March 13, 1951 L. A. PHILIPP 2,544,938

REFRIGERANT EVAPORATOR

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Fig-1

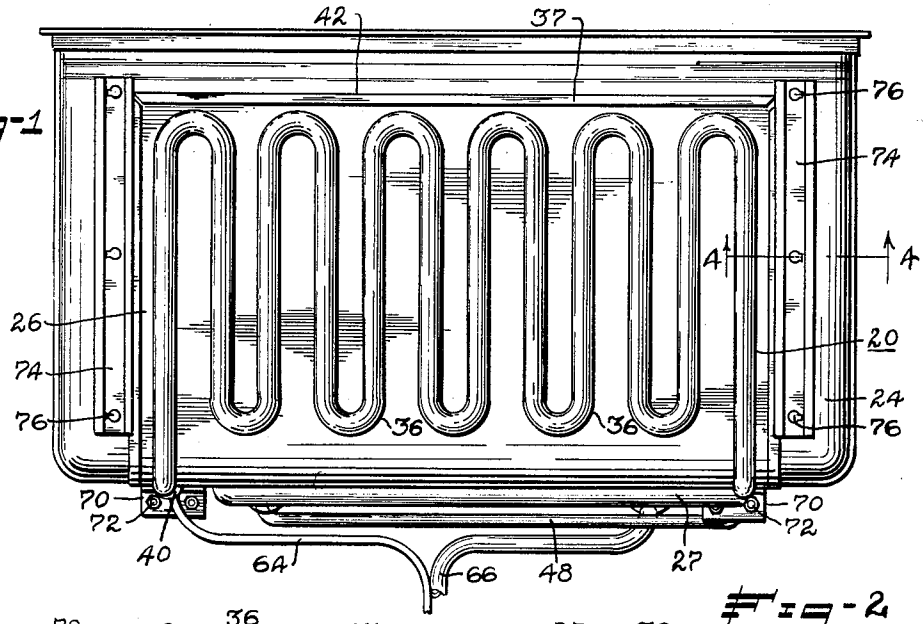


Fig-2

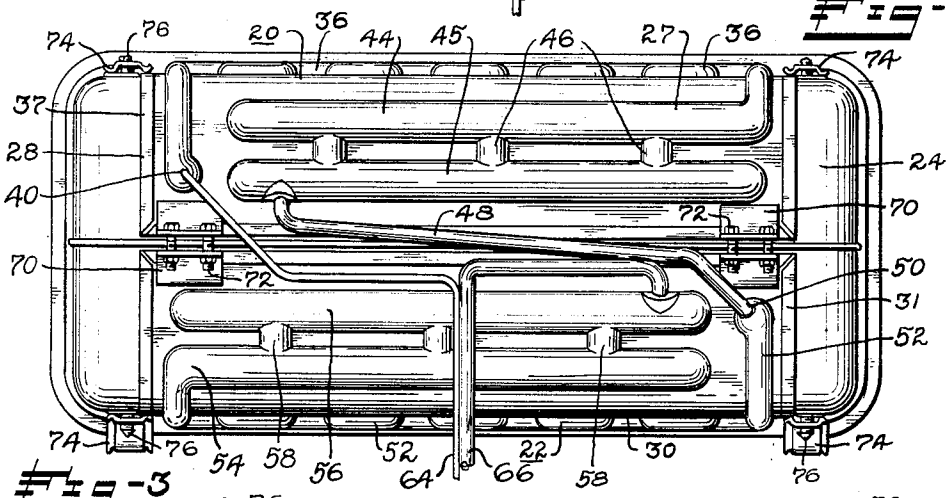
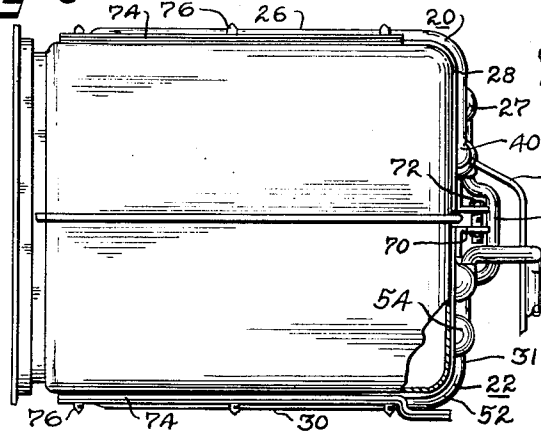


Fig-3



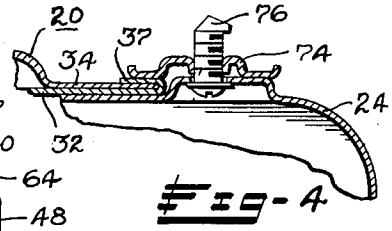


Fig-4

INVENTOR.
LAWRENCE A. PHILIPP
BY Ralph E. Baker
ATTORNEY

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Fig - 5

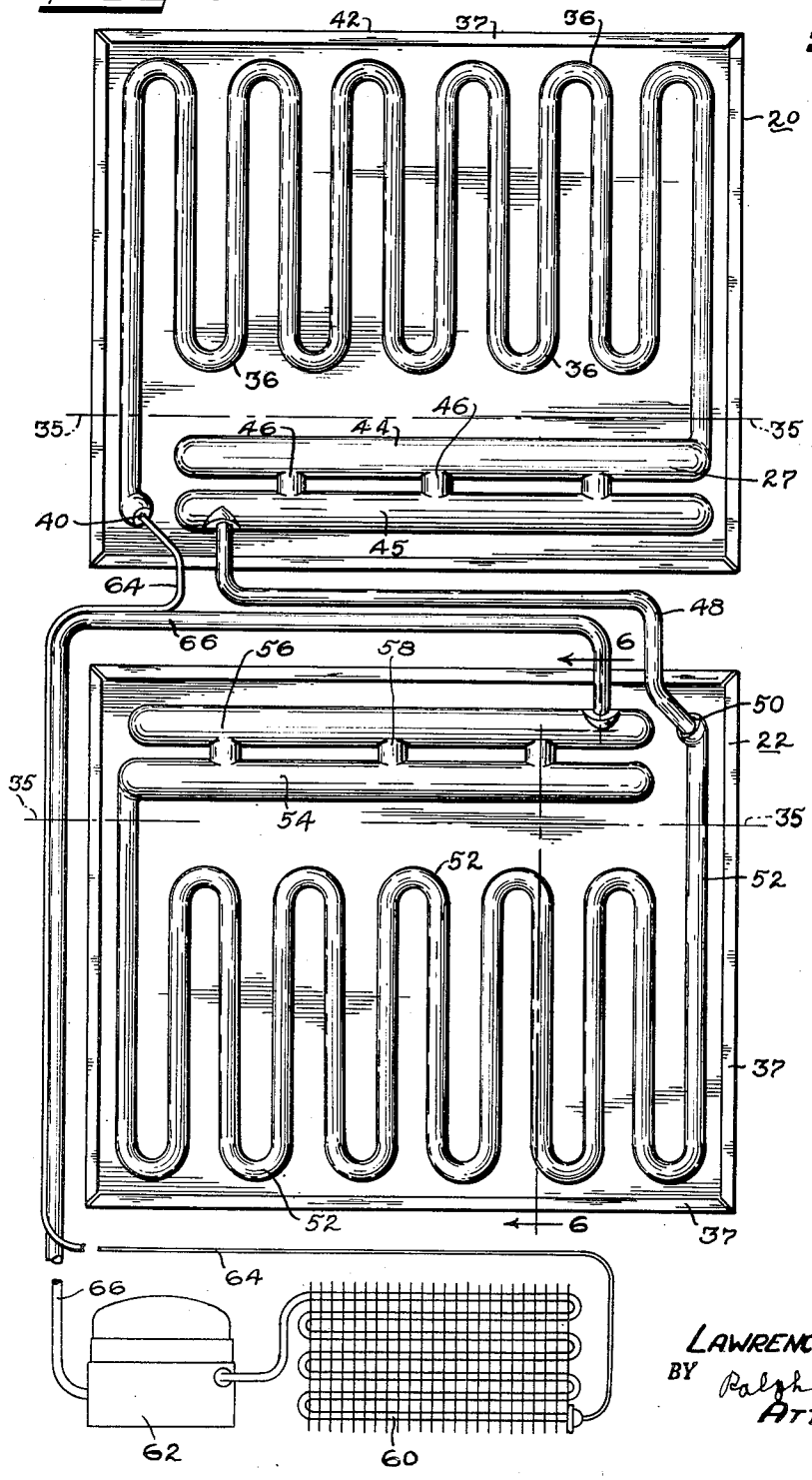
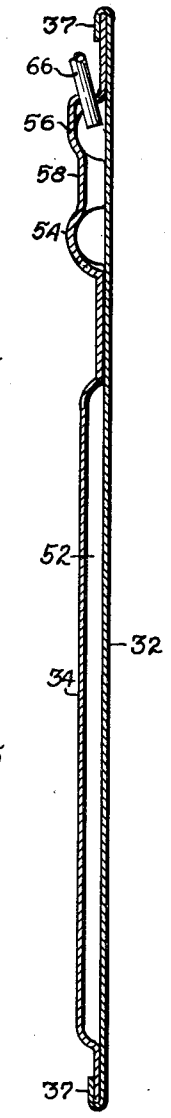


Fig - 6



INVENTOR.
LAWRENCE A. PHILIPP
BY Ralph L. Baker
ATTORNEY

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REFRIGERANT EVAPORATOR

Lawrence A. Philipp, Detroit, Mich., assignor to Nash-Kelvinator Corporation, Detroit, Mich., a corporation of Maryland

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4 Claims. (Cl. 62—126)

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This invention relates generally to refrigerating apparatus and more particularly to refrigerant evaporators therefor.

It is an object of the present invention to provide a refrigerant evaporator of improved construction, particularly with respect to refrigerant flow passages in walls of the evaporator, so as to obtain improved distribution of refrigerant and resultant improved absorption of heat of the entire surface area of the evaporator.

Another object of the invention is to provide an improved evaporator construction having walls containing a series circuit refrigerant passageway effecting direct expansion and substantially equal distribution of refrigerant over the surface of the evaporator.

Another object of the invention resides in the economy of construction of an evaporator of the above mentioned character in two similar sections or parts.

Another object of the invention is to provide an improved evaporator of sectional construction which may be readily assembled with and/or disassembled from a storage container.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a plane view of my improved refrigerant evaporator;

Fig. 2 is a rear view of the evaporator;

Fig. 3 is an end view of the evaporator partly broken away and in section;

Fig. 4 is an enlarged fragmentary sectional view of the evaporator taken along the line 4—4 of Fig. 1;

Fig. 5 is a view shown in flat of my evaporator together with units shown diagrammatically of a refrigerating system; and

Fig. 6 is a cross sectional view of part of the evaporator taken along the line 6—6 of Fig. 5.

Referring to the drawings by characters of reference, my improved refrigerant evaporator is of sectional or composite construction comprising an upper L-shaped section 20 and a lower L-shaped section 22. These evaporator sections 20, 22 are arranged in good heat absorbing relationship with a box-like container 24 which provides a storage compartment for ice trays (not shown), food, or other things to be frozen or cooled to a low temperature. The container 24 may be fixed to and in a suitable refrigerator cabinet (not shown) and may extend substantially entirely across the width of the cabinet.

The upper L-shaped evaporator section 20 has a relatively large plate-like leg 26 which seats flat on and substantially covers the top wall of the container 24 and has a relatively small or short,

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plate-like leg 28 which seats flat against an upper portion of the container rear wall. Similarly, the lower L-shaped evaporator section 22 has a relatively large horizontal, plate-like leg 30 held against the underside of the container 24 and has a relatively small, plate-like leg 31 held against a lower portion of the container rear wall. These L-shaped sections 20, 22 cooperate in forming a substantially U-shaped evaporator which may be slidably fitted onto or over the container 24 from the rear thereof.

Preferably the evaporator sections 20, 22 are made of sheet material, such as thin sheet steel and each is preferably a composite structure having an inner sheet 32 and an outer sheet 34. The sheets 32, 34 are preferably rectangular in shape before being bent along the bend lines 35 into L-shaped sections. In the present construction, the inner sheets 32 of each section have outer marginal portions 37 which are bent over flat against the outer sheets 34 and the sheets are welded together and sealed along these flanges around the entire periphery of the sheets.

The inner and outer sheets 32 and 34 respectively of the upper evaporator section 20 are formed to provide a series circuit refrigerant flow passage therebetween comprising a sinuous portion 36 in the horizontal leg 26 and a manifold portion 27 in the vertical leg 28 of the evaporator. From an inlet 40 on the vertical evaporator leg 28, the evaporator passage extends toward the front edge, as at 42, of the leg 26 and then extends substantially the length of the leg in sinuous or serpentine form to connect to one end of the refrigerant manifold 27. This manifold 27 comprises a pair of spaced substantially parallel passages or portions 44, 45 and a number of spaced, vertical connecting passages 46. The manifold portions 44, 45 extend horizontally along the vertical leg 28 of the upper evaporator section 20 and the connecting passages 46 extend vertically, connecting the portions 44, 45 intermediate the ends thereof. The sinuous passage 36 connects or communicates with one end of the upper manifold portion 44 and connected to the opposite end of the lower manifold portion 44 is one end of a conduit 48 which connects the manifold to the inlet, as at 50, of a refrigerant passageway in the lower evaporator section 22. In this lower evaporator section 22, a refrigerant passage 52 extends in sinuous or serpentine form along the bottom horizontal leg 30 of the evaporator and connects to one end of an enlarged passage or manifold 54 provided in the vertical leg 31 of the lower evaporator section 22. The manifold 54 has an upper refrigerant accumulator portion 56 connected thereto by spaced, vertically extending passages 58. It will be seen that the upper and lower evaporator sections 20 and 22

may be made substantially alike and that to do so entails a saving in die costs.

The evaporator may be connected in a refrigerating system, including a refrigerant condenser 60 and a motor-compressor unit 62. From the condenser 60, liquid refrigerant may be delivered through a capillary tube 64 to the inlet 40 of the evaporator and gaseous refrigerant may be returned to the compressor 62 through a return conduit 66. The return conduit 66 is connected to the accumulator 56 adjacent the top thereof and adjacent the accumulator end opposite the inlet of the manifold 54. Refrigerant entering the evaporator at the inlet 40 flows through the sinuous passage 36 of the upper evaporator section 20 into the upper manifold 44 and then flows into the lower manifold 45 through connecting passages 46. From the lower manifold 45 the refrigerant flows through the conduit 48 into the lower evaporator section 22. The connecting conduit 48 is of smaller flow capacity than the manifold 44 and consequently restricts flow of refrigerant from this manifold to the lower section 22 of the evaporator. Refrigerant entering the lower section of the evaporator passes directly into the sinuous portion 52 thereof and flowing through this passage along the bottom wall of the evaporator, enters the manifold 54. Any surplus liquid refrigerant will be accumulated in the accumulator 56, passing upwardly thereinto from the manifold 54 through the branch passages 58.

Welded or otherwise suitably secured to the adjacent evaporator legs 28 and 31 are L-shaped clamp members 70 which may be drawn together by nuts and bolts 72 to hold the L-shaped sections 20, 22 of the evaporator tightly against the top and bottom surfaces respectively of the container 24. Additional clamps 74 are preferably provided to clamp the upper and lower evaporator legs 26, 30 flat against the container 24 to insure good surface contact therebetween for efficient heat exchange relationship between the evaporator and the container 24. The clamps 74 may be elongated metal strips, arranged to overlap and engage outer marginal portions of the side edges of the evaporator legs 28 as shown, for example, in Fig. 4. These clamping strips 74 may be made of spring metal and may be drawn down to the container top wall by self threading or sheet metal screws 76.

From the foregoing description it will be noted that I have provided an improved refrigerant evaporator of a structural character such that direct expansion of refrigerant is obtained throughout entire passage of refrigerant along passageways in the top, bottom and rear walls of the evaporator. Further, it will be noted that I have provided an improved refrigerant evaporator of two like sections which may be readily assembled with and/or disassembled from a storage container and that the evaporator sections may be arranged and held in good heat absorbing relationship with the container.

Although only a preferred form of the invention has been illustrated, and that form described in detail, it will be apparent to those skilled in the art that various modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

I claim:

1. A refrigerant evaporator having a series circuit refrigerant passageway comprising an upper and a lower L-shaped plate having legs thereof forming the top and bottom walls of the evaporator and having their other legs partly forming an upright wall of the evaporator, a sinuous passage formed in each of said top and bottom walls, a manifold in the upright leg of the upper plate connected to the outlet of the sinuous passage in said upper plate and connected to the inlet of the sinuous passage in the lower plate, and a manifold formed in the upright leg of the lower plate connected to the sinuous passage in said lower plate.

2. In refrigerating apparatus, a box-shaped container forming a storage compartment, a pair of refrigerated L-shaped plates fitting respectively complementary with adjacent sides of said box-shaped container and being arranged with legs thereof in spaced relation to each other lying flat against one of said sides, and clamps engaging said legs urging said L-shaped plates toward each other into intimate contact with said container.

3. A refrigerant evaporator having a series circuit refrigerant passageway comprising, an upper passage having an inlet and a single outlet, a manifold below said passage connected to said single outlet and having a single outlet, a lower refrigerant passage below said manifold having an inlet connected to the single outlet of said manifold and having an outlet, a manifold above said lower refrigerant passage having a single inlet connected to the second passage outlet, and a refrigerant accumulator above and connected in parallel communication with said second manifold.

4. A refrigerant evaporator having a series circuit refrigerant passageway comprising, an upper sinuous passage having an inlet and an outlet, a manifold below said passage having an outlet, a lower sinuous refrigerant passage below said manifold having an inlet and outlet, the manifold being in series with said first and second sinuous passages, a conduit portion connecting the outlet of said manifold to the inlet of said lower sinuous passage and an accumulator connected to the outlet of the lower sinuous passage and disposed above said lower refrigerant passage.

LAWRENCE A. PHILIPP.

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