Feb. 6, 1951 G. MUFFLY 2,540,343

REFRIGERATING MECHANISM

Filed Oct. 9, 1945 2 Sheets-Sheet 1

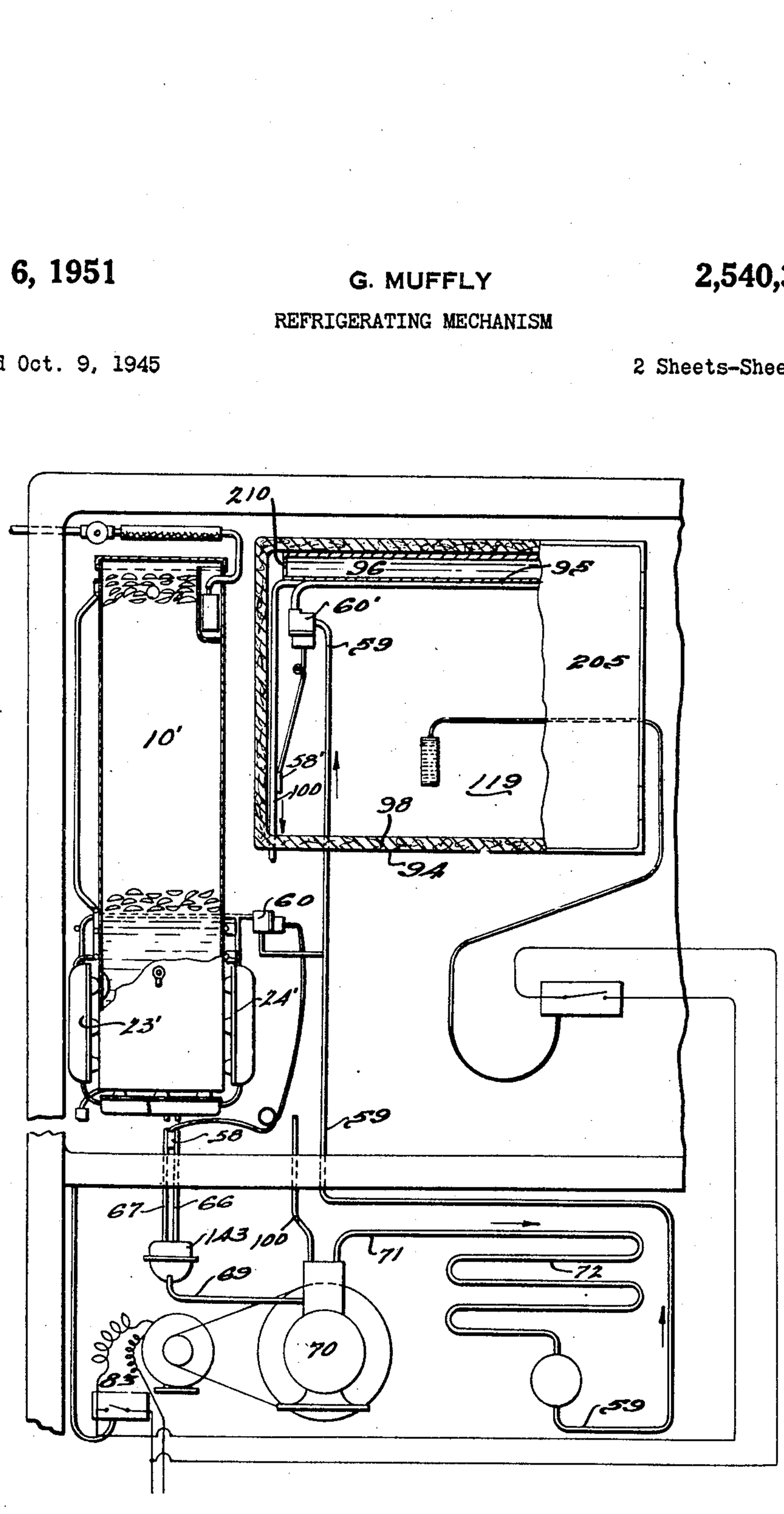

FIG. 1

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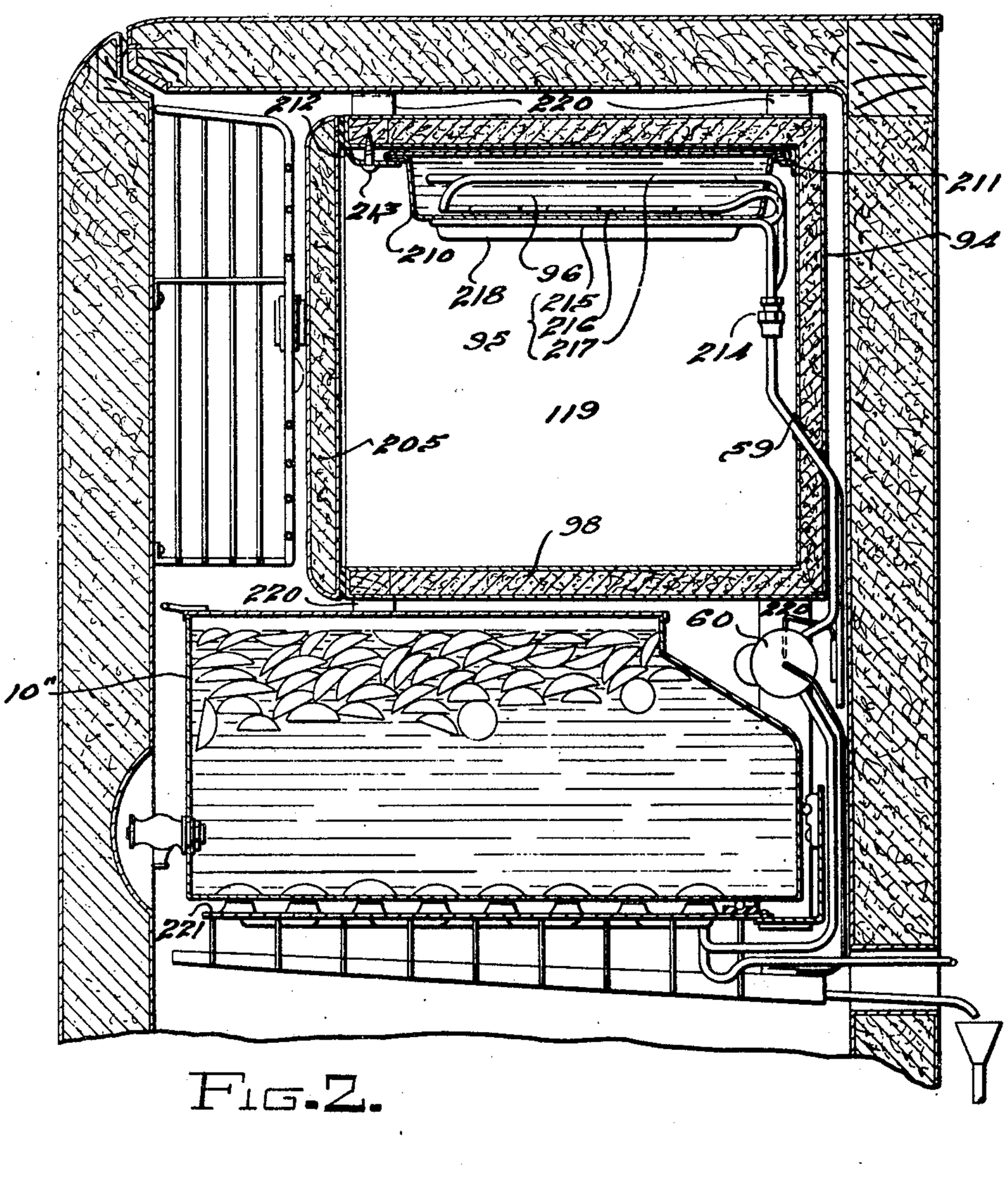

FIG. 2.

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REFRIGERATING MECHANISM

Glenn Muffly, Springfield, Ohio

Application October 9, 1945, Serial No. 621,240

4 Claims. (Cl. 62—95)

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This invention relates to refrigerating mechanism and particularly to the use of latent heat hold-over means in connection with systems including two or move evaporators. The application relates to the same subject matter as my application, Serial No. 237,629, filed October 29 1938, which matured into U. S. Patent No. 2,359,780, October 10, 1944. Reference is made to this issued patent for additional details of the herein disclosed mechanisms and their uses.

An object of the present invention is to provide means for maintaining one zone of a refrigerator at a sub-freezing temperature during an extended idle period of the refrigerating system.

Another object is to provide an improved arrangement of the freezing solution tank and the evaporator associated therewith so that the initial operation of the refrigerating system at the beginning of a running period acts to cool the air of a frozen food compartment and then to cool and freeze the hold-over solution.

A further object of this invention is to provide for ready heat transfer from the air of a frozen food compartment to the frozen solution within the hold-over tank.

Other objects of the invention will become apparent from the following specification, the drawings relating thereto, and the claims hereinafter set forth.

In the drawings in which like numerals are used to designate like parts:

Figure 1 is a front elevation, partly in section and partly diagrammatic, showing a refrigerator and refrigerating system including a freezing hold-over tank, an evaporator and an inner insulated compartment for frozen food storage.

Fig. 2 is a sectional view in side elevation showing a slightly modified arrangement of the parts in Fig. 1 with further details.

In both figures there is enclosed within an outer refrigerator cabinet an inner compartment 119 which is provided with additional insulation 98 and is cooled to a lower temperature.

The refrigerant path may be followed in Fig. 1 as follows: High pressure gas from compressor 70 passes through tube 71 to condenser 72, where it is liquefied and the liquid enters the cabinet through tube 59, going to expansion valves 60 and 60′ which are here shown connected in parallel though they might be connected in series.

That part of the liquid passing through expansion valve 60 flows into one of the evaporators 23′ or 24″ according to which has its outlet open

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at the valve 143 and the vaporized refrigerant returns through tube 69 to the higher pressure suction port of the compressor 70, here shown as a port in the side of the cylinder to be uncovered by the piston near the bottom of its stroke.

Another portion of the liquid refrigerant passes through the expansion valve 60′ to the sharp freezer evaporator 95 and returns through tube 100 to the lower pressure suction port of compressor 70, here indicated as a valve in the cylinder head. On the suction stroke (or portion of rotation in the case of a rotary compressor) the compressor draws in nearly a cylinder full of low pressure vapor from the colder evaporator 95, after which a further movement of the compressor uncovers the high pressure suction port and takes in a volume of higher pressure vapor from the warmer evaporator associated with the ice-maker and/or an evaporator which serves to cool the air in the main food compartment.

Since there is, in accordance with common practice, a check valve where gas from tube 100 enters the cylinder, gas from the higher pressure suction line 69 cannot pass into the lower pressure suction line 100. Gas from both suction lines is compressed and discharged through tube 71 to the condenser. The expansion valve 60 is of the thermostatic type, having its bulb 58 clamped against suction tubes 66 and 67. Expansion valve 60′ is likewise of the thermostatic type, but is designed to stop refrigerant flow at a lower temperature of its bulb 58′ which is clamped against suction tube 100. This arrangement serves to divide the refrigerant flow between the two expansion valves as required by their respective evaporators to avoid frost-back and to prevent excessive refrigeration of the warmer (main) food storage space.

The space 119 is enclosed by insulated walls and is fitted with an insulated door 205, shown broken away in Fig. 1 and in section in Fig. 2. The eutectic freezing solution 96 is preferably of the jelly type with a freezing point of about zero F. to 10 degrees above, thus keeping the space 119 well below the freezing for several hours with the system idle and providing refrigerating effect that is normally stored up for instant use in freezing foods more quickly than they could be frozen by the evaporator 95 lacking this hold-over.

The tank 210 contains the freezing solution previously described and in Fig. 2 it also contains the sections 216 and 217 of the colder evaporator 95. This tank is shown in Fig. 2 as being held

in place by the angle 211 attached to the rear lining of the freezer 94 and by the clamping strip 212 which is removably secured by screws 213. By removing the clamping strip 212 and disconnecting the unions 214 at the inlet and outlet of the expansion coil 95 (comprising sections 215, 216 and 217) the tank 210 may be removed from the freezer assembly and from the cabinet. This facilitates repairs or substitution of a new tank assembly 210 in which there may be a freezing solution 96 of different characteristic as to freezing temperature, or tanks of different sizes may be interchanged. The bottom of tank 210 is fitted with fins 218 for increasing heat transfer rate between the air of freezer compartment 119 and the coil 215 on the outside bottom of tank 210 or the mixture 96 within it.

When a load is placed in the compartment 119 and the control has caused the system to start, the first expansion of refrigerant within the freezer occurs in the section 215 of the evaporator 95. This section is exposed to air within the space 119, which it will cool more rapidly than if all of evaporator were within the tank. In addition to exposing this part of the evaporator coil to air, I provide the fins 218, soldered to the bottom of tank 210 between the legs of coil 215 or directly to the coil 215. These fins and the coil section 215 assist in cooling the air of compartment 119 both when the system is in operation and between runs when the heat absorbing capacity of the material 96 is called upon to do this cooling.

Liquid refrigerant from expansion valve 60' which may be located inside of the freezing space 119, as in Fig. 1 or outside of it as in Fig. 2, enters loops 215, then goes to the crosswise loops 216 on the inside of tank bottom and finally to the upper loops 217, which extend from front to back like loops 215. This arrangement of expansion coil on and in a tank of freezing solution causes the solution to freeze from the bottom upwardly and avoid expansion strains on the tank. The arrangement here shown represents an improvement over my disclosure in Patent No. 1,827,097 issued October 13, 1931, wherein the method of freezing from the bottom upward is shown.

The freezer assembly 94 and evaporator 221 are supported from the top of the cabinet or top and side wall by means of the straps 220. These straps are not attached to the tank 10'' which merely rests upon the evaporator 221 and may be withdrawn from the cabinet without disconnecting anything. Evaporator 221 is provided with round raised areas contacting the bottom of tank 10'' and providing expansion spaces between the two sheets of metal forming 221. These expansion spaces are joined by passages embossed in the lower sheet of the evaporator 221.

What is claimed is:

1. In a refrigerator, a tank containing a freezable material for storing refrigerating effect, a refrigerating system including an evaporator located in part on an outside wall of said tank and in part inside of said tank, and means for cooling said evaporator progressively, first in said outside part and then in said inside part.

2. In a refrigerator, insulated walls completely enclosing a space for the storage of a frozen product, a tank having its bottom wall exposed to contact with the air of said space and containing a freezable material for storing refrigerating effect, and a refrigerating system including an evaporator located within said storage space externally of said tank in thermal contact with the bottom thereof and also in direct contact with the air of said storage space, said evaporator serving to cool the entire body of air enclosed within said space to a sub-freezing temperature and thereafter to complete the freezing of said material from the lower portion of said tank upwardly until substantially all of the material is frozen, said evaporator also serving while not refrigerated by operation of said system to absorb heat from the air in said space and transfer it to said freezable material which has previously been frozen and thereby to utilize the stored refrigerating effect.

3. In a refrigerating system, means forming a storage space, a tank having its bottom wall exposed to said space, a material sealed within said tank having a freezing temperature well below 32° F., and an evaporator located within said storage space externally of said tank in thermal contact with the bottom thereof and in direct contact with the air of said space, said evaporator serving to cool said air and to freeze said material.

4. In a refrigerating system, means forming an enclosed and insulated sub-freezing space for the storage of frozen foods, a tank having its bottom wall exposed to said space, a freezable liquid filling a major portion of the interior of said tank, and an evaporator located within said storage space externally of said tank and in thermal contact with a bottom wall thereof and in direct contact with the air of said space, said evaporator serving to freeze said liquid and to cool the air within said space by direct contact therewith while the evaporator is active and also serving to cool said air by aiding in heat transfer from the air to the frozen liquid within said tank when the system is inactive.

GLENN MUFFLY.

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