Sept. 29, 1942. L. A. PHILIPP 2,297,633

REFRIGERATING APPARATUS

Filed Feb. 26, 1940

Fig. 1.

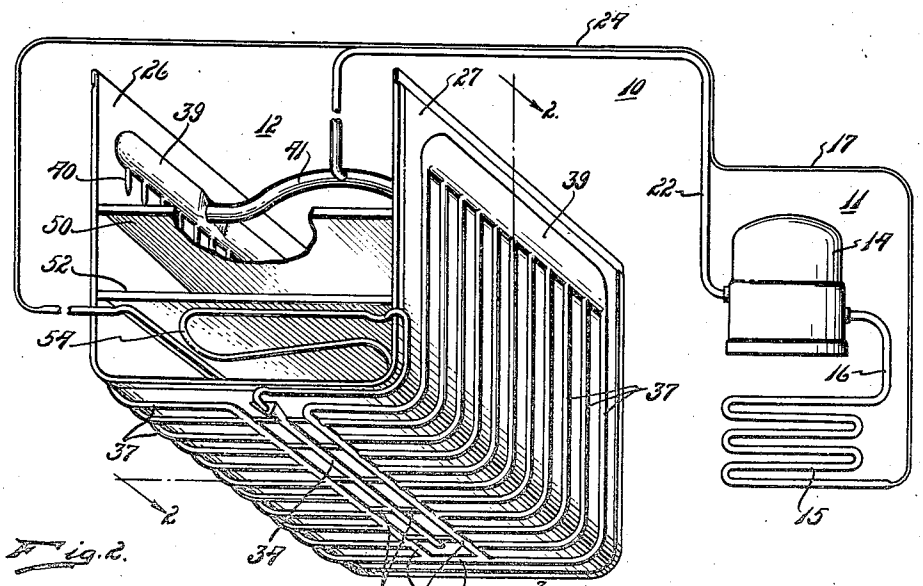


Fig. 2.

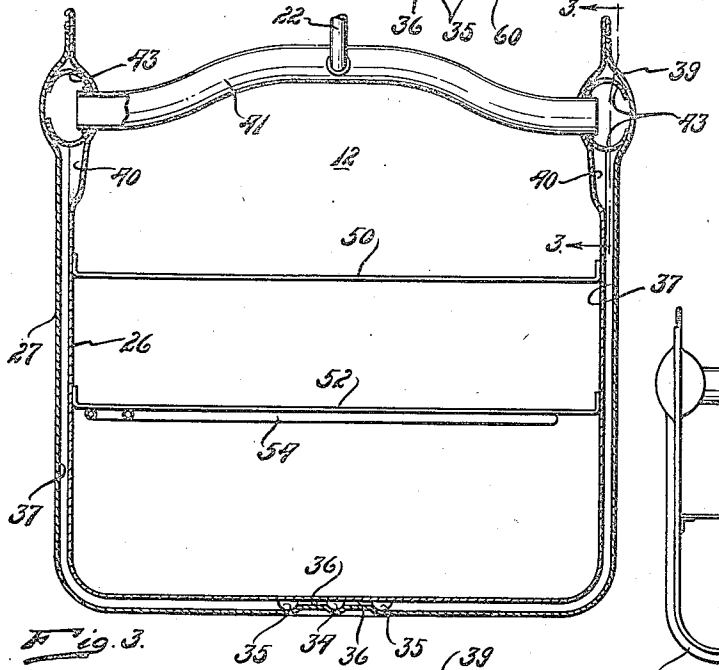


Fig. 4.

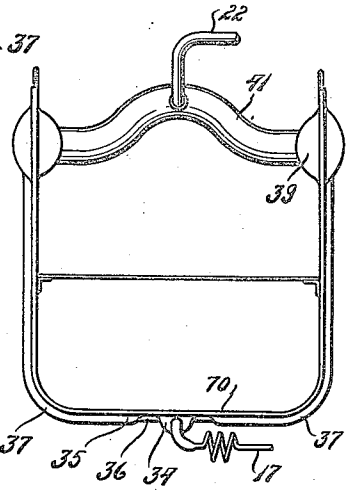
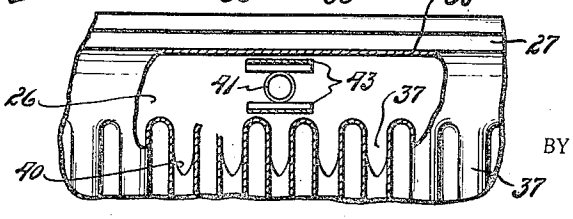


Fig. 3.



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REFRIGERATING APPARATUS

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Application February 26, 1940, Serial No. 320,857

7 Claims. (Cl. 62—126)

The present invention relates to refrigerating apparatus and more particularly to refrigerant evaporators for use in such apparatus.

It is an object of the present invention to provide a refrigerant evaporator with a receiving and distributing system in which the refrigerant is supplied to the evaporator below the liquid level in such manner as to obtain a substantial uniform introduction of the incoming refrigerant into the evaporator and substantial uniform circulation throughout the area of the evaporator.

It is another object of the present invention to provide a refrigerating system in which the refrigerant is supplied in the evaporator below the liquid level and distributed as ejected refrigerant at a plurality of regions throughout the length of the evaporator, and further distributed into a plurality of passages to provide for an effective and uniform cooling throughout the surface area of the evaporator.

The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments when read in conjunction with the accompanying drawing, in which:

Fig. 1 is a perspective view of the evaporator in schematic arrangement with a refrigerating system;

Fig. 2 is a transverse cross sectional view of the evaporator taken on line 2—2 of Fig. 1;

Fig. 3 is a fragmentary cross-sectional view taken substantially on line 3—3 of Fig. 2 with parts shown in full; and

Fig. 4 is an end elevational view of a modified arrangement of an evaporator.

Referring to the drawing, there is illustrated a refrigerating apparatus 10 comprising a compressor condenser unit 11 and an evaporator 12 which is adapted to be positioned within an enclosed compartment that is to be cooled. The compressor condenser unit 11 includes a motor compressor unit 14 and condenser 15. A conduit 16 connects the discharge side of the compressor with the condenser 15, and a small diameter or capillary tube 17 connects the discharge side of the condenser with evaporator 12. A conduit 22 connects the outlet side of evaporator 12 with the suction side of the compressor unit 14. A portion of the length of conduits 17 and 22 are in thermal or heat exchange relationship as at 24.

Suitable controls (not shown) may be employed for controlling the cycling operation of the motor compressor unit 14 which during the on-phase withdraws refrigerant vapor from the evaporator 12 through conduit 22 into the compressor where it is compressed and then discharged through conduit 16 into condenser 15 to be cooled, liquefied and returned through conduit 17 to the evaporator. The diameter of the conduit 17 is such as to meter the flow of liquid refrigerant therethrough in predetermined quantities. The passage of refrigerant in conduit 17 is further cooled by its thermal relationship, as at 24, with the return passage of refrigerant vapor in conduit 22.

The evaporator 12 comprises a pair of nested members 26 and 27 formed U-shaped with their outer edges secured together by welding or the like. The outer shell or member 27 is formed with indentations that form with the smooth wall of the inner shell or member 26 hollow tubes or passages for the flow of refrigerant therethrough.

Formed in the bottom or horizontal section to extend longitudinally of the evaporator 12 is an inlet or receiving manifold passageway 34 that is paralleled on opposite sides by distributing manifold passageways 35. Communicating tubes or passageways 36 are formed at spaced intervals between passageways 34 and 35. The passageways 36 are of smaller diameter than passages 34 or 35 and serve as injecting tubes, the restrictions checking the flow so that there is an equal and uniform distribution of ejected refrigerant from passage 34 flowing at all communicating points into passages 35 throughout its longitudinal length. The vertical side walls of the evaporator 12 are each provided with longitudinally extending tubular headers 39 formed by depressing shells 26 and 27. Extending laterally from passages 35 to a respective header 39 are passageways 37. Depressions 40 are formed in the shell 26 that taper downwardly from headers 39 to cooperatively form an enlargement with a respective passageway 37. A conduit 41 connectively joins the headers 39 and is connected by conduit 22 for withdrawing heat laden refrigerant vapors from the headers to the motor compressor unit 14.

Positioned at the entrance into conduit 41 in each of the headers 39 are baffles 43 arranged to form a restricted longitudinally directed passageway therein. As the refrigerant vapor is withdrawn from the header through conduit 41 during the on-phase of the compressor unit 14 the baffle arrangements prevent undue agitation in the passages 37 that are directly in alignment

with the entrance to conduit 41 and prevents the possibility of a pumping action in withdrawing liquid refrigerant through the conduit 22. The arrangements of the baffles further permits a uniform withdrawal of the vapor from the opposite ends of the header.

Supported between the upright side walls of the evaporator 12 are shelves 50 and 52. A serpentined conduit 54 is secured in thermal relation by solder, weld or the like to the underside of shelf 52. One end of conduit 54 is joined to refrigerant conduit 17, the other end is connected to passageway 34.

The liquid refrigerant metered through the small diameter conduit 17 flows through the serpentined conduit 54 to refrigerator shelf 52, then to flow into the passage 34. The passage 34 serves as a manifold for a uniform distribution into the parallel passages 35 throughout its longitudinal length which in turn serves as a manifold for redistributing the liquid into the respective lateral passages 37. The uniform distribution from passage 34 to passages 35 being accomplished by the restricted passages 36. The level of liquid in the evaporator may be maintained at any desired level, preferably just below tube 43.

The flow through the restricted passages 36 into the larger cross-sectional area of the lateral passages 37 aids and facilitates ebullition of the refrigerant therein, and this together with the described manifolding arrangement provides for an effective cooling throughout the entire surface area of the evaporator, eliminating warm areas due to insufficient refrigerant in the passages, that is lack of sufficient flow of refrigerant thereto. To further provide for a complete flooding of the evaporator there is provided a connecting passageway 60 between the passageways 35. The passageway 60 provides for an intercommunication between the manifolds 35 and its respective headers permitting for a balanced condition in both sides of the evaporator.

In Fig. 4 there is shown a modified arrangement wherein the refrigerant is delivered through the small diameter conduit 17 directly into the central passageway 34 provided in the bottom section of the evaporator 70 which is similar in construction and operation to the described evaporator 12.

While I have illustrated and described the preferred form of my invention, I do not wish to limit myself to the precise details shown and described but wish to avail myself of such variations and modifications as may come within the scope of the appended claims.

I claim:

1. A refrigerant evaporator comprising a pair of refrigerant distributing manifolds, an inlet refrigerant manifold, refrigerant injecting means adjacent each end of said inlet manifold communicating with the corresponding ends of each of the other two manifolds to conduct refrigerant from the inlet manifold to the distributing manifolds, and means providing refrigerant passages communicating with said distributing manifolds.

2. A refrigerant evaporator comprising a pair of refrigerant distributing manifolds, an inlet refrigerant manifold, refrigerant injecting means adjacent each end of said inlet manifold communicating with the ends of the other two manifolds to conduct refrigerant from the inlet manifold to the distributing manifolds, additional injecting means associated with said manifolds intermediate the ends thereof, and means providing refrigerant passages communicating with said distributing manifolds.

3. A refrigerant receiving and distributing system for refrigerant evaporators comprising three manifolds arranged in parallel relation, the outer two manifolds constituting distributing manifolds and the inner constituting a receiving manifold, means for delivering ejected refrigerant from said receiving manifold to the distributing manifolds including restricted tubes which interconnect said manifolds at various points throughout their lengths.

4. A refrigerant evaporator comprising two sheets of metal formed to provide two spaced apart refrigerant manifolds with means providing refrigerant injecting passages associated therewith between the ends thereof to conduct refrigerant from one manifold to the other and including means providing refrigerant evaporating passages communicating with one of said manifolds.

5. A refrigerant evaporator comprising two sheets of metal formed to provide two spaced apart refrigerant manifolds and providing injecting passages associated therewith between the ends thereof to conduct refrigerant from one manifold to the other and also providing refrigerant evaporating passages communicating with one of said manifolds, said refrigerant evaporating passages being arranged to communicate with said manifold at points displaced from the points of association of said injecting passages with said manifold.

6. A refrigerant evaporator comprising two sheets of metal formed to provide two spaced apart refrigerant manifolds with means providing a plurality of uniformly spaced injecting passages associated therewith between the ends thereof to conduct refrigerant from one manifold to the other and including means providing refrigerant passages communicating with one of said manifolds.

7. A refrigerant evaporator comprising two sheets of metal formed to provide two spaced apart refrigerant manifolds with means providing a plurality of uniformly spaced injecting passages associated therewith between the ends thereof to conduct refrigerant from one manifold to the other and including means providing refrigerant passages communicating with one of said manifolds, said refrigerant evaporating passages being arranged to communicate with said manifold at points displaced from the points of association of said injecting passages with said manifold.

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