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REFRIGERATING APPARATUS

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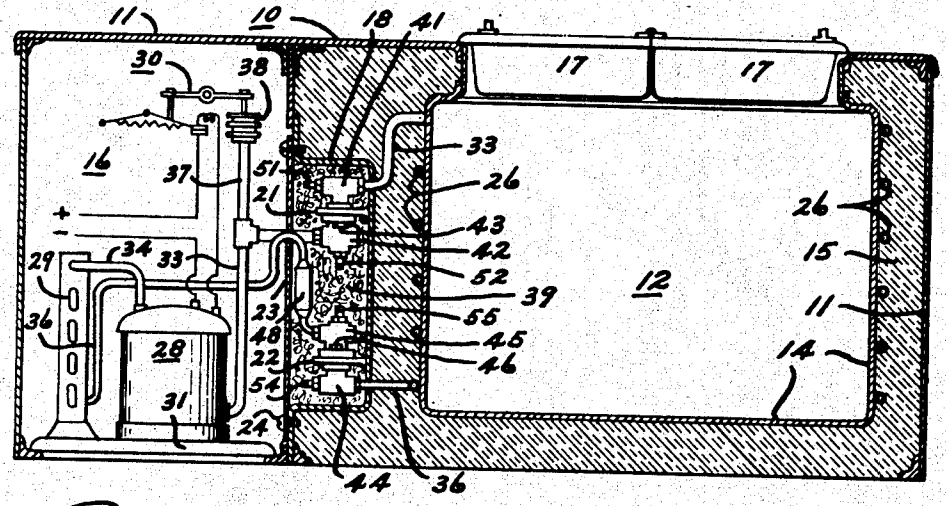


Fig. 1

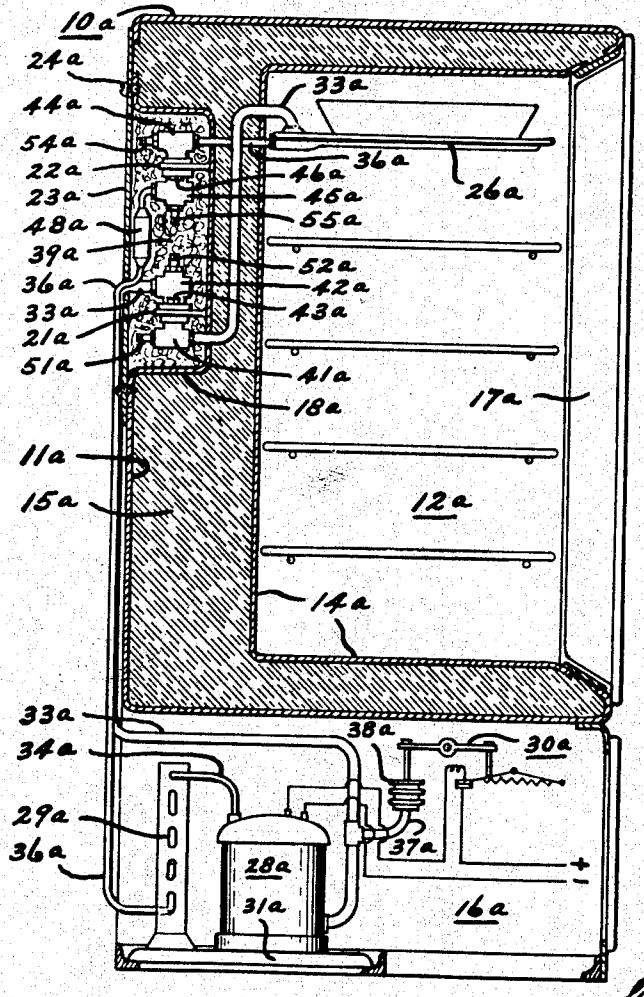


Fig. 2

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REFRIGERATING APPARATUS

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2 Claims. (Cl. 62—116)

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My invention relates to refrigerating apparatus of the type employing a hermetically sealed refrigerating system that cannot, as a practical matter, be serviced on the premises where the refrigerator is installed.

In such apparatuses, it has been customary to mount the sealed refrigerating system in the refrigerator cabinet in such a manner that the entire system can be removed as a unit and returned to the factory or service center for repair. This practice has not been entirely satisfactory and in addition has its disadvantages. It complicates and increases the cost of a refrigerator cabinet construction in that it necessitates the provision of an additional sealed opening in a wall structure of the cabinet through which the evaporator may be removed. In other structures it necessitates some special construction such as the provision of grooves or recesses in the door jamb, behind a removable door molding, for the reception of conduits connecting the evaporator to the motor-compressor. In these structures proper sealing of the refrigerated chamber, against heat leakage, is impaired by the breaking of the seal between detachable parts of the cabinet construction when the system is removed and, furthermore, such structures all limit the size and shape of an evaporator such that it can be removed as required.

I propose to overcome the disadvantages of such present day refrigerators by providing means so placed in a hermetically sealed refrigerating system with respect to the evaporator thereof that the entire high pressure side of the system including the motor-compressor, condenser and the refrigerant flow control means may be separated from the evaporator. In this manner I provide for the removal from the apparatus and the return to the factory or service center of that portion of the system containing all the elements wherein trouble, which causes failure of the refrigerating system, usually occurs. By reason of my arrangement, I also eliminate all limitations heretofore placed upon the design and size of the evaporator, for, since it is unnecessary to remove the evaporator, it may be fixed within or built-in to form a permanent part of the refrigerator.

In the drawing:

Fig. 1 is a vertical sectional view through a refrigerating apparatus having a closed refrigerating system of the present invention associated therewith; and

Fig. 2 is a view similar to Fig. 1 showing my

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invention embodied in household refrigerating apparatus.

Referring now to the drawing for illustrating my invention, I have shown in Fig. 1 thereof a refrigerating apparatus of the ice cream or frozen food storage type. This apparatus comprises a cabinet 10 enclosed in metal walls 11 and provided with a storage chamber 12 formed by a metal liner 14. Any suitable insulating material 15 may surround the liner 14 for insulating the chamber 12. The cabinet 10 also has a machine compartment 16 formed therein adjacent chamber 12. A door or doors 17 may normally close an access opening, formed in the cabinet top wall, leading to the interior of chamber 12. The wall of cabinet 10 intermediate chamber 12 and machine compartment 16 is provided with a cavity formed by a box-like member 18 having two supporting ledges 21 and 22 for a purpose to be presently described. This cavity may be closed by a removable plate 23 or a plurality of such removable plates secured to member 18 by screws 24.

A closed or hermetically sealed refrigerating system associated with cabinet 10 includes an evaporator 26, in the form of a conduit coil, secured to and extending over walls of the liner member 14 of chamber 12. This evaporator is fixed or built-in the cabinet 10 as distingushed from a structure wherein the evaporator can be removed from the cabinet. The evaporator 26 is connected by conduits with a refrigerant liquefying and circulating unit removably located within the machine compartment 16. The refrigerant liquefying and circulating unit comprises a sealed casing 28 housing a conventional motor directly connected to a rotary or the like compressor. The unit also comprises a condenser 29 and a conventional snap acting switch 30 shown diagrammatically. Casing 28 and condenser 29 are mounted upon a base 31 which removably supports these elements within the compartment 16 so as to provide for the removability of the refrigerant liquefying and circulating unit as will be hereinafter described. Operation of the motor-compressor within casing 28 causes evaporated refrigerant to be withdrawn from evaporator 26 through a conduit 33 and circulated into the casing 28. The compressor compresses the refrigerant vapor entering the casing 28 and forwards same under pressure, through a conduit 34, into the condenser 29. The compressed refrigerant is cooled in any suitable or conventional manner in condenser 29 and is liquefied. Liquid refrigerant is conveyed, by a con-

duit 36, from condenser 29 into the lower portion of evaporator 26 for reevaporation therein to therefore remove heat from the storage chamber 12. The motor-compressor within casing 28 may be started and stopped in any well-known or conventional manner such as in response to the pressure in the low pressure side or conduit 33 of the closed refrigerating system. Thus a pipe line 37 communicating with and branching off conduit 33 extends to an expansible and contractable bellows 38 of the switch 30 which controls the electric circuit to the motor and consequently controls operation of the motor-compressor within the casing 28.

In the present refrigerating system there are two valved couplings, of any suitable or conventional construction, interposed in each of the conduits 33 and 36 and these valved couplings are located in the cavity formed in the insulating wall extending between the chamber 12 and compartment 16. The cavity formed by box-like member 18 is filled with any suitable and removable insulating material 39 disposed or packed about the valved couplings. One valved coupling 41 is stationarily secured to the support ledge 21 on member 18 and communicates with another valved coupling 42 which is removably mounted to the ledge 21 by bolts or the like 43. A valved coupling 44, corresponding to coupling 41, is stationarily secured to the support ledge 22 on member 18 and communicates with another valved coupling 45 which is removably mounted to the ledge 22 by bolts or the like 46. It will be noted that in the present refrigerating system the means for controlling the flow of liquid refrigerant into the evaporator 26 is in the form of a restrictor 48 interposed in conduit 36 in advance of the removable valve coupling 45. Restrictor 48 may be of any conventional construction and the type having a relatively long continuously open passage therethrough of small cross sectional area and of spiral or any other desired form. Liquid refrigerant passing through restrictor 48 expands through the valved couplings 45 and 44 into the evaporator 26 and for this reason it is desired to locate the valved couplings 45 and 44 as near the inlet to evaporator 26 as is possible.

The valved couplings are adapted to divide the closed refrigerating system of the refrigerating apparatus disclosed in Fig. 1 into two portions. The one portion or evaporator 26 of the refrigerating system is fixed or permanently mounted in the cabinet 10 as a part thereof while the other portion or the refrigerant liquefying and circulating unit is adapted to be removable from the apparatus. The feature of including the refrigerant flow control device or restrictor 48 in the removable portion of the refrigerating system is important for reasons hereinabove pointed out and which will now be described more in detail. Should the refrigerant liquefying and circulating unit become inoperative, due to damage internally of the sealed casing 28, this unit can be readily removed from the refrigerating system without losing any appreciable amount of refrigerant from the system and without impairing proper operation of the system when the unit is repaired and replaced. For example, should it be necessary to replace the refrigerant liquefying and circulating unit, plate or plates 23 are removed and enough of the loose insulation 39 taken out of the cavity, formed by member 18, to permit access to the stems 51, 52, 54 and 55 of valves located in the valved couplings 41, 42, 44 and 45 respectively. The stems of these valves are rotated, by a key or the like, so as to close all of the valves within the four valved couplings. Thereafter bolts 43 are removed and coupling 42 is detached from coupling 41 and bolts 46 are removed to detach coupling 45 from coupling 44. Then the one portion or the refrigerant liquefying and circulating unit, including valved couplings 42 and 45, switch 30, base 31, upon which the motor-compressor casing 28 and the condenser 29 is mounted, and restrictor 48 of the refrigerating system is separated from evaporator 26 and removed from compartment 16 of cabinet 10 of the apparatus. By including the restrictor 48 in the removable portion of the system a source of deposit or of accumulation for contaminating substance may be returned to the factory with the removable unit where this element can be thoroughly cleaned at the time a burned out motor or other damaged part is repaired and/or replaced. Upon reversing the operations, described, in separating and removing the removable portion of the refrigerating system from the fixed portion thereof within the apparatus, a replacement unit can be readily installed in the refrigerating apparatus.

In Fig. 2 I have shown my invention embodied in a household refrigerating apparatus wherein the unit or machine compartment is below a food storage chamber and have illustrated the various similar or corresponding elements of the apparatus shown in Fig. 1 by reference characters having letter "*a*" affixed thereto. It will be noted that in the refrigerating apparatus shown in Fig. 2, evaporator 26*a* is of the embossed sheet metal type and may be of any suitable or conventional design. Evaporator 26*a* is in accordance with my invention, adapted to be fixed or permanently built-in the chamber 12*a* as distinguished from conventional refrigerators wherein the evaporator may be removably mounted in the cooling chamber. This modification of the showing of the adaptability of my invention is illustrated for the reason that advantages afforded in practicing the invention permits unlimited possibilities in designs of refrigerating apparatus and particularly household refrigerators. For example, many different arrangements of interior construction of household refrigerators can be obtained by my making the restrictor removable with a separable and removable portion of the refrigerating system which thus permits the evaporator to be fixed or permanently built-in a cabinet as a part of the interior structure of the cooling compartment thereof.

From the foregoing, it will be seen that I have, by locating the refrigerant flow control device or restrictor in that portion of a separable closed or hermetically sealed refrigerating system which is removable from a portion within the refrigerating apparatus, provided an improved apparatus. My invention not only facilitates the servicing of installations of refrigerating apparatus but also eliminates recurrence of failure of elements of the refrigerating system associated therewith by the fact that a replacement unit is factory repaired with especially designed fixtures which insures thorough cleaning of the parts of the system, which parts cannot be properly cleaned elsewhere with equipment ordinarily carried by a service man, such for example, as at the point of installation of the apparatus. My improvement permits the construction of refrigerator cabinets to be greatly simplified and manufactured at lower costs while at the same time

making it possible to fix or permanently mount evaporators of various sizes and shapes within such cabinets without complicating or impairing proper servicing of refrigerating systems associated with the refrigerator cabinets.

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. A refrigerating apparatus comprising in combination, a cabinet having a chamber therein to be cooled, a closed refrigerating system associated with said apparatus, said refrigerating system including an evaporator fixed within said cabinet for cooling said chamber, a refrigerant liquefying and circulating unit connected by conduits with said evaporator and means for controlling the flow of refrigerant from said unit to said evaporator, means interposed in said conduits for closing off each conduit at two adjacent points and for permitting separation of said unit from said evaporator intermediate said points, said unit being removable from said apparatus when said separation is effected, and said first named means being interposed in one of said conduits between said unit and said last named means and being removable along with said unit from said apparatus.

2. A refrigerating apparatus comprising in combination, a cabinet having a chamber therein to be cooled, a closed refrigerating system associated with said apparatus, said refrigerating system including an evaporator fixed within said cabinet for cooling said chamber, a refrigerant liquefying and circulating unit connected by conduits with said evaporator and a continuously open restrictor for controlling the flow of refrigerant from said unit to said evaporator, means interposed in said conduits for closing off each conduit at two adjacent points and for permitting separation of said unit from said evaporator intermediate said points, said unit being removable from said apparatus when said separation is effected, and said restrictor being interposed in one of said conduits between said unit and said means and being removable along with said unit from said apparatus.

SYLVESTER M. SCHWELLER.