

July 3, 1934.

J. D. LEAR

1,965,553

BEVERAGE COOLER

Filed April 22, 1933

2 Sheets-Sheet 1

FIG. 1.

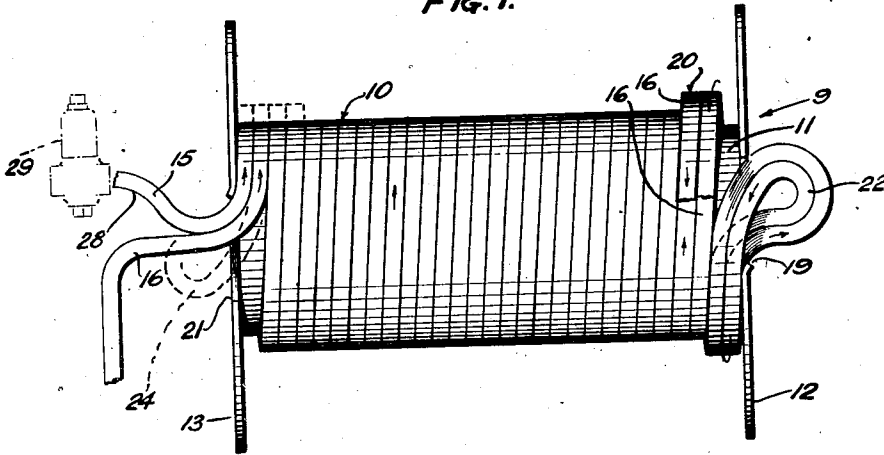


FIG. 2.

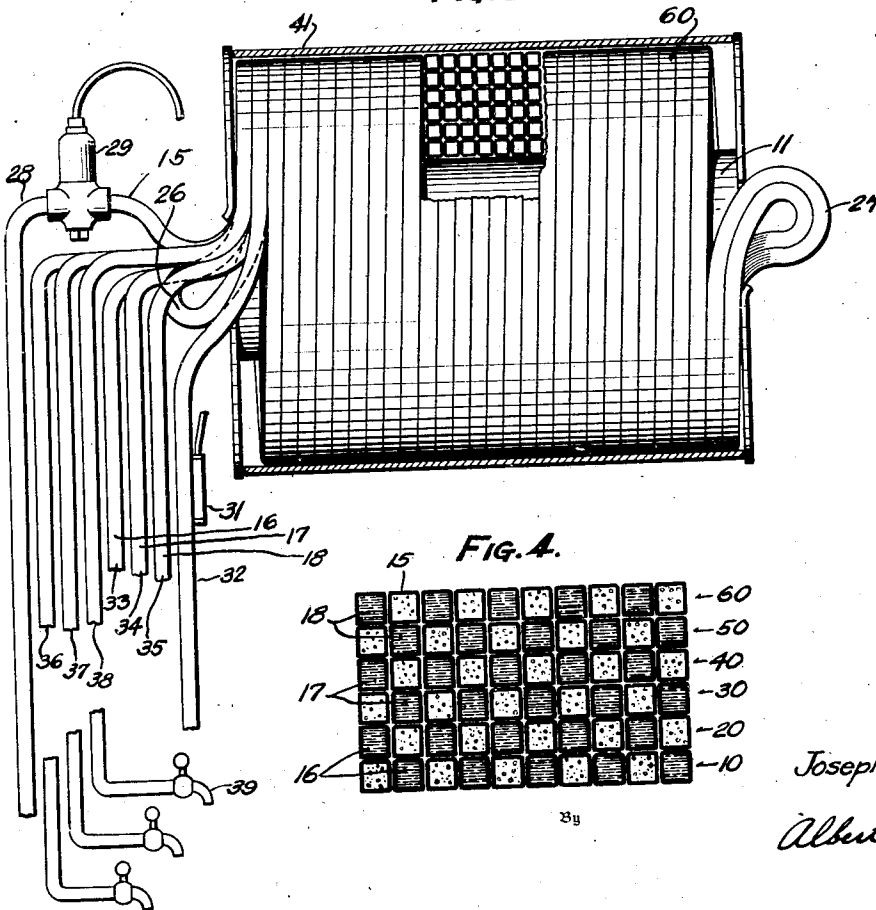
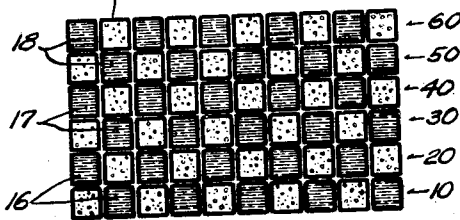


FIG. 4.



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FIG. 5.

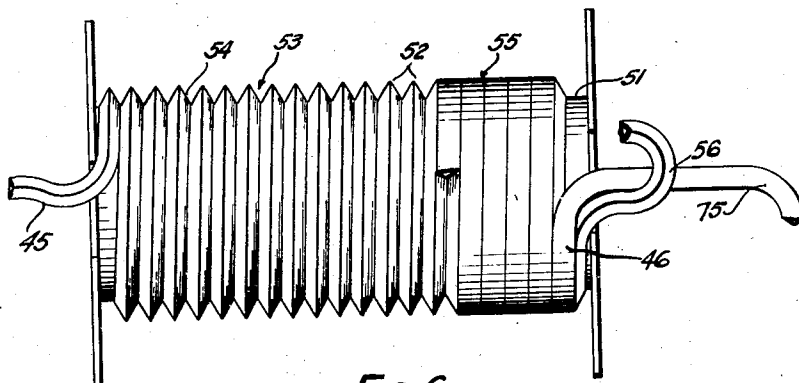


FIG. 6.

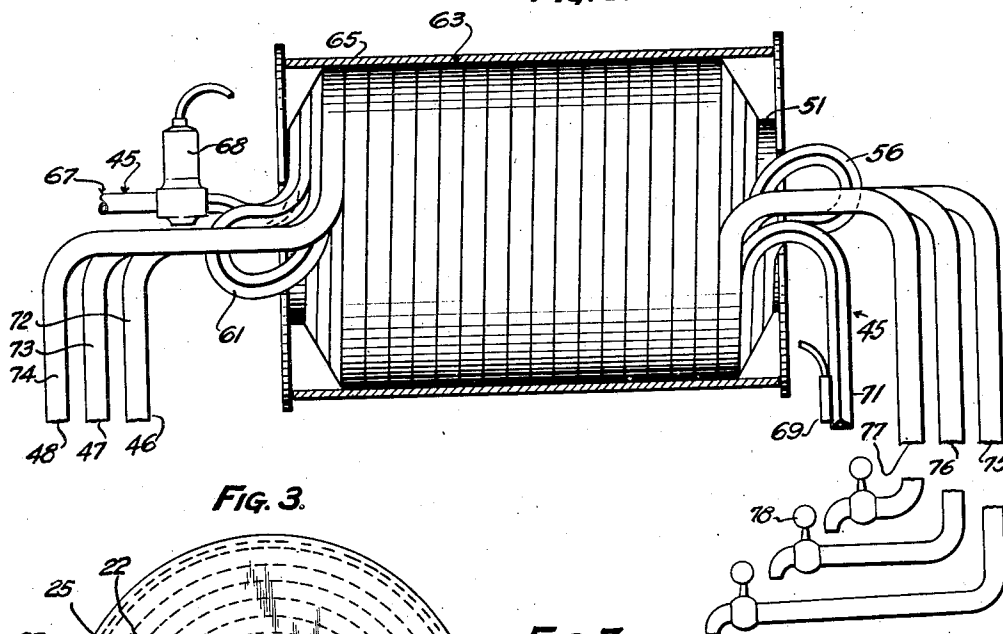


FIG. 3.

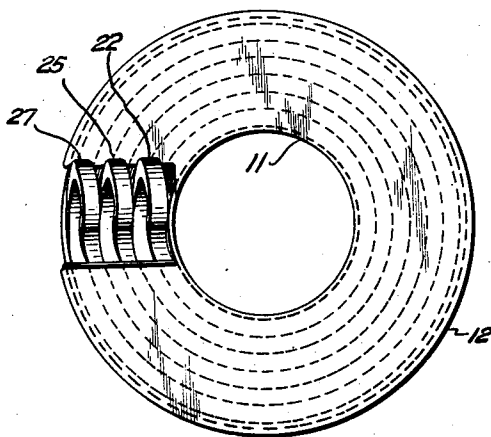
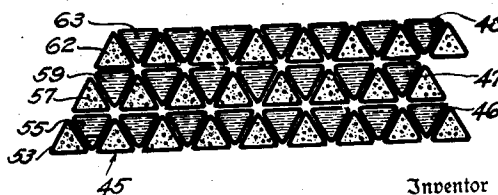


FIG. 7.



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BEVERAGE COOLER

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Application April 22, 1933, Serial No. 667,369

5 Claims. (Cl. 257—241)

This invention relates to improvements in refrigerated beverage dispensers.

In the cooling of beverages by refrigeration, it has been proposed to associate refrigerant and beverage coils in a tank and to obtain heat transference therebetween by means of a liquid medium, such as a saline solution, in which both coils are immersed. It has also been proposed to subject the beverage coil directly to the influence of the refrigerant and in both of these systems a serious danger is incurred of introducing either the liquid or the refrigerant into the beverage coil upon the occurrence of a slight break or rupture therein.

In the present invention the possibility of liquid communication between the coils is obviated by associating the coils in intimate thermal contact so that the metal walls of the tubes provide a direct heat exchange means.

A particular feature of the invention resides in the cooperative arrangement of the coils, wherein, due to a novel winding method and the choice of particular polygonal shapes in cross section, substantially the entire surfaces of the refrigerant and beverage coils are brought into mutual contact.

The principle of the invention is applied to the several embodiments which are more fully described in the accompanying specification and drawings wherein:

Fig. 1 is a side elevation of one embodiment of the invention showing the coil arrangement during the first step of the process of winding.

Fig. 2 is a side elevation of the completed device, portions of which are broken away to show the tube structure.

Fig. 3 is an end elevation of the first embodiment of the invention.

Fig. 4 is an enlarged longitudinal cross section through a group of tubes as arranged in Fig. 2.

Fig. 5 is a side elevation of a second embodiment of the invention showing a preliminary step in the process of winding the coils.

Fig. 6 is a side elevation of the completed device of the second embodiment of the invention, portions of the casing being broken away to show the underlying tube structure, and

Fig. 7 is an enlarged longitudinal section through a group of tubes as shown in Fig. 6.

In accordance with the present invention, a spool 9 provides a mounting base or guide for the refrigerating device, and it is formed with a cylindrical portion or mandrel 11 and end flanges 12 and 13. In the embodiment of the

invention shown in Figs. 1 to 4, tubing having a rectangular cross-section is wound upon the mandrel to form the liquid cooling device, and, for purposes of illustration a single refrigerant tube 15 is used for cooperation with a plurality of beverage tubes 16, 17 and 18.

Two tubes of rectangular cross section are placed together side by side and this double tube is wound in layers upon the mandrel 11, the completed first layer 10 being shown in Fig. 1, wherein the refrigerant tubing 15 and the beverage tubing 16 are arranged with their sides in intimate contact and are wound in flat relation to provide a double thread helix. For convenient access to the mandrel 11 during winding, the flanges 12 and 13 are notched at 19 and 21 respectively to permit entry and re-entry of the tubing ends as hereinafter described. Upon completion of the first layer 10, as indicated in Fig. 1, the tubes 15 and 16 are looped back upon themselves, as indicated by the numeral 22, so that they may be wound in the opposite direction to form a second layer 20 in superimposed relation on the first layer 10.

Upon completion of the second layer 20, the refrigerant tube 15 is looped back as indicated by the numeral 24 (dotted lines, Fig. 1) for a subsequent winding operation with the second beverage tube 17, thus forming a third superimposed layer 30 and the tubes 15 and 17 are thereafter looped back as indicated at 25 (Fig. 3) to complete the fourth layer 40. Finally, the refrigerant tube 15 is again looped back at 26 and wound with the third beverage tube 18 to form a fifth layer 50, whereupon both are looped back as indicated by the numeral 27 and the final or sixth layer 60 is formed (Fig. 2).

It will be particularly noted that, due to the reversal of the tubes in the alternate layers by means of the various looped portions, the alternate layers 20, 40 and 60 are so arranged that the convolutions of the refrigerant tubing are superimposed upon the convolutions of the liquid tubing of the preceding layer, and, similarly the liquid tubing in the alternate layers is superimposed upon the refrigerant tubing of the preceding layer. Thus, as shown in Fig. 4, a cross-section of the device simulates a checker arrangement of tubing wherein each beverage tube (except the surface tubing) is completely encompassed by refrigerant tubing. It will also be noted that all of the sides of the tubing are utilized, and that no refrigerant tubing surface is in contact with another refrigerant tubing surface.

Refrigerant enters the device through one of the extremities 28 of the tube 15, and a control device such as a thermostatic expansion valve 29 is interposed therein. The expansion bulb 31 of the valve is arranged in intimate thermal contact with the remaining or output extremity 32 of the tube 15, and it controls the valve in the manner well known in the art.

For exemplary purposes it is herein assumed that three sources of beverage under pressure are provided and that the input leads 33, 34 and 35 of the beverage tubes 16, 17 and 18 respectively communicate therewith, while the output leads 36, 37 and 38 thereof terminate in dispensing faucets 39 or the like.

The tube structure, as above described, is enclosed by a cover 41 of sheet material, which in cooperation with the spool 9, forms a complete housing for the tubing. In many cases, it will be found advantageous to form the spool 9 and the cover 41 of a material of low heat conductivity, thereby completely insulating the device from the outside atmosphere.

Tubing of a triangular cross-section may also be utilized to provide a checker coil construction as shown in Figs. 5 to 7, where a single refrigerant tube 45 and a plurality of beverage tubes 46, 47 and 48 are utilized, all of which are triangular in cross-section. The method of winding this device differs from that of the first embodiment in that single thread rather than double thread helices are formed. For example, the refrigerant tube 45 is first wound upon a mandrel 51 with the apices 52 of the convolutions thus formed extending outward (Fig. 5). This forms the first layer 53, and the threadlike groove 54 formed by these convolutions provides a winding guide for the beverage tube 46 which is wound thereon to form a second layer 55. This provides a solid structure wherein the first two layers occupy a substantially common plane.

Upon the completion of the layers 53 and 55, the refrigerant tube is formed with a loop 56, and it is wound to form a third layer 57 with one of its sides in contact with the underlying face of the layer 55, and in superimposed relation on the tube 46. This forms a winding base for the next refrigerant tube 47 which forms the fourth layer 59 whereupon the refrigerant tube 45 is again looped as indicated at 61 to form a fifth layer 62, and this is followed by a sixth or final layer 63 which comprises the beverage tube 48. A cover 65, similar to the cover 41 of the first embodiment, encloses the outer layer and completes the assembly.

The input lead 67 of the refrigerant tube 45 is provided with a control valve 68, and, as in the first embodiment, the bulb 69 thereof is secured to the refrigerant output lead 71. The beverage input leads 72, 73 and 74 of the tubes 46, 47 and 48 all extend from the left hand side of the device and communicate with sources of beverage under pressure (Fig. 6) while the output leads 75, 76 and 77 thereof protrude from the opposite side and are directed to dispensing faucets 78.

Particular attention is directed to the fact, that

in Figs. 5 to 7, the structure in effect comprises a plurality of double layers of tubing, that is, in grouping layers 53 and 55; 57 and 59; 62 and 63, it will be seen that a true superimposed relation therebetween as shown is not necessarily required to preserve the 100% contact previously referred to, since, regardless of the direction of winding, the contacting refrigerant and beverage tubes in adjacent groups substantially provide cylindrical surfaces. This differs from the first embodiment of the invention where either a left hand or right hand winding in true superimposed relation must be preserved throughout, and it is therefore contemplated that in the second embodiment different sizes of tubes or different winding may be utilized in adjoining groups.

It will be obvious that the refrigerant or beverage circuits in both embodiments of the invention may be varied in numerous manners without departing from the scope of the invention, and it is therefore intended that the structures disclosed herein be considered as exemplary of several methods of producing a checker coil as set forth in the appended claims.

I claim:

1. A heat exchange device comprising a refrigerant tube and a liquid tube each having a rectangular cross-section, said tubes being wound in adjacent relation to form a plurality of superimposed double thread helices, the direction of winding on alternate helices being reversed whereby the refrigerant tube is wound upon the underlying liquid tube to provide a checker cross-section through the tubes.

2. A heat exchange device, comprising a refrigerant tube and a liquid tube each having a rectangular cross-section, said tubes being wound in adjacent relation to form a double thread helix, the extremity of said tubes being looped back and wound upon said first helix to form a second double thread helix with the refrigerant tube therein superimposed upon the liquid tube of the first helix.

3. A heat exchange device comprising a refrigerant tube and a liquid tube each having a triangular cross-section, one of said tubes being wound to form a closely wound helix having a V shaped groove formed by the apices of the tube, said remaining tube being wound upon the helix and being entered in the groove thereof, whereby a pair of walls of one tube is arranged in thermal contact with a pair of walls of the remaining tube.

4. A heat exchange device comprising a refrigerant tube and a liquid tube each having a triangular cross-section, said tubes being wound to form an internested multi layer structure having a checker arrangement in cross-section.

5. A heat exchange device comprising a refrigerant tube and a plurality of liquid tubes each having a triangular cross-section, said tubes being wound to form a plurality of layers of internested helices with a liquid tube of helix interposed between refrigerant tube helices, said tubes having a checker arrangement in cross-section.

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