Sept. 14, 1948. V. V. TORBENSEN 2,449,343

REFRIGERATION APPARATUS

Filed Feb. 12, 1945 2 Sheets-Sheet 1

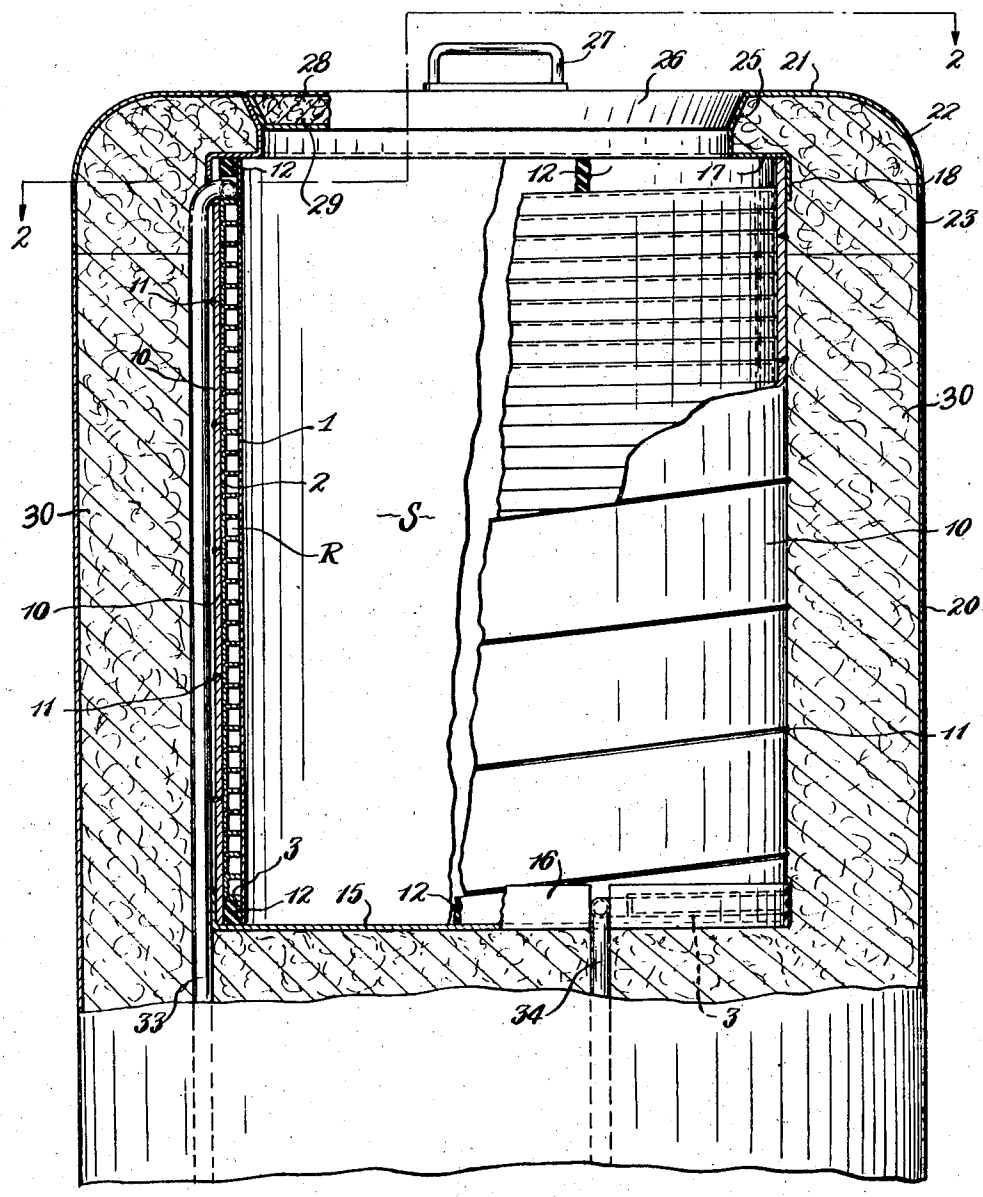


FIG. 1

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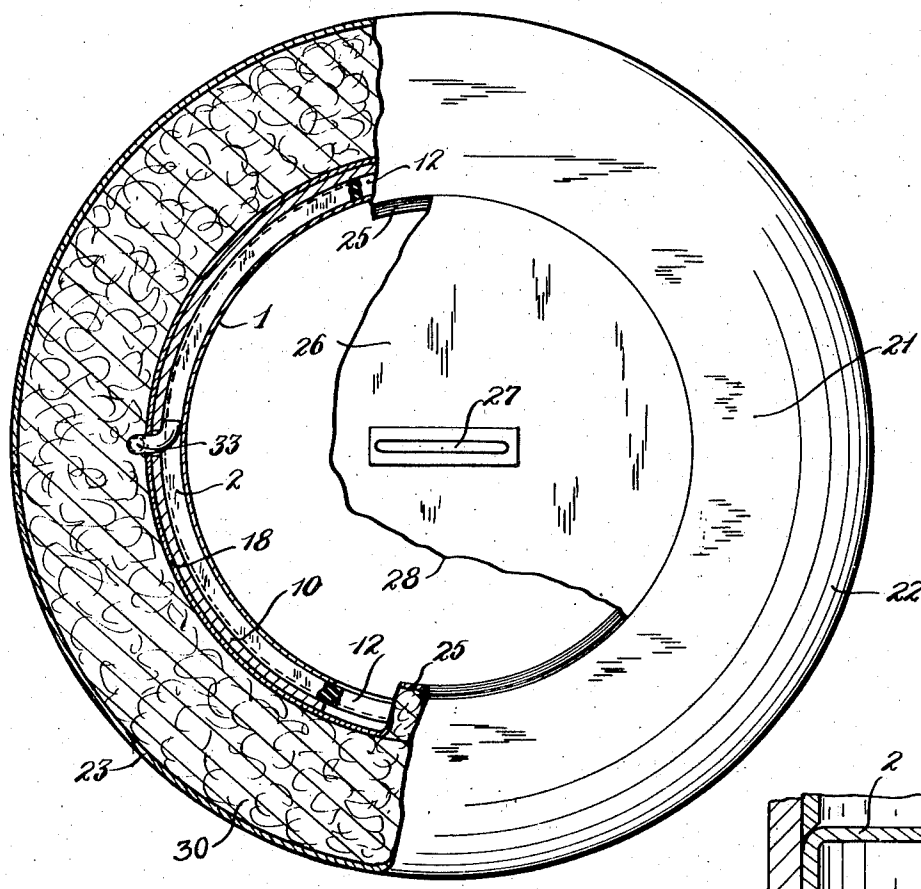


FIG. 2

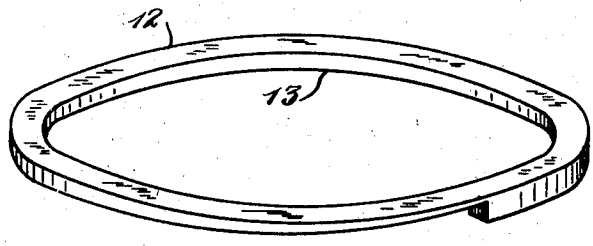


FIG. 4

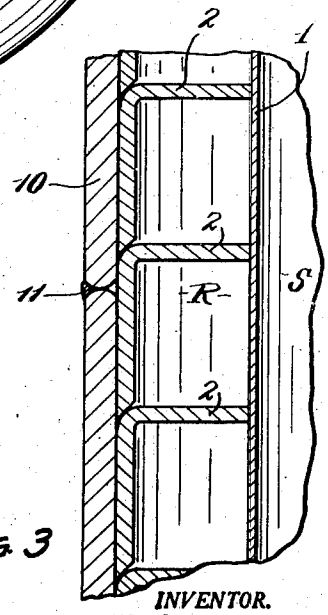


FIG. 3

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REFRIGERATION APPARATUS

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7 Claims. (Cl. 62—99)

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This invention relates to mechanical refrigeration apparatus, and more particularly to an improved construction for the evaporators of such apparatus.

While not limited thereto, my improvements are intended especially for embodiment in the type of refrigerator consisting of an open top insulated cabinet or casing, desirably cylindrical, equipped with an insulated top closure or cover, and enclosing a deep vessel that provides the refrigerating space and is surrounded by the evaporator unit. In refrigerators of this type very low temperatures are maintained for so-called "frosted food" storage.

The principal object of my invention is to provide an evaporator construction that is especially suitable for incorporation in refrigerators of the above described type; that is relatively simple and inexpensive; that is well adapted to production methods, and by the use of which the maximum efficiency of the refrigerant is realized.

The high degree of efficiency is obtained by using only a single wall or thickness of a suitable heat conducting material between the refrigerating space and the passage through which the refrigerant is circulated and within which it is evaporated. Such wall preferably consists of sheet metal of appropriate character and thickness to provide the maximum rate of heat exchange and the requisite physical strength.

Other objects will appear as I proceed to describe the invention by reference to the accompanying drawings wherein Fig. 1 represents a fragmentary side elevation of a refrigeration apparatus incorporating my improvements, the upper portion of the cabinet or casing and a part of the evaporator and the vessel that encloses the refrigerating space being in central section, while other parts are broken away forwardly of the plane of section in order to better illustrate the construction; Fig. 2 is a plan view of the apparatus, partly in section; Fig. 3 is a sectional detail of the evaporator on an exaggerated scale; and Fig. 4 is a perspective view of one of the filler rings that are applied to the opposite ends of the evaporator coil.

A wall designated 1, desirably cylindrical, surrounds the refrigerating space S. This wall is of a material of high thermal conductivity, preferably thin sheet metal of such character as will insure rapid heat penetration and the necessary physical strength. To the outer side of the wall 1 is applied a member 2, between which and the wall 1 is enclosed a space or passage R through which the refrigerant is circulated, as will hereinafter more fully appear.

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According to the present preferred construction, the member 2 consists of a continuous strip of thin metal that is L-shaped in cross section, or, more broadly stated, is of a trough-like formation, and it is arranged spirally about the wall 1 with one of its edges in contact with said wall, and its other edge engaged with the medial portion or angle of the adjacent convolution of said member. The adjoining convolutions may be welded together continuously or at intervals. As appears in Fig. 3, the flanges of the angle strip that forms the member 2 are joined by a curved portion, and the edge of the flange engaged therewith is shown as beveled to correspond approximately to the radius of said curved portion. The open side of the bottom convolution of the member 2 is closed by a strip 3, the terminal portion of which forms the end wall of said convolution, as shown in dotted lines in Fig. 1.

The member 2, after being rolled or otherwise treated to give it its angle or trough-like formation, may be wound tightly about the wall 1 while the latter is firmly supported on a collapsible mandrel or other suitable support. On the other hand, the member 2 may be preformed into spiral shape, at the same time, or after, it is given its angle or trough-like formation, and applied endwise to the wall 1.

A band 10 of steel or other suitable metal, of appropriate width and thickness, is wound spirally about the member 2, and its adjacent convolutions are connected together by welding, as indicated at 11. The ends of the wall 1 are in planes normal to the longitudinal axis of said wall, and the end convolutions of the band 10 are finished off in the same planes. Applied to the end convolutions of the member 2, between the wall 1 and band 10, are filler rings 12, preferably of plastic. One of such rings is shown in perspective in Fig. 4, and the annular face 13 thereof that is intended for engagement with the member 2 is shaped to fit the end of the member.

Applied to the bottom of the above described structure is a shallow pan-like part including a circular bottom wall 15 and a peripheral flange 16, the latter encircling the lower end of said structure and being suitably connected, as by welding, to the band 10. Similarly applied to the top of the structure is a ring-like part including an annular wall 17, and a peripheral flange 18 that fits over the adjacent end of the band 10 and is welded or otherwise attached thereto.

The unit thus constructed constitutes the evaporator of the refrigerating apparatus and

encloses both the refrigerating space S and the refrigerant passage R, the two being separated only by the relatively thin wall 1. This unit, in the present embodiment, is situated centrally within a casing or cabinet comprising a cylindrical wall 20, which may be made of sheet metal, and an annular top wall 21 of similar material and which merges, through a curved portion 22, into a cylindrical skirt 23 that joins the top of the cylindrical wall 20 in the plane thereof and is connected to said wall, as by welding. Depending from the inner edge of the top wall 21 and joining the corresponding edge of the previously mentioned wall 17 is a collar 25, convergent for a distance downwardly from its upper end, and within which fits a cover 26, equipped with a handle 27. The cover may be of any suitable construction and material. For example, it may consist of a shell 28 of sheet metal, and a filling 29 of suitable insulating material. Following the usual refrigerator practice, the space between the evaporator unit and the casing is filled with insulating material 30.

The compressor and other customary parts of the refrigerating apparatus are desirably housed within a chamber in the lower part of the cabinet or casing, such being omitted from the drawings as they constitute no part of the present invention.

The refrigerant in liquid form is delivered to, and in gaseous form withdrawn from, the refrigerant space or passage R through pipes 33 and 34. The pipe 33 is connected to the end wall of the top convolution of the member 2, as best shown in Fig. 2, while the pipe 34 is connected to the end wall of the bottom convolution, as indicated in dotted lines in Fig. 1. Said pipes enter the space occupied by the member 2 through notches in the band 10 and in the flanges 16 and 18.

Having thus described my invention, what I claim is:

1. In refrigeration apparatus, an evaporator including a wall made of efficient heat conducting material and arranged with one of its sides exposed to the refrigerating space of the apparatus, a device disposed in such relation to the opposite side of said wall as to enclose therewith a refrigerant passage, said device comprising adjacent trough-like parts each of which has one of its edges contacting said wall and its opposite edge engaging the longitudinal medial portion of the adjacent part, a reinforcing member closely embracing said device in firm contact with the side thereof remote from said wall, and means providing a refrigerant circuit including said passage.

2. In refrigeration apparatus, a relatively thin wall made of material readily pervious to heat and surrounding the refrigerating space of the apparatus, a member engaged spirally about said wall, said member consisting of a strip that is angular in cross section and is arranged with one of its edges in contact with said wall and its opposite edge in engagement with the angle of the adjacent convolution of said strip, a spirally wound reinforcing element tightly encircling said member in firm contact with the side thereof remote from said wall, the spiral passageway provided between the member and said wall constituting a refrigerant circulating space that is separated from the refrigerating space solely by said wall, and means providing a refrigerant circuit of which said circulating space forms a part.

3. In refrigeration apparatus, a relatively thin wall made of material readily pervious to heat

and surrounding the refrigerating space of the apparatus, and a member engaged spirally about said wall, said member consisting of a trough-like strip that is arranged with one of its edges in contact with said wall and its opposite edge in engagement with the longitudinal medial portion of the adjacent convolution of the strip, an element applied to each end of said member the side of which adjacent said member is a counterpart of the end convolution thereof while its opposite side is in a plane normal to the axis of the aforesaid wall.

4. In refrigeration apparatus, a relatively thin cylindrical wall enclosing the refrigerating space of the apparatus, a member engaged spirally about said wall, said member consisting of a trough-like strip of material arranged with one of its edges in contact with said wall and its opposite edge in engagement with a longitudinal medial portion of the adjacent convolution of the strip, a filler ring applied to each end of said member the side of which adjacent said member is a counterpart of the end convolution of the member while its opposite side is in a plane normal to the axis of said cylindrical wall and is substantially flush with the adjacent end of the wall, a reinforcing band wrapped spirally about the member, adjacent convolutions of the band being connected together, the reinforcing band terminating at each end in the plane of the adjacent end of the cylindrical wall, the spiral passageway provided between the aforesaid member and said cylindrical wall constituting a refrigerant circulating space that is separated from the refrigerating space solely by said wall, and means providing a refrigerant circuit including said circulating space.

5. In refrigeration apparatus, a relatively thin cylindrical wall surrounding the refrigerating space of the apparatus, a member engaged spirally about said wall, said member consisting of a strip of material that is angular in cross section and is arranged with one of its edges in contact with said wall and its opposite edge in engagement with the angle of the adjacent convolution of the strip, the exterior of said angle being convexedly curved and the edge engaged therewith being beveled to correspond approximately with the contour of the angle, said edge and the contiguous part of the adjacent convolution being welded together, a reinforcing band extending spirally about said member, the adjoining convolutions of which band are welded together, the ends of said cylindrical wall and band terminating in a common plane normal to the axis of said wall and beyond the ends of the aforesaid member, a filter ring engaged with the ends of said member and the side of which adjacent the member is a counterpart of said end while the opposite side of said filler ring is in substantially the aforesaid plane; a bottom wall having an upstanding peripheral flange telescoped over the lower end of said reinforcing band and attached thereto, an annular top wall applied to the opposite end of said reinforcing band and having a depending peripheral flange surrounding the upper end of said band and connected thereto, the spiral passageway provided between the aforesaid member and said cylindrical wall constituting a refrigerant circulating space, and means providing a refrigerant circuit including said circulating space.

6. In refrigeration apparatus, a relatively deep, thin-walled cylindrical vessel enclosing the refrigerating space of the apparatus, a member en-

gaged spirally about the peripheral wall of said vessel, said member consisting of a trough-like strip of material arranged with one of its edges in contact with said wall and its opposite edge in engagement with the longitudinal medial portion of the adjacent convolution of the strip, a reinforcing element closely embracing said member in firm contact with the side thereof remote from said wall, the spiral passageway provided between the aforesaid member and said peripheral wall constituting a refrigerant circulating space, means providing a refrigerant circuit including said circulating space, an open top casing surrounding and spaced from the foregoing parts, insulating material filling the space between the casing and said parts, and an insulated closure for the open top of the casing.

7. In refrigeration apparatus, a relatively thin cylindrical wall surrounding the refrigerating space of the apparatus, a member engaged spirally about said wall, said member consisting of a strip of material that is angular in cross section and is arranged with one of its edges in contact with said wall and its opposite edge in engagement with the angle of the adjacent convolution of the strip, the exterior of said angle being convexedly curved and the edge engaged therewith being beveled to correspond approximately with the contour of the angle, said edge and the contiguous part of the adjacent convolution being welded together, a reinforcing band extending spirally about said member, the adjoining convolutions of which band are welded together, the ends of said cylindrical wall and band terminating in a common plane normal to the axis of said wall and beyond the ends of the aforesaid member, a filler ring engaged with the ends of said member and the side of which adjacent the member is a counterpart of said end while the opposite side of said filler ring is in substantially the aforesaid plane, a bottom wall having an upstanding peripheral flange telescoped over the lower end of said reinforcing band and attached thereto, an annular top wall applied to the opposite end of said reinforcing band and having a depending peripheral flange surrounding the upper end of said band and connected thereto, the spiral passageway provided between the aforesaid member and said cylindrical wall constituting a refrigerant circulating space, means providing a refrigerant circuit including said circulating space, an open top casing surrounding and spaced from the foregoing parts, insulating material filling the space between the casing and said parts, and an insulated closure for the open top of the casing.

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