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HOLD-OVER REFRIGERATION UNIT

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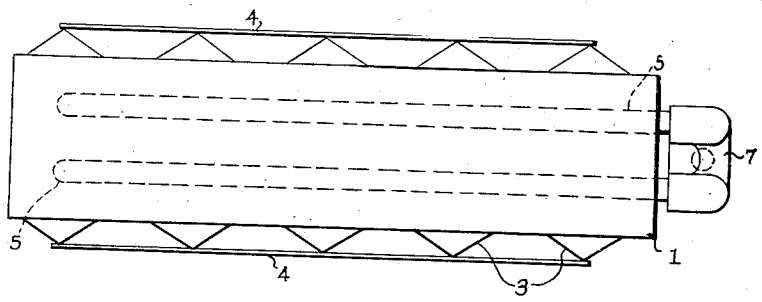


Fig. 1

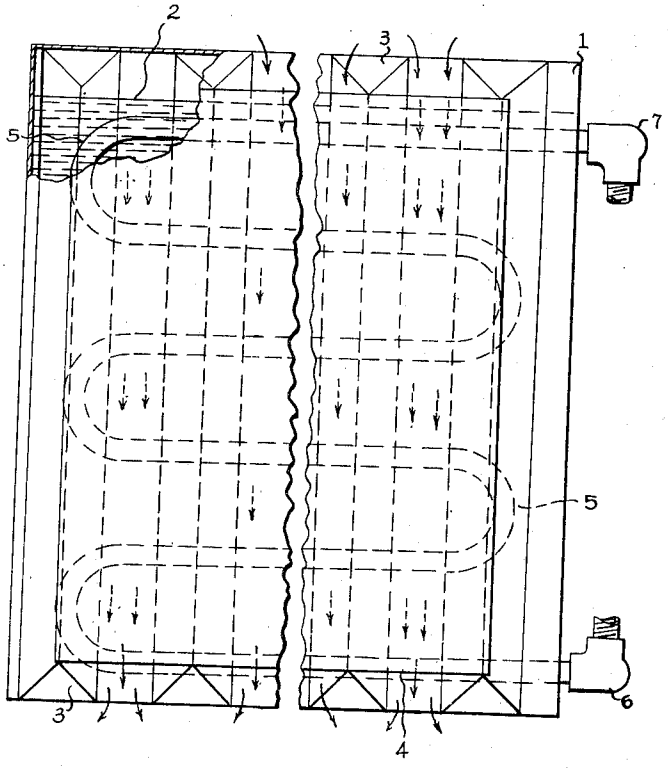


Fig. 2

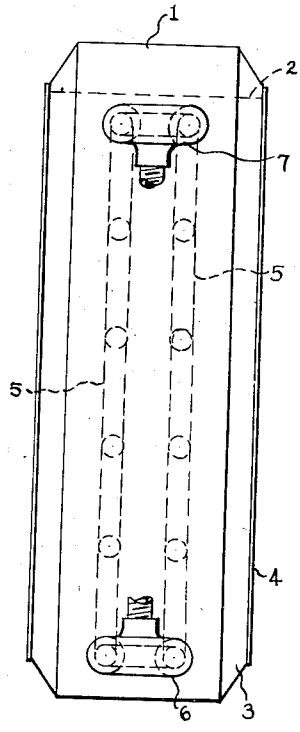


Fig. 3

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HOLD-OVER REFRIGERATION UNIT

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4 Claims. (Cl. 62—134)

This invention relates to mechanical refrigeration and particularly to hold-over refrigeration units.

Hold-over mechanical refrigeration involves submergence of an evaporator, coiled or of other form, in a freezable liquid confined in a suitable tank. Freezing of the liquid during active periods of the installation permits of prolonged idle periods, the unit exercising substantially its full refrigerant effect, throughout melting of the frozen liquid.

An object of the invention is to provide a plurality of air passages extending substantially from top to bottom of a hold-over unit in close exterior proximity thereto, whereby air in said passages is more effectively cooled and consequently acquires a greater downward velocity than would otherwise be the case, and a more rapid and efficient thermo-syphon circulation of air surrounding the unit is achieved than heretofore.

More specifically, it is an object of the invention to form the tank of a hold-over unit with corrugations extending substantially from top to bottom thereof, and to mount a metal plate in such bridging relation to the corrugations as to form, conjointly with the latter, passages for the down flow of air.

Another object is to so arrange one or more evaporators within the tank of a hold-over unit and to so deliver a refrigerant to and from such evaporator or evaporators as to initiate freezing of the liquid contents of the tank substantially at the bottom thereof, and to effect a steady upward progression of such freezing.

These and various other objects are attained by the construction hereinafter described and illustrated in the accompanying drawing, wherein:

Fig. 1 is a top plan view of the improved unit.

Fig. 2 is a side view of the same.

Fig. 3 is an end view of the unit.

In these views, the reference character 1 designates a sheet metal container for a freezable liquid 2, said container being preferably rectangular and having its contents permanently sealed therein. The freezable liquid may be of any suitable character according to the temperature to be maintained, being in some instances a eutectic solution, and for many purposes consisting of ordinary water. Sufficient space is, of course, provided above the liquid level to afford it such expansion as is incident to freezing. It is preferred to form the container with at least two vertical (or substantially vertical) walls, considerably exceeding in area the remaining walls and corrugated as indicated at 3 substantially from top to bottom thereof. The corrugations 3 are formed preferably by a press operation whereby the wall thickness of the corrugations is somewhat reduced as compared to the wall thickness of the tank as a whole. Soldered or otherwise rigidly secured to each of the corrugations 3 is a sheet metal plate 4, forming with the tank a series of vertically elongated air passages open at their upper and lower ends.

Within the tank and submerged in the liquid 2, is a plurality of evaporators 5 whereof two are employed in the illustrated construction. Each such evaporator consists of a metal pipe (preferably copper) coiled to form a series of vertically spaced horizontal spans joined alternately at opposite ends thereof. These evaporators, which are preferably duplicates, project similarly at their upper and lower ends through an end wall of the tank 1, the lower ends being engaged and interconnected by an inlet fitting 6 and the upper ends being engaged and interconnected by an outlet fitting 7. A suitable refrigerant, as for example sulphur dioxide, is adapted to be delivered to the fitting 6 and withdrawn from the fitting 7 by connections (not shown) to any ordinary mechanical refrigerating system.

In the use of the described unit, ebullition of the refrigerant in the coils 5 adapts it to withdraw heat from the liquid 2, presently reducing the latter to the freezing point. Since the refrigerant is admitted to the evaporators at their lower ends, ebullition occurs initially only in the lower spans of the evaporators and hence the liquid surrounding such spans is first reduced to the freezing point. As an ice formation thickens about the lower spans, such formation diminishes heat delivery to such spans from the surrounding liquid, whereupon the next higher span begins to accumulate an ice coating. Thus freezing progresses upwardly from the bottom of the tank to the surface of the liquid, and progresses somewhat more rapidly in the region between the two evaporators, since both thereof are withdrawing heat from this region. It follows that the forming mass of ice first extends to the tank walls at the tank bottom and progresses steadily up such walls, the surface of the mass rising always to a ridge in the region between the two evaporators. This achieves the important result of avoiding the formation of any liquid pockets or traps in the ice mass, with resulting undue stress on the tank walls, upon freezing of the trapped liquid. Furthermore, the described

surface formation of the mass, involving an upward inclination of the surface from the walls to the region between the evaporators, tends to relieve the walls from the expansive pressure, resulting from ice accretion at said surface. Undue lateral strain on the walls of the tank with resultant deformation or bursting thereof is avoided by the described method of freezing. By arranging the evaporators in a somewhat closer proximity to each other than to the corrugated walls of the tank (see Fig. 3), freezing in the described manner is still more positively assured.

The formation of air passages between the corrugated walls and the plates 4 is productive of a more rapid thermo-syphon air circulation than would otherwise prevail. This is for the reason that the air flowing in said passages, as indicated by the arrows in Fig. 2, is cut off from the air exteriorly adjacent to the plates 4, and is consequently more effectively cooled by contact with the corrugated container walls. Since the velocity of down flow of such air is proportionate to its rate of cooling, it follows that such velocity is increased by confining the air as described.

The invention is presented as including all such modifications and changes as come within the scope of the following claims.

What I claim is:

1. A mechanical refrigerating unit comprising a tank formed with corrugations extending approximately from top to bottom thereof, a freezable liquid within such tank, means submerged in the liquid for freezing the liquid, and members bridged across adjoined corrugations of the tank to form open-ended air passages between the corrugations.

2. A mechanical refrigerating unit comprising a tank having a wall thereof formed with a plurality of corrugations extending approximately from top to bottom of such wall, a freezable liquid within the tank, means submerged in the liquid for freezing the liquid, and a plate mounted upon and bridged across the corrugations exteriorly of the tank and forming open-ended air passages between the corrugations.

3. A mechanical refrigerating unit comprising a tank having opposed substantially parallel walls, a freezable liquid within the tank, two evaporators submerged in such liquid and circuitously extending upward in substantial parallelism with said parallel walls, the proximity of said evaporators to each other being greater than their proximity to said walls, a common means for delivering a refrigerant to the lower portions of the evaporators, and a common means for withdrawing the refrigerant from the upper portions of the evaporators.

4. A mechanical refrigerating unit comprising a tank, a freezable liquid within the tank, a plurality of evaporators fully submerged in the liquid and each comprising a pipe having vertically spaced spans alternately connected at opposite ends thereof, the space between said spans being occupied by the liquid, an inlet fitting interconnecting the lower ends of said evaporators, means for delivering a refrigerant to such fitting, an outlet fitting interconnecting the upper ends of said evaporators, and means for withdrawing the refrigerant from the outlet fitting, the delivery and outlet connections to the evaporators being established through the same wall of the tank.

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