

July 20, 1943.

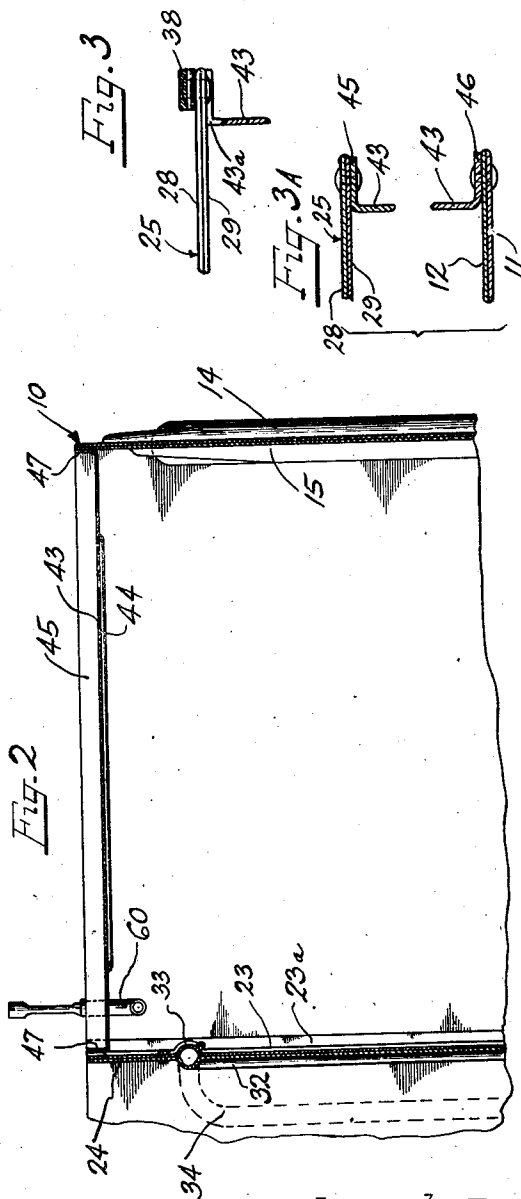
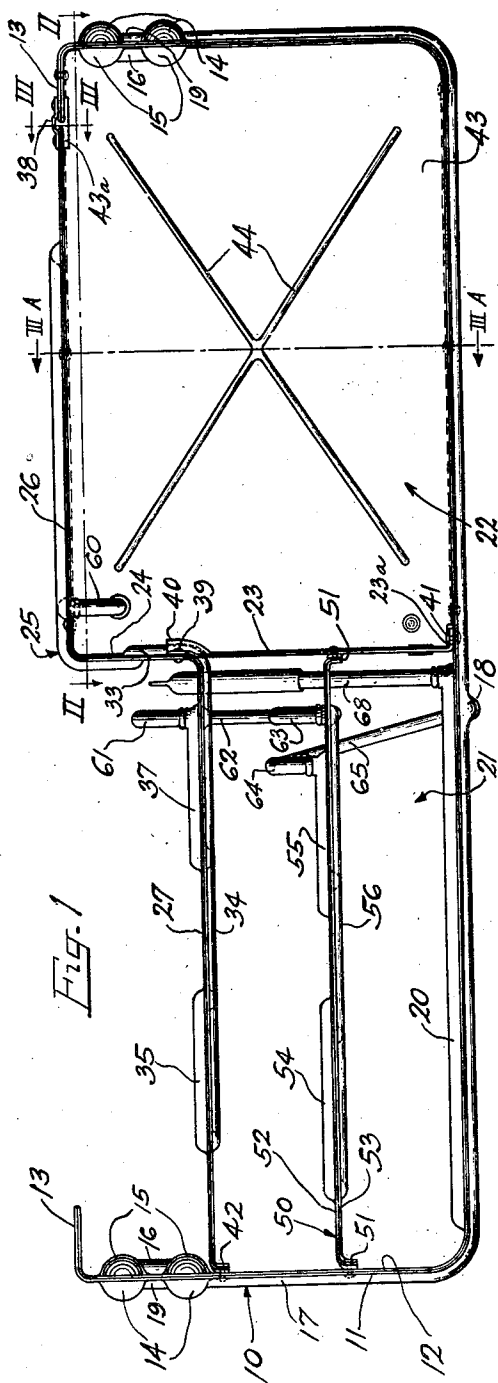
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2,324,931

EVAPORATOR UNIT WITH FROZEN FOOD COMPARTMENTS

Filed Dec. 30, 1940

5 Sheets-Sheet 1



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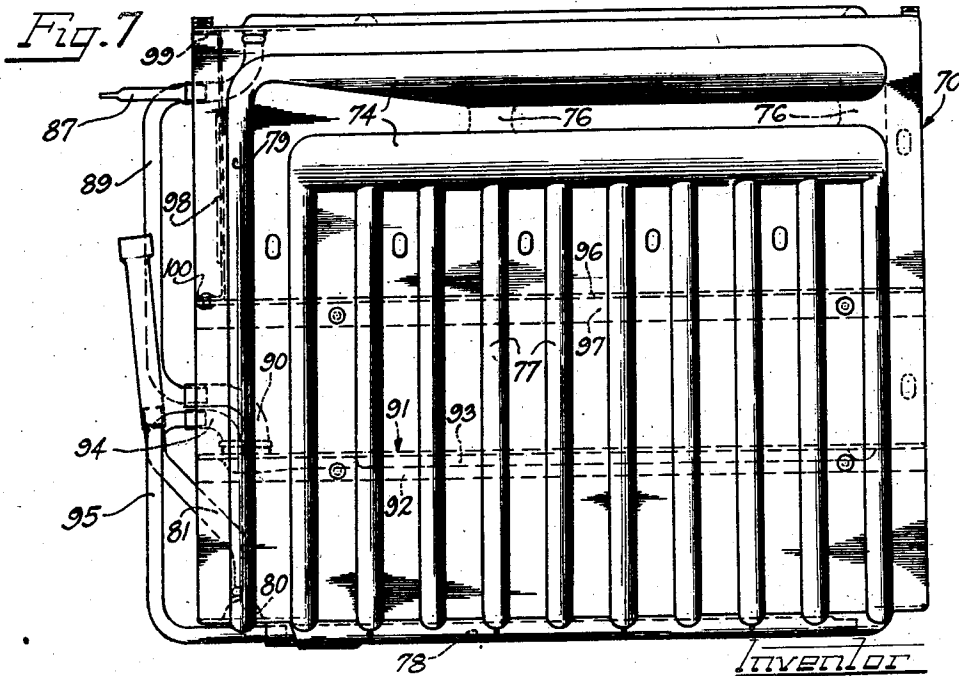
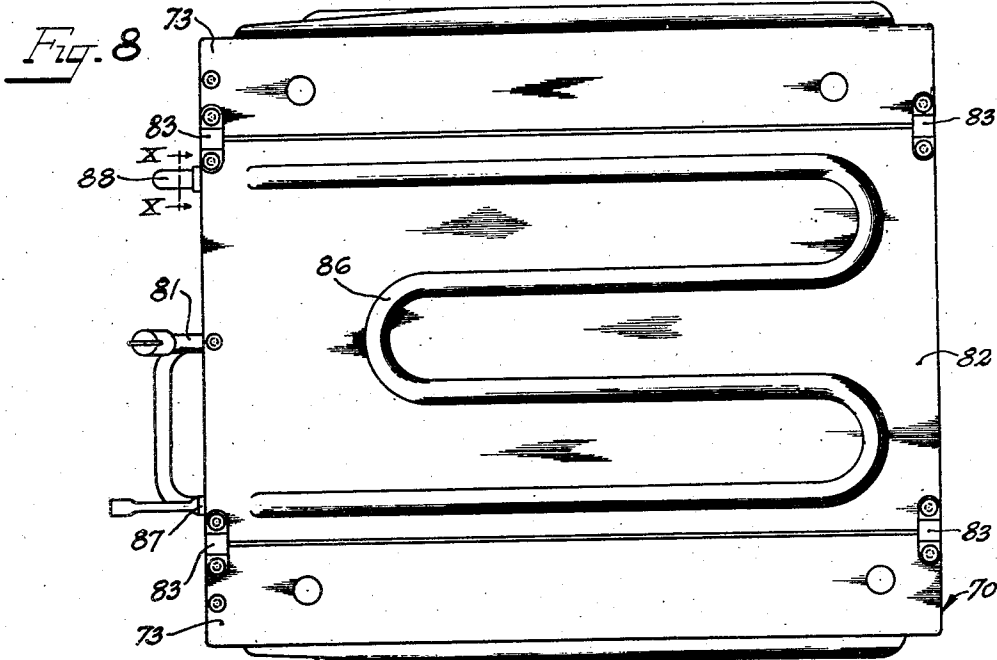
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EVAPORATOR UNIT WITH FROZEN FOOD COMPARTMENTS

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5 Sheets-Sheet 3



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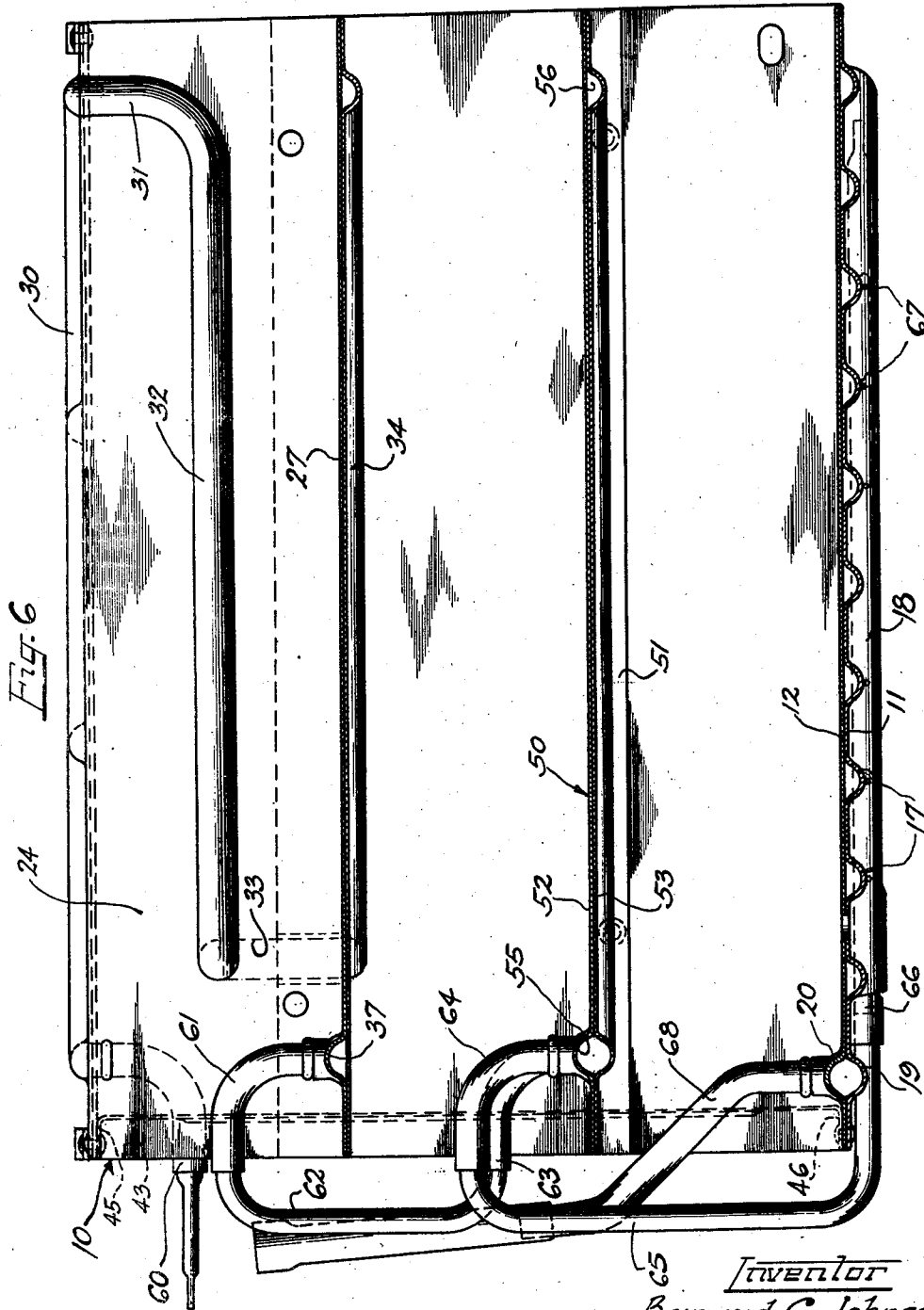
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EVAPORATOR UNIT WITH FROZEN FOOD COMPARTMENTS

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5 Sheets-Sheet 4



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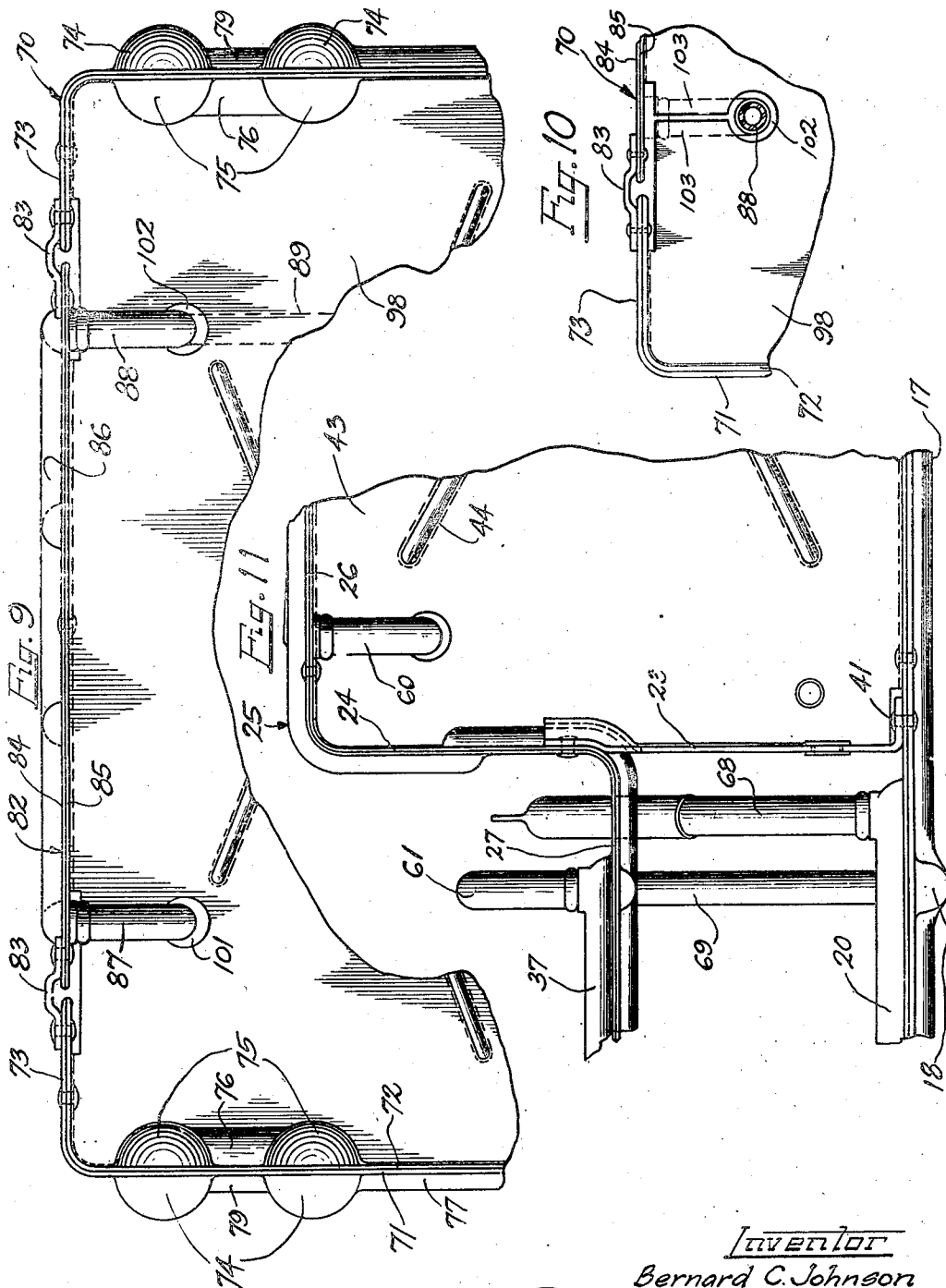
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EVAPORATOR UNIT WITH FROZEN FOOD COMPARTMENTS

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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

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EVAPORATOR UNIT WITH FROZEN FOOD COMPARTMENTS

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8 Claims. (Cl. 62—126)

This invention relates to evaporator units having low temperature food storage compartments in addition to the usual ice tray compartments.

More particularly the invention relates to sheet metal evaporator units equipped with separate refrigerant conducting top walls and with back walls to define food storage compartments separate from the ice tray compartments.

The demand for more low-temperature or freezing compartments in mechanical refrigerators has materially increased the production costs of such units. Low-temperature or freezing food storage compartments should preferably be isolated from other compartments. This has resulted in food storage compartments which are entirely separate from the evaporator unit in mechanical refrigerators but such constructions are very expensive in that they require separate cooling coils or refrigerant circulating ducts.

In accordance with the present invention, frozen food compartments are made part of the evaporator units which also define the customary ice tray compartments. As a result of this invention, only one refrigerant circulating unit is necessary in each refrigerator and the production costs are thus materially decreased.

The evaporator units of this invention can have the ice tray compartment and frozen food compartment either in side by side relationship, or in superimposed relationship. The units are formed from welded-together embossed flat metal sheets providing refrigerant circulating chambers and header chambers therebetween. These sheets are bent into a U-shape so as to form the side walls and bottom of an enclosed chamber. In one form of the invention a second pair of welded-together embossed metal sheets are bent so as to provide laterally extending horizontal portions at different levels connected through a vertical intermediate portion. The horizontal portion of the thus-bent sheets, which is at the highest level, forms the top wall of a frozen food compartment, the vertical portion forms a partition wall, and the other horizontal portion forms a shelf in the ice tray compartment of the unit. In another form of the invention a separate pair of embossed welded-together flat metal sheets is secured to the tops of the side walls of the unit to bridge the space therebetween and form a refrigerated top wall. A horizontal partition at a lower level between the side walls but above the bottom of the unit isolates the unit into top and bottom compartments. The rear end of the food compartment can be closed with a sheet metal

plate while the fronts of the compartments can be closed with separate doors.

It is, then, an object of this invention to inexpensively provide an evaporator unit with a separate frozen food compartment in addition to the usual ice tray compartment.

Another object of the invention is to provide a sheet metal evaporator unit equipped with separate wall members providing additional refrigerated closure walls.

A specific object of the invention is to provide sheet metal evaporator units with frozen food compartments and ice tray compartments in either superimposed relationship or in side by side relationship.

Another specific object of this invention is to equip U-shaped sheet metal evaporator units with separate cooling walls for providing, within the units, frozen food compartments in addition to the usual ice tray compartment.

A further specific object of this invention is to provide bridging walls for U-shaped sheet metal evaporator units adapted to isolate a frozen food compartment within the unit.

Other and further objects of the invention will be apparent to those skilled in the art from the following detailed description of the annexed sheets of drawings which disclose preferred embodiments of the invention.

On the drawings:

Figure 1 is a front end elevational view of an evaporator unit according to this invention having separated ice tray and food compartments in side by side relation.

Figure 2 is a fragmentary horizontal cross-sectional view taken along the line II—II of Figure 1.

Figure 3 is a fragmentary vertical cross-sectional view taken along the line III—III of Figure 1.

Figure 3—A is a fragmentary vertical cross-sectional view taken along the line III—A—III—A of Figure 1.

Figure 4 is a top plan view of the unit shown in Figure 1.

Figure 5 is an end elevational view of the bridging wall for the unit shown in Figure 1.

Figure 6 is a vertical cross-sectional view, with parts in elevation, taken along the line VI—VI of Figure 4.

Figure 7 is a side elevational view of another form of evaporator unit according to this invention.

Figure 8 is a top plan view of the unit shown in Figure 7.

Figure 9 is an enlarged fragmentary front end elevational view of the unit shown in Figures 7 and 8.

Figure 10 is a vertical cross-sectional view taken along the line X—X of Figure 8.

Figure 11 is a fragmentary front elevational view of a unit similar to that shown in Figure 1, but equipped with only one refrigerated shelf in the ice tray compartment.

As shown on the drawings:

In Figures 1, 2, 4, and 6, the reference numeral 10 designates generally one form of evaporator unit according to this invention. As best shown in Figure 1, the unit 10 includes a pair of embossed welded-together metal sheets 11 and 12 bent into U-shape to provide vertical side walls and a horizontal bottom for the unit. The top ends of the sheets 11 and 12 are bent inwardly as at 13 to form horizontal flanges for hanging the unit in a refrigerator cabinet, preferably from the top wall of the cabinet.

The outer metal sheet 11 has semi-cylindrical flutes 14 extending in superimposed relation across the upper ends of the vertical walls. The inner sheet has complementary flutes 15 embossed therein. The flutes 14 and 15 together define a pair of superimposed header chambers on each side wall of the unit. The inner sheet 15 is further embossed as at 16 to provide passageways connecting the header chambers of each pair.

The outer sheet has a plurality of flutes 17 embossed thereon which, as shown in Figures 1 and 6, extend from the lower header chamber in each side wall around the entire unit. These flutes provide a plurality of refrigerant distributing ducts and are intersected by a flute 18 in the bottom of the unit and embossed on the outer sheet 11. This flute 18 serves as a manifold connecting the ducts provided by the flutes 17 and receives refrigerant as will be hereinafter described for circulating the refrigerant along the bottom and side walls of the unit into the lower header chambers on each side wall. The spent refrigerant then flows through the passageways 16 into the top header chambers on each side wall. Each top header chamber communicates with a flute 19 embossed in the outer sheet 11 and extending completely around the unit. This flute 19 communicates with a flute 20 embossed in the inner sheet at the rear end thereof as shown in Figures 1 and 6. The flute 20 receives an exhaust tube, as will be hereinafter described, for removing the spent refrigerant from the unit.

It will be noted from Figure 1 that the U-shaped unit 10 is quite wide and thus defines the side walls and bottom of a wide chamber. This chamber, in accordance with the present invention, is divided into an ice tray compartment 21 and a food compartment 22 in side by side relationship by means of a vertical partition plate 23 and the vertical intermediate portion 24 of a separate refrigerated wall member 25 having a horizontal portion 26 defining a top wall for the compartment 22 and a second horizontal portion 27 at a lower level defining a top shelf in the compartment 21.

As best shown in Figure 5, the wall member 25 is composed of a pair of embossed welded-together sheets of metal 28 and 29. The top sheet 28 is embossed as at 30, as shown in Figure 4, to provide a serpentine duct extending from the rear to the front end of the sheet, over the portion 26 of the wall member. The duct provided by the embossed flute 30 continues over

the vertical portion 24 of the member at the front end thereof as at 31 and communicates with a flute 32 (Figure 6) extending horizontally along the wall portion 24 to the rear end thereof. The rear end of the flute 32 communicates with an embossed flute 33 on the sheet 29 and this flute 33 continues from the vertical wall portion 24 of the member under the portion 27 of the member to provide a duct 34 which, as shown in Figure 4, extends to the front end of the unit, thence across this front end and rearwardly to a flute 35 embossed on the upper sheet. The flute 35 communicates with a U-shaped flute 36 embossed on the lower sheet which discharges into a flute 37 on the upper sheet. As a result, refrigerant can flow in a serpentine path through the passageway provided by the flute 30 in the portion 26 of the member, thence through the passageway provided by the flutes 31, 32 and 33 in the portion 24 of the member and thence through the path provided by the flutes 34, 35, 36 and 37 in the portion 27 of the member. Thus, the wall member 25 provides a refrigerated top wall for the compartment 22, a refrigerated partition wall between the compartments 21 and 22, and a refrigerated top shelf for the compartment 21.

The member 25, as shown in Figures 1 and 4, is secured to the unit by means of brackets 38 riveted to the flange 13 in the compartment 22 and to the corners of the portion 26 of the member 25. These brackets 38 will hold the top wall portion 26 in alignment with the flange 13. The partition plate 23 is riveted to the vertical wall portion 24 of the member 25 as at 39 and the partition plate can be embossed as at 40 to fit around the embossed flute 33 in the vertical wall portion 24. The bottom of the partition wall 23 has a horizontal flange 23a riveted as at 41 to the bottom of the unit 10.

The other end of the member 25 has a downturned flange 42 which is riveted to the side wall of the unit.

The rear end of the compartment 22 is closed by means of a sheet metal plate 43 which can be embossed as at 44 to rigidify the plate. This plate has a rearwardly extending top flange 45 (Figure 3—A) riveted to the top wall portion 26 of the member 25 and to the flange 13 of the unit (Figure 1). The plate also has a rearwardly extending bottom flange 46 riveted to the bottom of the unit as shown in Figure 3—A.

The top flange 45 is cut away as at 43a adjacent the rear bracket 38 as shown in Figures 1 and 3 so as not to interfere with the rivets for the bracket 38.

As shown in Figure 2, the plate 43 can also have rearwardly extending side flanges 47 secured to the side wall of the unit and to the partition plate 23.

As shown in Figures 1 and 6, a shelf 50 is mounted in the compartment 21 below the portion 27 of the member 25. This shelf 50 has downturned flanges 51 riveted to the partition plate 23 and to a side wall of the unit. The shelf 50 is composed of embossed welded-together metal sheets 52 and 53. Thus the top sheet 52 can be embossed as at 54 and 55 while the lower sheet 53 is embossed as at 56 to provide communicating ducts for the circulation of refrigerant across the full area of the shelf.

Refrigerant is introduced into the serpentine duct 30 of the top wall member through a tube 60 which extends through the rear wall 43. The

refrigerant flows through the duct 30 to cool the top wall member 28 and thence flows through the ducts in the vertical wall portion 24 to cool this wall. The refrigerant next flows through the ducts in the shelf-defining portion 27 of the member 25 and thence through an L-shaped fixture tube 61 secured to the flute 37 and extending beyond the rear end of the evaporator unit as shown in Figure 6 to a connecting tube 62. The tube 62 discharges into a second L-shaped fixture tube 63 which, as best shown in Figure 1, communicates with the passageway 56 in the shelf member 50. The refrigerant thus circulates through the shelf 50 and into an L-shaped fixture tube 64 communicating with the flute 55 and having a rearwardly extending leg portion receiving a tube 65 which extends around the rear end of the unit and connects with a perforated inlet pipe 66 telescoped in the inlet manifold 18 of the unit and having a plurality of holes 67 therein in alignment with the refrigerant ducts 17, as shown in Figure 6. The refrigerant is thus distributed to the ducts 17 and flows along the bottom to the side walls of the unit where it can rise into the lower header chamber in each side wall. The spent refrigerant gas can be exhausted through the passageways 16 into the top header chambers and thence out through the exhaust flute 19 into the flute 20 and out through an exhaust tube 68 communicating with the flute 20.

As a result, the refrigerant first flows through the top wall of the frozen food compartment 22, thence through the vertical partition wall, next through the top shelf of the ice tray compartment 21, then through the lower shelf of the ice tray compartment and next into the main refrigerant distributing ducts of the unit. Only one inlet 60 and one exhaust outlet 68 need be provided for the entire assembly.

The front end of the frozen food compartment 28 can be closed with a door hinged on a side wall of the unit and, if desired, the ice tray compartment can be closed with a door or can remain in an open ended condition.

In the modification shown in Figure 11, the shelf 50 is omitted and the L-shaped tube fixture 61 communicating with the duct 37 in the portion 27 of the member 25 is joined to a tube 69 communicating directly with the inlet manifold 18. In the modified construction, the wall portion 24 can be somewhat deeper since the portion 27 can be closer to the bottom of the unit. As a result the partition plate 23 need not be as high as shown in Figure 1.

In the embodiment shown in Figures 7 to 10 the evaporator unit has the frozen food compartment above the ice tray compartment instead of alongside of it as in the embodiments shown in Figs. 1 to 6 and 11. In Figures 7 to 10, the reference numeral 70 designates generally a U-shaped sheet metal evaporator unit composed of embossed welded-together outer and inner sheets 71 and 72. The sheets 71 and 72 are bent into U-shape and form the side walls and bottom of the unit and the top ends of the side walls are turned in as at 73 to form hanger flanges. The outer sheet 71 has semi-cylindrical embossed portions 74 near the upper ends of the vertical side walls cooperating with complementary embossed portions 75 on the inner sheet 72 to provide a pair of superimposed header chambers on each side wall. The inner sheet is further embossed as at 76 to provide passageways connecting the header chambers.

The outer sheet 71 has a plurality of spaced parallel flutes 77 embossed thereon extending around the unit into communication with the lower header chambers in each side wall. A transverse inlet manifold flute 78 is embossed in the outer sheet at the bottom of the unit and communicates with the ducts provided by the flutes 77.

The top header chamber of each pair communicates with a duct provided by a flute 79 extending around the side walls and bottom of the unit and communicating with a duct 80 embossed on the inner sheet at the bottom of the unit. The duct 80 receives a single exhaust tube 81 for removing spent refrigerant from the unit.

In accordance with the present invention a refrigerated top wall member 82 bridges the space between the flanges 73 and is secured to the flanges by means of four brackets 83 riveted to the corners of the wall and to the flanges. The wall member 82 is composed of welded-together embossed metal plates 84 and 85 with the top plate 84 having a serpentine flute 86 defining a refrigerant passageway over the area of the wall and with the bottom plate receiving L-shaped tube fixtures 87 and 88 in communication with the passageway provided by the flute 86. The tube fixture 87 receives refrigerant and feeds the same to the duct provided by the flute 86. The refrigerant then flows out of the tube fixture 88 through a tube 89 in back of the unit and thence through a tube fixture 90 provided on a refrigerated shelf 91. The shelf 91 is composed of embossed welded-together sheet metal plates having downturned side flanges 92 riveted to the side walls of the unit and bridging the side walls in spaced relation from the bottom of the unit. The shelf 91 has refrigerant circulating ducts 93 embossed therein and, after flowing through the passageway 93, the refrigerant is discharged out of the shelf through a tube fixture 94 receiving a tube 95 communicating with the inlet manifold 78 of the unit. The refrigerant thus first flows through the top wall member 82, thence through the shelf 91 and next into the inlet manifold 78 for distribution through the circulating ducts 77 around the bottom and side walls of the unit.

A partition wall 96 (Fig. 7) composed of a single metal plate bridges the space between the side walls of the unit and has downturned flanges 97 secured to the side walls. The plate 96 is spaced above the shelf 91 and below the top wall 82. A compartment is thus defined in the top portion of the unit enclosed by the upper portions of the unit side walls, by the top wall 82, and by the plate 96. This compartment can have the rear end thereof closed by a plate 98 having rearwardly extending top and bottom flanges 99 and 100 secured to the flanges 73 of the unit and to the plate 96 as shown in Figure 7.

The tube fixtures 87 and 88 extend through apertures 101 and 102 in the rear wall plate 98. Since the tube fixture 88 is connected with the tube 89, the back wall 98 is cut as shown in Figure 10, so that flaps 103 can be folded back to provide a space adapted to clear the tube. After the wall member has been inserted, the flaps 103 can be folded back to close this space.

The top compartment is thus provided with a back wall and the front of the compartment can be closed by means of a door hingedly connected to the side wall of the unit if desired.

The top compartment will have refrigerated top and side walls and is adapted to receive food

products such as meat, ice cream and the like materials which are to be kept at temperatures lower than those existing in the main body of the refrigerator cabinet. The bottom compartment receives the usual ice trays. It is provided with a refrigerated shelf.

From the above descriptions it will be understood that this invention now provides refrigerator units having frozen food compartments in addition to the usual ice tray compartments by incorporating an additional refrigerated wall into U-shaped sheet metal units. The refrigerated wall structure is also formed from sheet metal and the units can either have the compartments thereof in side by side relationship or in superimposed relationship.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. A sheet metal evaporator unit having an ice tray compartment and a frozen food compartment which comprises a pair of secured-together embossed metal sheets defining refrigerant circulating passageways and header chambers therebetween and forming the side walls and bottom of a storage chamber, a vertical partition wall secured to said bottom between the side walls and extending upwardly in spaced relation from the side walls to a level below the tops of said side walls, a pair of secured-together embossed metal sheets defining a refrigerant passageway therebetween and having a vertical intermediate wall portion secured to said partition wall and extending upwardly therefrom together with horizontal portions extending on opposite sides of said partition wall forming the top wall for the frozen food compartment and a shelf for the ice tray compartment and means connecting the passageways defined by said pairs of sheets.

2. An evaporator unit having a frozen food compartment alongside of an ice tray compartment comprising refrigerated spaced opposed side walls and a connecting wall, a vertical partition wall between said side walls, a refrigerated wall member having offset laterally extending horizontal portions and an intermediate vertical portion, means securing said vertical portion to said partition wall, and means securing said horizontal portions to said side walls to form a top for the frozen food compartment and a shelf in said ice tray compartment.

3. A U-shaped sheet metal evaporator unit having a vertical partition wall secured to the bottom thereof in spaced relation from the legs of the U to divide the space enclosed by the unit into a pair of compartments in side by side relation, and a unitary horizontal wall member bridging said legs of the U having an interme-

diate vertical portion secured to said partition wall, said wall member arranged to provide a top for one chamber and a shelf in the other chamber.

4. A sheet metal evaporator unit comprising a pair of embossed secured-together metal sheets defining a refrigerant passageway therebetween and shaped to provide the side walls and bottom of a chamber, a vertical partition wall secured to said bottom between said side walls, a second pair of embossed secured-together metal sheets defining a refrigerant passageway therebetween and shaped to provide a vertical wall extending above said partition wall and laterally extending horizontal walls on each side of the partition wall, means for securing said horizontal walls to the side walls and means for connecting the passageways of both pairs of sheets.

5. A sheet metal evaporator unit comprising a pair of embossed secured-together metal sheets defining a refrigerant passageway therebetween and shaped to provide the side walls and bottom of a chamber, said side wall portions having inturned horizontal flanges at their upper ends, a second pair of embossed secured-together metal sheets defining a refrigerant passageway therebetween extending laterally from one of said flanges to the mid-portion of the unit, thence downwardly toward the bottom of the unit and thence horizontally to the other side wall, a partition wall secured to said bottom and bridging the space between the downwardly extending portion of said pair of sheets and said bottom whereby said chamber is divided into a pair of compartments in side by side relation, and a back wall for one of said compartments.

6. A U-shaped sheet metal evaporator unit having a vertical partition wall dividing the chamber enclosed by the unit into a pair of compartments in side by side relation, and a refrigerated top wall member having an intermediate vertical portion thereof secured to said partition wall together with laterally extending horizontal leg portions forming a top wall for one of said compartments and a shelf in the other of said compartments.

7. In a sheet metal evaporator unit having an ice tray compartment and a frozen food compartment in side by side relation, the improvement which comprises a pair of embossed secured-together metal sheets having horizontally offset laterally extending legs secured to the unit, the upper offset leg being arranged to provide a top wall for the frozen food compartment and the lower offset leg being arranged to provide a shelf for the ice tray compartment.

8. In a U-shaped sheet metal evaporator unit having spaced opposed inturned flat flanges on the tops of the legs thereof the improvement which comprises a separate refrigerating top wall for the unit bridging the space between the flanges and brackets connecting said top wall to said flanges.

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