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C. S. HOCKING ETAL

3,150,796

REFRIGERATOR CABINET

Original Filed April 26, 1960

5 Sheets-Sheet 2

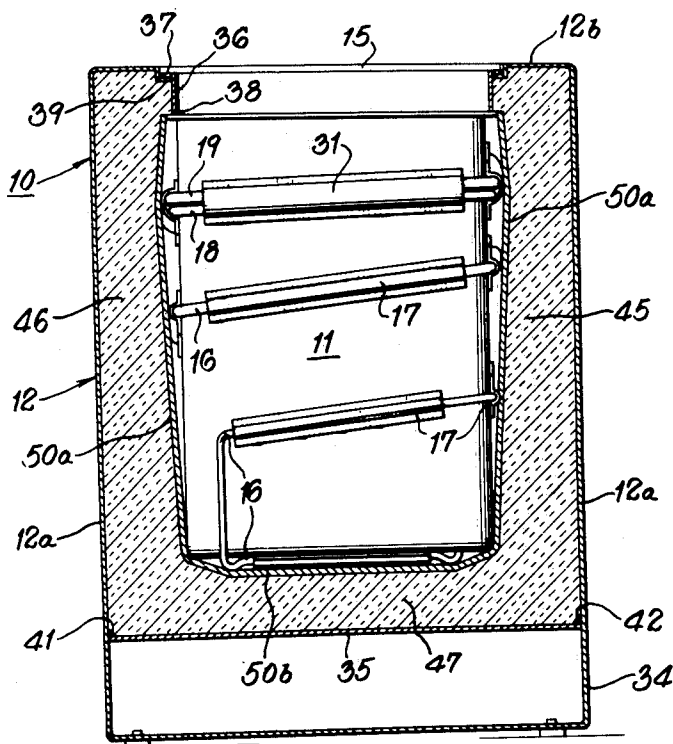


Fig. 3.

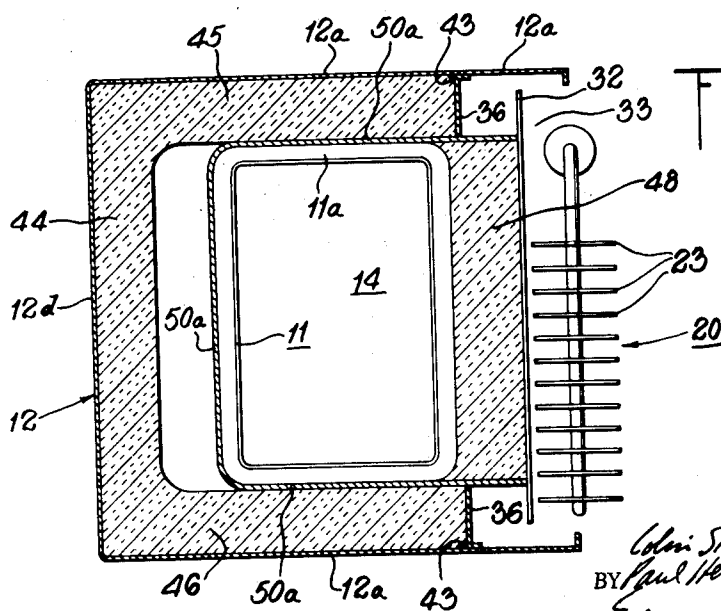


Fig. 4.

INVENTORS
Colin Stanley Hocking
 BY *Paul Herbert Amelie*
Edward A. Penner
 ATTORNEY

Sept. 29, 1964

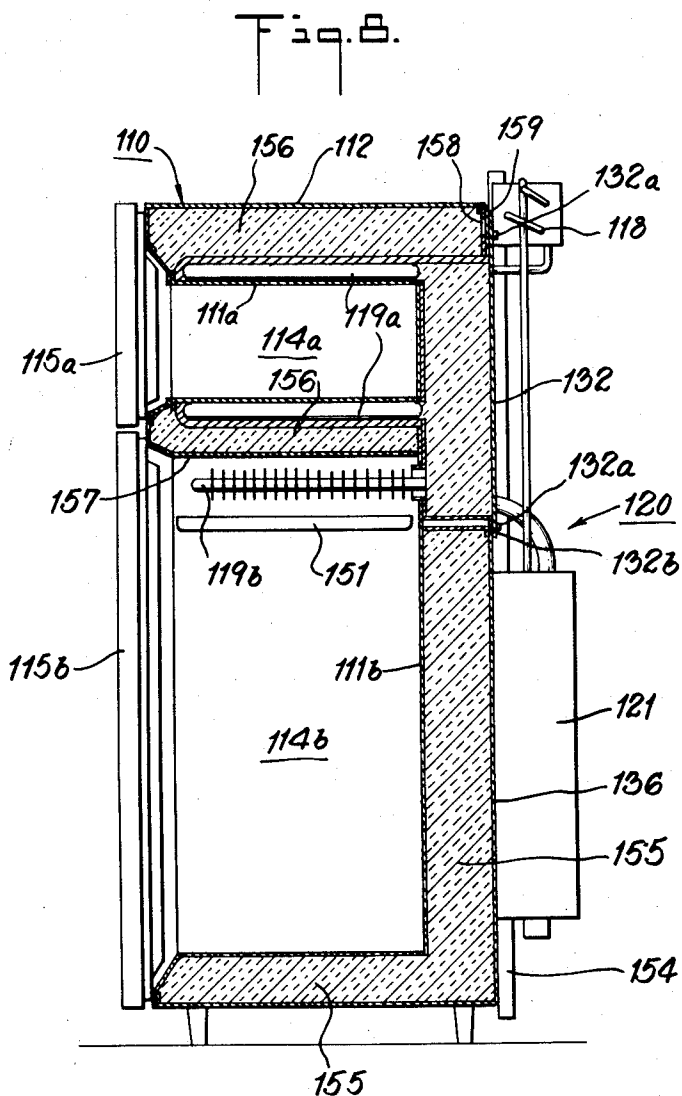
C. S. HOCKING ET AL

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REFRIGERATOR CABINET

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INVENTORS
Colin Stanley Hocking
BY *Paul Herbert Hornsted*
William C. Hornsted
THEIR ATTORNEY

Sept. 29, 1964

C. S. HOCKING ET AL

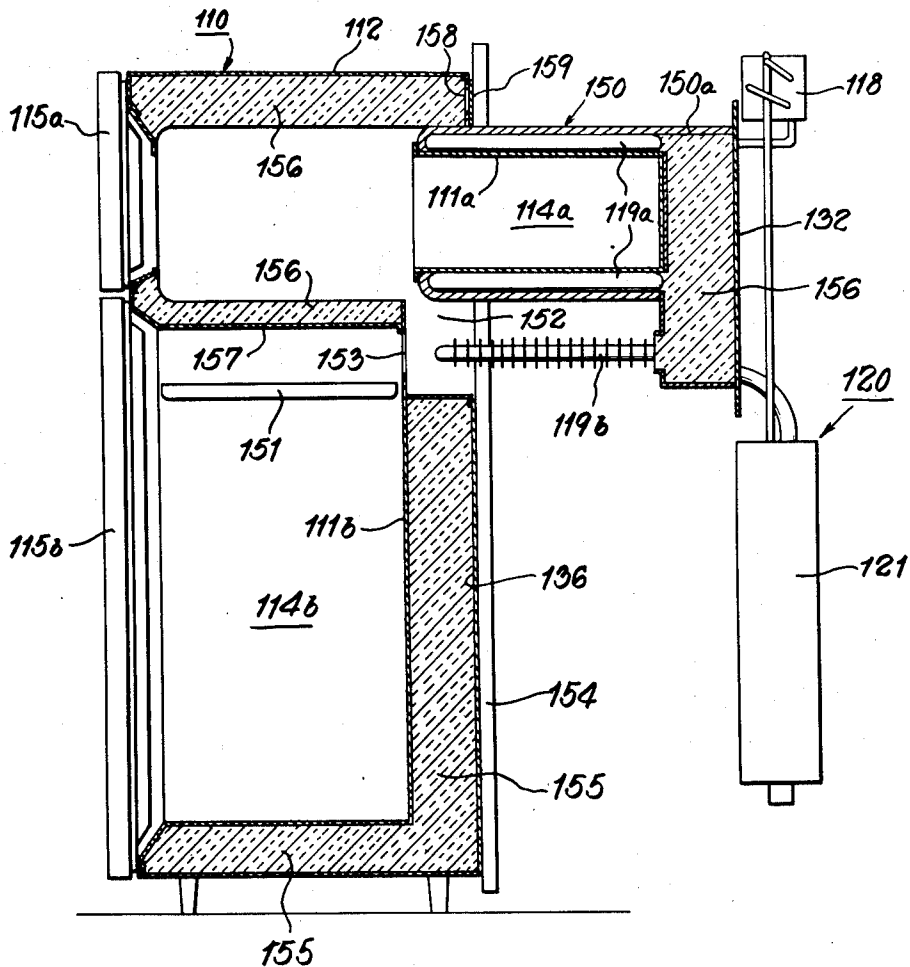
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Fig. 9.



INVENTORS
Colin Stanley Hocking
BY Paul Herbert Hinkel
Edmund B. Penner
their ATTORNEY

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3,150,796

REFRIGERATOR CABINET

Colin Stanley Hocking, Bromma, Sweden, and Paul Herbert Cronelid, Cuttack, Orissa, India, assignors to Aktiebolaget Electrolux, Stockholm, Sweden, a corporation of Sweden

Continuation of application Ser. No. 24,816, Apr. 26, 1960. This application Nov. 25, 1963, Ser. No. 325,823

Claims priority, application Sweden, Apr. 28, 1959, 4,147/59

5 Claims. (Cl. 220-9)

Our invention relates to refrigerator cabinets, and more particularly to a refrigerator cabinet having a body of foamed plastic insulation foamed in situ in the cabinet. This application is a continuation of our application Serial No. 24,816, filed April 26, 1960.

A refrigerator includes an inner shell or liner which is arranged to be supported within an outer shell and insulated therefrom. The inner shell, which defines a space for storing items to be refrigerated, often is cooled by an evaporator of refrigeration apparatus which is in the form of a coil and in good thermal contact with the outer surface of the inner shell. The inner shell and coil usually are removable from the cabinet as a unit to facilitate servicing and inspection.

In recent years considerable interest has been evidenced in foamed plastic as an insulating material for refrigerator cabinets. Foamed plastic insulation which can be foamed in situ in a refrigerator cabinet usually is of a type that adheres very strongly to the surfaces defining the insulating space.

It is an object of our invention to provide a refrigerator of the type described above by providing about the inner shell and the cooling coil in thermal contact therewith a layer of material which is removable therefrom, and foaming a foamable plastic in situ in the space defined by the layer of material and the outer shell to form a body of foamed plastic insulation which adheres to the inner surface of the outer shell and from which the layer of material can be separated when the inner shell and cooling coil fixed thereto are removed from the cabinet.

Another object of the invention is to form a body of foamed insulation in situ in a refrigerator of the type described above by providing about a part having the general configuration of the outer surface of the inner shell and the cooling coil in thermal contact therewith a layer of material which is removable therefrom, and, while the part occupies a position within the outer shell normally occupied by the inner shell, foaming a foamable plastic in situ in the space defined by the layer of material and the outer shell to form a body of foamed plastic insulation which adheres to the inner surface of the outer shell and from which the layer of material can be separated when the part is removed from the cabinet.

The novel features we believe to be characteristic of our invention are set forth with particularity in the claims. The invention, both as to organization and method, together with the above and other objects and advantages thereof, will be better understood by reference to the following description taken in connection with the accompanying drawings forming a part of this specification, of which:

FIG. 1 is a vertical view, partly in section, of a refrigerator embodying the invention;

FIG. 2 is a view of the refrigerator shown in FIG. 1 illustrating one part of the refrigerator partly separated from another part thereof;

FIG. 3 is a vertical sectional view taken at line 3-3 of FIG. 1;

FIG. 4 is a view, partly in section, taken at line 4-4 of FIG. 3;

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FIGS. 5, 6 and 7 are fragmentary sectional views of a refrigerator like that shown in FIGS. 1 to 4 illustrating modifications of the invention;

FIG. 8 is a vertical view, partly in section, of another type of refrigerator embodying the invention; and

FIG. 9 is a view of the refrigerator shown in FIG. 5 with the refrigeration apparatus partly withdrawn from the cabinet.

Referring to FIG. 1, the invention is shown in connection with a refrigerator comprising a cabinet 10 having a one-piece inner metal shell or liner 11 arranged to be supported within an outer metal shell 12 and insulated therefrom in a manner which will be explained presently. The inner metal shell 11 defines a thermally insulated storage space 14 for storing frozen food packages and freezing meat, fruit, vegetables and other foods. Access to the storage space 14 is afforded through the opening 15 at the top which is adapted to be closed by a removable insulated closure or lid (not shown).

The storage space 14 is arranged to be cooled by an evaporator 16 in the form of a coil which is disposed about the inner metal shell 11, the coil 16 being held in good thermal contact with the bottom and side walls of the shell by clamps 17 secured thereto.

The evaporator 16 is connected to a condenser 18 which is in heat exchange relation with a low temperature cooling element 19. The evaporator 16 and condenser 18 connected thereto form a secondary refrigeration system, the evaporator being of the flooded type and located at a lower level than the condenser. The evaporator 16 and condenser 18 form a closed fluid circuit which is partly filled with a suitable volatile fluid that evaporates in the evaporator 16 and takes up heat, thereby producing cold. The vapor flows from the evaporator 16 into the condenser 18 in which it is cooled and condensed by cooling element 19. The liquid condensate formed in condenser 18 returns by gravity to the evaporator 16.

The low temperature cooling element 19 desirably forms a part of primary refrigeration apparatus 20 of any suitable type. By way of example, the primary refrigeration apparatus 20 may be of an absorption type containing an inert gas or pressure equalizing agent. In such apparatus, refrigerant vapor expelled from solution in a generator 21 by heating flows through a conduit 22 to a condenser 23 in which it is liquefied. The liquid refrigerant, such as ammonia, for example, flows from condenser 23 through a conduit 24 to the low temperature cooling element 19 in which the liquid evaporates and diffuses in the presence of an inert gas, such as hydrogen, for example, thereby producing a refrigerating effect for condensing vapor in the condenser 18.

The resulting gas mixture of refrigerant and inert gas flows from cooling element 19 through a conduit (not shown), one passage of gas heat exchanger 25, conduit 26 and absorber vessel 27 to the lower end of absorber coil 28 where refrigerant vapor is absorbed into liquid absorbent, such as water, which enters through a conduit (not shown). Inert gas weak in refrigerant is returned to cooling element 19 in a path of flow including conduit 29, another passage of gas heat exchanger 25 and another conduit (not shown). Absorption liquid enriched in refrigerant in the absorber 28 passes into the absorber vessel 27 and flows therefrom through a conduit 30 to generator 21 where it is heated and refrigerant vapor again is expelled out of solution. The weakened absorption liquid from which refrigerant has been expelled as vapor is conducted from the generator 21 to the absorber 28 through the conduit referred to above (not shown) to again absorb refrigerant vapor.

In order to simplify the drawings, parts of the primary refrigeration apparatus have been omitted and other parts have been shown only diagrammatically, a complete il-

illustration of the apparatus not being necessary for an understanding of our invention. The parts of refrigeration apparatus of the absorption type, whose relative positions are substantially fixed, usually are formed of iron or steel when ammonia and water are employed as the refrigerant and liquid absorbent, respectively. Therefore, the piping for the cooling element 19, which is connected by conduits to other parts of the primary refrigeration apparatus and forms a unitary part thereof, may be formed of such ferrous metal.

The primary cooling element 19 comprises piping disposed about the inner liner 11, the piping being disposed alongside of and in heat exchange relation with the condenser 18 of the secondary heat transfer system. The primary cooling element 19 and condenser 18 may be fixed to the exterior surface of the inner liner 11 in any suitable manner, as by clamps 31, for example. During normal operation, heat is effectively abstracted from the interior of space 14 by the evaporator 16 of the secondary heat transfer system in the manner explained above. In addition, the primary cooling element 19 is employed to abstract heat from the upper part of the space 14.

In order to facilitate servicing and inspection of the refrigeration equipment, particularly the secondary heat transfer system which forms a unitary part of the primary refrigeration apparatus, the refrigeration equipment is mounted on the cabinet 10 in such a manner that it and the inner metal shell 11 can be removed as a unit from the outer shell of the cabinet. Accordingly, the refrigeration equipment forms a unitary structure which includes the inner liner or shell 11 and a plate 32 which is fixed to parts of the primary refrigeration apparatus in any suitable manner (not shown).

The plate 32 forms the outside panel of the rear insulated wall of the cabinet 10, as best shown in FIG. 4. The lateral side walls 12a and top 12b of the outer shell 12 extend or project rearward beyond the plate 32 to provide a vertical compartment 33 in which parts of the primary refrigeration apparatus are housed. During operation of the primary refrigeration apparatus, natural draft circulation of air is induced to effect air cooling of the absorber 28 and condenser 23, such cooling air flowing upward and passing through openings 12c at the rear part of the top 12b of the cabinet.

The cabinet 10 is so constructed that the inner liner 11, which forms a unitary part of the refrigeration equipment, can be readily removed from the cabinet and placed back in position whenever necessary. Referring to FIGS. 1 and 3, the cabinet 10 includes a base 34 which is formed in part by the front wall 12d and lateral side walls 12a of the outer shell 12. A horizontal plate 35 forming the outer panel of the bottom insulated wall is fixed to the front and lateral side walls of the outer shell 12 and also to the bottom part of a vertical panel 36 having an opening therein sufficiently large for the inner liner 11 to pass therethrough, the panel 36 being fixed to the top 12b and lateral side walls 12a of the outer shell.

The top opening 15 of cabinet 10 is defined by a hollow rectangular frame 37 which may be made of suitable insulating material, such as plastic, for example. To form a good seal between the frame 37 and outwardly extending flange 11a of the inner liner 11, a suitable sealing material, such as that sold under the trademark "Permagum," for example, desirably is employed at 38 at the region these parts abut one another. The frame 37 is formed with a lip 37a which is held in place at the depressed peripheral edge 39 of the opening 15 in the top 12b of the cabinet.

Essentially, the refrigerator of FIGS. 1 to 4 comprises two main units or components which are readily separated whenever inspection or repair of the refrigerating system is necessary. One component comprises the base bottom, front and lateral side walls; and the other com-

ponent comprises the primary refrigeration apparatus 20, secondary heat transfer system, inner liner 11 and insulation for the rear insulated wall of the cabinet 10. The plate 32, which forms the outside panel of the rear insulated wall of the refrigerator cabinet 10 and is fixed to and forms a unitary part of the parts making up the primary refrigeration apparatus 20, is removably secured at 32a to the apertured vertical wall member 36, as best shown in FIG. 1.

When it becomes necessary to inspect or repair the refrigerating system, the sealing material 38 is removed from the bottom edge of the hollow rectangular frame 37 at the top opening 15. The connections 32a at the rear insulated wall of the cabinet 10 are loosened, which then allows the primary refrigeration apparatus 20, secondary heat transfer system, inner liner 11 and insulating material between the rear wall of the inner liner 11 and the vertical plate 32 to be moved as a unit. It will be understood that when this is done, the flange 11a of the inner liner 11 can immediately move rearward.

When the two units or components of the refrigerator are reassembled and brought together in functioning relation, and the inner liner 11 is inserted through the opening in the plate 36, the connections 32a for plate 32 are tightened. With the flange 11a of inner liner 11 now correctly positioned at the vicinity of the frame 37, sealing material, desirably having the physical characteristics of a non-drying cement, may again be inserted at 38 at the joint between the frame 37 and flange 11a to effect a seal between these parts. The plate 32, connections 32a and body of insulation 43 coact with the peripheral edge portion about the opening in the plate 36 of the outer shell 12 and peripheral edge portion 11a of the inner liner 11 for removably locking the inner liner 11 within the outer shell 12.

It will be understood that all of the seams of the outer shell 12 of the cabinet may be internally sealed at 40, 41, 42 and 43 with a suitable material like asphalt, for example. Such a sealing material may be employed, for example, at the underside of the depressed peripheral edge 39 of the opening 15 to seal the latter to the underside of the lip 37a of the frame 37. A suitable sealing agent 32b, like the sealing agent at 38, may be employed at the peripheral edge of plate 32 also when the latter is secured in place by the connections 32a to provide an airtight seal for the insulation retained in the cabinet 10.

The inner metal shell or liner 11 is insulated from the outer metal shell 12 by front insulated wall 44, lateral or side insulated walls 45 and 46, bottom insulated wall 47, and rear insulated wall 48. The insulating material employed for the walls 44 to 47, and possibly for rear insulating wall 48 also, is foamed plastic which can be foamed in situ and is of a type that adheres very strongly to the surfaces defining the insulating spaces. Foamed plastic insulation of this kind completely fills the insulating spaces to provide an insulation that is extremely efficient and possesses other desirable physical properties. For example, foamed plastic insulation is self-sustaining and can be developed so that it possesses significant mechanical strength, whereby a refrigerator or freezer can be provided that is extremely rigid and utilizes the insulation to support and hold the inner liner in position within the outer shell.

By way of example and without limitation, it is possible to effect foaming of a suitable plastic in situ by adding to such a plastic a chemical which liberates a heavy gas in the resulting foamed insulation produced. Fluorine-substituted hydro-carbons which are sold under the trademark "Freon" are examples of such chemicals. Accordingly, it is possible to foam in situ in the walls 45 to 48 a polyurethane plastic to which has been added dichlorodifluoromethane, for example. Foamed plastic insulation of this kind, as explained above, will adhere very strongly to the inner surfaces of the outer shell 12. In accordance with our invention, in order to be able

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to employ insulating walls for the cabinet 10 having insulation foamed in situ and of the character just described and yet allow the inner liner 11 to be readily withdrawn at will from the outer shell 12, we provide an inner core 50 which defines the inner boundaries of the insulated walls 44 to 47 and is in intimate physical contact with the inner liner 11 and piping in thermal contact therewith, the inner core being capable of being pulled loose and separated from the foamed insulation so that substantially all or at least a part of such inner core 50 is removed with the inner liner when the latter is withdrawn from the outer shell.

In FIGS. 1 to 4 the inner core 50 comprises a layer of material having small internal cohesive capacity, such as rock wool, for example, which will not adhere to the inner liner 11 and piping in thermal contact therewith. The inner core 50 may be formed of two parts 50a and 50b, the part 50a overlying the front and lateral sides of the inner liner 11 and extending rearward to the vertical plate 32, as illustrated in FIG. 4. The inner core part 50b is positioned at the bottom of the inner liner 11 and also extends rearward to the vertical plate 32, as shown in FIGS. 1 and 2. From FIGS. 2 and 4 it will now be seen that the inner core parts 50a and 50b define the bottom and lateral sides of the rear insulated wall 48, the opposing flat sides of which are defined by the rear wall of the inner liner 11 and the vertical plate 32. A layer of material 41, such as rock wool, is positioned at the top of the rear insulated wall 48 also, the top surface of this layer being substantially flush with the flange 11a of the inner liner 11, as seen in FIGS. 1 and 2.

By providing an inner core 50 of the character just described for the insulated walls 44 to 47 in which foamed plastic insulation is formed in situ, the inner liner 11 can be readily separated from the cabinet 10 and removed therefrom even though foamed plastic normally adheres very strongly to metal and plastic surfaces which define its ultimate shape. While the foamed plastic remains fixed to the inner surfaces of the walls of the outer shell 12 when the inner liner 11 is withdrawn therefrom, as shown in FIG. 3, the inner core 50 can be pulled loose from the foamed plastic insulation. When the inner core 50 is formed of a material like rock wool, for example, only an insignificant quantity of the rock wool will adhere to and remain on the foamed plastic insulation upon separation of the core from the insulation.

When the inner core 50 is provided about the inner liner 11 having piping in thermal contact with the sides and bottom thereof, some consideration must be given to the form or configuration of the inner core as well as to its ability to be separated and pulled loose from the foamed plastic insulation. The part of the inner core 50 which is at the front of the inner liner 11 and faces the front wall 12d of cabinet 10 may assume practically any form or shape because, when the inner liner 11 is withdrawn from the cabinet 10, such front part of the inner core and the front insulated wall 44 from which it is separated are at right angles or perpendicular to the direction of movement of the inner liner 11.

However, the parts of the inner core 50 which are at the bottom and lateral sides of the inner liner 11 and face the bottom plate 35 and lateral walls 12a of cabinet 10 must be formed so that folds will be avoided that would tend to hold the inner liner 11 in place within the cabinet 10 and prevent the liner from being separated from the bottom insulated wall 47 and lateral insulated walls 46. Also, the layer of material forming the inner core 50 should not be so thick that it will not snugly fit about the inner liner and assume its proper outer configuration.

In accordance with our invention, the parts 50a and 50b of the inner core 50 are fixed about the sides and bottom of the inner liner, after which the rear insulated wall 48 is provided with insulation which may be a

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foamed plastic insulation formed in situ and of the type referred to above. Since parts of the refrigeration apparatus 20 connecting the cooling element 19 and components housed in the rear compartment 33 pass through the rear insulated wall 48, it may be desirable that the insulation in the wall 48 be removable so that access to the connecting parts therein may be gained when this becomes necessary during servicing. In any event, the rear insulated wall 48 is defined by the rear wall of the inner liner 11, vertical plate 32, and the layers 50a, 50b and 51 of material, such as rock wool, about the four sides of the insulated wall.

With the inner core 50 provided about the liner 11, the latter is positioned within the cabinet 10 and plate 32 secured to the vertical plate 36 by the connections 32a. At this stage of fabricating the cabinet 10, the hollow rectangular frame 37 has not as yet been secured in position at the top opening 15, thereby providing an opening through which the foamable plastic material, such as polyurethane plastic, and a substance like dichlorodifluoromethane, may be introduced. The resulting foamed plastic completely fills the space between the inner liner 11 and outer shell 12 to form the insulated walls 44 to 47 at the front, lateral sides and bottom of the cabinet 10, and also the insulating wall section 48a above the rear insulated wall 48. When foaming of the plastic is taking place, the hollow wall spaces become completely filled with the insulating material and in the final stage of foaming a quantity of the foamed plastic flows into the top opening 15 through the filling opening normally closed by the hollow rectangular frame 37. After the foamed plastic has set and hardened, it is trimmed at the vicinity of the opening 15 so that the hollow rectangular frame 37 may thereafter be fixed in position, as explained above.

It will now be understood that an improved refrigerator has been provided in which a foamed plastic insulation can be formed in situ for effectively insulating the walls of the cabinet 10 and, due to the provision of the inner core 50 which defines the insulating wall spaces when the foamed plastic insulation is being formed in situ, the inner liner can still be removed from the cabinet. When the inner liner 11 and core 50 thereon are removed from the cabinet 10 for inspection and servicing, the core 50 can be readily removed from the liner 11 to gain access to the piping in thermal contact therewith. Subsequently, when the liner 11 is repositioned in the cabinet 10 after completion of inspection and servicing, the inner core 50 can be fixed about the liner before the latter is moved into position within the cabinet.

In FIG. 5 we have illustrated another embodiment of the invention which differs from the embodiment illustrated in FIGS. 1 to 4 and just described in that a preformed layer 50c of foamed plastic is provided about the inner liner 11 and piping in thermal contact therewith. The preformed layer 50c may comprise a number of slabs whose inner faces have configurations similar to the sides and bottom of the liner against which they are adapted to be fixed. The outer surfaces of the slabs are essentially flat to provide a smooth outer surface to which a layer 50d of soft material like rock wool, for example, can be fixed. The embodiment of FIG. 5 requires the preformed foamed plastic layer 50c but possesses the advantage that it is not necessary to pay particular attention to the ultimate form or outer configuration of the inner core, as in the first described embodiment.

The embodiment of FIG. 6 is similar to the embodiment of FIG. 5 in that a preformed plastic foam layer 50c is provided about the inner liner, such plastic layer having essentially a smooth outer surface. The embodiment of FIG. 6 differs from that of FIG. 5 in that the layer 50d of soft material is replaced by several sheets 50e and 50f of material like paper, for example. The foamed plastic insulation becomes bonded and adheres to the outermost sheet 50e when it is formed in situ.

When the inner liner 11 is withdrawn from the cabinet 10, the outermost sheet 50e becomes separated from the sheet 50f, as seen in FIG. 6, so that the piping in thermal contact with the liner 11 can easily be reached simply by removing the innermost sheet 50f and the preformed plastic layer 50c.

Instead of inserting the foamable plastic material through an opening normally closed by the hollow rectangular frame 37, the latter may be fixed in position before the walls of the cabinet are insulated and the foamable plastic material may be inserted through an opening 35a formed in the bottom plate 35, as illustrated in FIG. 7. In this arrangement, the cabinet 10 may be inverted while the foamable plastic material and additional substance like "Freon," for example, are introduced within the outer shell 12. After the foamed plastic has hardened the excess material at the opening 35a may be trimmed and the opening closed with a cover 35b to the edges of which sealing material may be applied at 35c.

In FIGS. 8 and 9 we have shown our invention in connection with an upright refrigerator comprising a cabinet 110 having top and bottom inner shells 111a and 111b arranged to be supported within an outer metal shell 112 and insulated therefrom in a manner that will be described presently. The top inner shell 111a defines a thermally insulated freezer space 114a, and the bottom inner shell 111b defines a food space 114b for storing foods at a higher temperature than in the space 114a and preferably at a temperature above 32° F. Access to the spaces 114a and 114b is afforded at front openings which are adapted to be closed by insulated doors 115a and 115b hinged in any suitable manner (not shown) at the front of the cabinet 110.

The freezer space 114a is arranged to be cooled by an evaporator section 119a in the form of a coil having portions thereof in good thermal contact with the top and bottom of the top inner shell 111a. The food storage space 114b is arranged to be cooled by an evaporator section 119b below which a drip tray 151 may be supported in any suitable manner (not shown).

The evaporator sections 119a and 119b desirably form low and higher temperature sections of a cooling unit refrigeration apparatus of any suitable type. As shown, the refrigerator apparatus may be of an absorption type containing an inert gas and like that diagrammatically illustrated in FIGS. 1 and 2 and described above. The evaporator section 119a and 119b are connected by conduits, only some of which are shown in part, to other parts of the refrigeration apparatus 120 at the rear of the cabinet 110. Parts of the refrigeration apparatus have been omitted and other parts, like the generator 121 and condenser 118, for example, have been shown only diagrammatically, a complete illustration of the apparatus not being necessary for an understanding of the embodiment of FIGS. 8 and 9.

In order to facilitate servicing and inspection of the refrigeration apparatus, the refrigeration equipment is mounted on the cabinet 110 in such a manner that the apparatus 120, together with the evaporator sections 119a and 119b and top inner shell 111a, can be removed as a unit from the outer shell 112 of the cabinet. It will be seen in FIGS. 8 and 9 that the refrigeration apparatus and inner shell 111a form a unitary structure which also includes a plate 132 which is fixed to parts of the refrigeration apparatus (not shown).

The rear wall 136 of the cabinet 110 is apertured to provide an opening 152 sufficiently large for the top inner shell 111a and coil 119a to pass therethrough, a part of the rear wall opening being at the same height as an opening 153 in the bottom inner shell 111b so that the evaporator section 119b may pass therethrough. The plate 132, which forms the outside panel of the rear insulated wall of the upper part of the cabinet 110, is removably secured at 132a to the apertured wall 136.

When it becomes necessary to inspect or repair the refrigerating system, sealing material 132b is removed from the periphery of the plate 132. After unmounting the refrigeration apparatus 120 from its frame 154, the refrigeration apparatus 120, evaporator sections 119a and 119b, top inner shell 111a and the vertical plate 132 can be moved as a unit from the position shown in FIG. 8 to the position shown in FIG. 9. It will be understood that all of the seams of the outer shell 112 may be internally sealed with a suitable sealing material in the same manner that the outer shell 12 in the first described embodiment is sealed.

Since the food storage space 114b is maintained at a higher temperature than is maintained in the freezer space 114a and the temperature differential between the space 114b and the ambient air is not too large, conventional insulation 155 like rock wool or glass wool, for example, may be employed in the cabinet 110 for insulating the lateral side walls, rear wall and bottom wall defining the space 114b. As seen in FIGS. 8 and 9, the insulation 155 extends upward at the lateral side walls and rear wall of cabinet 110 to the vicinity of the bottom part of the opening 152 in the rear wall 136.

Since the temperature differential between the freezer space 114a and the ambient air is much higher than that between the space 114b and the ambient air, a foamed plastic insulation having better insulating properties than rock wool desirably should be employed to insulate the freezer space 114a. Accordingly, foamed plastic insulation 156 which is formed in situ, and like that described in the embodiment of FIGS. 1 to 4, is employed to insulate the rear wall of the freezer space 114a, the lateral side walls and top of cabinet 110 and the horizontal partition 157 between the freezer space 114a and food space 114b.

In order to be able to withdraw the inner liner 111a and piping in thermal contact therewith from the outer shell 112 when foamed plastic insulation is employed which is formed in situ, we provide an inner core 150 which defines the inner boundaries of the insulated walls at the top, bottom and lateral sides of the inner liner 111a. The inner core 150 comprises a layer of material like rock wool, for example, overlying the top, bottom and lateral sides of the inner liner or shell 111a. The portion 150a of the core 150 at the top of the inner shell 111a extends rearward to the plate 132 and overlies the insulation 156 in the removable rear wall section adapted to close the opening 152.

By providing the inner core 150 for the insulated walls of cabinet 110 in which foamed plastic insulation is formed in situ, the inner liner 111a can be readily removed from the cabinet even though foamed plastic normally adheres very strongly to metal and plastic surfaces which define its ultimate shape. While the foamed plastic remains fixed to the inner surfaces of the walls of the outer shell 112 and top of inner liner 111b when the inner liner 111a is withdrawn from the cabinet 110, the inner core 150 can be pulled loose from the foamed plastic insulation 156. When the core 150 is formed with a material possessing the physical properties of rock wool or like material, only an insignificant quantity of the material will adhere to and remain on the insulation.

After the insulation 156 is provided in the removable wall section of cabinet 110, the core 150 is fixed about the inner liner 111a and top part of the insulation 156. With the inner core 150 provided about the liner 111a, the latter is positioned within the cabinet 110 and plate 132 is secured to the vertical panel 136 by the connections 132a.

A suitable opening 153, desirably offset with respect to the condenser 118, is provided in the top part of the rear panel 136 for introducing the foamable plastic material, such as polyurethane plastic, and a substance like dichlorodifluoromethane, for example. The resulting foamed plastic completely fills the space between the inner liner 111a and top part of the outer shell 112 and

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top of the inner liner 111b to form the insulated walls 156. After the foamed plastic has set and hardened, excess plastic is trimmed at the opening 158 after which the opening may be closed by a suitable closure plate 159.

In the embodiment of FIGS. 1 to 4 the inner shell 11, piping in thermal contact therewith, clamps 17 and 31 and rear insulated wall 48 may, when the refrigerator cabinet 10 is being fabricated, be replaced by a mold or part having the outer configuration of all of these elements. In such case, the inner core 50 may be provided about the portion of the mold or part corresponding to the inner shell 11 and piping in thermal contact therewith, the core parts 50a and 50b overlying portions of the mold replacing the rear insulated wall 48.

With such mold or part positioned within the outer shell 12 with the core 50 fixed thereon, the foamable plastic material and heavy gas-producing substance may be introduced into the cabinet 10 through an opening formed in the top part of the rear wall 36 at a region immediately beneath the top wall 12b. After the body of foamed plastic insulation has been formed within the cabinet 10, the opening in the rear panel 36 may be closed with a suitable closure member about the periphery of which a sealing material can be applied. In this way, the necessity of securing the removable unit of the refrigerating system in position at 32a is avoided.

Similarly, a mold or part may be employed in the embodiment of FIGS. 8 and 9 which has the outer configuration of the inner shell 111a, piping in thermal contact with the shell, and rear insulated wall 148. With such mold or part in position within the outer shell 112 and the core 150 fixed about the inner shell and piping, foamable plastic material may be introduced within the outer shell through the opening 159. In this way, the same mold or part may be employed to fabricate a number of cabinets 10 and 110 in accord with the invention.

Modifications of the embodiments of our invention which have been described will occur to those skilled in the art. Therefore, as we desire our invention not to be limited to the particular arrangements set forth, we intend in the claims to cover all those modifications which do not depart from the spirit and scope of the invention.

We claim:

1. A cabinet construction comprising, an outer shell member, a box-like liner member nested substantially within said shell member each having coextensive surfaces disposed in spaced-apart face-to-face relationship with insulation foamed into the space therebetween, said members having juxtapositioned preformed peripheral edge portions, said cabinet construction also comprising a divider layer of material extending between said peripheral edge portions and continuously over the inner face surface of said liner member adjacent the insulation preventing same from bonding to said liner member or said peripheral edge portions whereby said insulation bonds only to said outer shell member, said outer shell member and the insulation bonded thereto forming an inseparable permanent component of said cabinet construction cradling said box-like liner member, said box-like liner member defining walls of a chamber in said cabinet having an access opening, and means coacting with said peripheral edge portions for removably locking said liner member within said shell member, said unbonded box-like liner member being removable as a unit along said divider layer from said cabinet construction without fracturing the insulation of said permanent component thereof when said locking means is removed.

2. A cabinet construction comprising, an outer shell member, a box-like liner member nested substantially within said shell member each having coextensive surfaces disposed in spaced-apart face-to-face relationship with juxtapositioned peripheral edges and insulation foamed into the space therebetween, said cabinet con-

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struction also comprising a divider layer of material extending continuously over the inner face surface of one of said members adjacent the insulation preventing same from bonding thereto whereby said insulation bonds only to the other of said members, said other member and the insulation bonded thereto forming an inseparable permanent component of said cabinet construction cradling said box-like liner member, said box-like liner member defining walls of a chamber in said cabinet having an access opening, and means coacting with said members for locking said liner member within said shell member, said one unbonded member being removable as a unit along said divider layer from said cabinet construction without fracturing the insulation of said permanent component thereof when said locking means is ineffective to lock said liner member within said shell member.

3. A cabinet construction comprising, an outer shell member, a box-like liner member nested substantially within said shell member each having coextensive surfaces disposed in spaced-apart face-to-face relationship with insulation foamed into the space therebetween, said members having juxtapositioned peripheral edge portions, said cabinet construction also comprising a divider layer of material extending between said peripheral edge portions and over the inner face surface of said liner member adjacent the insulation preventing same from bonding to said liner member or said peripheral edge portions whereby said insulation bonds only to said outer shell member, said outer shell member and the insulation bonded thereto forming an inseparable permanent component of said cabinet construction cradling said box-like liner member, said box-like liner member defining walls of a chamber in said cabinet having an access opening, and means coacting with said peripheral edge portions for removably locking said liner member within said shell member, said unbonded box-like liner member being removable as a unit from said cabinet construction without fracturing the insulation of said permanent component thereof when said locking means is removed.

4. A cabinet construction comprising, an outer shell member, a box-like liner member nested substantially within said shell member each having coextensive surfaces disposed in spaced-apart face-to-face relationship with juxtapositioned peripheral edges and insulation foamed into the space therebetween, said cabinet construction also comprising a divider layer of material extending over the inner face surface of one of said members adjacent the insulation preventing same from bonding thereto whereby said insulation bonds only to the other of said members, said other member and the insulation bonded thereto forming an inseparable permanent component of said cabinet construction cradling said box-like liner member, said box-like liner member defining walls of a chamber in said cabinet having an access opening, and means coacting with said members for locking said liner member within said shell member, said one unbonded member being removable as a unit from said cabinet construction without fracturing the insulation of said permanent component thereof when said locking means is ineffective to lock said liner member within said shell member.

5. In the method of insulating the hollow walls of a refrigerator cabinet having outer shell and an inner shell spaced therefrom which defines a space to be cooled and has a cooling coil of refrigeration apparatus in thermal contact with its outer surface, the inner shell and cooling coil being removable as a unit from within the outer shell, the improvement which comprises providing about a part having the general configuration of the outer surface of the inner shell and cooling coil in thermal contact therewith a cover which is removable therefrom and has an outer layer of rock wool, and, while such part occupies a position within the outer shell normally occupied by the inner shell, foaming a foamable poly-

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urethane plastic in situ in the spaces in the hollow walls defined by the outer wool layer of the cover and the outer shell to form a body of foamed polyurethane plastic insulation which adheres to the inner surface of the outer shell and which is in intimate physical contact with the outer rock wool layer of the cover and is separable therefrom, removing from the outer shell and the body of foamed polyurethane plastic insulation adhering to the inner surface thereof the part and the cover and the outer wool layer thereof, providing about the inner shell and cooling coil in contact therewith a layer of insulation which is removable therefrom, and removably positioning within the outer shell the inner shell about which the layer of insulation is disposed, the layer of insulation being sufficiently thick so that it will be in intimate physical contact with the inner surface of the body of foamed polyurethane plastic insulation within the outer shell.

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