

June 23, 1953

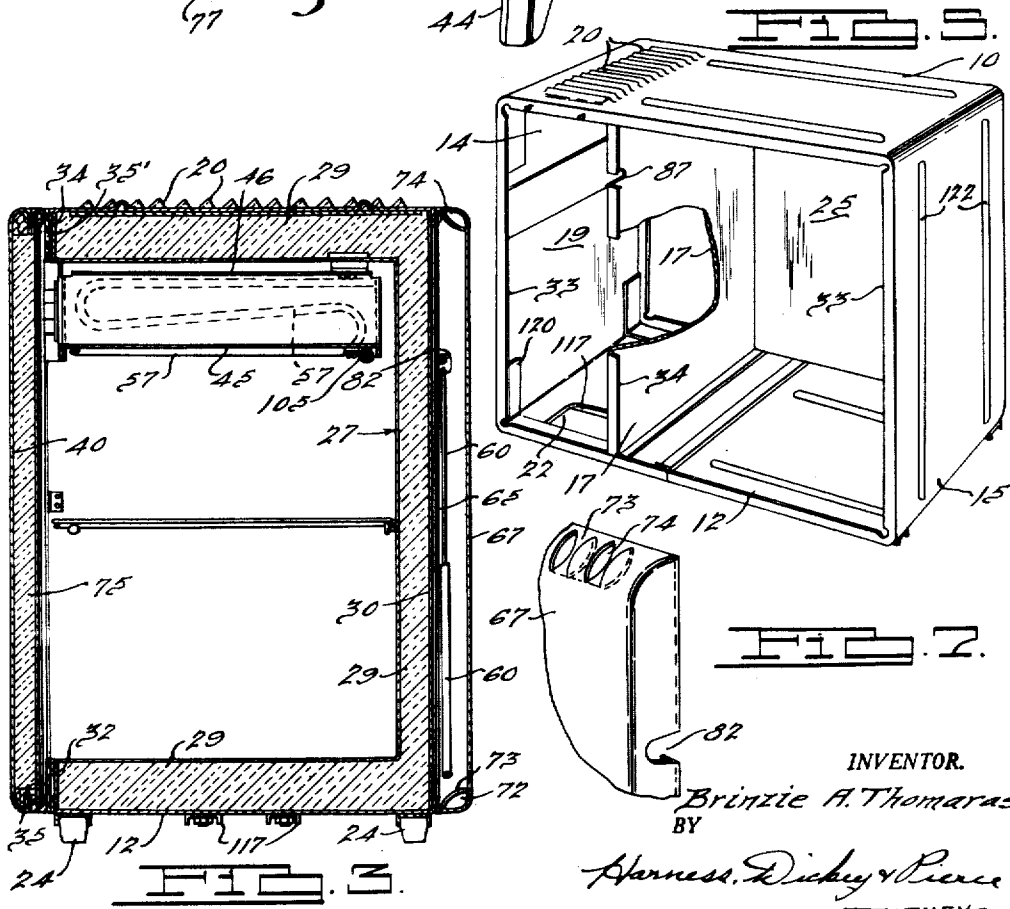
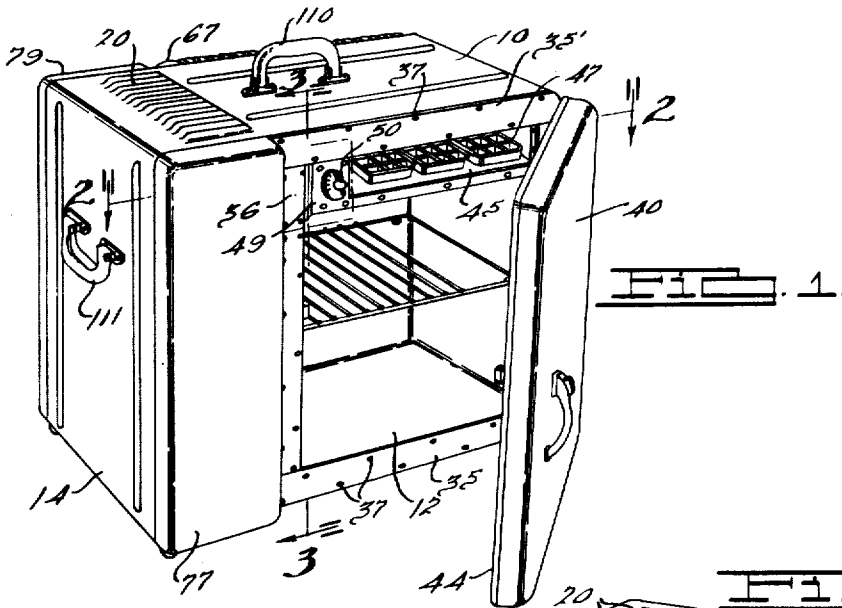
B. A. THOMARAS

2,642,728

PORTABLE REFRIGERATOR CONSTRUCTION

Filed Feb. 27, 1950

3 Sheets-Sheet 1



INVENTOR.

Brinzie A. Thomaras.

BY

Harness, Dickey & Pierce
ATTORNEYS.

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B. A. THOMARAS

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3 Sheets-Sheet 2

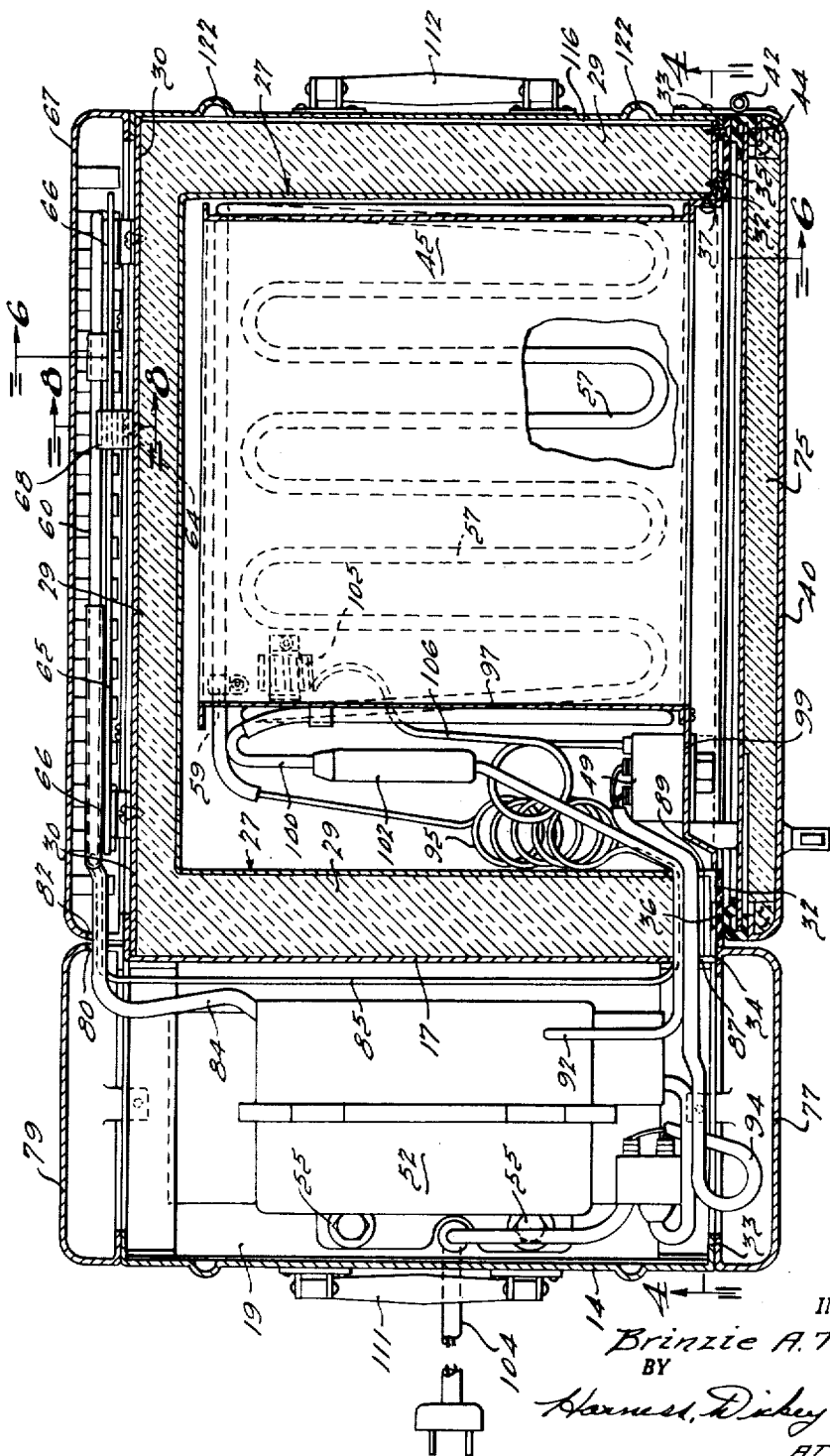


FIG. 2.

INVENTOR.

Brinzie A. Thomaras

BY

Harriet Dickey & Pierce.
ATTORNEYS.

June 23, 1953

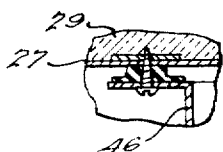
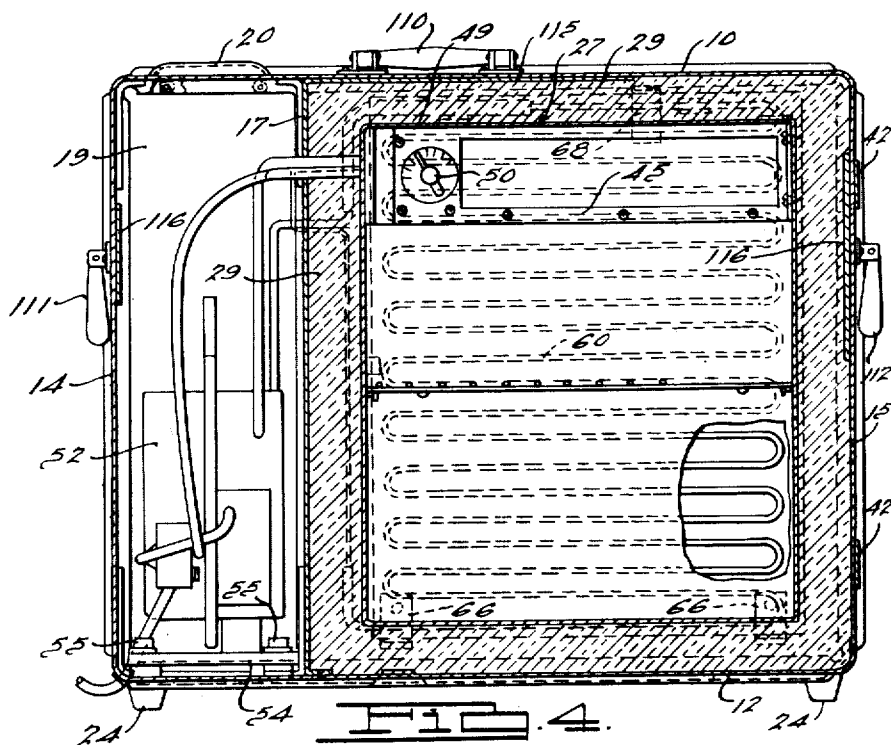
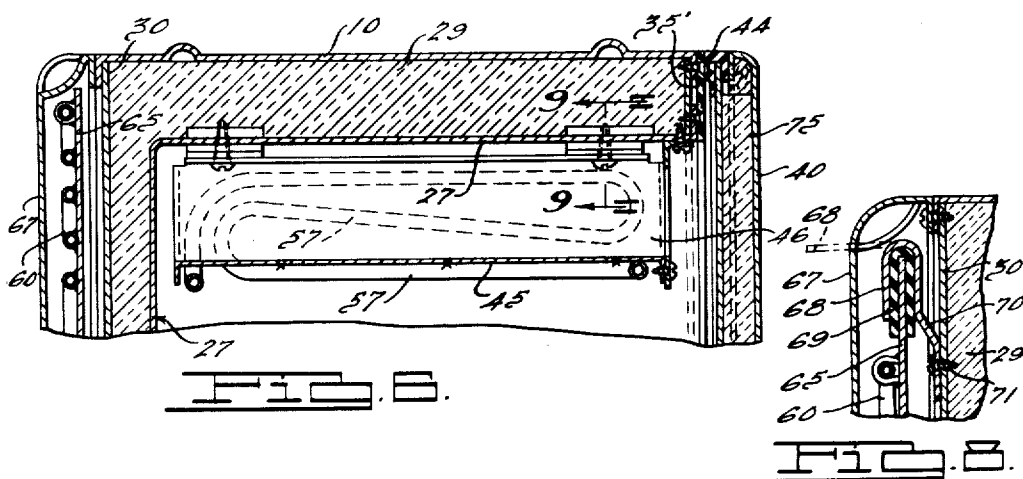
B. A. THOMARAS

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PORTABLE REFRIGERATOR CONSTRUCTION

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3 Sheets-Sheet 3



INVENTOR.

Brinzie A. Thomasas.

BY

Harness, Dickey & Pierce

ATTORNEYS.

UNITED STATES PATENT OFFICE

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PORTABLE REFRIGERATOR CONSTRUCTION

Brinzle A. Thomaras, Detroit, Mich.

Application February 27, 1950, Serial No. 146,479

5 Claims. (Cl. 62—116)

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This invention relates to portable refrigerators, and particularly to the construction of an improved extremely compact and lightweight portable refrigerator assembly incorporating a closed-cycle refrigerating system which may be of essentially conventional character, the arrangement being such as to provide a large refrigerated storage space in proportion to the overall dimensions of the assembly. An important object of the invention is to provide such a portable refrigerator, all of the operative components of which can be completely preassembled, including a complete, fully enclosed, sealed and operative refrigerating system. Another object is to provide such a refrigerator constructed and arranged in such manner that the preassembled refrigerating components can be installed in the cabinet in a unique and very simple manner, which also permits ready removal and substitution of different refrigerating systems in the same cabinet, so that in event servicing becomes necessary, a complete substitute refrigerating system can be quickly, easily and inexpensively installed in place of a unit requiring repair.

An object related to that last stated is to provide such a portable refrigerator having fixed insulated walls and a conventional hinged insulating door, and wherein standardized fully-sealed and operative refrigerating systems are readily substitutable and interchangeable in a unique manner without disturbing or penetrating the insulated walls or door.

A further object is to provide such a refrigerator having an evaporator and control assembly installed in and accessible from the front of the cabinet, a condenser installed upon and supported by the back of the cabinet, and a motor-compressor unit and related "high side" components arranged at one end of the cabinet, all of these several components, including the evaporator, condenser, control assembly and motor-compressor unit, being permanently interconnected and concurrently installable and removable, despite their arrangement on different sides of the cabinet, none of the connections between the several parts requiring separation during such installation or removal.

Still another object of the invention is to provide an improved cabinet construction for a portable refrigerator of the indicated character, which cabinet construction incorporates a shell formed as a continuous loop of sheet metal having integral top, bottom and ends, but open both at the front and at the back, with a vertical partition serving as a tying and reinforcing mem-

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ber between the top and bottom walls of the shell, and also extending from front to back, the arrangement being such that the entire assembly may be easily and safely lifted by means of a handle secured to the top wall and all of the loads being distributed through the walls and the partition in such manner that the structure provides a high degree of strength and rigidity in proportion to its weight.

Still another object is to provide a cabinet construction of the indicated character which presents the appearance of an attractive valise or traveling bag, which incorporates improved condenser supporting and housing means serving both as a structural and ornamental part of the cabinet, and also as a stack to promote effective air circulation over the condenser and adequate cooling thereof, the arrangement of these parts being such that although positioned on the back of the cabinet, the finished appearance of the back of the cabinet is substantially indistinguishable from that of the front, yet the condenser and related back-mounted parts are removable and replaceable in the manner previously described.

Other objects and advantages of the invention will become apparent upon consideration of the present disclosure in its entirety.

In the drawings:

Figure 1 is a perspective view of a portable refrigerator constructed in accordance with the present invention;

Fig. 2 is a horizontal sectional plan view taken on the line 2—2 of Fig. 1, and looking in the direction of the arrows, but with the door closed;

Fig. 3 is a vertical cross-sectional view taken substantially on the line 3—3 of Fig. 1, and looking in the direction of the arrows, but with the door closed;

Fig. 4 is a vertical longitudinal sectional view taken substantially on the line 4—4 of Fig. 2 and looking in the direction of the arrows;

Fig. 5 is a perspective view of the shell of the cabinet, with the partition partly broken away;

Fig. 6 is a sectional detail taken substantially on the line 6—6 of Fig. 2 and looking in the direction of the arrows;

Fig. 7 is a fragmentary detailed perspective view of a rear upper corner portion of the combined rear cabinet panel and condenser housing stack;

Fig. 8 is a fragmentary sectional detail on the line 8—8 of Fig. 2 looking in the direction of the arrows; and

Fig. 9 is a sectional detail taken substantially

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on the line 3-3 of Fig. 6 and looking in the direction of the arrows.

Referring now to the drawings, and particularly to Figs. 1 and 5, it will be seen that the cabinet structure of my improved portable refrigerator includes a shell formed of a looped sheet which may comprise a single length of sheet metal, such as aluminum, bent to rectangular form and preferably somewhat longer than its height, having flat parallel top and bottom walls 10, 12, respectively, joined by integral upright end walls 14, 15 located at the left and right ends, respectively, as the cabinet is viewed from the front. A vertical sheet metal partition 17 extends between the top and bottom walls 10, 12, and is preferably rigidly secured to both such walls as by welding, the partition being located nearer the left end wall 14 than the right wall, and the space to the right of the partition being assigned to the refrigerated compartment, while the space to the left of the partition accommodates the compressor, motor, and other components of the refrigerating mechanism.

The compartment to the left of the partition 17, which is generally referred to as the mechanism compartment, is designated 19, and the top wall of the compartment 19 is provided with a plurality of openings, shown as defined by louvered slots 20. A plurality of feet, which may be formed by rubber pads 24 of substantial height, are secured to and project downwardly from the bottom wall 12 and, as best shown in Figs. 3 and 4, these serve to hold the cabinet elevated above the surface upon which the unit rests, so that air may freely enter the mechanism compartment through an opening 22 in the bottom wall of the compartment 19 and may flow outwardly through the top louvers 20 to carry away heat developed in the mechanism compartment.

The space to the right of the partition 17 is designated 25. Mounted within the space 25 is a box-like sheet metal inner shell 27 which may also be formed of aluminum and which is provided with five integral walls comprising end walls and top, bottom and back walls, such shell being open at the front and dimensioned to provide a substantially uniform space surrounding its walls to permit the insertion of insulating material, indicated at 29, between the walls of the inner shell and the walls of the outer shell and the partition 17. Such insulation is also arranged behind the back wall of the inner shell and retained by a panel 30 which covers the back of that portion of the outer shell between partition 17 and the right-hand end wall 15, but does not extend over the back of the compartment 19.

The inner shell 27 is provided with an out-turned flange 32 extending around the front opening thereof. The walls of the outer shell and of the partition 17 surrounding the front opening 25 are provided with coacting intumed flanges as 33, 34, which lie in coplanar relation with flange 32. Upper and lower horizontal supporting and insulating breaker strips, which may be formed of plastic or other suitable material and which are designated 35, 35', extend between and are secured to the flange portions of the inner and outer shells, being indicated as secured thereto by means of screws as 37. The breaker strips serve to position the inner shell with respect to the outer shell and also to stiffen the entire assembly, while preventing substantial heat conduction between the shells.

A hinged door which is generally designated 40 is mounted upon the right end wall 15 as by con-

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ventional hinges 42, and carries a resilient gasket 44 adapted to seat and seal against the breaker strips when the door is closed.

Mounted transversely within the inner shell is a sheet metal shelf 45 extending entirely thereacross and serving as a support for ice trays 47. The shelf 45 forms the bottom wall of a generally tubular tray supporting assembly 48. Arranged at the front of and above the shelf 45 and close to the partition 17 is an adjustable control assembly 49 having a regulating knob 50 located accessibly beside the ice tray compartment defined by the assembly 48, to permit regulation of the action of the refrigerating mechanism.

The refrigerating mechanism of the preferred construction herein disclosed is of the compressor-type, although it will be recognized that an absorption system might be used if preferred. The motor compressor unit may be of one of the sealed varieties now well known in the trade, and the details thereof need not be considered since they form no part of my present invention. This unit, only the casing of which is illustrated, is generally designated 52, and is mounted in the compartment 19, the unit having a supporting pedestal portion 54 which is secured to the floor defined by the bottom wall 12 of the outer cabinet shell as by nut and bolt assemblies 55.

An evaporator is provided shown as comprising a sinuous tubing, generally designated 57, fitted to extend beneath the shelf 45 and held in position as by retaining clip means 59.

A condenser is secured to the back panel 30, and comprises sinuous tubing 60 carried upon a stack-defining panel 65, which may be pressed of sheet metal and proportioned to cover the entire rear of the cabinet assembly except for the part behind the compartment 19. This panel is secured in parallel relation to and behind the panel 30. In order to provide for the securing of the panel 65, in position for ready removal when desired, as well as provide for ease of installation, the panel is slipped at its lower edge into a pair of U-shape upwardly opening clips 66 upon the bottom of the backing casing structure 67 and, at its upper edge, is retained in a downwardly opening U-shape clip 68, seen clearly in Fig. 8. This clip is formed from bendable sheet metal and initially is in the form shown in dotted lines, that is, in the shape of an inverted L, one leg projecting straight out as shown in dotted lines, to permit inserting the panel, and being bent down in installation to embrace the top edge of the panel 65 and also to embrace an interposed cushioning element 69. The back of the clip is offset by a portion 70 which is secured to the panel 30, as by screw 71. The front portion of the clip 68 can be bent back, as seen in dotted position in Fig. 8, to permit the panel 65 to be removed when desired and to constitute a ready means of assembly by simply bending this front portion of the clip downwardly after the bottom edge of the panel has been engaged in the bottom clips 66.

The backing casing structure 67 is dished sufficiently to provide depth adequate to constitute a condenser compartment and stack, and a plurality of slot-like openings 72 are formed across and near the lower edge of the panel, the major portions of the slotted areas 72 lying in the bottom edge wall of the dished panel. Corresponding slots, as 74, are formed along the upper edge of the panel, the side edge walls of the panel being imperforate, as is the back wall, so that by virtue of the slots 72, 74 the structure consti-

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tutes a stack assisting natural convection over the condenser. Slots 72, 74 are formed by shearing strip-like metal portions 73 from the material of the panel in the curved regions joining the back wall to the top and bottom edge walls, leaving such sheared strips fully attached to and unsevered from the remaining metal at their ends, and pressing the strips inwardly out of the plane of the remaining metal to form slot-like openings.

The door 40 is also of dished or convaco-convex form to correspond to the back casing structure 67 in general shape and appearance, the corners of all of these parts being similarly rounded and the space within the door being filled with insulating material in the usual manner as indicated at 75.

Sheet metal covers 77, 79 of generally similar contour are also removably secured to the outer cabinet shell in its positions to close the front and rear, respectively, of the mechanism compartment 19. Covers 77, 79 are proportioned to provide external walls coplanar with and presenting the appearance of smooth continuations of the door 40 and back casing structure 67 respectively. In the adjacent vertical edge walls of the back structure 67 and cover 79, respectively, notches 80, 82 are cut out for the tubing portions 84, 85 leading to and from the condenser 60. Such cutout portions extend to the free edges of the cover 79 and back part 67 so that these parts may be removed without disturbing the tubing. The front edges of the partition 17, and of the adjacent but spaced side wall of the inner shell 27, are also provided with notched portions 87, 89, and the insulation between such side wall and partition is also cut out in alignment with the notches 87, 89. Such notched and cutout portions are deep enough to permit the tubing portions 85, 92, extending to and from the evaporator assembly, to project there-through beneath the breaker strip, and also to accommodate a conductor cord 94 for the control assembly 49. Preferably, a small section 36 of the breaker strip located over the notched portions 87, 89 is separately removable.

Refrigerant from the compressor within the sealed unit 52 flows through the tube 84 to the condenser 60, and then through the tube 85 which leads to a capillary tube 95 located behind the control 49. The control, capillary tube, and other connecting tubing portions leading to the evaporator may be isolated from the ice tray space and from the remainder of the refrigerated compartment as by partitioning panels 97, 99. The capillary tube 95 leads to the evaporator inlet, while the evaporator outlet is connected through tubing 100 and a trap and drier assembly 102 to the tubing 92 through which the expanded refrigerant is conducted back to the unit 52 for recompression.

An electric motor (not shown) within the unit 52 may be supplied through a flexible conductor cord 104 which is adapted to be connected to any appropriate electrical supply outlet. One of the leads to the motor is connected in series with a switch which is not illustrated, but which is incorporated in the control unit 49 in order that the operation of the control mechanism may serve to start and stop the motor. The control switch is actuatable under the influence of a thermostat which includes a temperature responsive bulb 105 attached to the evaporator near its outlet, as shown in Fig. 2, the bulb being connected to the control unit by a tube 106. The

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operation of these and the other components of the refrigerating system is conventional and will require no further description to those skilled in the art.

It is to be observed that all of the tubing portions 84, 85, 92, and the cord 104, are readily bendable, and that the effective height and width of the complete condenser unit, including all mounting brackets and mechanical parts, are less than the maximum cross-sectional dimensions of the compartment 19 and of the front and rear openings thereof. As previously noted, all of the refrigerating components are completely preassembled and preconnected to one another, charged with refrigerant, and sealed, so that the system is fully operative independently of the cabinet.

In installing the refrigerating components in the cabinet, none of them need be disconnected, adjusted or disassembled and the operation of the system is in no wise interfered with. The front and rear covers 77, 79 for the compartment 19 are off, as also is the casing part 67. The door 40 is open and the short removable section 36 of the breaker strip is also removed, although in other respects the cabinet is also fully preassembled. The tubing portions 84, 85 are straightened sufficiently to permit the condenser assembly to be passed through the compartment 19 from front to rear and until the unit 52 is properly positioned in such compartment. The evaporator is simultaneously moved into the cabinet section 25. The unit is secured in place by the bolts 55, the condenser is swung to a perpendicular position until it lies flat behind the panel 30, the tubing 84, 85 being bent to extend through the dished portions of the cover 79, and through notches 82, 80 and into the rear casing part 67, in the manner best shown in Fig. 2. The front tubing portions 85, 92 leading to the evaporator are preliminarily bent to the general shape required to permit the evaporator to be moved into position in the refrigerated compartment. As stated, the evaporator may move into the compartment 25 as the unit 52 moves into the compartment 19. The tubing is moved into the notches 85, 89, as the unit 52 and evaporator move into position. The evaporator is secured to the tray shelf 45. The control 49 and its supporting panels 97, 99 may also be preassembled with respect to the evaporator and installed simultaneously, the electrical conductor cord being fitted in the notches 87, 89 along with the tubing. After the evaporator and condenser are secured in place in the manner described, the breaker strip section 36 is installed and the covers 77, 79 and rear casing part 67 are applied by the attaching means previously described, to complete the assembly. It will be observed that if any servicing of any of the refrigerating components is required, the complete refrigerating system can be exchanged by removing it from the cabinet, the aforementioned assembly operations being performed in reverse and the new unit being then substituted. Of course, this permits servicing by substitution of rebuilt units on the basis of an exchange servicing policy, in a minimum of time and with minimum inconvenience and expense, and with only a short interruption of refrigerating service.

A carrying handle 110 is secured to the top panel 10 of the outer shell of the cabinet, preferably at a position approximately over the center of gravity of the complete refrigerator, al-

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lowance being made, however, for the weight of a normal load within the cooling compartment 25. By virtue of the fact that the mechanism is heavier than such a normal load, the handle 110 is positioned relatively close to the partition 17, and the partition 17 is thus effective to transmit a substantial proportion of the load almost directly to the handle, such partition acting in tension to distribute the load between the top and bottom walls in a most effective manner and preventing any tendency of the top panel to bulge upwardly even though it is formed of relatively light gauge sheet aluminum. Handles as 111, 112 are also attached to the end panels 14, 15, relatively near the top, so that the assembly may be conveniently carried by two persons.

Reinforcing strips as 115, 116 may be arranged beneath the handles 110, 111, 112 to further distribute the load and oppose the tendency of the handle fastenings to tear the aluminum sheet, and reinforcing channel elements as 117 may also be placed beneath the mechanism compartment and in the vicinity of the motor-compressor unit 52.

Reinforcing angle irons 120 are also preferably provided in the outer shell, attached to the inside corners thereof, and such shell is also stiffened by longitudinal outpressed beads 122.

While it will be apparent that the preferred embodiment of the invention herein disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

I claim:

1. A portable refrigerator cabinet structure including a substantially flat structural floor, a top structural wall spaced above the floor, end walls rigidly connected to and joining said floor and top wall, a substantially inelastic and vertically disposed combined partition and tension member formed of sheet metal and spaced from the end walls and rigidly tied to both the floor and top wall and acting to hold such floor and top wall against unwanted separation in the region of said combined partition and tension member, and a handle portion secured to the top wall in the vicinity of said combined partition and tension member.

2. In a mechanical refrigerator, a cabinet structure including a substantially vertical partition extending from front to rear of the cabinet structure, a cooling compartment on one side of said partition and a mechanism compartment on the other side of the partition, the mechanism compartment having openings at the front and rear and the cooling compartment having a front opening and a back wall, openable panels normally closing said front and rear openings of the mechanism compartment, a condenser which is smaller in at least one dimension than the mechanism compartment and also smaller than the front and rear openings of said mechanism compartment, means securing said condenser at least partly behind said back wall of the cooling compartment and outside both the cooling compartment and the mechanism compartment, refrigerant compressing means located in the mechanism compartment and refrigerant evaporating means located in the cooling compartment, means for connecting said condenser to said refrigerant evaporating means including a refrigerant conductor extending through said mechanism compartment from rear to front thereof and around

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the front and rear of said partition, means for connecting said refrigerant compressing means to said condenser including a refrigerant conductor extending from said mechanism compartment around the rear of said partition and means for connecting said refrigerant compressing means to said refrigerant evaporating means including a refrigerant conductor extending from said mechanism compartment around the front of said partition, said mechanism compartment having openings near the top and bottom thereof, and a second wall at the rear of said cooling compartment and spaced to the rear of but substantially parallel to said first-mentioned back wall, said second wall extending over said refrigerant condensing means, and having top and bottom openings and coacting with said first-mentioned back wall to define a stack.

3. In a refrigerator construction, a cabinet structure including a substantially vertical partition extending from front to rear of the cabinet structure, a cooling compartment on one side of the partition and a mechanism compartment on the other side of the partition, the mechanism compartment having openings at the front and rear and the cooling compartment having a front opening and a back wall, openable panels normally closing said front and rear openings of the mechanism compartment, a condenser which is smaller in at least one dimension than the mechanism compartment and also smaller than the front and rear openings of said mechanism compartment, means securing said condenser at least partly behind said back wall of the cooling compartment and outside both the cooling compartment and the mechanism compartment, refrigerant compressing means located in the mechanism compartment, refrigerant evaporating means located in the cooling compartment, and means for connecting said condenser to said refrigerant evaporating means including a refrigerant conductor extending through said mechanism compartment from rear to front thereof and around the front and rear ends of said partition.

4. A portable refrigerator construction including a cabinet having a cooling compartment and a mechanism compartment, a vertical partition separating said compartments, the mechanism compartment having openings near the bottom and near the top thereof, individual, separately openable, substantially coplanar front door panel portions closing the fronts of said compartments, a fixed vertical wall closing the rear of said cooling compartment, coplanar removable finishing wall panel portions covering the rear of said mechanism compartment and extending behind and spaced from said fixed wall and coacting therewith to define a stacklike condenser compartment behind the cooling compartment, said finishing wall panel portions having openings near the top and near the bottom thereof, and interconnected refrigerating means including a compressor in said mechanism compartment, a condenser in said condenser compartment, and an evaporator in the cooling compartment.

5. A refrigerator comprising a cabinet in the form of a regular hexahedron having fixed top, bottom and end walls, a fixed partition extending vertically between and rigidly attached to the top and bottom walls and substantially parallel to said end walls and separating said cabinet into two compartments, an openable back wall closing the compartment on one side of said partition, a fixed back wall closing the compartment on the other side of said partition, openable wall

portions closing said compartments on both sides of said partition, the walls defining the compartment on the first-mentioned side of the partition having air inlet and outlet openings therein near the bottom and top of said compartment, a compressor in said same compartment, an evaporator in the other compartment, a stack-defining wall spacedly disposed behind and substantially parallel with the fixed back wall and substantially coplanar with the removable back wall and having openings near the top and bottom thereof, and a condenser in the space between said fixed back wall and said stack-defining wall.

BRINZIE A. THOMARAS.

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