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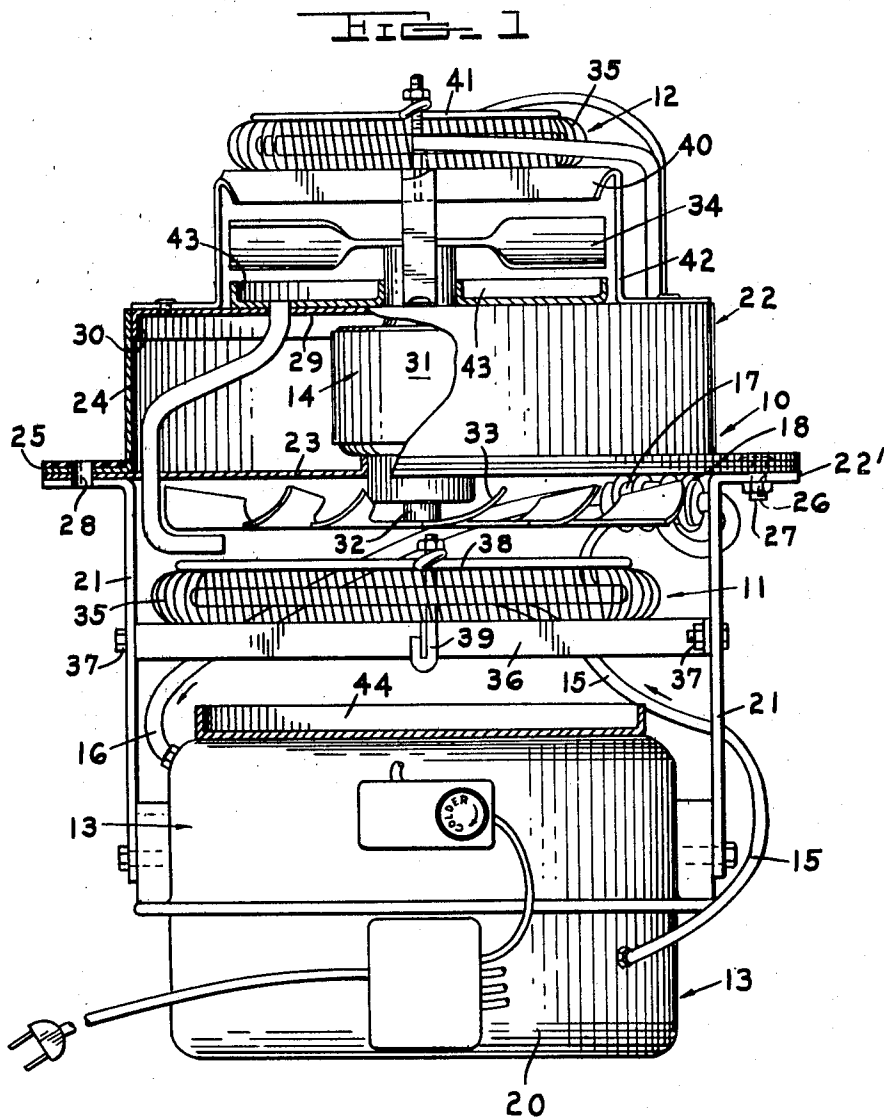
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2,561,278

REMOVABLE REFRIGERATING APPARATUS

Filed Aug. 2, 1948

2 Sheets-Sheet 1



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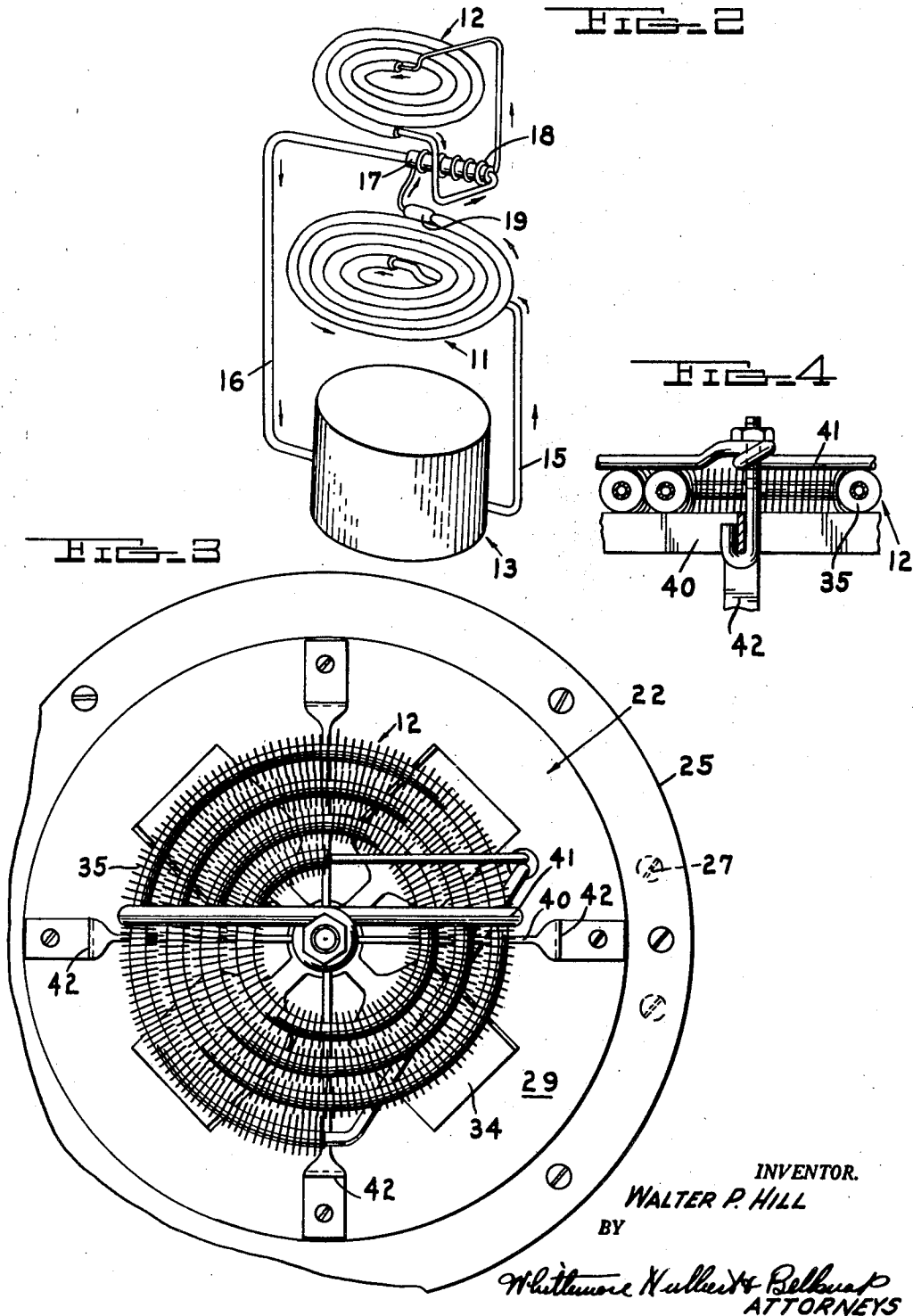
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UNITED STATES PATENT OFFICE

2,561,278

REMOVABLE REFRIGERATING APPARATUS

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6 Claims. (Cl. 62-140)

1

This invention relates to refrigerating systems of the closed circuit type embodying a motor-compressor unit, a condenser and an evaporator.

One of the objects of this invention is to provide a refrigerating system wherein the foregoing principal units including their fluid connections form a simple, compact assembly capable of being readily inserted into and removed from a confined space within a refrigerator cabinet.

Another object of this invention is to provide a refrigerating system comprising an evaporator, a condenser, supporting means for securing the evaporator and condenser in assembled relationship, and means carried by the supporting means in a position between the evaporator and condenser for forcing air in opposite directions over the latter units.

Still another object of this invention is to provide a refrigerating system wherein both the condenser and evaporator comprise a length of tubing coiled to form a substantially flat spiral, and having an integral fin extending helically around the same. Thus the area of the radiating surfaces available in condensers and evaporators of a given size is considerable, and the overall dimension of these units may be substantially reduced while providing more, or at least the same, area of radiating surface existing in the much larger condensers and evaporators of orthodox design.

A further object of this invention which also contributes materially to reducing the overall size of the refrigerating system assembly without sacrificing heat transfer capacity is to support a pair of fans between the evaporator and condenser in such positions that a substantial volume of air is moved over the latter units in a relatively short time.

The foregoing as well as other objects will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings, wherein:

Figure 1 is a side elevational view partly in section of a unitary refrigerating system embodying the features of this invention;

Figure 2 is a semi-diagrammatic view of the assembly shown in Figure 1;

Figure 3 is a plan view of the assembly shown in Figure 1; and

Figure 4 is a detailed sectional view of a part of the assembly.

The unitary refrigerating assembly about to be described may be used to advantage in connection with practically any type of refrigerator cabinet wherein the space available for accommo-

2

dating the assembly is of a limited nature. One specific use for such an assembly is in connection with the cabinet featured in my copending application Serial No. 42,045, filed August 2, 1948; wherein a domestic refrigerator cabinet is shown having a restricted space beneath the food storage area for receiving the assembly.

With the above in view, reference is now made more in detail to the drawings, wherein the numeral 10 designates generally a unitary refrigerating system comprising a condenser 11, an evaporator 12, a motor-compressor unit 13, and air circulating means 14. As shown in Figure 2 of the drawings, the motor-compressor 13 is of the hermetically sealed type used extensively with present day domestic refrigerating machines. The exhaust or pressure side of the compressor is connected to one side of the condenser by a conduit 15 and the suction side of the compressor is connected by a conduit 16 to an accumulator 17, which in turn, is connected to the suction end of the evaporator 12. The receiving end of the evaporator 12 is connected to one end of a capillary tube 18 having the opposite end connected to the pressure side of the condenser 11. The portion of the capillary tube 18 intermediate the ends is wound around the accumulator 15 in heat conduction relation thereto. A dryer 19 is shown in Figure 2 of the drawings as connected in the circuit between the pressure side of the condenser 11 and capillary 18. In some instances it may be desirable to locate the dryer in the low pressure side of the circuit between the capillary 18 and the intake end of the evaporator 12, where it supplements the capacity of the evaporator, while in other instances, it may be found advantageous to provide a dryer in both the low and high pressure sides of the system.

As stated above the motor-compressor unit 13 is preferably of the hermetically sealed type, and may be of any acceptable design. The specific construction of this unit forms no part of this invention, and is not described in detail herein. It will suffice to point out that this unit comprises a compressor and a suitable electric motor embodied within a housing 20. Secured to opposite sides of the housing are vertically extending members 21 having laterally outwardly extending flanges 22' at the upper ends for supporting a casing 22. The casing 22 may be of any suitable construction, and is shown in Figure 1 of the drawings as having a bottom wall 23 and a circular side wall 24 formed with a laterally outwardly extending flange 25 seated on the bottom wall 23. The flanges 22', flange

3

25 and interposed peripheral portion of the wall 23 are formed with two groups of registering openings therethrough. One group of openings 26 receive the fastener elements 27 for securing the parts together, and the other group of openings 28 are adapted to receive fastener elements for securing the assembly in position within a refrigerator cabinet. The top of the casing is closed by a wall 29 having a depending annular flange 30 at the periphery adapted to fit within the upper end of the side wall 24 and to be removably secured thereto.

The air circulating means 14 is supported on the casing 22. This means comprises an electric motor 31 having a drive shaft 32 and positioned within the casing with the drive shaft extending vertically. The upper end of the drive shaft projects through an opening in the top wall 29 of the casing and the lower end of the drive shaft extends downwardly through an opening in the bottom wall of the casing. A fan 33 is secured to the lower end of the drive shaft 32, and is of a design to force air downwardly upon rotation of the shaft in one direction. A second fan 34 is secured to the upper end of the drive shaft 32, and is designed to force air upwardly upon rotation of the shaft in the direction aforesaid.

The condenser 11 is supported between the fan 33 and motor-compressor unit 13 in the direct path of the air supplied by the fan 33. The evaporator 12 is supported on the top wall 29 of the casing 22 above the fan 34 in a position where the air discharged by the fan 34 passes upwardly directly over the radiating surface area of the evaporator. Both the condenser and evaporator are formed of a length of tubing coiled to provide a substantially flat spiral having adjacent convolutions spaced from each other. Also the tubing is formed with an integral helically extending fin 35 of substantial height. As shown particularly in Figure 3 of the drawings, the fins occupy the spaces between the adjacent convolutions of the coils, and greatly increase the radiating surfaces of both the condenser and evaporator. The overall diameter of the condenser approximates the diameter of the fan 33 and the overall diameter of the evaporator corresponds generally to the diameter of the fan 34, so that practically all of the air supplied by the fan comes in contact with some part of the radiating surfaces of the condenser and evaporator, respectively. The above construction is preferred because it enables obtaining a considerably greater area of radiating surface with a unit substantially smaller in overall dimension than units heretofore employed. This is especially advantageous in the present instance, where all of the parts are secured together in a compact assembly.

In detail the condenser 11 is seated on a support in the form of a spider 36 secured to the vertical members 21 by fastener elements 37. The condenser is clamped to the top of the spider 36 by a clamp 38 comprising a bar resting on the top of the condenser and anchored on the spider by a fastener 39. The evaporator is positioned directly above the fan 34 and is secured to a spider 40 by a clamp 41. The spider 40 has depending legs 42 at the free ends secured to the top wall 29 of the casing 22 and clamp 41 is similar to the clamp 38 previously described.

It follows from the foregoing that all of the instrumentalities making up the refrigerating sys-

4

tem 10 are secured together in a single, compact unitary assembly. This assembly may be installed into or removed from a limited space within a refrigerator cabinet and has relatively short fluid connections. It will be noted that the suction line 16 extending from the evaporator to the suction side of the compressor is unusually short and does not extend into the wall insulation of the cabinet as is the case in orthodox refrigerator construction. Thus the installation is not only greatly simplified and the cost substantially reduced, but in addition, the entire space available within the walls of the cabinet may be occupied by insulating material.

In the operation of the refrigerating system, the air passing over the evaporator 12 has a tendency to evaporate any ice that may accumulate on the radiating surface of the evaporator and increase the humidity of this air as it is discharged into the food storage area of the cabinet. Although this action very definitely reduces the defrosting cycle and in some instances may render defrosting unnecessary, nevertheless, provision is made herein for dissipating the moisture resulting from defrosting the evaporator. For the purpose of illustration, a pan 43 is positioned immediately below the evaporator fan 34 for collecting moisture draining from the evaporator. The moisture is drained from this pan to a second pan 44 suitably supported below the condenser 11. This moisture assists in cooling the condenser and is eventually dissipated within the room so that provision need not be made for draining this moisture from the cabinet within which the assembly is installed.

While in describing the present invention, particular stress has been placed upon supporting the refrigerating assembly in an upright position within a cabinet construction, nevertheless, it will be noted that the construction is such as to permit the assembly to be supported in a horizontal or in any desired angular position. For example in utilizing the assembly for the purpose of refrigerating sharp freeze-type cabinets, it may be desirable to support the assembly in a horizontal position, and this may be accomplished without altering the construction of the assembly.

What I claim as my invention is:

1. In refrigerating apparatus, a cooling unit having provision for circulating a refrigerant therethrough, refrigerant supplying means including a condenser and a compressor spaced from the cooling unit, a fan positioned adjacent the cooling unit for forcibly moving air over the latter, a second fan positioned adjacent the condenser for forcibly moving air over the condenser, driving means for the fans positioned between the cooling unit and refrigerant supplying means, an enclosure for the driving means and forming a partition separating the cooling unit from the refrigerant supplying means, and means for securing the cooling unit, refrigerant supplying means and fan driving means to said partition to provide a unitary assembly.

2. The refrigerating apparatus defined in claim 1 having means for conducting moisture from the cooling unit side of the enclosure to the condenser side of said enclosure and for discharging the moisture over the condenser.

3. In refrigerating apparatus a cooling unit having provision for circulating a refrigerant therethrough, refrigerant supplying means including a condenser and a motor-compressor

5

unit, a casing interposed between the cooling unit and refrigerant supplying means to separate one from the other, a fan positioned between the cooling unit and adjacent side of the casing, a second fan positioned between the opposite side of the casing and refrigerant supplying means, a motor enclosed within the casing and provided with a drive shaft having the opposite ends respectively extending through openings in the sides aforesaid of the casing and respectively coupled to the fans, and means for securing the cooling unit, refrigerant supplying means and motor to said casing to provide a unitary assembly.

4. The refrigerating apparatus defined in claim 3 wherein the cooling unit and condenser are respectively in the form of a coil of finned tubing positioned with the centers of the coils in substantial alignment with the axis of rotation of the fans.

5. In refrigerating apparatus, a casing having top, bottom and side walls, a cooling unit positioned above the top wall of the casing, a fan located above the top wall of the casing in a position to forcibly move air over the cooling unit, a condenser and motor-compressor unit positioned below the bottom wall of the casing, a fan located below the bottom wall of the casing in a position to forcibly move air over the con-

6

denser, driving means for the fans housed within the casing and connected to said fans, and means for securing the cooling unit, condenser, motor-compressor unit and fan driving means to the casing to provide a unitary structure.

6. The refrigerating apparatus defined in claim 5 having means on the top wall of the casing for collecting moisture draining from the cooling unit and having means for discharging the moisture into the space below the bottom wall of the casing and directly above the condenser.

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