

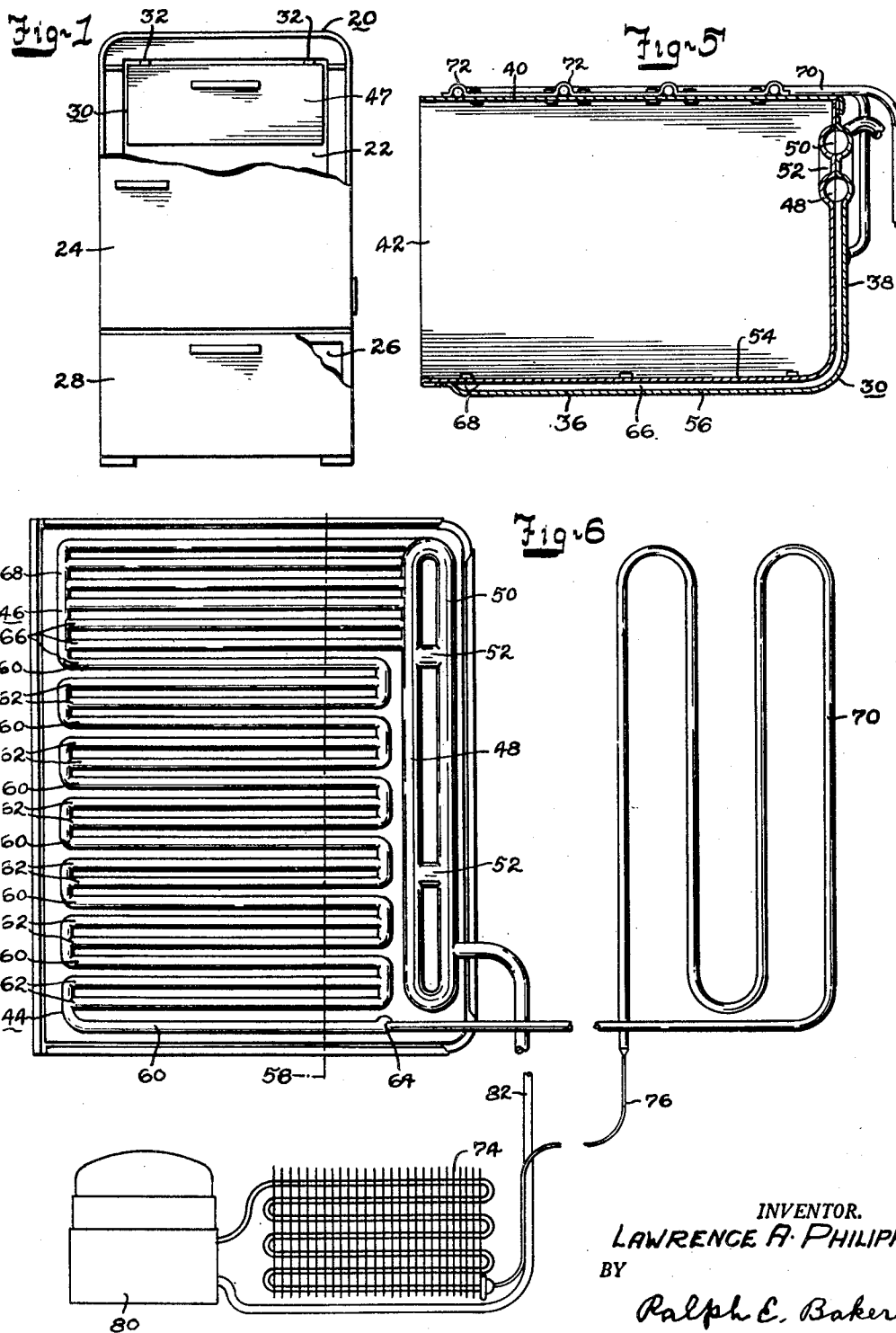
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L. A. PHILIPP
REFRIGERANT EVAPORATOR

2,496,558

Filed March 20, 1948

2 Sheets-Sheet 1



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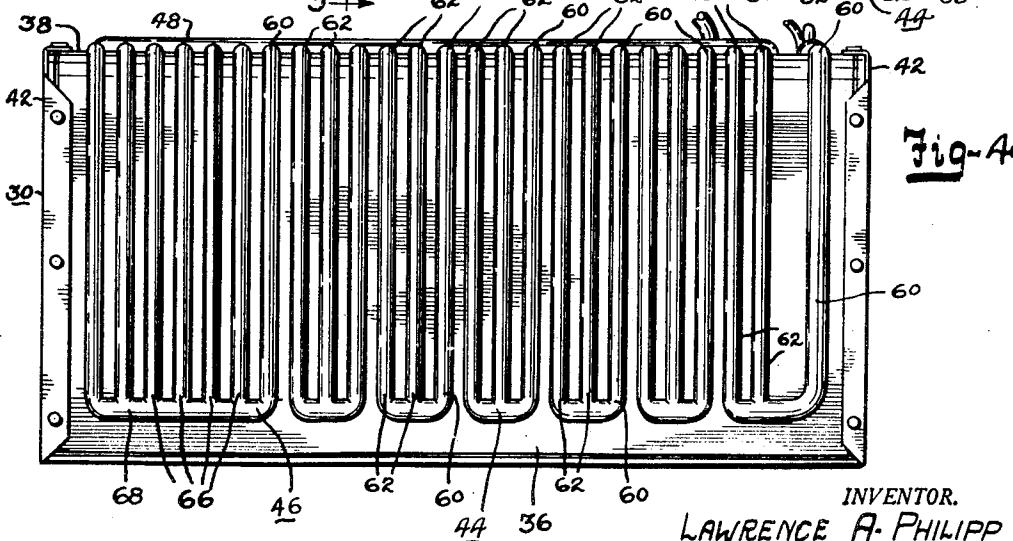
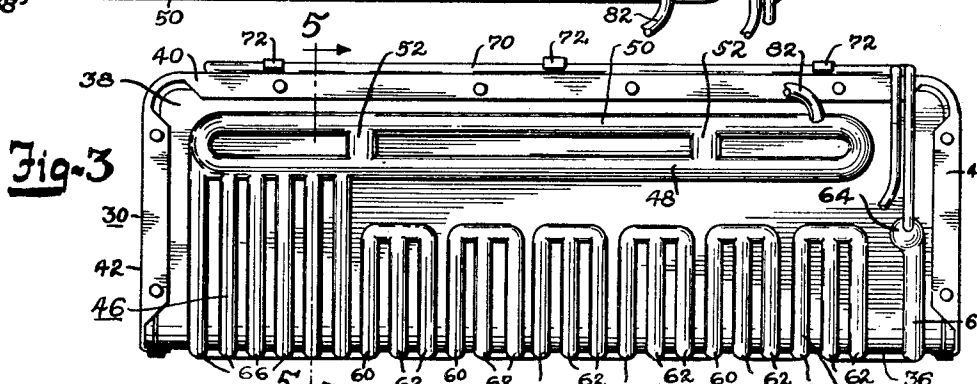
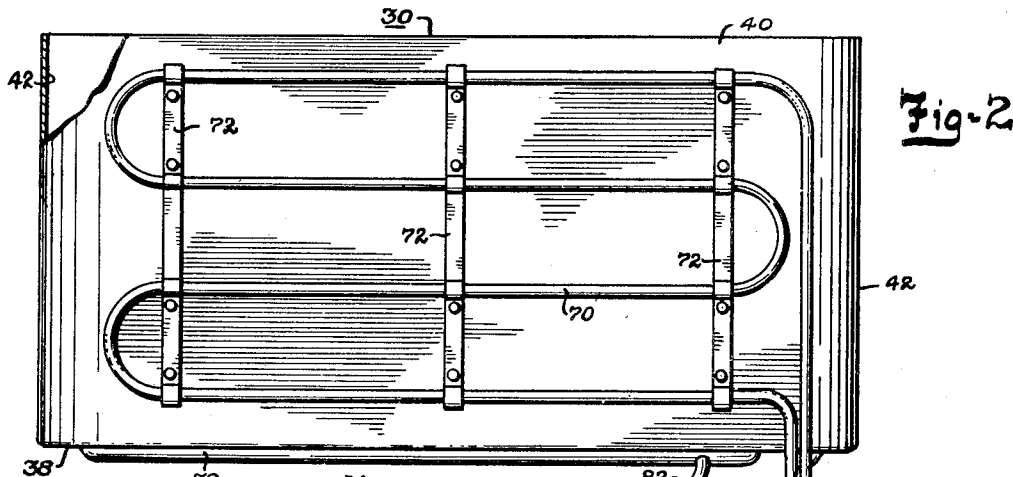
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REFRIGERANT EVAPORATOR

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REFRIGERANT EVAPORATOR

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5 Claims. (Cl. 62—126)

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

One of the objects of the present invention is to provide a refrigerant evaporator of improved construction and arrangement to increase efficiency of heat absorption.

Another object of the invention is to provide a refrigerant evaporator having an improved arrangement of a refrigerant flow passage to the end of accomplishing improved distribution of refrigerant and absorption of heat throughout the evaporator.

Another object of the invention is to provide a refrigerant evaporator having an improved flow passage of a character which enables uniform temperatures throughout the width thereof on relative wide evaporators which extend substantially across the entire width of the refrigerator cabinet.

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 front view partly broken away of a refrigerator including my improved refrigerant evaporator;

Fig. 2 is a top plan view of the evaporator;

Fig. 3 is a rear view of the evaporator;

Fig. 4 is a bottom view of the evaporator;

Fig. 5 is a cross sectional view of the evaporator taken along the line 5—5 of Fig. 3; and

Fig. 6 is a substantially diagrammatical view of the evaporator and of other units of a refrigerating system.

Referring to the drawings by characters of reference, the numeral 20 designates generally a refrigerator cabinet of the household type. The cabinet 20 has a food storage compartment 22 which may be closed at the front thereof by a hinged door 24. Immediately below the food storage compartment 22, a machinery, or condensing element compartment 26 is preferably provided and may be closed at the front of the cabinet by a hinged door 28. My evaporator, designated generally by the numeral 30, may be located in the upper region of the food storage compartment 22 and may be suspended from the cabinet top wall by suitable brackets 32.

In construction, the evaporator 30 is preferably of general L-shape in cross section having a horizontal leg or bottom wall 36 and a vertical leg or rear wall 38. Preferably, the evaporator 30

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extends substantially entirely across the width of the food storage compartment 22. A top wall 40 having downturned, opposite sides 42 may be provided to form, together with the L-shaped evaporator 30, a box-like container suitable for the storage of ice trays (not shown), food stuffs, and other things to be frozen. Access to the freezing compartment of the container may be had at the front thereof which may be closed by an interior door 41.

In accordance with my invention, I provide a refrigerant flow passage in the bottom and rear walls of the evaporator comprising, an inlet and direct expansion portion 44, a flooded portion 46, a manifold 48 and an accumulator 50. The direct expansion portion 44 and the flooded portion 46 of the refrigerant passage are relatively laterally positioned and extend substantially from the front edge of the evaporator bottom wall 36 rearwardly and continue partway up the evaporator rear wall 38. Above the direct expansion and flooded portions of the refrigerant flow passage in the evaporator rear wall 38 is the manifold 48, and above this is the accumulator 50. The manifold 48 and the accumulator 50 extend substantially parallel and preferably substantially entirely across the width of the evaporator vertical wall 38, adjacent the top thereof. As shown, the manifold 48 and the accumulator 50 are connected or are in communication at their opposite ends. Also, spaced passages 52 may be provided, interconnecting the manifold and the accumulator intermediate their ends to increase flow capacity for passage of refrigerant upwardly into the accumulator.

The evaporator 30 may be constructed of sheet material, such as a pair of thin steel sheets 54 and 56 which may be formed to provide the herein mentioned refrigerant flow passage therebetween. The sheets 54, 56 are superimposed flat against each other and may be secured and sealed around their peripheral edges by welding or by any other suitable means. In Fig. 6, the numeral 58 designates the bend line along which the sheets 54, 56 are bent to form the L-shaped evaporator.

Further in accordance with my invention, I arrange the direct expansion portion 44 of the refrigerant flow passage to extend in sinuous form across the evaporator, and I provide for decreasing resistance to refrigerant flow through the passage by alternately decreasing and increasing flow capacity of adjacent runs of the sinuous passage. To this end, I provide single passage runs

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60, alternating with double or pairs of parallel passage runs 62. By this arrangement, refrigerant entering the evaporator inlet, as at 64, flows through the first single run 60, then is divided to flow through the adjacent pair of parallel runs 62 and then through the next single run and so on preferably across substantially two-thirds of the evaporator walls. Thus, at the parallel runs 62, resistance to flow is decreased and at the single runs is increased to control evaporation throughout the length of the passage. At the end of the last of the runs 60, the refrigerant flows into the flooded portion 46 of the evaporator. This flooded portion of the evaporator 30 comprises a number of parallel passages 66 connected adjacent the front edge of the evaporator by a common connecting passage or manifold 68, and connected at their upper ends to the underside of the manifold 48. During operation of the system the liquid level in the flooded section may be in the manifold 48 which would enable the manifold 48 to serve as a header. If desired for certain operation the system may be charged with refrigerant to maintain this liquid level in the accumulator 50 during operation of the system.

The top wall 40 of the container may be refrigerated by a refrigerant evaporator coil or conduit 70. This evaporator coil 70 may be arranged to extend sinuously over the upper surface of the top wall 40 as shown, for example, in Fig. 2. Clamps 72 or other suitable means may be provided to hold the evaporator coil 70 down against, in good heat absorbing relationship with, the container top wall 40. Liquid refrigerant may be delivered from a suitable refrigerant condenser 74 to the inlet of the evaporator 70, through a small diameter or capillary tube 76. From the outlet of the evaporator 70, refrigerant flows into the evaporator 30, at the inlet 64 of the direct expansion flow passage and passes through the passage portion 44 flowing first in a single run 60 and then through a pair of parallel runs 62 and then through the next single run 60 and so on, finally passing into the flooded portion 46 of the evaporator. These alternate, parallel runs 62 provide increased flow capacity and thus decrease resistance to flow of refrigerant with accompanying decrease in pressure between the high and low sides of the system. From the flooded portion of the evaporator 30 and from the manifold 48 gaseous refrigerant rises to the top of the accumulator 50 where it is drawn off by and returned to a motor-compressor unit 80 through a refrigerant return conduit 82.

From the foregoing description, it will be noted that I have provided a refrigerant evaporator having an improved arrangement of refrigerant flow passageways in which the refrigerant is allowed to expand directly in passing through a portion of the passageway which is so constructed as to alternately effect restricting and expansion of the refrigerant. In addition, I have provided an improved refrigerant evaporator of the above mentioned character in which the refrigerant passageway includes both direct expansion and flooded type expansion along the bottom of an evaporator. In the arrangement disclosed herein, I have found that the evaporator operates at uniform temperature across its entire width.

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.

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I claim:

1. A refrigerant evaporator comprising, wall means, a refrigerant accumulator formed in and by said wall means, a sinuous refrigerant passage extending from an inlet partway along and in said wall means for direct expansion of refrigerant passing therethrough, and a series of connected parallel passages extending along another portion of said wall means laterally of and parallel to said sinuous passage and connected to the outlet of said sinuous passage and also connected to the inlet of said accumulator.

2. A refrigerant evaporator comprising, a wall, a sinuous or series circuit portion of a refrigerant passageway extending along and in a portion of said wall, said series circuit portion of said passageway having alternately large and small flow capacity portions along the length thereof, a plurality of parallel passages in said wall positioned laterally of and parallel to said sinuous portion of said refrigerant passageway and communicating with a small flow capacity portion of the refrigerant passageway, and an accumulator connected adjacent one end thereof to said parallel passages and overlying ends of said sinuous circuit portion.

3. A refrigerant evaporator comprising a wall section having a header extending laterally thereacross, parallel passages having their outlet ends connected to one end section of said header and a serpentine passage on said wall section positioned laterally of and extending parallel to said parallel passages and below said header with said serpentine passage being arranged with its outlet end connected to the inlet ends of said parallel passages.

4. A refrigerant evaporator comprising, superimposed L shaped sheets forming bottom and rear walls of a storage container, a sinuous refrigerant passage formed between and by said L shaped sheets, said passage having alternate relatively large and relatively small flow capacity portions in parallel relationship spaced widthwise of said sheets and terminating intermediate the side edges thereof in one of the relatively small flow capacity portions, said passage also having relatively long run portions in said bottom wall and relatively short run portions in said rear wall, an elongated refrigerant accumulator formed by and between said sheets in said rear wall, said accumulator extending transversely of said runs along and above said short run portions and beyond said relatively small flow capacity terminal portion, and a series of parallel passages formed by and between said sheets beneath an end portion of said accumulator, said series of parallel passages being parallel to said runs and laterally positioned therewith having an inlet connected to said relatively small flow capacity portion and having individual outlets connected to said accumulator.

5. A refrigerant evaporator comprising, a pair of superimposed L shaped sheets forming a bottom wall having front and side edges and forming a rear wall having side and top edges, a refrigerant passage formed by and between said sheets having an inlet in said rear wall adjacent one edge thereof, said passage extending from said inlet sinuously crosswise of said walls over more than half of said walls with the runs of said passage extending from said front edge rearwardly and partway up said rear wall, a refrigerant accumulator formed by and between said sheets having a pair of connected parallel

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passages extending across substantially the entire width of said rear wall above the turns of said sinuous passage, and a series of individual refrigerant passages formed between and by said sheets parallel to each other and to the runs of said sinuous passage, said series of passages being individually connected to the outlet end of said sinuous passage and being individually connected to said accumulator.

LAWRENCE A. PHILIPP. 10

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