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ICE CREAM CABINET

Filed May 12, 1936

Fig. 1.

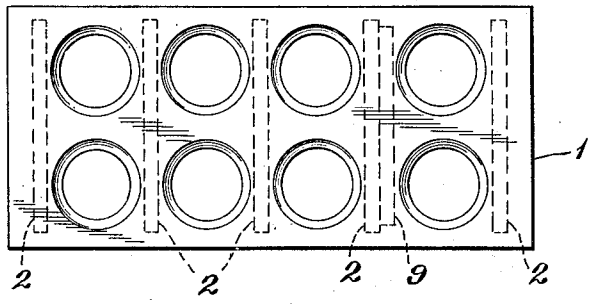
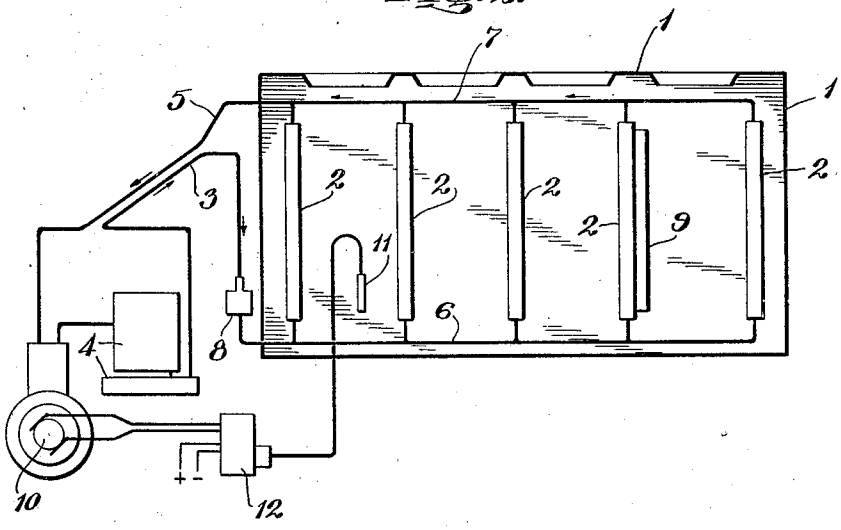


Fig. 2.



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ICE CREAM CABINET

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5 Claims. (Cl. 62—95)

This invention relates to the maintenance of uniform temperatures in the compartments of cold storage cabinets of the type refrigerated by the intermittent operation of a refrigerating compressor or other type of refrigerating unit. Such machines, as well known, are controlled by a thermostat in the refrigerated space and are automatically stopped and started as the temperature decreases below or increases above an established setting; or they are controlled by a pressure switch which starts and stops the compressor at predetermined pressures of refrigerant gas in the evaporators. Difficulty arises in the use of such cabinets that some one compartment may be opened more frequently than the others during the inactive or stand-by period of the compressor unit, thereby becoming warmer than the others so that the product, for example, ice cream stored in that compartment becomes soft. If the thermostat be located in that particular compartment, the other compartments become over-refrigerated and the ice cream therein too hard; if the compartments are provided with hold-over units as has been done, the unit in the more frequently opened compartment becomes exhausted ahead of the others, which is inefficient, besides which space for all such hold-over units cannot always be found in the cabinet except at the sacrifice of storage capacity. By hold-over unit is meant a container of a low freezing solution or mixture which, becoming chilled to a low temperature or frozen during the active period of the refrigerating circuit, tends to absorb heat and maintain a predetermined or constant temperature in its neighborhood during the inactive period, while it is in the process of warming or thawing. See for example De Remer Patent No. 1,861,957.

This invention provides a satisfactory means of eliminating these difficulties and enables a cold storage cabinet to be constructed, or an existing cabinet to be easily remodelled, so that all of its compartments will remain at the same temperature during the stand-by periods of the refrigerating circuit notwithstanding that one compartment may absorb heat at a greater rate than its neighbors. It includes the use of, and provides the advantages of the hold-over system without sacrifice of storage space in ordinary cases or of any appreciable amount of it in any case.

The invention is illustrated in its preferred form in the accompanying drawing and diagrammatically,

Fig. 1 represents in outline a conventional ice cream cabinet, in plan, having four ice cream compartments with two can spaces to a compartment;

Fig. 2 an elevation showing the system connections according to this invention.

The cabinet is represented at 1 and is of course to be understood as provided with insulating walls and usual covers for its several compartments, the cans being omitted for clearness. Each can or pair of cans is located between two evaporators 2 which alone or in connection with other partitioning means act as partitions to define the compartments. They may be understood to be merely hollow flat receptacles installed on edge in any suitable way, their structure and form not being of consequence to this invention. Condensed refrigerant is supplied to these evaporators by pipe line 3 from the condenser and receiver tank 4 of the refrigerating unit, and vaporized refrigerant is returned to the unit by low pressure line 5. Ordinarily lines 3 and 5 are put in heat interchanging relation as indicated by the diagram.

According to this invention the evaporator portions 2 of the refrigerant circuit are connected or arranged all at substantially the same level so that the refrigerant liquid level will be the same for all compartments, being connected at their lower ends by a liquid refrigerant header 6 and being connected at their tops by the refrigerant gas header 7. The delivery of liquid refrigerant via pipe line 3, during the active period of the unit, thus fills all of the evaporators to the same level and they are thus also under the same internal pressure. The usual expansion valve is shown at 8 and other valves may be assumed to be present as required or desired.

One of the evaporators is intimately associated with a hold-over unit represented by 9. In its simplest form this is merely a box or tank attached to or built onto the side of the evaporator plate and filled with a suitable brine or with a low freezing mixture, preferably one of the character disclosed in the patent above referred to and which freezes at a temperature around 0° F. or as desired.

The refrigerator unit, shown as a compressor-condenser combination is driven by an electric motor 10 under the control of a thermostat 11 through an electric switch 12.

The several compartments preserve a uniform temperature, during the hold-over periods, regardless of whether one of them absorbs more external heat than the others. The action is believed to be due to the fact that if any com-

partment is warmer than the others, the evaporator adjacent the warmer compartment will absorb heat more rapidly, resulting in raising the temperature of the liquid refrigerant in the warmer evaporator. This will cause some of the liquid refrigerant therein to evaporate, thereby tending to lower the liquid level and increase the pressure in the vapor space above its liquid. Such pressure increase being communicated to the colder evaporator plate 2 in association with the hold-over unit 9 and which is held thereby at a lower or a constant temperature, will result in condensation of vapor in the colder evaporator, such condensation tending to reduce the pressure and by so much raise the liquid level. Since the liquid level is equalized by the liquid header 6, it thereupon becomes the same in the warmed evaporator as in the others, hence there will be a transfer of heat from the warmer to the colder evaporator, effected by the boiling of the refrigerant in the warmer evaporator and the condensing in the colder evaporator, thereby balancing the temperature in all the compartments. Also, the refrigerating capacity of the warmer compartment becomes equal to that of the others, during the stand-by periods of the compressor as well as the operating period.

It follows that the thermostat 11 can be located in any one of the compartments with equal effect and that not until the hold-over medium is warmed or nearly thawed out will it call for further operation of the motor, at which time all of the compartments will equally require recharging and to the same extent. Except for the liquid level equalization effected by the header 6 the warming of one of the evaporators would soon exhaust the liquid therein and there would be no further heat transfer from one evaporator to another; also one or more of the evaporators might be thus emptied of liquid refrigerant and no refrigeration would occur upon the starting of the compressor.

The organization, or reorganization, of the cabinet to provide the space for a single hold-over unit can be accomplished without difficulty and in various ways not practical were one to be attached to each evaporator, although where space permits, and within the invention, more than one of the evaporators can be combined with a hold-over unit to prolong the stand-by period. In Fig. 1, the compartments have been crowded to one end to make room for a single hold-over unit, located between a terminal compartment and the one next adjacent, but it could be just as well between the two middle compartments. Preferably it is in any event mechanically combined with the evaporator as for instance by being built directly onto it and therefore in good heat-exchanging relation with the refrigerant therein.

We claim:

1. The combination of an ice cream cabinet having a plurality of compartments, an intermittently operated refrigerating unit having a refrigerant evaporator circuit appurtenant to all of said compartments, the portions of said circuit appurtenant to the several compartments being in free pressure and liquid communication adapted to maintain a substantially equal liquid level for each compartment and a hold-over medium for the circuit local to one of said compartments.

2. In an ice cream cabinet or the like, the combination of a plurality of evaporators, a hold-over medium associated with one of them, means for inter-connecting said evaporators near their bottoms to provide an equal liquid level therein, means affording pressure communication between the upper parts of said evaporators and an intermittently operated refrigerant circuit including said evaporators.

3. In an ice cream cabinet or the like, the combination of a plurality of evaporators interconnected at their tops and bottoms, an automatically controlled refrigerating unit for intermittently delivering liquid refrigerant to and removing refrigerant vapor from said evaporators and a hold-over medium associated with one of said evaporators.

4. An ice cream cabinet or the like having a plurality of individually accessible compartments, a refrigerant evaporator appurtenant to each of them, a hold-over medium associated with one of them, means for interconnecting said evaporators near their bottoms to provide an equalized liquid level therein, means affording pressure communication between the upper parts of said evaporators, a thermal regulator in said cabinet and an intermittently operated refrigerant circuit including said evaporators and controlled by said regulator.

5. In an ice cream cabinet or the like, the combination of a plurality of evaporators assembled on an equal level therein, a hold-over medium associated with one of them, a common gas header connected to the upper parts of said evaporators, a common liquid manifold connected to the bottoms of said evaporators, a refrigerant compressor delivering condensed refrigerant to said liquid manifold and receiving gaseous refrigerant from said gas header and a thermal device for intermittently operating said compressor.

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