Nov. 17, 1964 I. C. COURSON 3,157,306

CABINET STRUCTURE

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FIG. 1.

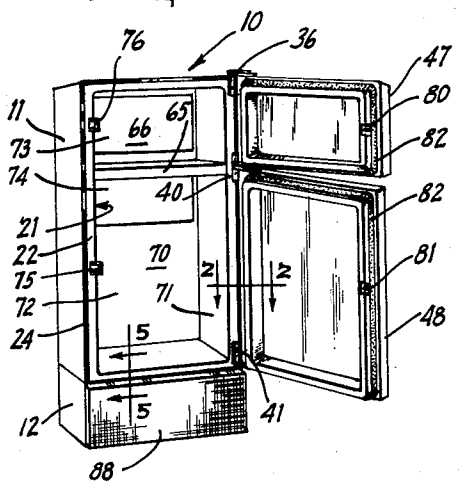
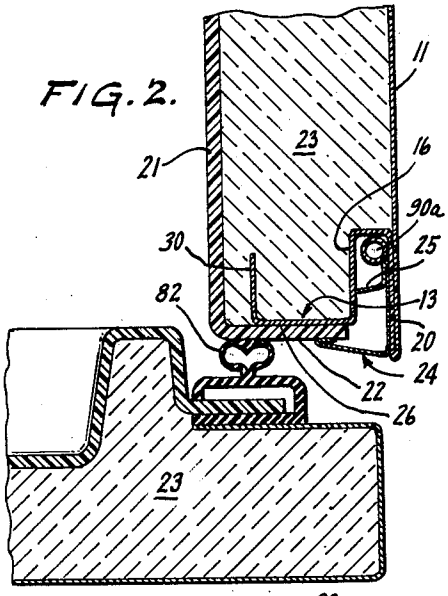


FIG. 2.



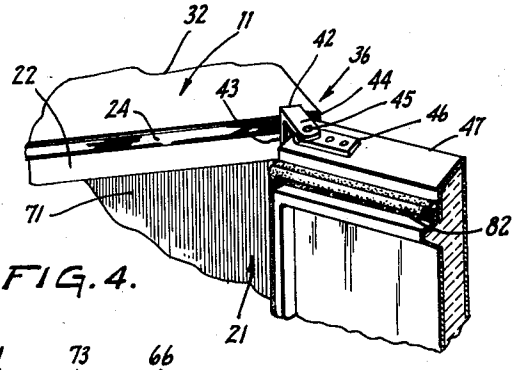


FIG. 4.

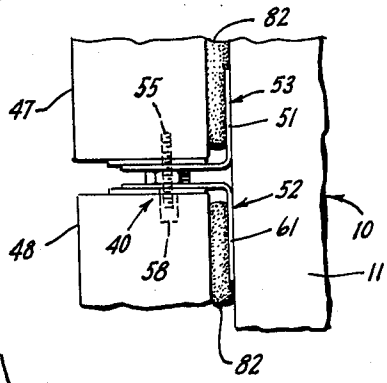


FIG. 6.

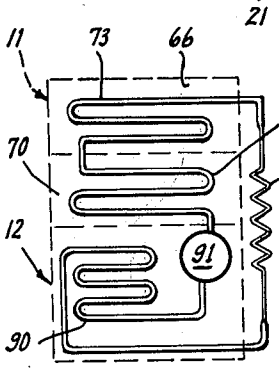


FIG. 7.

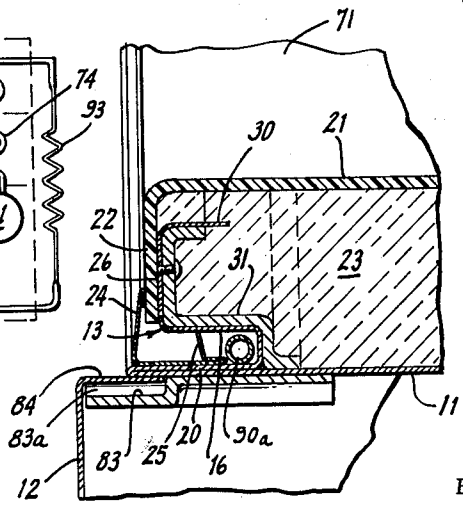


FIG. 5.

INVENTOR.
IBER C. COURSON

BY
Harry W. Hargis III

AGENT

Nov. 17, 1964 I. C. COURSON 3,157,306

CABINET STRUCTURE

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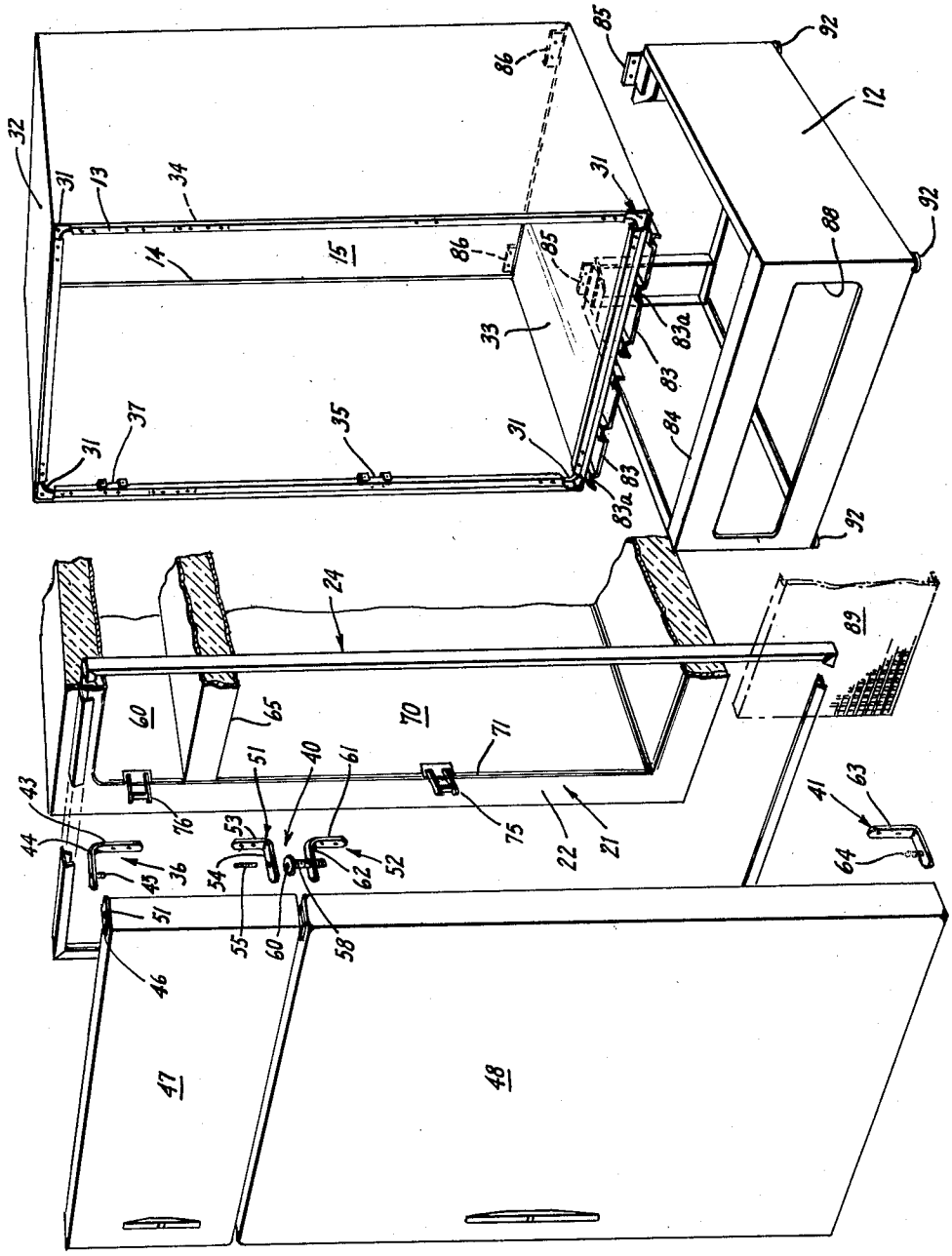

FIG. 3.

INVENTOR.
IBER C. COURSON

BY
Harry W. Hargis III
AGENT

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3,157,306

CABINET STRUCTURE

Iber C. Courson, Glenside, Pa., assignor, by mesne assignments, to Philco Corporation, Philadelphia, Pa., a corporation of Delaware

Filed Mar. 6, 1961, Ser. No. 93,662
2 Claims. (Cl. 220—9)

This invention relates to cabinet structure, and more particularly to thermally insulated cabinet structure provided with refrigerating means adapted to cool the interior thereof.

Considering refrigerated cabinet structure, and by way of example domestic refrigerators, it is normally the practice to provide unitary structure housing both the refrigerated storage compartment and the machine compartment, the latter being adapted to receive the condensing unit. It has been the practice in structure of this type thermally to insulate the storage compartment to the exclusion of the machine compartment. With the advent of foamed insulation which is installed by foaming of constituents directly in the region of an assembly to be insulated, for example in the region between the assembled outer shell and inner liner comprising the storage compartment, it has been proposed that the insulating operation be carried out automatically, which operation involves handling the cabinet outer shell and inner liner assembly by automatic machinery. When foaming the insulation in place, relatively high pressures are developed within the confines of the space being insulated, which pressures create forces tending to bulge the liner and shell walls. To counter this tendency, fixtures are provided for bracing the walls, which procedure makes it highly desirable to isolate the storage compartment undergoing insulation from the non-insulated machine compartment which requires its own assembly operations quite part from those operations performed on the storage compartment. Also it is desirable to minimize the number of assembly operations following the insulation operation, for example operations involved in mounting of doors, latches, trim, and the like.

It is therefore an objective of the invention to provide improved refrigerator cabinet structure comprising component parts readily adapted for handling and assembly by automatic machinery.

It is another and more specific objective of the invention to provide thermally insulated cabinet structure having improved heat-leakage characteristics.

It is another object of the invention to provide improved cooperative positioning of elements of refrigerator cabinet structure facilitating assembly and construction thereof.

It is still another object of the invention to provide improved methods facilitating assembly and construction of refrigerator cabinet structure.

In the achievement of the foregoing and other objectives, the invention contemplates provision of separately handleable insulated storage compartment and condensing unit compartment elements adapted for assembly into a single, complete refrigerated cabinet. The invention further contemplates that the storage compartment comprise a separately handleable element for the insulating operation, apart from the compartment for the condensing unit, and structure for attaching the condensing unit compartment to the storage compartment. The invention additionally comprises thermal breaker strip structure characterized in that it is formed integrally with the cabinet liner and is disposed for cooperative sealing engagement with door gasket means to seal the compartment.

The manner in which the foregoing as well as other objects and advantages may best be achieved will be

understood more fully from a consideration of the following description, taken in light of the accompanying drawing, in which:

FIGURE 1 is a perspective view of a refrigerator cabinet made in accordance with the present invention, with shelving and receptacles removed, and with the doors opened.

FIGURE 2 is a sectional view, with parts broken away, taken along line **2—2** as applied to the cabinet seen in FIGURE 1, but with the doors closed.

FIGURE 3 is an exploded view, in perspective, of the refrigerator cabinet seen in FIGURE 1, and with the insulation shown as attached to the inner shell. As will be clear from what follows, this attachment is shown in the interest of illustration only. In actuality insulation is foamed after assembly, and adheres to both the inner and the outer shells.

FIGURE 4 is an enlarged fragmentary view of the cabinet seen in FIGURE 1 and showing the upper door hinging arrangement.

FIGURE 5 is a fragmentary sectional view, with parts removed, looking in the direction of arrows **5—5** applied to FIGURE 1.

FIGURE 6 is a fragmentary elevational showing of the between-doors hinging arrangement, and

FIGURE 7 is a diagrammatic showing of a refrigerating system suitable for use in the present invention.

With more particular reference to the drawings, and first to FIGURES 1, 2 and 3 thereof, there is illustrated a refrigerator cabinet **10**, of the household type, having outer shell structure comprising separately handleable upper and lower sections **11** and **12**, respectively which are adapted to be fitted and secured together, in accordance with novel features of the present invention, to form rigid unitary outer shell structure. The shell structure is shown in the drawings both prior to (FIGURE 3) and after (FIGURES 1, 2, and 4 to 6) assembly. It will be further noted that the lower shell section **12** comprises both the mounting base for the cabinet **10** and the housing for the compressor and condenser assembly (FIGURE 7).

As best seen in FIGURE 3, the upper section **11** is formed of a single sheet of metal or other material bent to rectangular shape and provided with front and rear peripheral flanges **13** and **14**, respectively. The rear flange **14** extends inwardly substantially at right angles to the plane of the sheet material, and a rear panel **15** is attached to rear flange **14** in any suitable manner, such as by welding or by screws (not shown). As best seen in FIGURES 2 and 5, the front flange **13** is disposed along the front edge of shell **11** and defines a channel having an open portion presented forwardly of the cabinet and leg portions **16** and **20** spaced one from the other between outer shell **11** and inner shell **21**. The inner shell or liner **21** also is provided with a frontal flange **22** disposed along its periphery and presented toward flange **13** of the outer shell.

Thermal insulation **23** is disposed within the space separating the inner and outer shells **21** and **11**, and the flange **22** of the inner shell comprises the breaker strip for the front of the cabinet. As can be seen in FIGURES 2 and 5, breaker strip trim means **24** is disposed between inner shell flange **22** and leg **20** of outer shell flange **13**. Trim means **24** is mounted by a resilient portion **25** thereof disposed in the channel opening and resiliently engaging the channel leg portions **16** and **20**.

The inner leg portion **16** of outer shell flange **13** is provided with a flat face portion **26** presented toward the front opening of outer shell **11**. Flat face portion **26** includes a rearwardly presented flange **30** disposed at substantially right angles to the frontally facing portion **26**. As will be seen in FIGURES 3 and 5, reinforcing angular

members or gussets **31** are disposed in each corner of the outer shell **11** and are rigidly attached, for example by screws, to the frontally presented portion **26** of the channel.

Intermediate the respective upper and lower walls **32** and **33** of outer shell **11** (FIGURE 3) are tapping plates **34**, **35** and **37** spot welded to the frontally presented strip **26**. With reference also to FIGURES 4 and 6, the door hinge means **36**, **40**, and **41** are mounted to tapping plate **34** and to the upper and lower right hand gussets **31**. Uppermost hinge means **36** comprises an inverted L-shaped bracket **42** having a flat face portion **43** mounted against the flange **22** of cabinet liner **21** and attached by screws (not shown) to the upper right hand gusset **31**. Bracket **42** further includes a horizontal portion **44**, having a pin **45** that depends therefrom and into an opening **51** provided with a bearing disposed within a hinge bracket **46** carried by the upper door **47**.

The between-door hinge means **40** (FIGURES 3 and 6) comprises a pair of L-shaped brackets **51** and **52**, the upper one of which has a flat base portion **53** attached by screws to tapping plate **34**. Upper bracket **51** further has a horizontal portion **54** extending from base portion **53**. A pin **55** is insertable through an opening **57** in portion **54** to extend upwardly and downwardly therefrom. The downwardly presented portion of pin **55** extends into an opening **60** in a pin **58**, which pin extends through horizontal portion **62** of another hinge bracket **56** having a face portion **61** mounted to the face of the cabinet also by tapping plate **34**.

Similarly, the lowermost hinge means **41** includes a hinge bracket **63** disposed at the bottom of the cabinet at the lower right hand corner of its face. This bracket has an upwardly presented pin **64** that pivotally engages the lower bracket (not shown) of lower door **48**.

Tapping plates **35** and **37** are mounted to rearwardly extending flange **30** of face portion **26**. Latch strikes **75** and **76** are mounted to respective tapping plates **35** and **37**, and are disposed, respectively, for door latching engagement with latch bolts **81** and **80** (FIGURE 1).

An insulative baffle **65** divides liner **21** into a pair of food storage compartments **66** and **70**, closed, respectively, by doors **47** and **48** mounted to the hinge brackets as hereinabove described. Insulative baffle **65** is disposed in close sealing engagement with the respective side and rear walls **71** and **72** of the inner shell or liner **21**. The forward edge of baffle **65** is a substantially flat, vertically extending surface and is adapted for sealing engagement with horizontal portions of upper and lower door gaskets **82**.

As shown diagrammatically in FIGURE 7, the refrigerating unit includes an evaporator **73** disposed in the upper compartment **66** and adapted to operate at below freezing temperatures, and an evaporator **74** disposed in the lower or above-freezing food compartment and adapted to operate between above and below freezing temperature to provide for defrosting thereof at desired intervals. While not shown for the sake of convenience in FIGURE 7, a portion of the conduit connecting the discharge of compressor **91** to the inlet of condenser **90** may be configured as a loop **90***a* (FIGURES 2 and 5) and inserted in the channel portion of flange **13**. In this location of conduit **90***a* hot gaseous refrigerant flowing therethrough tends to warm the cabinet outer shell in this region thereby to prevent "sweating" on the outer surface of the cabinet shell under high relative humidity conditions encountered in some geographical areas. It will of course be further understood that, while none has been shown, conventional thermostatic control means may be provided for the illustrated refrigerating unit in accordance with known practice.

It is a particular feature of the invention that the hinge brackets **42**, **46**, and **56**, if desired, may be mounted upon the left side of cabinet **10** and the doors hinged thereto merely by turning them end-for-end. Also, the latch strikes may be moved to the opposite side, in the event that hinging of the doors is reversed, merely by providing a duplicate set of tapping plates on the said opposite side prior to insulating the cabinet at the time of assembly.

The door sealing gaskets **82** are mounted thereon according to usual practice, and are adapted to seal against the inner shell flange **22**, and the front baffle **65**, when the doors are moved to closed position.

As best seen in FIGURES 3 and 5, an additional important feature of the invention resides in structure for mounting the base or lower shell **12** to the upper outer shell **11**. This structure comprises a forwardly presented channel **83** disposed along a lower front edge portion of the outer shell **11**, the base **12** for outer shell **11** having a projection **84** receivable in channel **83** to mount the base to the cabinet. Bosses **83***a* are formed on the lower leg of channel **83** and serve as a bearing surface for the engaged flange **84**. Final attachment means for connecting the base **12** to the outer shell **11** includes tabs **85** at the rear of the base which are attachable by screws (not shown) to the rear of the outer shell. Such screw attachment is afforded by tapping plates **86** spot-welded to the rear-panel as shown.

The front wall of base **12** has an opening **88** over which a decorative grill **89** is positioned, said grill and opening providing for ventilating the refrigeration unit components (FIGURE 7) disposed within the base.

It will be appreciated, from the exploded showing of FIGURE 3 that outer and inner shells **11** and **12**, breaker trim **24**, and hinge mounting brackets **42**, **46**, **56**, are all mounted or assembled to one another in a single direction, that is in a direction transverse the opening of the food compartment. This unidirectional assembly feature minimizes the number of assembly manipulations, and renders the cabinet structure particularly adaptable to assembly by automatic devices.

In assembling of the cabinet, outer and inner shells **11** and **21** are assembled together by nesting shell **21** within outer shell **11** in such manner that the front flange of the inner shell rests against the front flange of the outer shell, as best seen in FIGURE 2. The inner shell is centered from side to side so that the extreme edge of the flange **22** is substantially aligned with leg portion **16** of the flange **13**. This insures a uniform access opening for the recess formed by legs **16** and **20** of the front outer shell flange **11**. With reference also to FIGURE 3 it will be noted that prior to the above described assembly the required mounting plates, as seen for example at **35**, **37** and **34**, have been attached to the outer shell by suitable means described elsewhere in the specification.

The outer and inner walls of the above described assembly of shells **11** and **21** are then braced by suitable means (not shown). For example, a plug device may be inserted into the liner and nested therein against its walls. The entire assembly may then be inserted into a cavity-like structure having walls disposed and adapted to embrace the walls of outer shell **11**. While the assembly is thus braced, the insulation, as seen at **23**, is foamed in place, in accordance with known practice, and closely adheres to surfaces of the outer and inner shell that face one another. Adherence of the insulation to the shells rigidifies the structure into a single, unitary element. Thereafter the bracing structure is removed for the next assembly operation.

In accordance with one feature of the invention, the insulation charge to be foamed in place is disposed between the rear walls of the liner and outer shell while the food compartment structure is positioned on its back with the opening facing upwardly.

In accordance with another feature of the invention, the rear panel of the outer shell may be removable and the food compartment assembly may be placed with its opening facing downwardly. The charge of insulation is then distributed both in the side wall cavities and upon the rear wall of the liner. The rear panel is then at-

tached, the cabinet is suitably braced, and the insulation foamed in place. This latter technique for carrying out the insulating operation is particularly advantageous, inasmuch as it has been found that a charge of insulation when in the process of foaming will move readily, of its own accord, in a vertical direction whereas some difficulty is encountered in achieving lateral movement thereof. It will therefore be appreciated that by having a removable rear panel, and placing the cabinet on its front face with the liner in position, the insulation charges placed in each of the side, top, and bottom wall cavities need only rise vertically to fill the same. Also the charge distributed across the rear wall of the liner need only move vertically to fill the rearmost cavity. By insulating the cabinet in this manner, there is ensured uniformity of texture of the body of insulation as well as freedom from voids.

Preferably, inner shell **21** is of a thermally non-conductive material whereas outer shell **11** is of metal. It will of course be understood that both the inner and outer shells may consist of a thermally nonconductive material.

Keeping in mind that the insulating operation is carried out utilizing an assembly of the upper outer shell **11** and inner shell **21** only, the mounting base **12** including condenser **90** and compressor **91** is mounted to the upper assembly after insulating, and at which time refrigerant connections may be made between the condenser and evaporators. Mounting of the base **12** to cabinet **11** is achieved by relatively tilting these elements while inserting flange **84** into channel means **83** (see FIGURE 5) followed by relatively moving the opposite edges of the base and cabinet together so that tabs **85** are properly aligned with the tapping plates **86**. Tabs **85** are then attached to plates **86** by screws, thereby completing the assembly of the base to the cabinet.

Upon completion of this operation, the door hinge brackets are fastened to the front of the cabinet, by screws extending through the brackets and into the tapping plates, and at the same time doors **47** and **48** may be mounted to their brackets. Also, latch strike members **75** and **76** may be mounted to the cabinet by screws threadedly engaging tapping plates **35** and **37**.

Considering that the arrangement of a particular home makes it desirable to hinge the doors from a side of the refrigerator in accordance with such arrangement, it will be appreciated that the disclosed mode of assembly and construction makes it possible, at the last stages of assembly, to select the side to which the door will be hinged. This advantage of course flows from the symmetrical nature of the assembly afforded by the novel configuration of the elements comprising the present invention. In fact, hinging of the doors advantageously can be modified either in the home or upon purchase of the refrigerator, due to the interchangeability of the doors, hinges and latches.

It will be seen further that the base portion **12** of the outer shell includes a floor portion **17**, the corners of which are provided with levelling feet **92** for cabinet **10**. Also, suitable means (not shown) may be provided for attaching elements of the condensing unit to floor portion **17**.

It will be evident from the foregoing that structural features of the present invention afford numerous other

advantages. For example, by using insulation that is foamed in place, a rigid box-like structure is provided in which the top, side, rear and bottom walls of the cabinet are formed as a substantially integral member, with the result that a sturdy cabinet structure is afforded. Additionally, the number of components to be handled in the operations performed during assembly are considerably reduced.

I claim:

1. A refrigerator cabinet comprising: an outer shell; an inner liner disposed within and spaced from said outer shell; thermal insulation disposed within the space separating said shell from said liner, said shell and said liner having edge portions defining an access opening over which a door may be mounted; means defining a flange disposed along the periphery of said liner and presented toward the edge portion of said shell; means defining a channel extending along the edge portion of said shell, the open portion of said channel being presented forwardly of the cabinet, said channel including leg portions disposed between said shell and said liner flange; and trim means comprising a channel formed of flexible and resilient material, one leg portion of said trim means extending transversely of and disposed in frictional resilient engagement with opposed leg portions of said cabinet channel to retain said trim means, the other leg portion of said trim means extending from said outer shell toward said liner, over said shell channel, and onto the flange of said liner, said last recited leg and said flange being cooperatively disposed to form a substantially continuous, frontally presented frame for said cabinet opening.

2. A refrigerator cabinet comprising inner liner and outer shell elements spaced one from the other, means defining a forwardly presented channel extending along the forwardly presented edge portions of said liner and shell elements and including leg portions disposed between said shell and said liner elements, and trim means including a channel formed of flexible and resilient material, one leg portion of said trim means extending transversely of and disposed in frictional resilient engagement with opposed leg portions of said cabinet channel to retain said trim means, the other leg portion of said trim means extending from said outer shell element toward said liner element, over said first mentioned channel, whereby to form therewith a substantially continuous frontally presented frame for said forwardly presented edge portions.

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