in the condenser 64. The liquid thus condensed re-

turns by gravity through the line 87 in a recurring cycle to remove heat from the unit 50 and the compartment 61.

In the modification shown in Figs. 1, 2 and 4, the motor-compressor unit may be started and stopped by a thermostat placed in the compartment which is cooled by the evaporator.

In all of the modifications, the control may be manual instead of automatic. A manually operable switch may be provided which controls the circuit to the motor, and the unit is adapted to operate continuously until turned off by opening the switch.

It will be seen that this invention has many uses. It may be used wherever it is desired to transmit a rotary motion through a casing without passing the shaft therethrough.

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. A refrigerating system including a motor and compressor mounted on a rigid frame, a condenser member and evaporator member in refrigerant circuit with said compressor, and a fan circulating air over said evaporator member and being actuated by movement of said frame.

2. A motor-compressor unit including a casing, a motor and compressor within said casing, a support for said casing permitting said casing to vibrate, a fan outside said casing, means for mounting said fan for rotation in a plane at an angle to the plane of rotation of said motor, and means to operate said fan by vibrations of said casing.

3. A refrigerating system including a motor and compressor mounted on a rigid frame within a room, an evaporator member within said room, a condenser member outside said room, and a fan circulating air over said condenser member and being actuated by movement of said frame.

4. A refrigerating system including a hermetically sealed motor and compressor mounted on a frame, a condenser member and evaporator member in refrigerant circuit with said compressor, and means for circulating condensate drained from said evaporator over said condenser member and being actuated by movement of said frame.

5. A refrigerating system including a hermetically sealed motor and compressor mounted on a rigid frame, a condenser member and evaporator member in refrigerant circuit with said compressor, and means for circulating cooling liquid over said condenser and being actuated by movement of said frame.

6. A refrigerating system including a motor and compressor mounted on a rigid frame, a condenser member and an evaporator member in refrigerant circuit with said compressor, a fan circulating air over said evaporator member and being actuated by movement of said frame, and a second fan circulating air over said condenser member and being actuated by movement of said frame.

7. A refrigerating system including motor-compressor mechanism, a casing therefor, a condenser and evaporator in refrigerant flow relationship with said motor-compressor mechanism, and a fan rotatable about an axis at an angle to the axis of rotation of said motor-compressor mechanism and actuated by movement of said casing.

8. In a refrigerating system, a hermetically sealed motor-compressor unit, an evaporator, a condenser, fluid flow connections between said evaporator, condenser and compressor, means enclosing said motor-compressor and condenser units, means for circulating air into said enclosure, a flue for directing the air out of said enclosure, and a fan member circulating air through said flue and being actuated by movement of said motor-compressor unit.

9. In combination, a prime mover unit having a part rotatable about an axis, a frame secured to said unit, means for mounting said frame permitting gyrations of said frame, said means including a rubber cushion substantially in alignment with said axis, and mechanism operated by gyrations of said frame.

HARRY F. SMITH. 10