Aug. 25, 1936. J. G. KING 2,052,407

REFRIGERATING APPARATUS

Filed Dec. 2, 1931 2 Sheets-Sheet 1

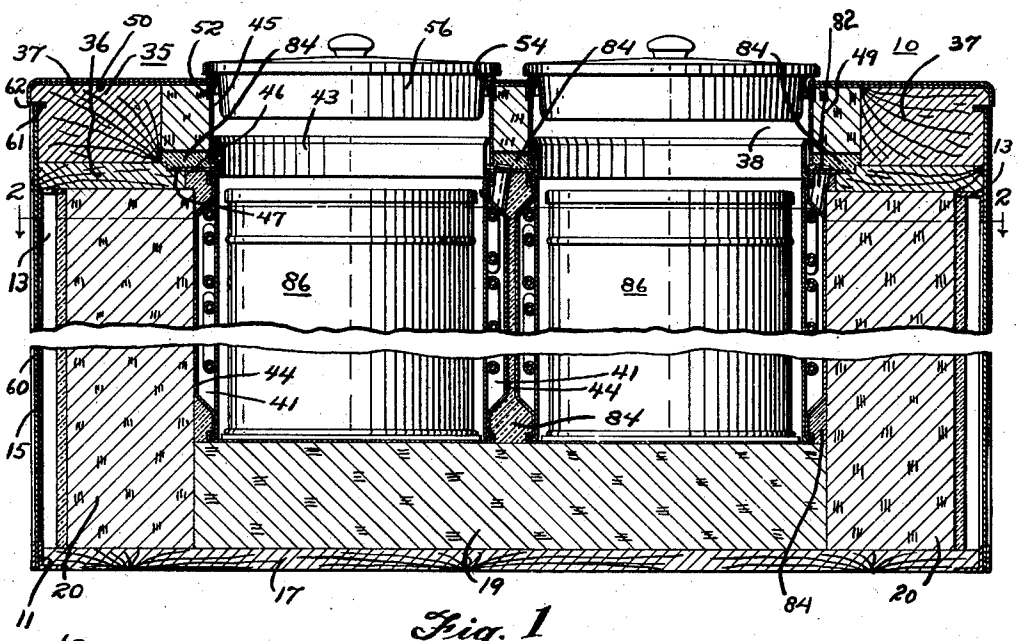

Fig. 1

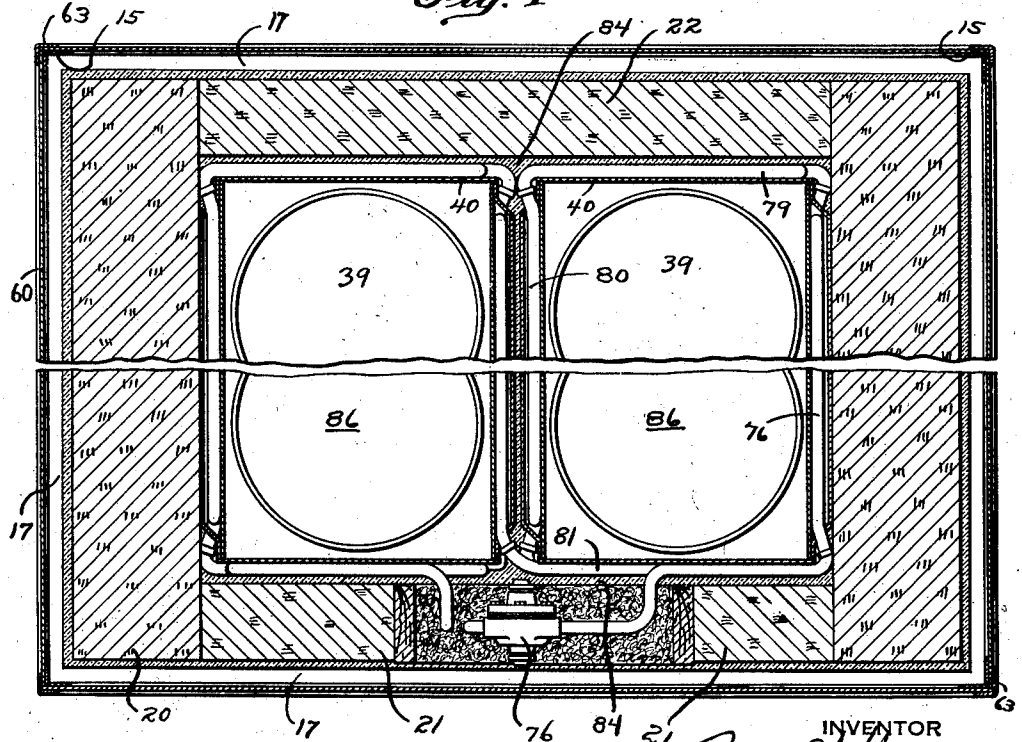

Fig. 2

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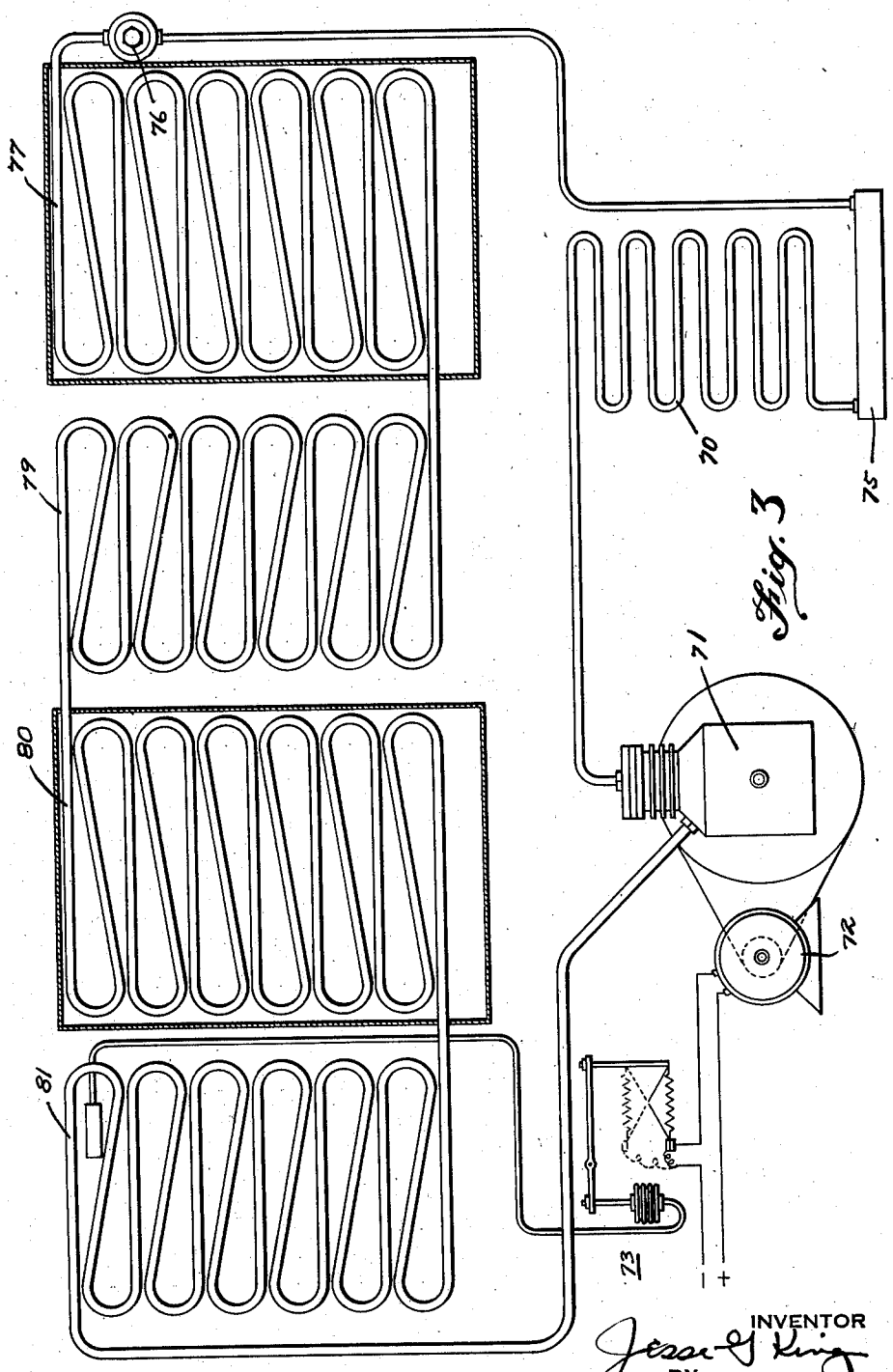

Fig. 3

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Patented Aug. 25, 1936 2,052,407

UNITED STATES PATENT OFFICE

2,052,407

REFRIGERATING APPARATUS

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Application December 2, 1931, Serial No. 578,531

8 Claims. (Cl. 62—95)

This invention relates to refrigerating apparatus, and particularly to refrigerated cabinets and the arrangement of refrigerating apparatus therein.

The objects of my invention are to provide a refrigerated cabinet having incorporated therein an improved low side unit. More particularly, the objects of my invention include an improved low side unit so constructed and arranged that several individual units may be assembled together to form a multi-unit cabinet.

A further object of my invention is to provide an improved arrangement of cooling coils, at least a part of the coils being imbedded in a cryohydrate or other hold over solution as fully described hereinafter.

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 vertical sectional view taken through an ice cream cabinet embodying features of my invention;

Fig. 2 is a horizontal section taken on the line 2—2 of Fig. 1; and

Fig. 3 is a diagrammatic view showing the arrangement of the cooling coils within the ice cream cabinet.

For the purpose of illustrating my invention, I have shown an ice cream cabinet generally designated by the reference numeral 10. This cabinet is shown for illustrative purposes as composed of an angle iron frame construction including the longitudinally extending bottom angle irons 11 the cross angle irons 12 connected together at their corners to form a lower angle iron unit. Near the top of the cabinet cross angle irons 13, parallel with the angle irons 12, are provided and these angle irons are likewise connected at their corners to longitudinally extending irons, not shown on the drawings but similar and parallel to the angle irons 11. Upright angle irons 15 are provided connecting the lower angle iron unit with the upper angle iron unit to complete the frame structure.

Supported upon the lower angle iron unit and specifically upon the angle irons 11 and 12 is a wood bottom member 17 on which member are supported slabs of insulating material including the bottom slab 19, the two upright end slabs 20, and the side slabs 21 and 22. The upright insulating slabs extend upwardly flush with the upper surface of angle irons 13.

Supported on the top angle iron unit is the top wall structure generally designated by the reference character 35. This top wall structure includes the wood member 36 directly carried by the top angle iron unit and the wood frame member 37 extending around the perimeter of the top wall. The top wall structure is provided with openings 38, in this particular embodiment four openings, permitting access to the interior of the cabinet.

Located within the cabinet 10 and supported on the lower insulating slab 19 are two tank assemblies indicated by the reference character 39. Both these tank assemblies are identical in construction and for this reason only one of them will be specifically described. Each tank assembly is composed of a tank 40 provided on two oppositely disposed sides with containers 41, formed by the plates 44. These tank assemblies may be formed by welding to the outer sides of the tank 40 the preformed sheet metal plates indicated at 44. As an alternative construction, the tank assemblies may be made in the manner shown; that is, by overlapping the edges of the bottom and sides of the tank and the plates 44 and soldering the joint so formed in the usual manner.

Each tank 41 is rectangular in shape and has formed in its top wall flanged openings aligned with the openings 38 in the top wall structure and sleeves 43 secured to the said flanges, extend upwardly into the said openings 38. Each opening 38 is formed by an annular member 45 composed of some non-conducting material, such as fiber board, or non-hydroscopic, non-conducting material, such as Bakelite or the like. The annular members 45 are insertable into said openings and extend from the upper surface of the top wall structure to a point below the top of the sleeves 43. A metal plate 46 is supported on the ledges 47 formed in the wood member 36, the plate 46 being provided with openings through which the sleeves 43 pass and in which they fit snugly. Thus, the plate 46 effectively separates the lower portion of the cabinet from the upper portion thereof. Above the plate 46 and surrounding the annular members 45 is provided insulating material indicated at 49.

A metal plate 50 provided with flanged openings corresponding with the openings 38 extends across the top of the cabinet 10, the flanges 52 extending down into the openings 38 as shown. An annular flexible gasket member 54 is provided for each opening 38 and a closure member 56, resting on said gaskets, closes each opening.

The exterior of the cabinet is provided with metal side panels indicated at 60 secured in position in any suitable manner. For instance, they may be provided with the inwardly directed flanges 61 extending into the slots 62 formed in the members 37 and may be secured to the upper and lower angle iron units by means of screws or the like. Corner finishing strip members 63 may likewise be provided. The top of the cabinet is shown as covered with a metal plate provided with openings registering with the openings 38 and provided with down turned edges overlapping the end members 37.

The tank assemblies 39 are cooled in a novel manner by means of an arrangement of expansion coils. For example, an expansion coil is formed with four serially connected sections, each section being disposed on one side of the tank 40. Two of these sections are located within the containers 41 for a purpose hereinafter described.

This arrangement of expansion coils is more clearly disclosed in Fig. 3 wherein the four sections of the expansion coil have been shown in a single plane. For example, refrigerant which is compressed into the condenser 70 by means of the compressor 71 driven by the motor 72 and controlled by means of the thermostat 73, is collected in liquid form in the receiver 75. From the receiver 75 the liquid refrigerant passes through the expansion valve 76 to the top of the first section 77 located within one of the containers 41. From the bottom of the section 77, the refrigerant passes in series upwardly through the section 79, thence downwardly through the section 80 located in the other of the containers 41 and finally upwardly through the section 81. From the section 81 the refrigerant is withdrawn in gaseous form by the compressor to be again compressed into the condenser 70.

The containers 41 are adapted to contain a hold over solution and particularly a solution of substantially cryohydrate proportions to which has been added a salt or other solute capable of preventing the complete solidification of the hold over solution until a rather low temperature has been reached. An example of such a solution is as follows:

	Percent
KCl	15
$BaCl_2$	5
NaCl	5
H_2O	75

The tanks 41 are provided with filling openings 82. The tanks 41 are also completely sealed to prevent the condensation of moisture on the cold surfaces thereof by means of hydrolene, or other asphaltic material, adapted to fill the various spaces indicated by the reference character 84. By means of this asphaltic material, the condensation of moisture on the exterior surface of the tanks is prevented.

It should be noted that in the construction shown in Figs. 1 and 2 there are two tank assemblies 39. The inlet and outlet of each tank assembly is so arranged that they may be connected to the outlet and inlet respectively to a second tank assembly. In this manner if a larger size refrigerated ice cream cabinet is desired, a plurality of individually formed tank assemblies may be connected in series as shown in Figs. 1 and 2. If, on the other hand, a single tank assembly is desired, then its inlet and outlet will be connected directly to the refrigerating apparatus as indicated in Fig. 3. In the construction shown, the expansion valve 76 is arranged within the insulating material 21 by removing a section thereof. In this manner the expansion valve is conveniently located so that it may be reached from the outside of the cabinet without disturbing the remaining parts of the apparatus and, at the same time, it does not occupy any of the space otherwise available for refrigerating purposes.

In the modification shown in Figs. 1 and 2, receptacles 86 are shown located within the tank assemblies 39. These receptacles are designed for ice cream or other food products to be refrigerated.

As pointed out above, the coils 76, 79, 80, and 81 are arranged outside of the tanks 40 and in direct contact with the walls thereof. Coils 76 and 80 are located within the cryohydrate solutions and are adapted to maintain this solution in solid form during normal operation of the apparatus. Should the apparatus, for any reason, become inoperative for any length of time, the tanks will be maintained cold by the melting of the cryohydrate solutions. The cooling coils and the cryohydrate tanks are sealed by the asphaltic material and as little of this asphaltic material is used as possible since it is used for sealing purposes only.

Another advantage of my novel arrangement of coils is that different temperatures may be maintained with the two tanks. For example, by adjusting the expansion valve 76 so as to operate at a lower back pressure more liquid refrigerant will evaporate within the right hand tank assembly than in the left hand tank assembly and consequently a lower temperature will be obtained in the first named tank assembly.

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. An ice cream cabinet construction including insulated walls forming a compartment, a tank within said compartment, said tank being provided with containers formed on oppositely disposed walls thereof, an expansion coil for cooling said tank, said expansion coil including serially connected sections, one for each vertical wall of said tank, each container enclosing one of said sections.

2. An ice cream cabinet construction including insulated walls forming a compartment, a tank within said compartment, said tank being provided with containers formed on oppositely disposed walls thereof, an expansion coil for cooling said tank, said expansion coil including serially connected sections, one for each vertical wall of said tank, each container having therein a hold over solution and each containing one of said sections.

3. An ice cream cabinet construction including insulated walls forming a compartment, a plurality of individually formed tanks in said compartment, each tank having containers formed on oppositely disposed walls thereof, an expansion coil for cooling said tanks, said expansion coil including serially connected sections, one section for each vertical wall of said tanks, each container enclosing one of said sections.

4. A low side unit for refrigerated cabinets including a tank, an expansion coil including a plurality of serially connected sections, one for

each vertical wall of said tank, containers formed on oppositely disposed walls of said tank, each container having enclosed therein one of said sections.

5. A low side unit for refrigerated cabinets including a tank, an expansion coil including a plurality of serially connected sections, one for each vertical wall of said tank, containers formed on oppositely disposed walls of said tank, each container having enclosed therein one of said sections, said tank being so constructed and arranged that the inlet and outlet to said expansion coil coincides with the outlet and inlet of a similar tank whereby two or more of said tanks may be connected in series.

6. An ice cream cabinet comprising a tank for receiving ice cream receptacles, said tank having an expansion coil in direct contact with its walls comprising an initial downwardly extending portion followed by an upwardly extending portion, another downwardly extending portion and a final upwardly extending portion, means for supplying liquid refrigerant to the initial downwardly extending portion and withdrawing vaporized refrigerant from the final upwardly extending portion, and insulated walls for the cabinet enclosing the tank.

7. A cabinet including a container enclosing a cold storage space, a congealing solution in heat exchange relation with said container, an expansion coil for cooling said container, said expansion coil having an initial downwardly extending portion in heat exchange relation with said congealing solution and an upwardly extending portion in heat exchange relation with the cold storage space, means for circulating refrigerant first through the downwardly extending portion and then through the upwardly extending portion of the coil, and insulated walls enclosing said container.

8. A cabinet including a container enclosing a storage space to be cooled, a space adapted to contain a congealing solution in heat exchange relation with said container, a refrigerant expansion conduit for cooling said container, said expansion conduit having an initial portion extending in heat exchange relation with one of said spaces and another portion extending in heat exchange relation with the other of said spaces, means for circulating refrigerant first through the initial portion then through the said another portion of the refrigerant expansion conduit, and insulated walls surrounding said container.

JESSE G. KING.