April 29, 1969 M. E. NEREM 3,440,790

CORNER ASSEMBLY

Filed Nov. 17, 1966 Sheet 1 of 4

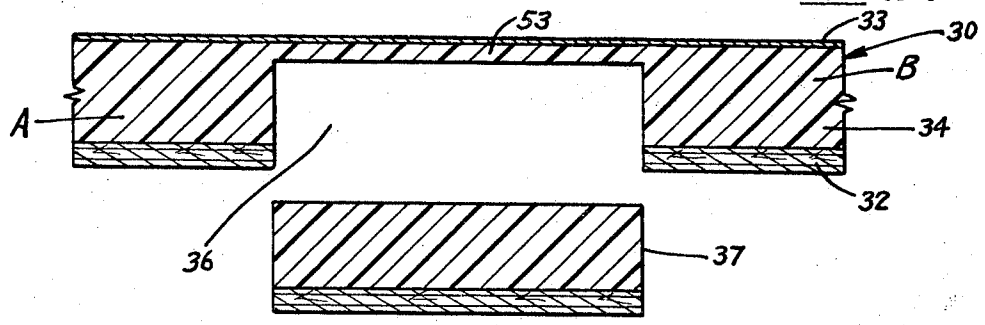

FIG. 1

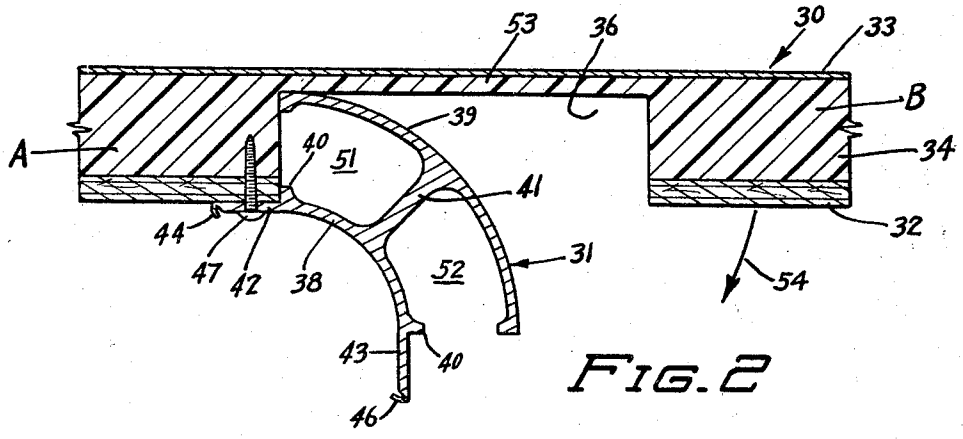

FIG. 2

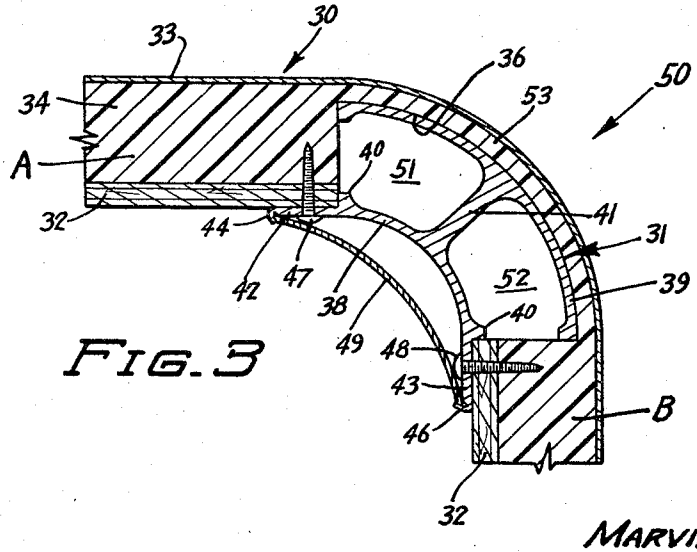

FIG. 3

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CORNER ASSEMBLY

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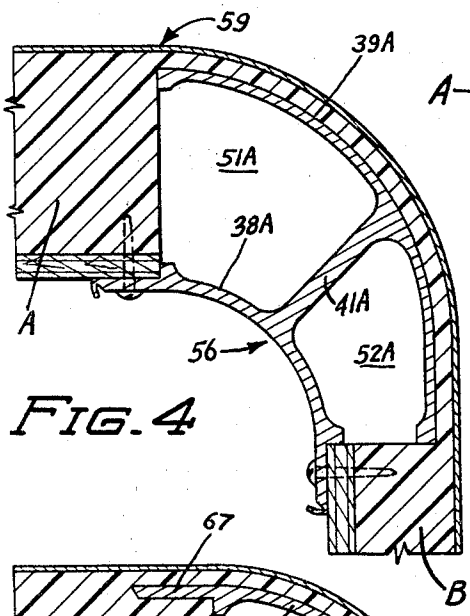

FIG. 4

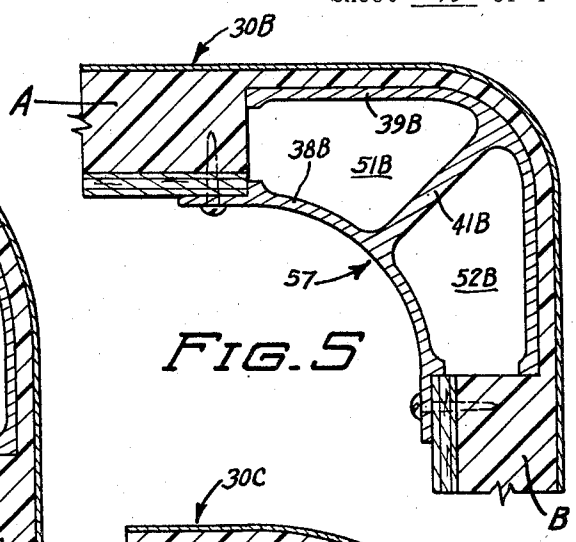

FIG. 5

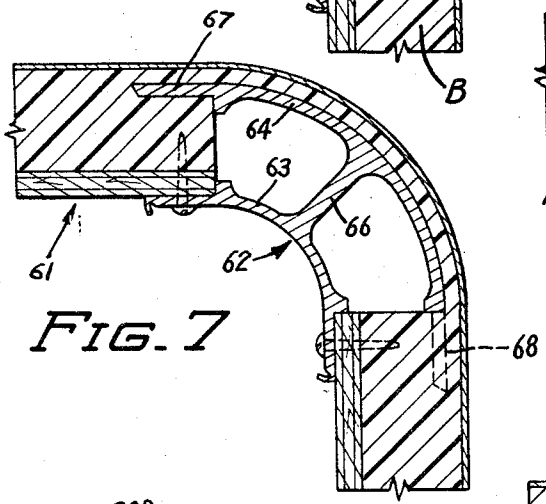

FIG. 7

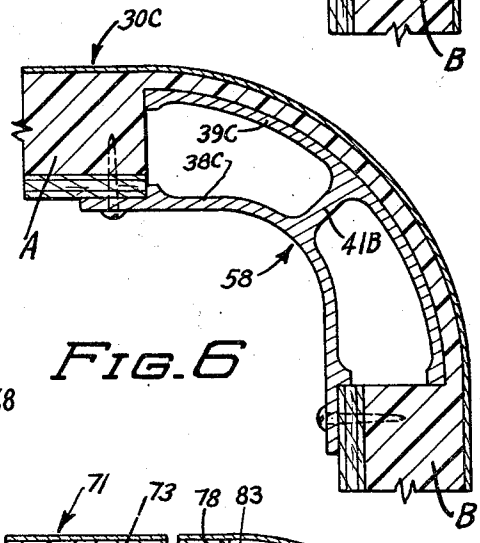

FIG. 6

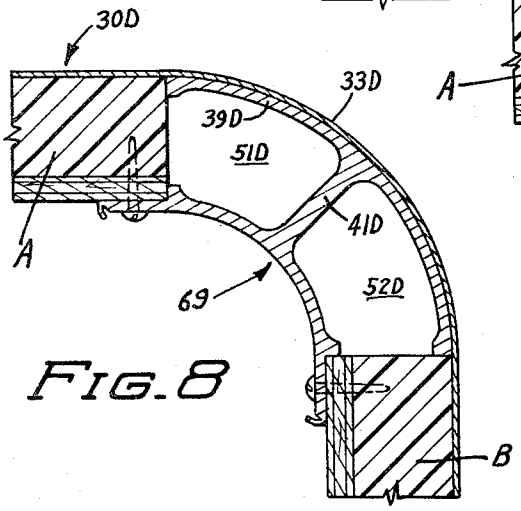

FIG. 8

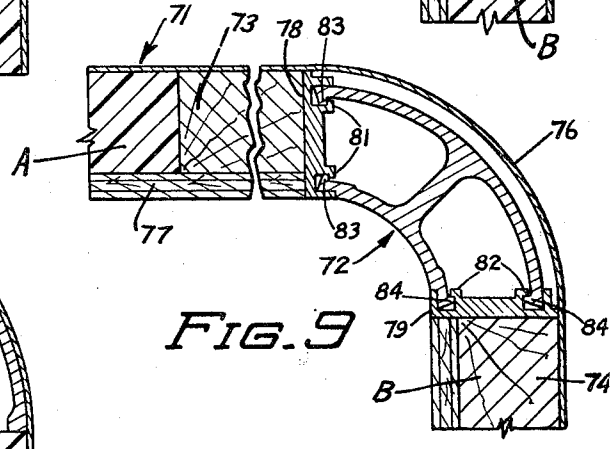

FIG. 9

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CORNER ASSEMBLY

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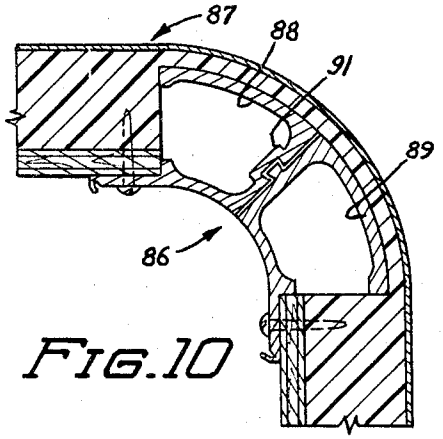

FIG. 10

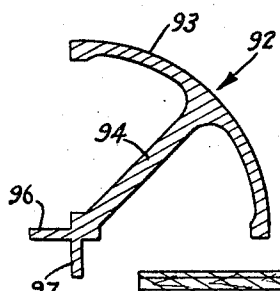

FIG. 11

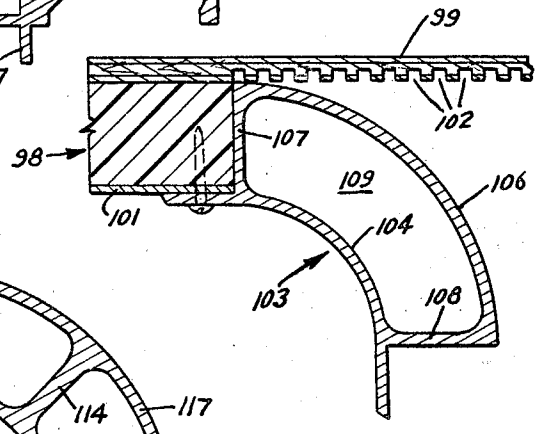

FIG. 12

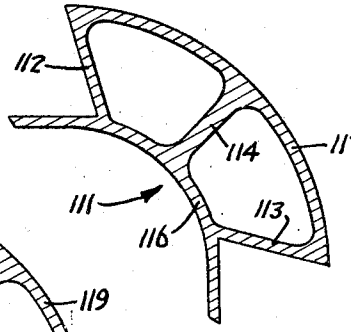

FIG. 13

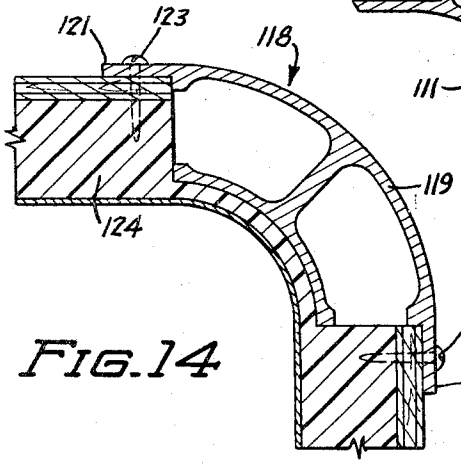

FIG. 14

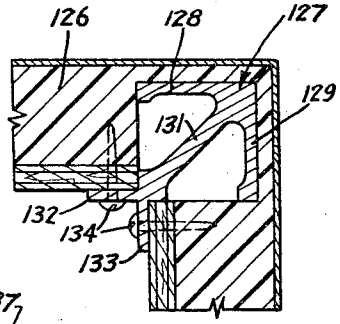

FIG. 15

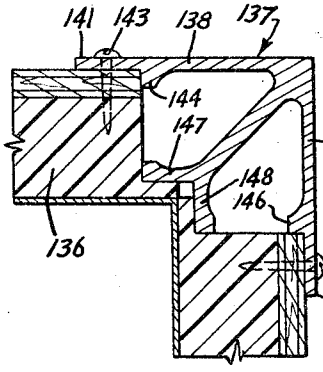

FIG. 16

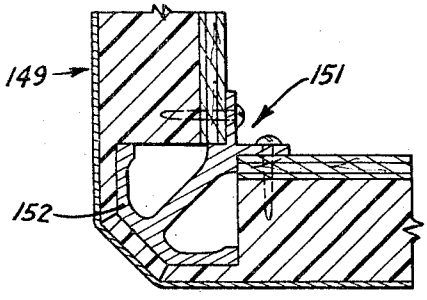

FIG. 17

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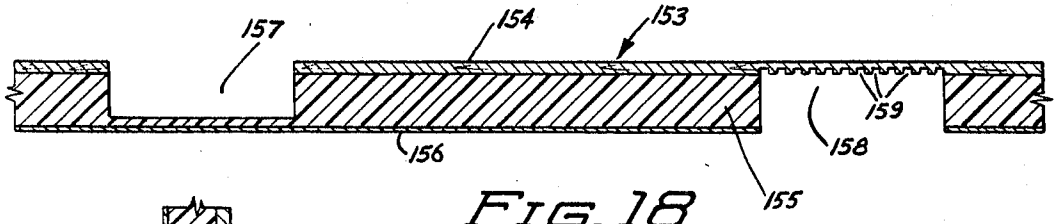

FIG. 18

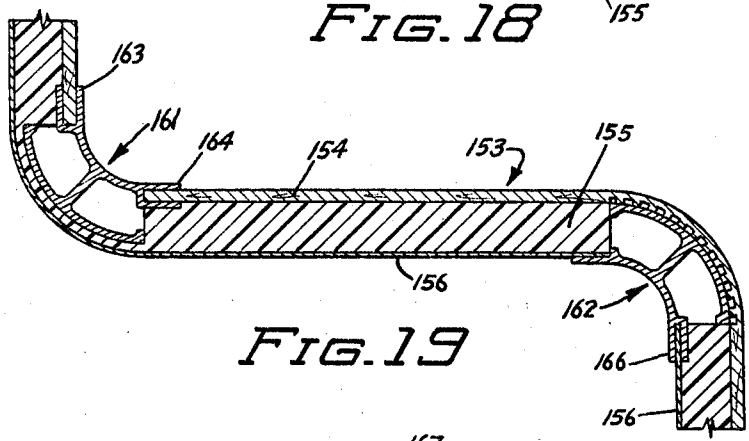

FIG. 19

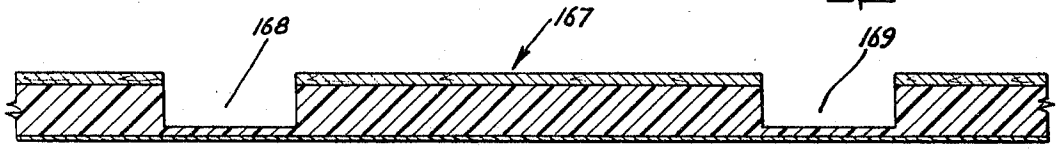

FIG. 20

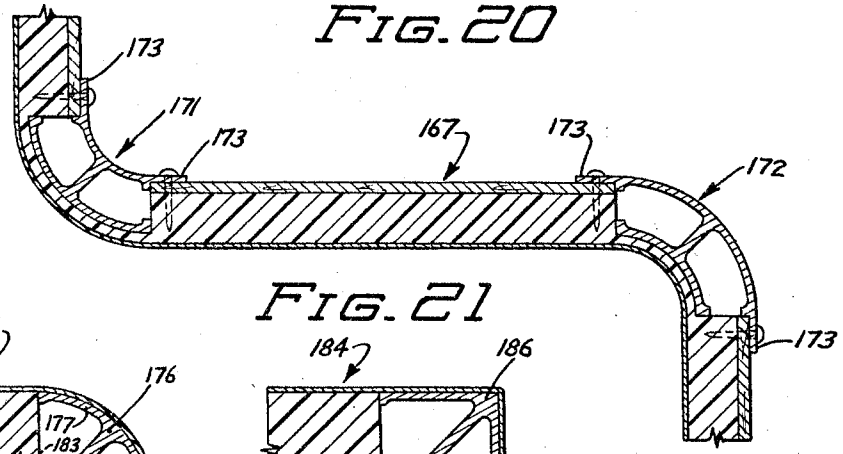

FIG. 21

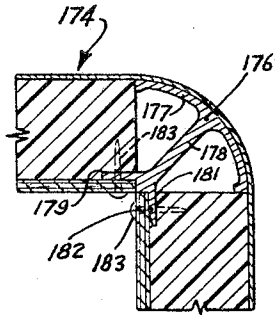

FIG. 22

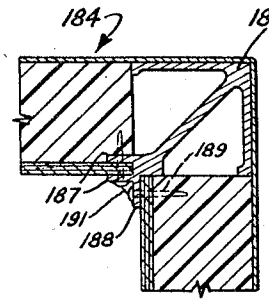

FIG. 23

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United States Patent Office 3,440,790 Patented Apr. 29, 1969

3,440,790

CORNER ASSEMBLY

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Filed Nov. 17, 1966, Ser. No. 595,118
Int. Cl. E04c 2/30, 1/34; E04b 5/48
U.S. Cl. 52—631 13 Claims

ABSTRACT OF THE DISCLOSURE

A sandwich panel corner assembly comprising a single panel having an outer facing and an inner facing secured to opposite sides of a foamed plastic core. One facing and the core is provided with a groove for accommodating an elongated corner member. The corner member has inner and outer wall members to shape and reinforce the corner and to hold sections of the panel in relative angular positions. One wall member is in surface engagement with a portion of the core connecting the sections of the panel to provide a full, shock resistant and insulated corner assembly.

This invention relates to a corner assembly for sandwich panels and a method of forming a corner in a single sandwich panel with a corner member.

Briefly described, the invention is a corner assembly comprising a single panel having an inner facing and an outer facing attached to opposite sides of a core. One or more linear grooves in one of the facings of the panel project into the core toward the other facing and extend across the panel dividing the panel into two or more sections. An elongated corner member or a series of short corner members interposed in each of the grooves is attached to one of the facings to hold neighboring sections in relative angular positions including a right angle relationship as well as obtuse or acute angle relationships. In the event that a series of short corner members are used, they may be placed in end to end relationship or intermittently spaced from each other. With this invention, a corner can be made in a single sandwich panel by retaining one of the panel faces continuous and uninterrupted.

The invention also contemplates a method of forming a corner in a single panel with a corner member. Additional corners may be placed in the same panel with the use of additional corner members. The method includes the steps of cutting or incorporating a groove in one facing of the panel and core to divide the panel into two or more sections. The grooves may extend partially into the panel or go all the way to the opposite facing of the panel. If desired, the corner member may be placed in the corner and may be secured to one section. The opposite section of the panel is moved by bending the portion of the panel between the sections around the corner member to change the angular position of the first panel section with respect to the second panel section. The joint is completed by securing the opposite portion of the corner member to the second panel section. Alternatively, the corner member may not be secured to either panel sections until the panel is bent or the corner member may never be secured to the panel section. Furthermore, the panel member can be initially bent and the corner member then inserted into the groove.

In the drawings:

FIGURES 1, 2 and 3 are sectional views of one form of the corner assembly illustrating the method of making the corner in a sandwich panel;

FIGURES 4, 5 and 6 are sectional views illustrating various shapes of the corner member of FIGURE 1 to compensate for differences in panel thickness as well as changes in the radius of curvature between the inner and outer walls of the corner member;

FIGURE 7 is a section view of a corner assembly including a corner member having an extended leg inserted into the core adjacent the outer facing;

FIGURE 8 is a sectional view of a panel having a modified corner assembly including a corner member wherein the outer facing of the panel is in direct contact with the corner member;

FIGURE 9 is a sectional view of a further modification of the corner assembly having a corner member including hooked end portions which snap into oppositely hooked grooves in members secured to the panel member;

FIGURE 10 is a cross-sectional view showing a further modification of the corner assembly having a two-piece interlocked corner member;

FIGURE 11 is a cross-sectional view of a further modified corner member;

FIGURE 12 is a cross-sectional view of a corner assembly in assembled relation with a panel, the outer skin of the panel having a plurality of cuts to permit bending of the outer skin around a corner member;

FIGURE 13 is a cross-sectional view of a further modified corner member;

FIGURE 14 is still another cross-sectional view of still another modification of the corner assembly showing the corner member positioned in an outwardly open groove and secured to the outside facing of the panel;

FIGURES 15, 16 and 17 are cross-sectional views of the corner assembly showing different shapes and positions of the corner members;

FIGURE 18 is a sectional view of a sandwich panel cut to receive a pair of corner members;

FIGURE 19 is a sectional view showing corner members securing the sandwich panel of FIGURE 18 with the sandwich panel bent around the corner members;

FIGURE 20 is a sectional view of another sandwich panel cut to receive a pair of corner members;

FIGURE 21 is a sectional view showing corner members secured to the sandwich panel of FIGURE 20 with the sandwich panel bent around the corner members;

FIGURE 22 is a sectional view of another modified corner assembly having a corner member in assembled relation with a sandwich; and

FIGURE 23 is a sectional view of another corner assembly showing a right angle corner member in assembled relation with a sandwich panel.

Referring to the drawings, there is shown in FIGURES 1 to 3 a panel member **30** carrying an arcuate corner member **31** to form a corner assembly indicated generally at **50**. Panel **30** is a sandwich panel having an inner facing **32** and an outer facing **33** secured to opposite sides of core **34**, as a foamed plastic material. As shown in FIGURE 1, facing **32** is a plywood sheet and facing **33** is a metal sheet. Core **34** is rigid expanded polystyrene. Other materials, as hardboards and the like, can be used as facings.

In making the corner assembly, a linear groove **36** is placed in panel **30** separating the panel into two sections interconnected with outer facing **33** and a portion **53** of core **34**. Groove **36** is an elongated cut-out formed by cutting and removing a portion **37** of inner facing **32** and part of core **34**. The groove may extend all the way to the opposite facing **33** of the panel as shown in FIGURE 8. The panel may be made with a groove or recess similar to groove **36**.

Corner member **31** has an arcuate inner wall **38** and an arcuate outer wall **39** interconnected with a radial web **41** to form a one-piece member. Flanges **42** and **43** project outwardly from opposite ends of inner wall **38**. The opposite ends of wall **38** have outwardly projected lugs **40** which engage the facing edges of inner facing **32** to positively locate the corner member in groove **36**. Flanges **42** and **43** terminate in inwardly directed hooks **44** and

46 holding a cover 49. As shown in FIGURE 3, corner member 31 is located in groove 36 with flanges 42 and 43 adjacent inner facing 32. Fasteners 47 and 48 project through suitable holes in the flanges and into facing 32 to secure corner member 31 to the panel. Cover 49 retained by hooks 44 and 46 conceals the heads of fasteners 47 and 48. Cover 49 may be paper, metal, plastic laminate and the like and can be clipped, bonded or fastened in any suitable way to the corner member. Corner member 31 is made of rigid material, as metal, plastic or the like and can be extruded, roll-formed, molded, built up or milled.

As shown in FIGURE 3, corner assembly 50 is a reinforced right angle corner having spaces 51 and 52 formed by corner member 31 and panel 30. A layer 53 of core material is located between the outer arcuate wall 39 of the corner member and outer facing 33 of the panel. Spaces 51 and 52 may be filled with insulating material, as foamed in place plastic, to increase the thermo insulating characteristic of the corner assembly. Spaces 51 and 52 can be used as chases for electrical wiring, piping and the like.

The method of making corner assembly 50 in a single panel 30 comprises the steps of initially cutting or incorporating groove 36 in one facing of the panel to divide the panel into a first section A and a second section B. The width of the groove is determined by the arcuate length of corner member 31. The groove may extend partially into the panel or all the way to the opposite facing of the panel depending on the width of corner member 31. Corner member 31 is initially placed in groove 36 and may be optionally secured to one section with fastening member 47 or set in place. As shown in FIGURE 2, fastening member 47 extends through flange 42 into inner facing 32 thereby attaching corner member 31 to the panel. After the corner member is positioned adjacent section A of the panel, section B of the panel is moved by bending it downwardly as indicated by arrow 54 around the corner member locating layer 53 of core material adjacent arcuate outer wall 39 as shown in FIGURE 3. This places facing 32 of panel section B adjacent flange 43. A fastener 48, if use is desired, secures flange 43 to facing 32. The corner assembly is completed by arcuately flexing and inserting cover 49 under hooks 44 and 46 thereby concealing the heads of fasteners 47 and 48. Cover 49 may be slipped under hooks or flanges 44 and 46.

As shown in FIGURE 18, a plurality of grooves may be cut into or incorporated into opposite facings of the single panel to permit bending of the panel in opposite directions to achieve inside and outside corner assemblies in the same panel. As shown in FIGURE 21, inside and outside corner assemblies may also be achieved in a single panel by providing the panel with grooves in the same panel facing and using inside and outside corner members. The details of this structure will be described hereinafter.

FIGURES 4, 5 and 6 show corner assemblies having corner members which have different arcuate shapes than corner member 31. In FIGURE 4, corner member 56 has an inner arcuate wall 38A and an outer arcuate wall 39A having different curvatures whereby the corner member 56 is usable with panel 59 of varying thickness. Section A of panel 59 is thicker than section B.

In FIGURE 5, corner member 57 has an inner wall 38B having a radius of curvature which is larger than the radius of curvature of outer wall 39B. This results in a broad curved inner corner surface and a more abrupt outer corner surface as well as an increase in the capacity of spaces 51B and 52B.

In FIGURE 6, corner member 58 has an inner wall 38C having a radius of curvature which is smaller than the curvature of outer wall 39C. This provides a more square internal corner surface and yet maintains a rounded outer surface of the corner. In FIGURES 5 and 6, the hooks at the opposite ends of the inner walls 38B and 38C have been deleted since covers are not used to enclose the heads of the fasteners.

As shown in FIGURE 7, a panel indicated generally at 61 carries a corner member 62 having an inner wall 63 and an outer wall 64. The midportions of the walls are interconnected with a radial web 66 making the corner member a one-piece unit. A flange 67 projects outwardly from one end of outer wall 64 into the core material of the panel. As indicated in dotted lines, a similar flange 68 may be extended from the opposite end of outer wall 64. Alternatively, flange 68 may replace flange 67.

As shown in FIGURE 8, corner member 69 has a shape similar to corner member 31 in FIGURES 2 and 3. Web 41D has a length so as to position outer arcuate wall 39D in engagement with outer facing 33D of the panel thereby eliminating core material from between the outer wall and the outer facing 33D.

Referring to FIGURE 9, there is shown a modified corner assembly having a panel indicated generally at 71 and a snap-in corner member 72. Panel 71 has a pair of supports 73 and 74 sandwiched between the outer and inner facings 76 and 77 respectively. The supports are spaced from each other to form a groove or recess for accommodating corner member 72. Secured to the facing sides of supports 73 and 74 are members 78 and 79 having pairs of hook portions 81 and 82 respectively. Each pair of hook portions have hooks that face in opposite directions away from each other and cooperate with pairs of hooks 83 and 84 on the opposite ends of corner member 72 to interlock corner member 72 with panel 71. The hooks are interlocking male and female members which coactively connect corner member 72 with a panel 74 without the use of fasteners or bonding material. The male and female relationship of the members may be reversed.

Referring to FIGURE 10, there is shown a two-piece corner member indicated generally at 86 in assembled relation with a panel indicated generally at 87. Corner member 86 comprises a pair of U-shaped sections 88 and 89. The sections have face-to-face bases containing an interlocking tongue and groove connection 91. Corner member 86 may be made up of three or more separate pieces which interlock to each other or may be variously fastened together to form a rigid corner member.

Referring to FIGURE 11, there is shown a further modified corner member indicated generally at 92 having an arcuate outer wall 93 integral with an inwardly projected radial rib 94. The inner end of the rib 94 has right angle disposed flanges 96 and 97 which cooperate with the inner facing of the panel to position the corner member on the panel as well as provide structure to accommodate fastening means used to secure the corner member to the panel.

Referring to FIGURE 12, there is shown a panel indicated generally at 98 having an outer facing 99 and an inner facing 101. Outer facing 99 has a plurality of side-by-side relief cuts 102 extended across the groove to accommodate corner member 103. The grooves permit the relatively stiff outer facing 99, usually plywood or similar rigid material, to be bent around the corner member. Corner member 103 has an inner arcuate inner wall 104 and a concentrically arcuate outer wall 106 interconnected with radial ends 107 and 108 which position against the panel. Corner member 103 has a single space 109 which may be used to accommodate thermo insulative material or form a passageway for electric lines or similar items.

FIGURE 13 shows a further modification of the corner member indicated generally at 111. Corner member 111 has angularly outwardly disposed ends 112 and 113 and a radial rib 114 connecting an arcuate inner wall 116 with an arcuate outer wall 117 forming two separate enclosed spaces. Additional ribs may be utilized to form a plurality of spaces. Corner member 111 is adapted to fit into a panel having a dovetailed inwardly directed groove.

FIGURE 14 shows an outside corner member indicated generally at **118** having an arcuate outer wall **119**. Opposite ends of outer wall **119** have outwardly directed flanges or extensions **121** and **122**, respectively, which accommodate fasteners **123** used to secure the corner member to panel **124**. Outside corner member **118** fits into a groove formed on the outside of panel **124**. The corner member **118** may be secured to the panel after the panel is angularly bent.

Referring to FIGURE 15, there is shown panel **126** carrying an inside right-angle corner member indicated generally at **127** forming a right-angle corner. Corner member **127** has normally disposed arms **128** and **129** and a central web **131** terminating at its inner end in right angle flanges **132** and **133** accommodating fasteners **134** used to secure the corner member to the inside facing of the panel.

As shown in FIGURE 16, panel **136** has an outside right angle corner member **137** comprising normally disposed outer arms **138** and **139**. Each arm has an extension **141** and **142**, respectively, for receiving fasteners **143** used to secure corner member **137** to the outside facing of the panel. Inwardly directed lugs **144** and **146** located at the outer ends of arms **138** and **139** abut against the outer facing of the panel. The inside of corner member **137** has right-angle legs **147** and **148** which cooperate with lugs **144** and **146** to position the corner member on the panel forming a right-angle corner.

Referring to FIGURE 17, there is shown an inside corner member **151** mounted in assembled relation with panel **149**. Corner member **151** is similar to inside corner member **127** and has an outside wall **152** divided into a plurality of flat angularly disposed sections to form a multi-sided corner assembly.

Referring to FIGURE 18, there is shown a panel **153** having facings **154** and **156** on opposite sides of a core **155**. The panel is divided into a plurality of sections with a groove **157** in facing **154** and a groove **158** in facing **156**. The bottom of groove **158** has a plurality of cuts **159** in facing **154** enabling this facing to be readily bent about a corner member. As shown in FIGURE 19, panel **153** is bent in opposite directions forming separate corner assemblies about inside corner member **161** and outside corner member **162**. Corner member **161**, similar in shape to corner member **31**, has bifurcated end flanges **163** and **164** positioned about the thick facing **154** of the panel. Fasteners or bonding material may be used to secure the bifurcated end flanges to the facing. Corner member **162** has one bifurcated end flange **166** located on opposite sides of facing **156** and illustrates another modification of the corner member.

Referring to FIGURES 20 and 21, there is shown a panel indicated generally at **167** having a pair of grooves **168** and **169** in one facing. An inside corner member **171** is located in groove **168** and an outside corner member **172** is located in groove **169**. Fasteners **173** are employed to fasten the corner members to one facing of the panel. Inside corner member **171** is identical in shape to corner member **31** and outside corner member **172** is identical in shape to corner member **118** shown in FIGURE 14.

Referring to FIGURE 22, there is shown a further modification of an inside corner member positioned in a panel indicated generally at **174**. Corner member **176** has an arcuate outside wall **177** joined to a radially inwardly directed rib **178** terminating in right angle legs **179** and **181** positioned adjacent the inside of the inner facing. Leg **181** has a groove **182** to serve as a drill and fastener guide. Fasteners **183** are used to secure the legs to the adjacent facing. Legs **179** and **181** may be of various shapes, as beveled, step beveled, sharp edge or concave and may have guide grooves.

Referring to FIGURE 23, there is shown a right-angle corner member in assembled relation with a panel **184** to form a right-angle corner assembly. Corner member **186** is similar in shape to the corner member **127** shown in FIGURE 15. The inside portion of corner member **186** has a bifurcated flange **187** located on opposite sides of the inner facing of the panel and an outside flange **188** normally disposed from flange **187**. Fastener **189** can be used to secure flange **188** to the facing. A similar fastener may be used to secure flange **187** to the facing. The corner between the flanges **187** and **188** may be filled with a trim **191**.

There has been shown and described a number of forms of the corner assembly of the invention. It is understood that additional modifications, changes in the radii and shapes may be made by those skilled in the art. For example, the faces on the opposite sides of the panel may be of the same or different materials and may be the same or of different thickness. The corner members may be made from rigid or semi-rigid materials including, but not limited to, metal, plastic, wood and the like. The corner assembly is usable to form multisided structures or enclosures for a variety of different purposes including but not limited to all types of recreational vehicles as campers, house trailers, motor homes and the like. In addition, corner members may be shaped so as to provide a corner assembly and the panel sections have angles which may be greater than or less than the right angle relationships shown in the drawings. The fasteners **47** and **48** may be screws, bolts, blind fasteners, nails, staples or replaced with bonding material.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A corner assembly comprising a sandwich panel having an inner facing, an outer facing, a core of foamed plastic material, and means securing the inner facing to one side of the core and securing the outer facing to the other side of the core, at least one groove in one of said facings projected into the core toward the other facing dividing the panel into separate inter-connected sections, the base of the groove being spaced from the other facing whereby the core is continuous, a corner member located in said groove for holding the sections in relative angular positions said corner member having one wall in surface engagement with the core portion adjacent the base of the groove, and means attaching the corner member to the sandwich panel.

2. The corner assembly of claim **1** wherein said corner member has an inner wall, an outer wall and means connecting the inner wall to the outer wall.

3. The corner assembly of claim **2** wherein one of said walls has end extensions positioned adjacent one of said facings.

4. A corner assembly comprising a panel having an inner facing and an outer facing, at least one groove in one of said facings projected toward the other facing providing the panel with separate sections, and a corner member located in said groove for holding the sections in relative angular positions, said corner member having an inner wall, an outer wall and means connecting the inner wall to the outer wall, one of said walls having end extensions positioned adjacent one of said facings and at least one of said extensions being bifurcated and located on opposite sides of said one facing.

5. A corner assembly comprising a panel having an inner facing and an outer facing, at least one groove in one of said facings projected toward the other facing dividing the panel into separate sections, and a corner member located in said groove for holding the sections in relative angular positions, said corner member having an inner wall, an outer wall and means connecting the inner wall to the outer wall, one of said walls having end extensions positioned adjacent one of said facings, said end extensions being on the ends of the inner wall and have facing hooks, fasteners connecting the end extensions

to the one facing and cover means engaging said hooks for enclosing said fasteners.

6. The corner assembly of claim 5 wherein said inner wall and said outer wall are arcuate in shape.

7. The corner assembly of claim 6 wherein the inner wall has a different radius of curvature than the outer wall.

8. The corner assembly of claim 4 wherein said inner wall and said outer wall are arcuate in shape.

9. The corner assembly of claim 5 wherein at least one of said walls includes angularly disposed arms.

10. The corner assembly of claim 1 including interlocking means for joining the corner member to the panel.

11. The corner assembly of claim 1 wherein said corner member has an arcuate outer wall, angularly disposed inner legs and web means connecting the wall with the legs.

12. The corner assembly of claim 5 wherein said outer wall is in surface engagement with a portion of the core adjacent the base of the groove.

13. The corner assembly of claim 5 wherein said corner member has right angle outer arms, right angle inner arms, and web means joining the apex portions of said inner and outer arms.

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