Sept. 27, 1966 R. S. GREGOIRE 3,274,739

SHEET PANEL ASSEMBLY AND SUPPORTING MEMBERS THEREFOR

Filed June 7, 1962 19 Sheets-Sheet 1

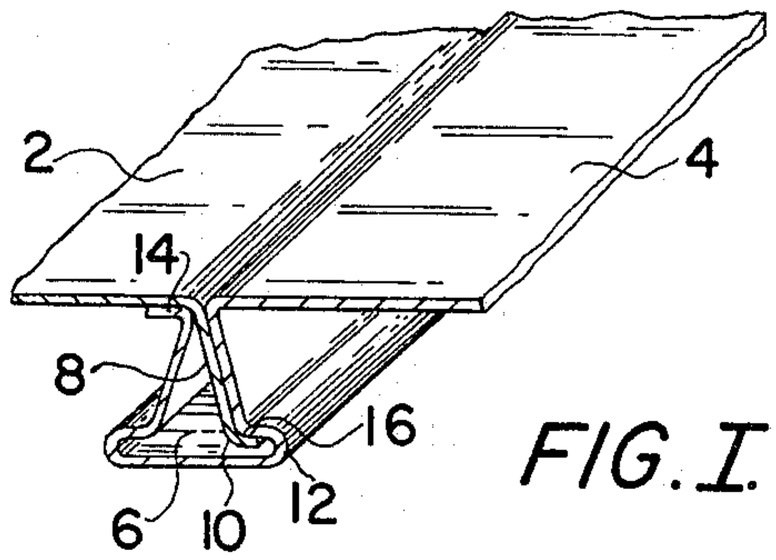

FIG. I.

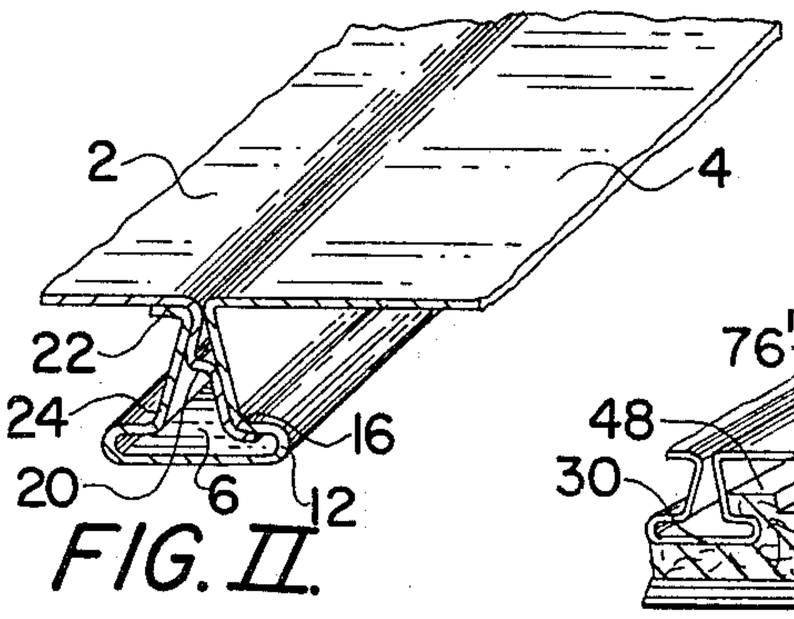

FIG. II.

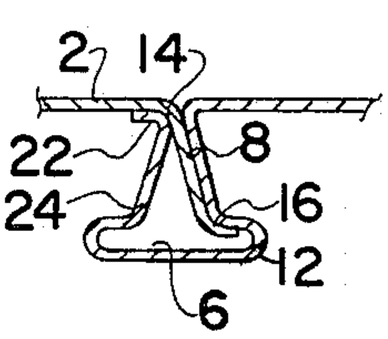

FIG. III.

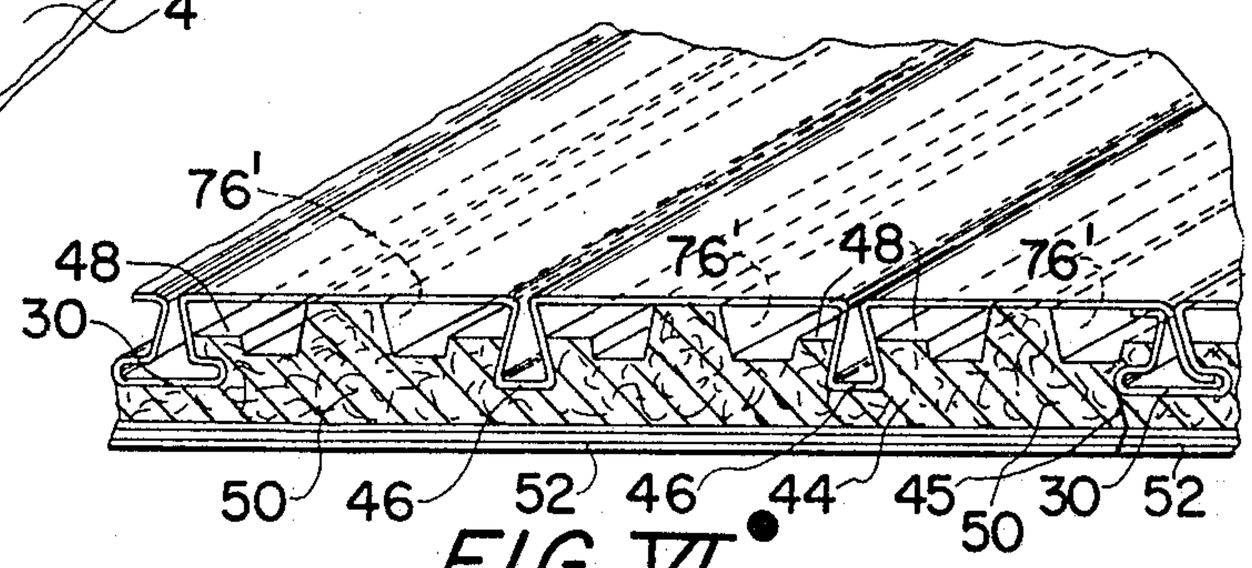

FIG. VI.

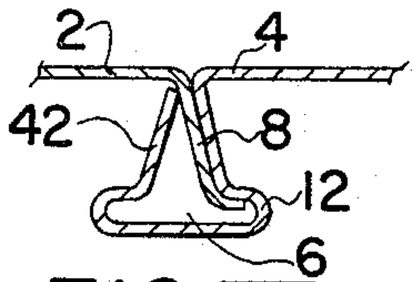

FIG. IV.

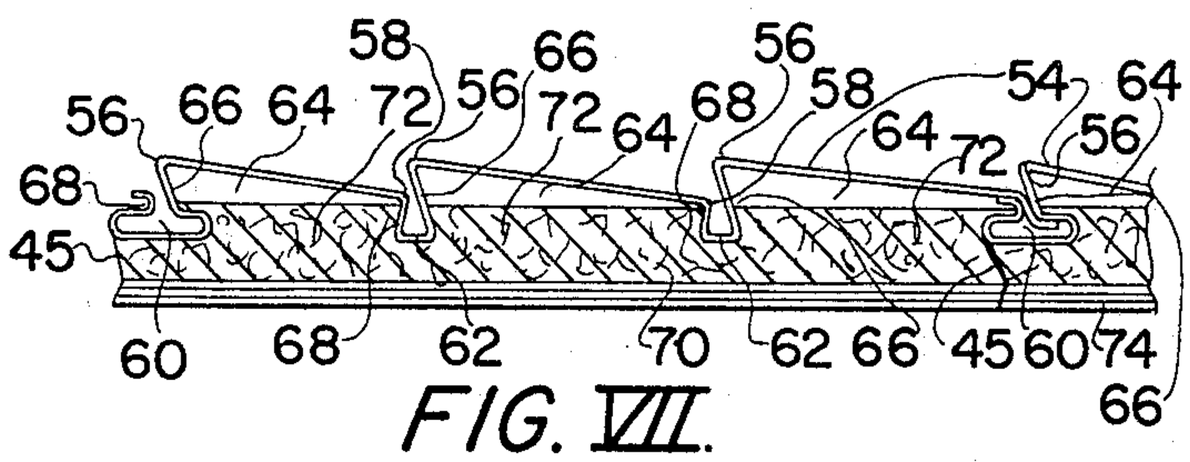

FIG. VII.

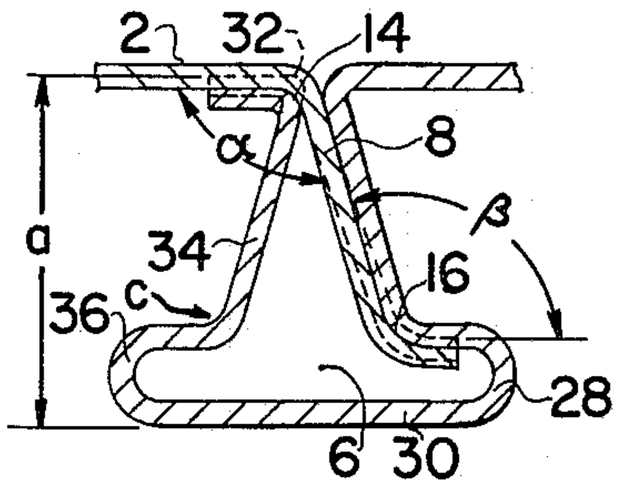

FIG. V.

INVENTOR
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SHEET PANEL ASSEMBLY AND SUPPORTING MEMBERS THEREFOR

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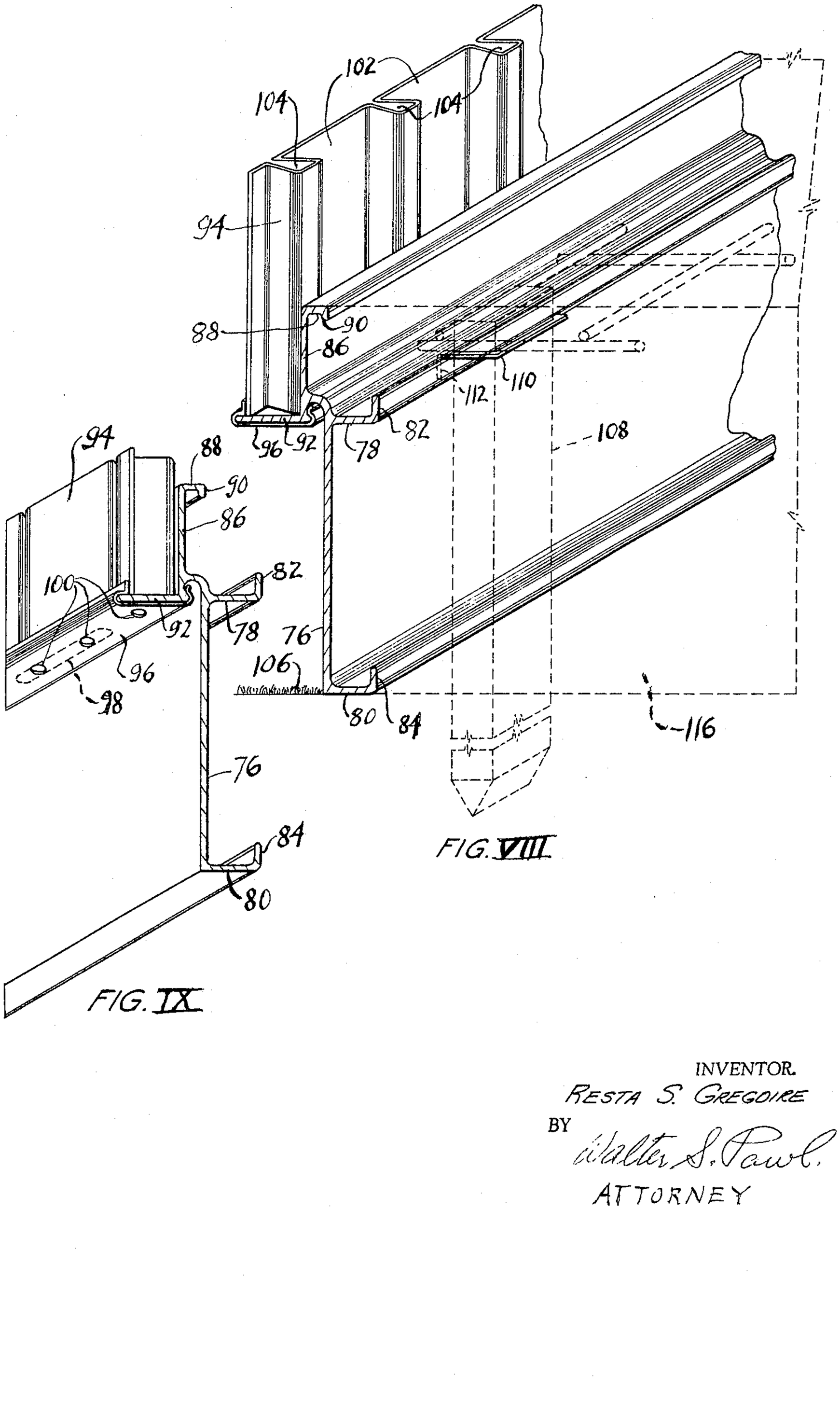

FIG. VIII

FIG. IX

INVENTOR.
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SHEET PANEL ASSEMBLY AND SUPPORTING MEMBERS THEREFOR

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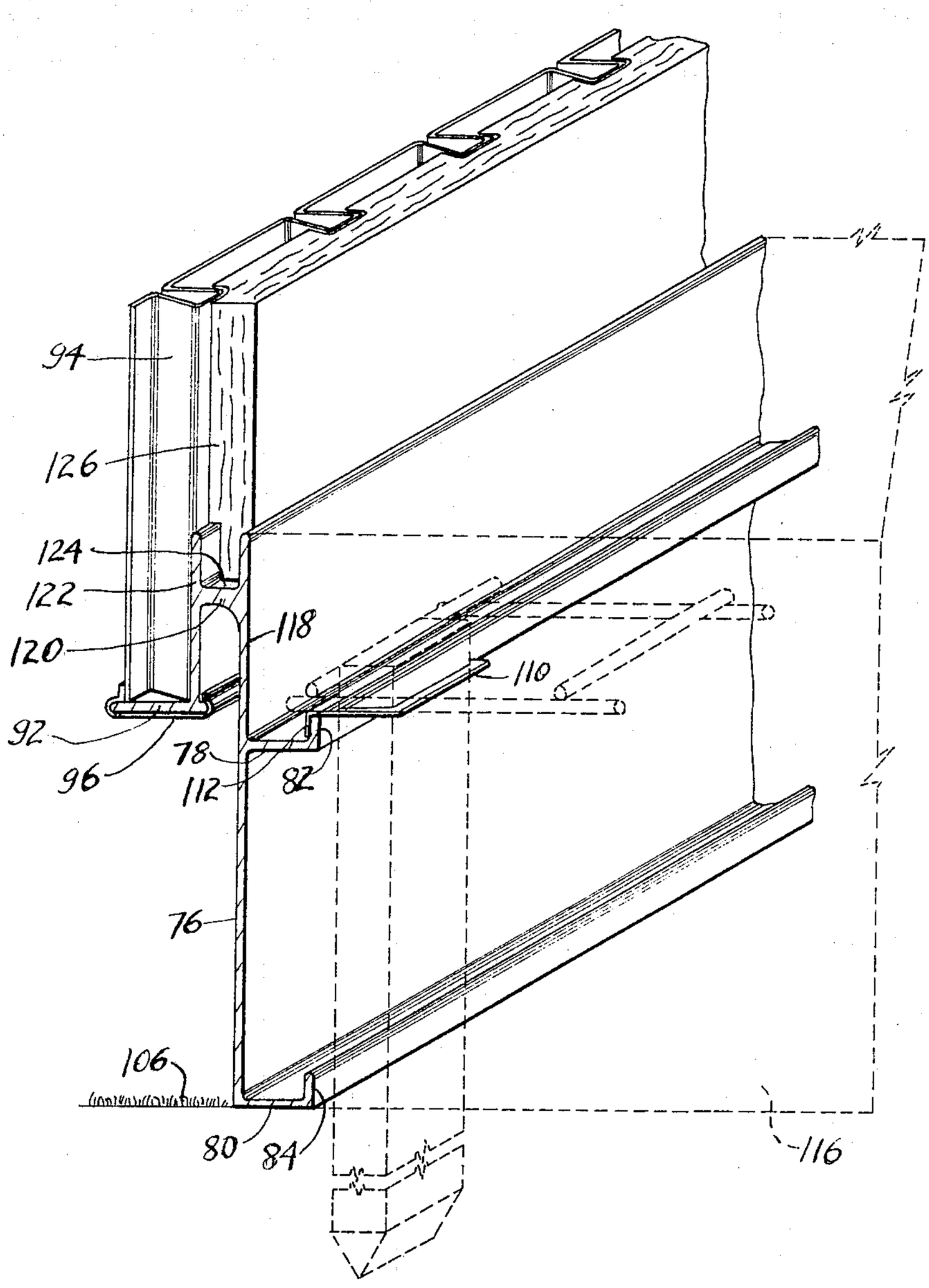

FIG. X

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SHEET PANEL ASSEMBLY AND SUPPORTING MEMBERS THEREFOR

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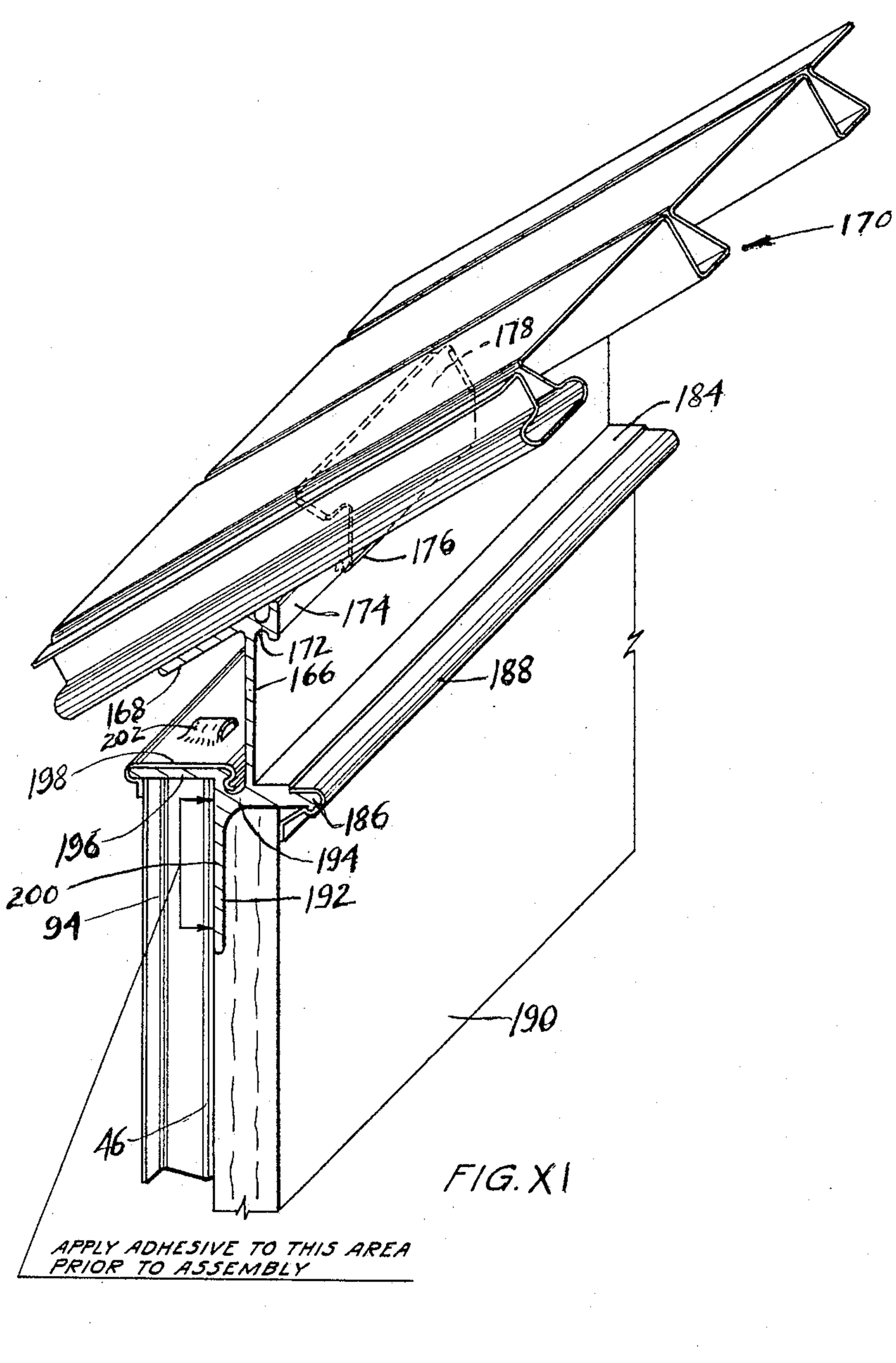

FIG. X1

INVENTOR.
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SHEET PANEL ASSEMBLY AND SUPPORTING MEMBERS THEREFOR

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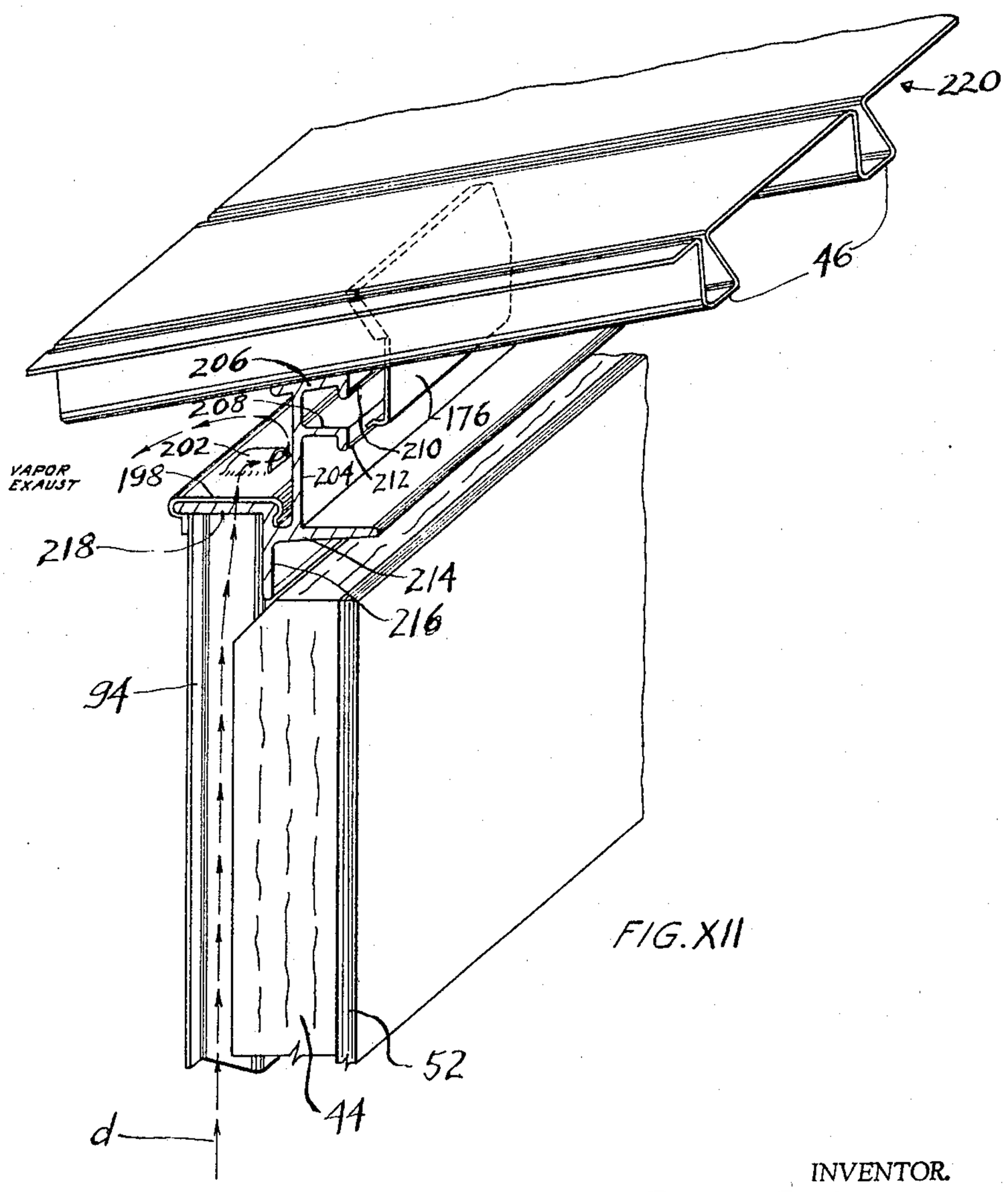

FIG. XII

INVENTOR.
RESTA S. GREGOIRE
BY Walter S. Pawl.
ATTORNEY

Sept. 27, 1966 R. S. GREGOIRE 3,274,739

SHEET PANEL ASSEMBLY AND SUPPORTING MEMBERS THEREFOR

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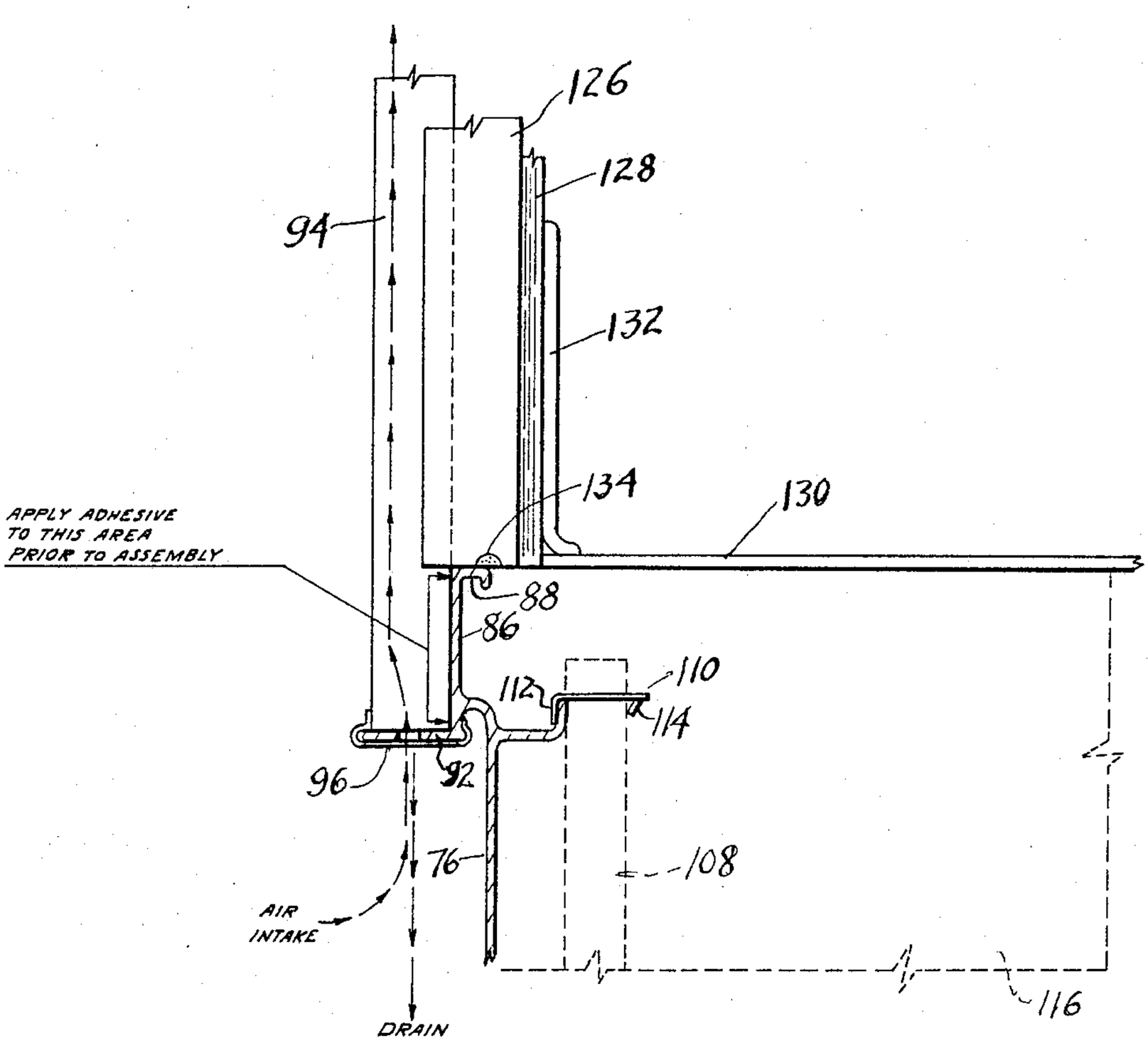

FIG. XIII

INVENTOR.
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SHEET PANEL ASSEMBLY AND SUPPORTING MEMBERS THEREFOR

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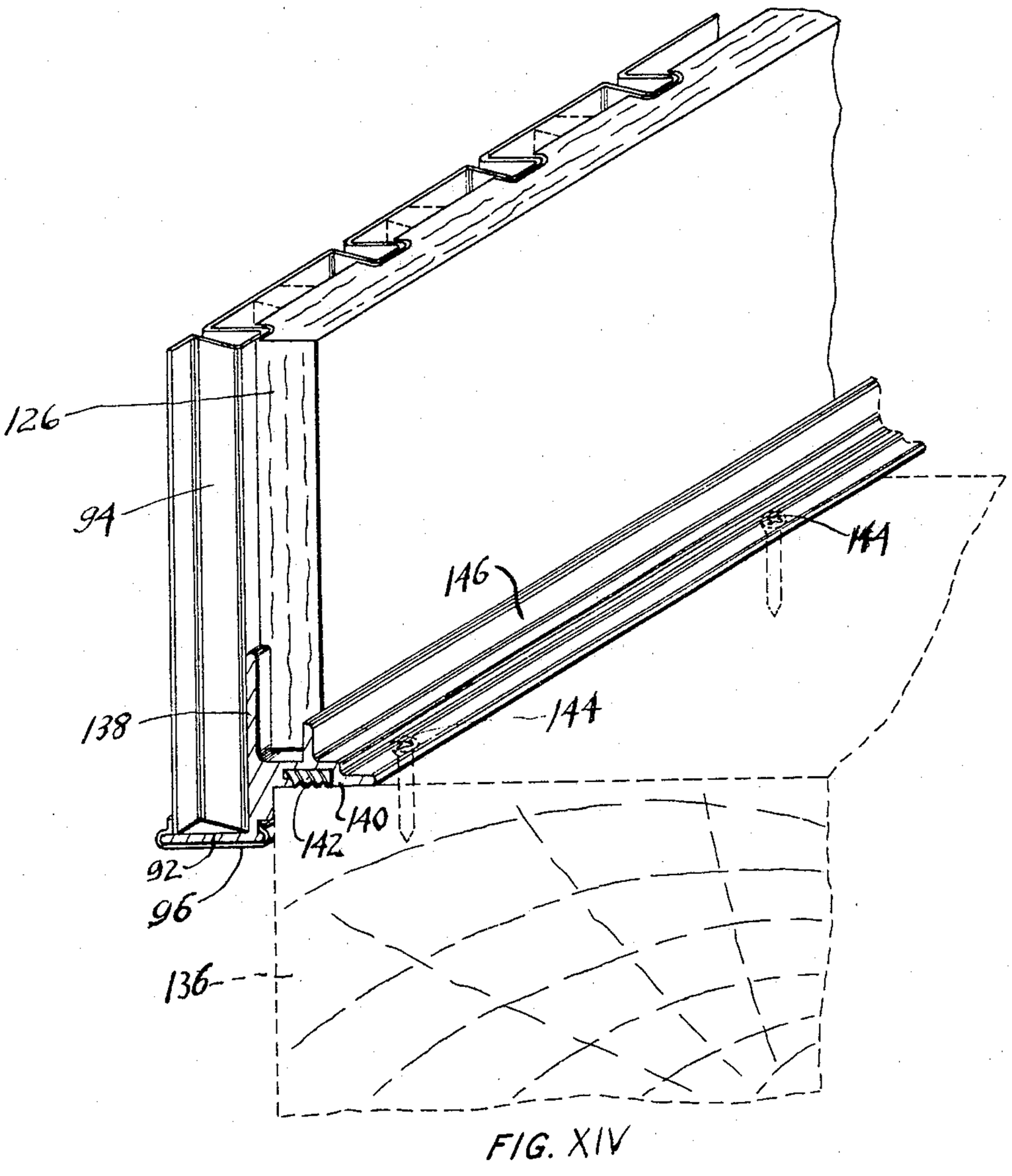

FIG. XIV

INVENTOR.
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SHEET PANEL ASSEMBLY AND SUPPORTING MEMBERS THEREFOR

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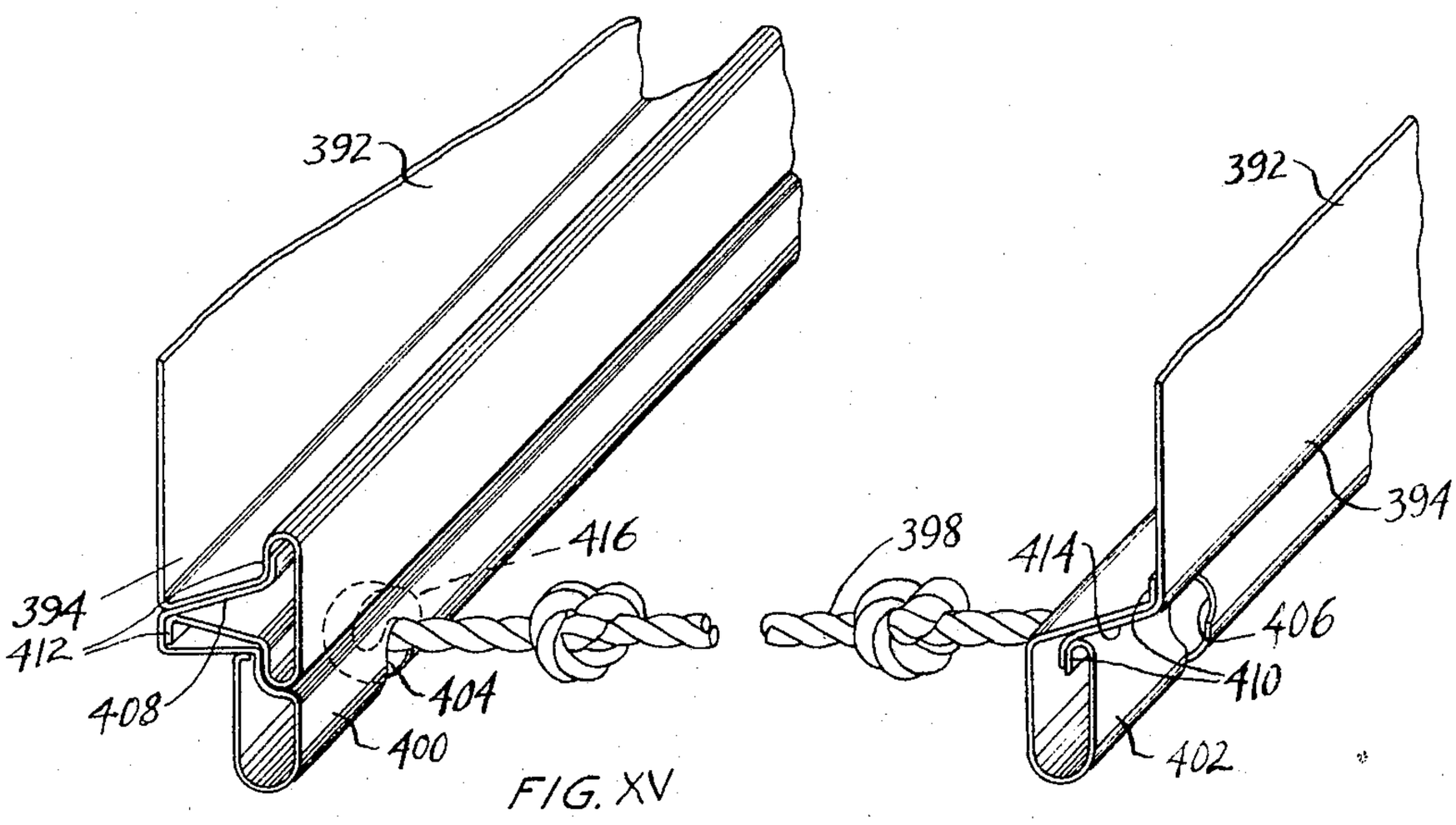

FIG. XV

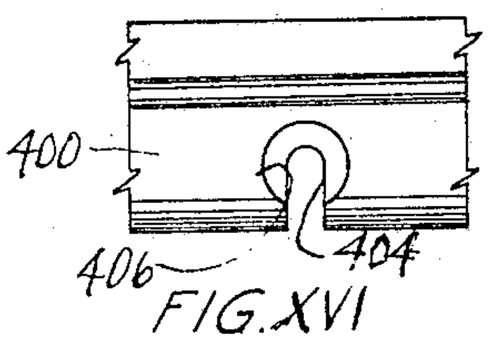

FIG. XVI

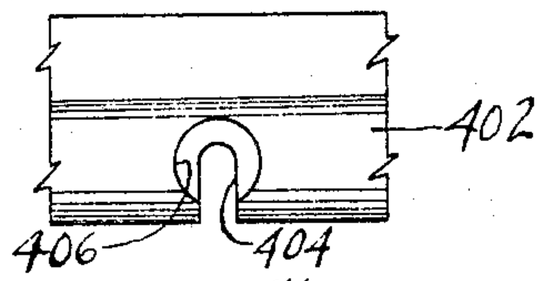

FIG. XVII

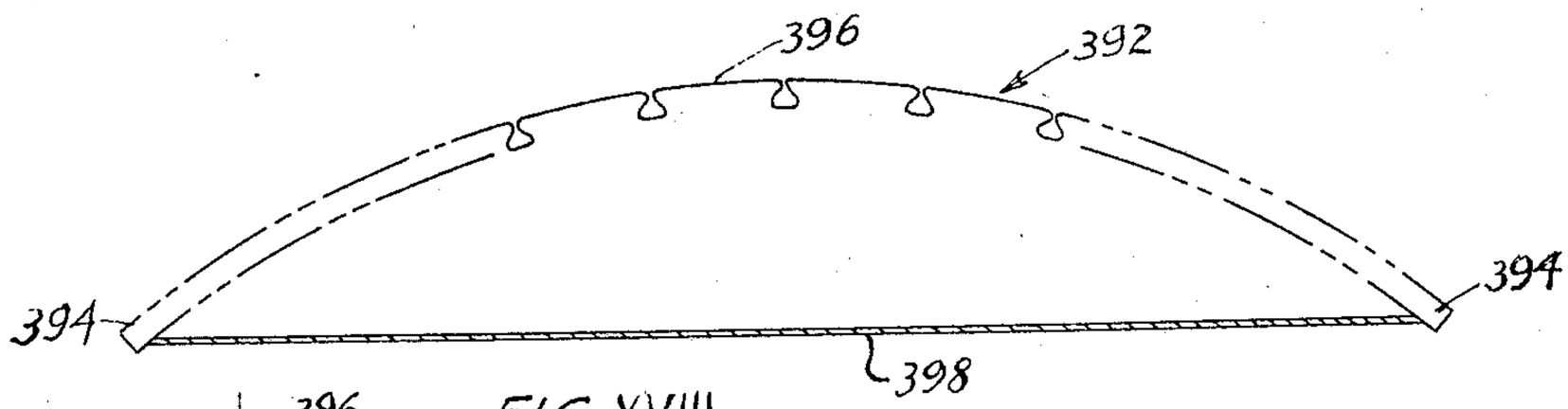

FIG. XVIII

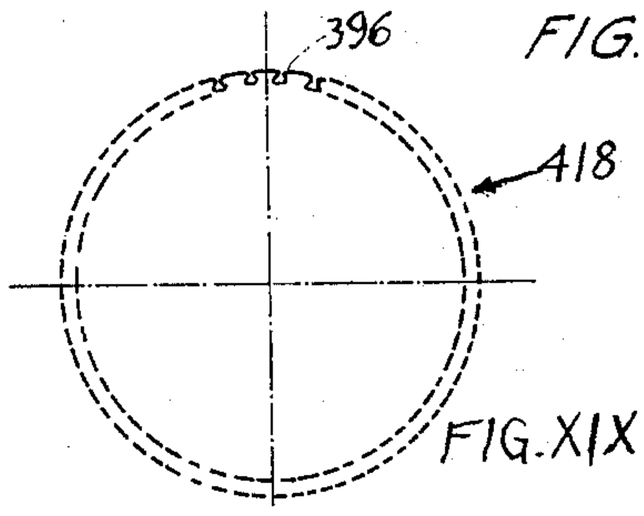

FIG. XIX

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SHEET PANEL ASSEMBLY AND SUPPORTING MEMBERS THEREFOR

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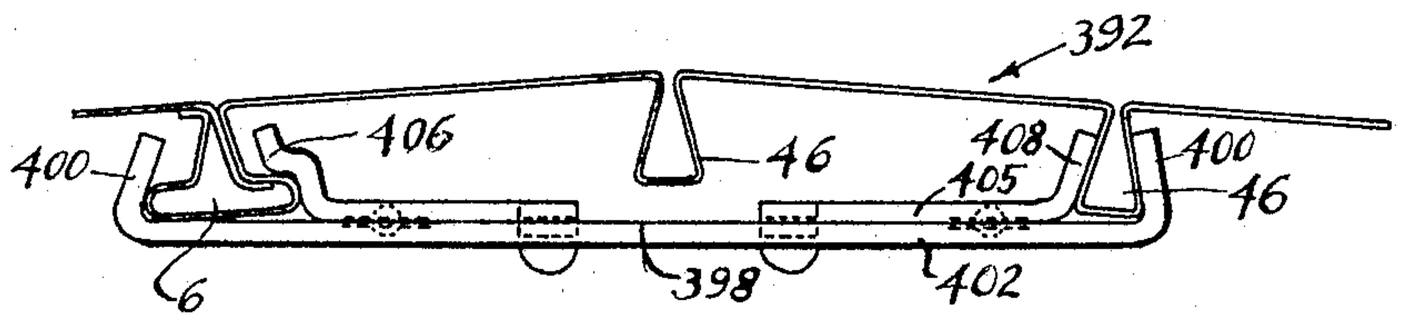

FIG. XX

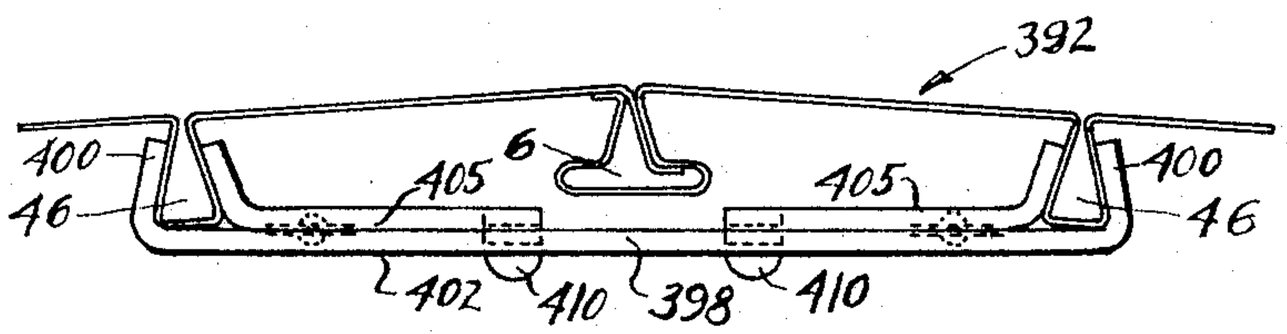

FIG. XXI

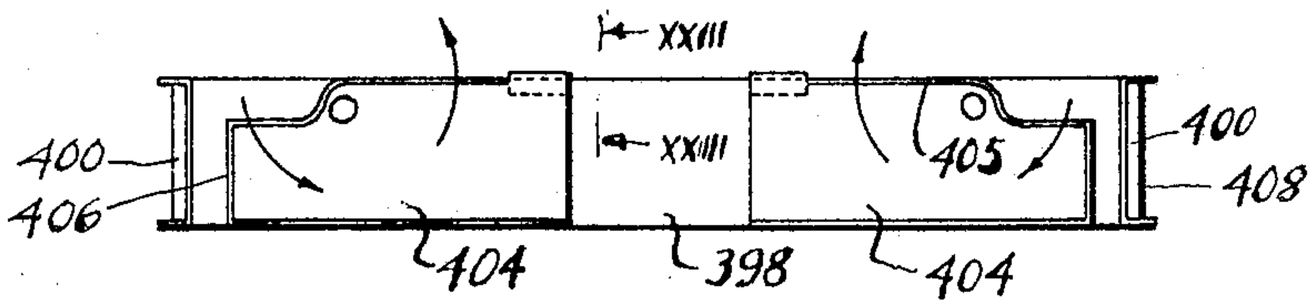

FIG. XXII

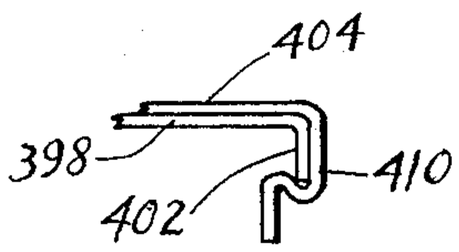

FIG. XXIII

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SHEET PANEL ASSEMBLY AND SUPPORTING MEMBERS THEREFOR

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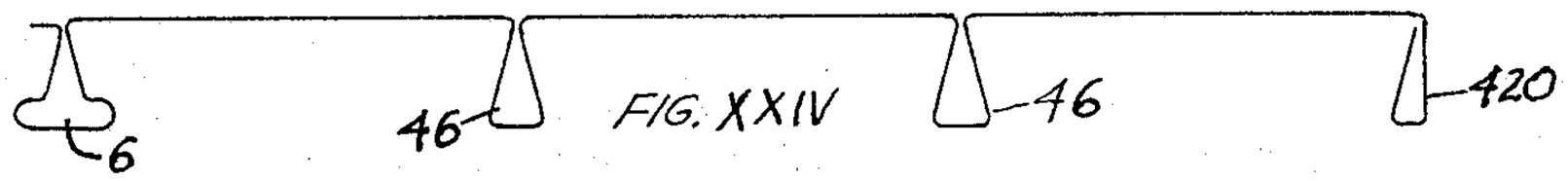


FIG. XXIV

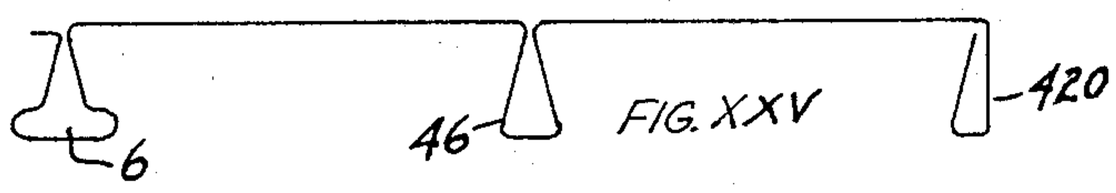


FIG. XXV

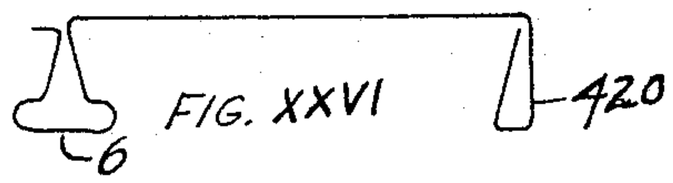


FIG. XXVI

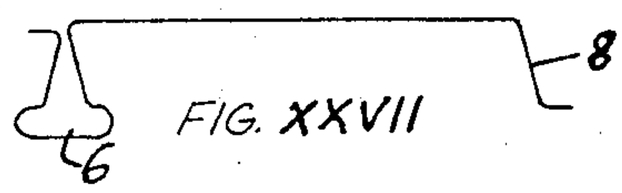


FIG. XXVII

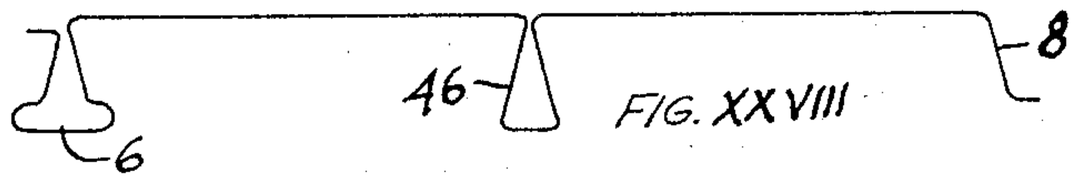


FIG. XXVIII

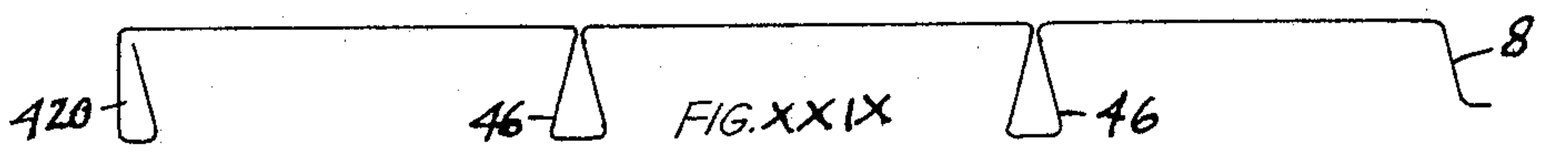


FIG. XXIX

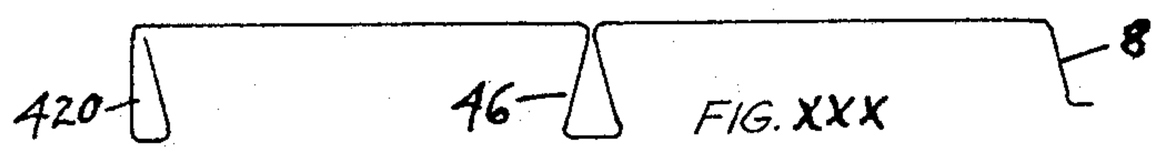


FIG. XXX

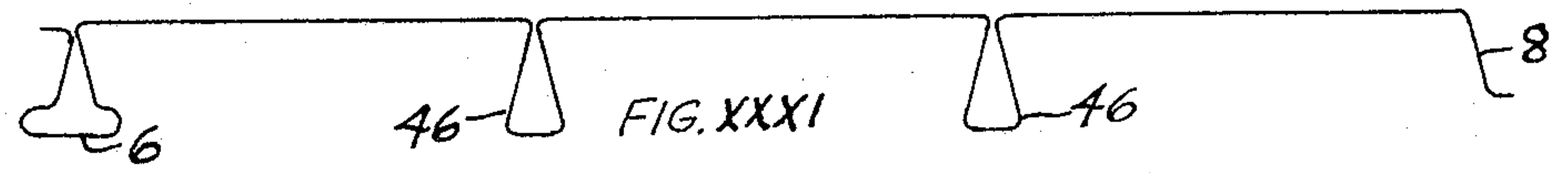


FIG. XXXI

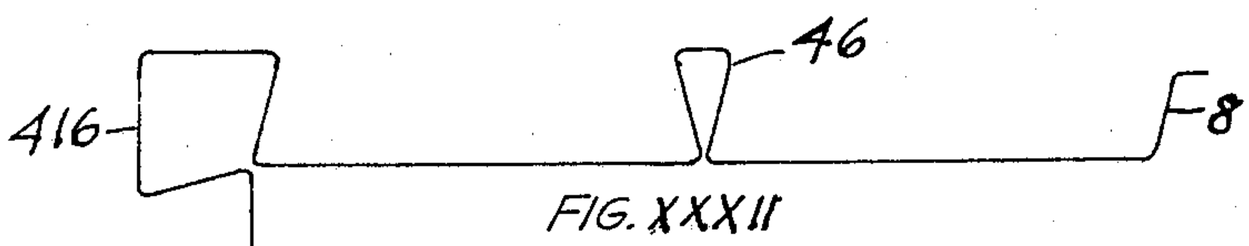
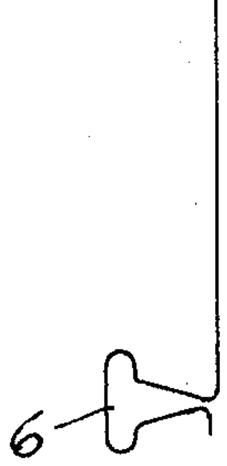


FIG. XXXII



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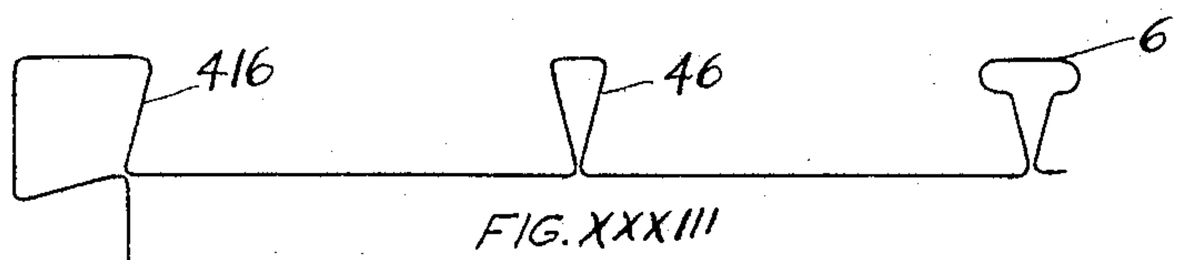

FIG. XXXIII

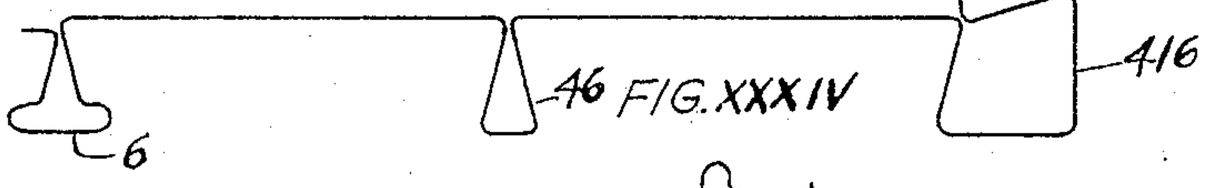

FIG. XXXIV

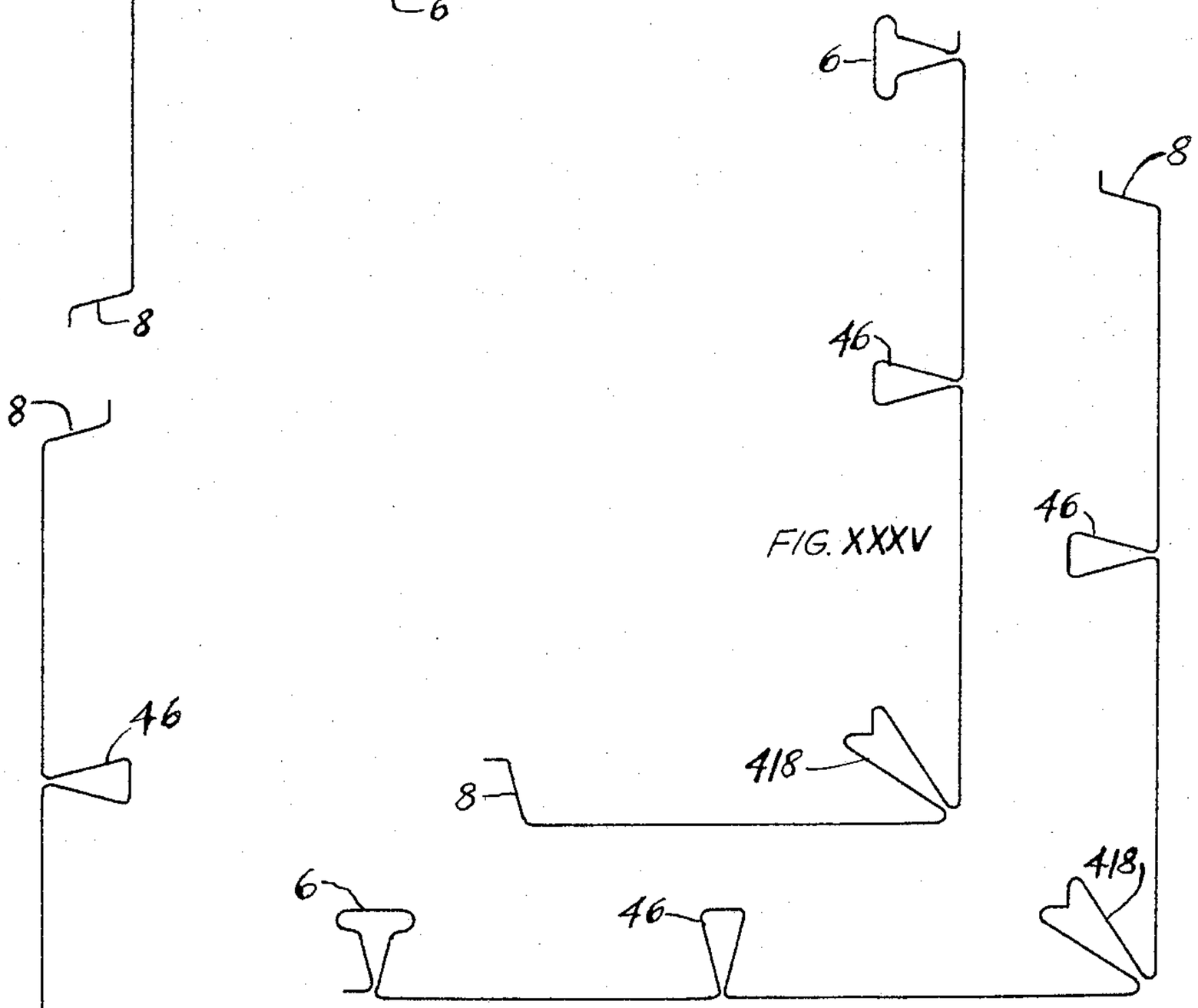

FIG. XXXV

FIG. XXXVI

FIG. XXXVII

INVENTOR.
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SHEET PANEL ASSEMBLY AND SUPPORTING MEMBERS THEREFOR

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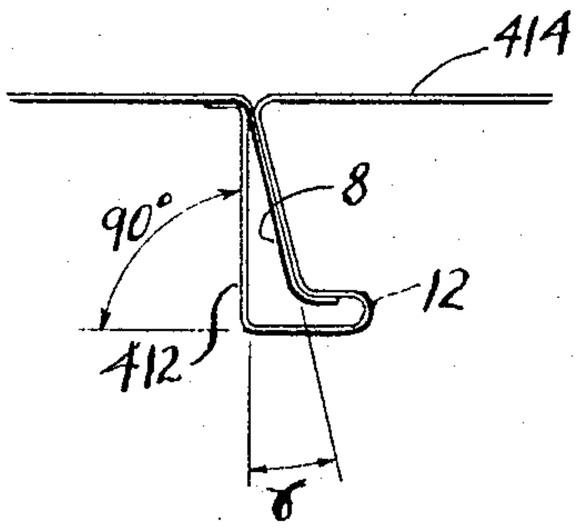

FIG. XXXX

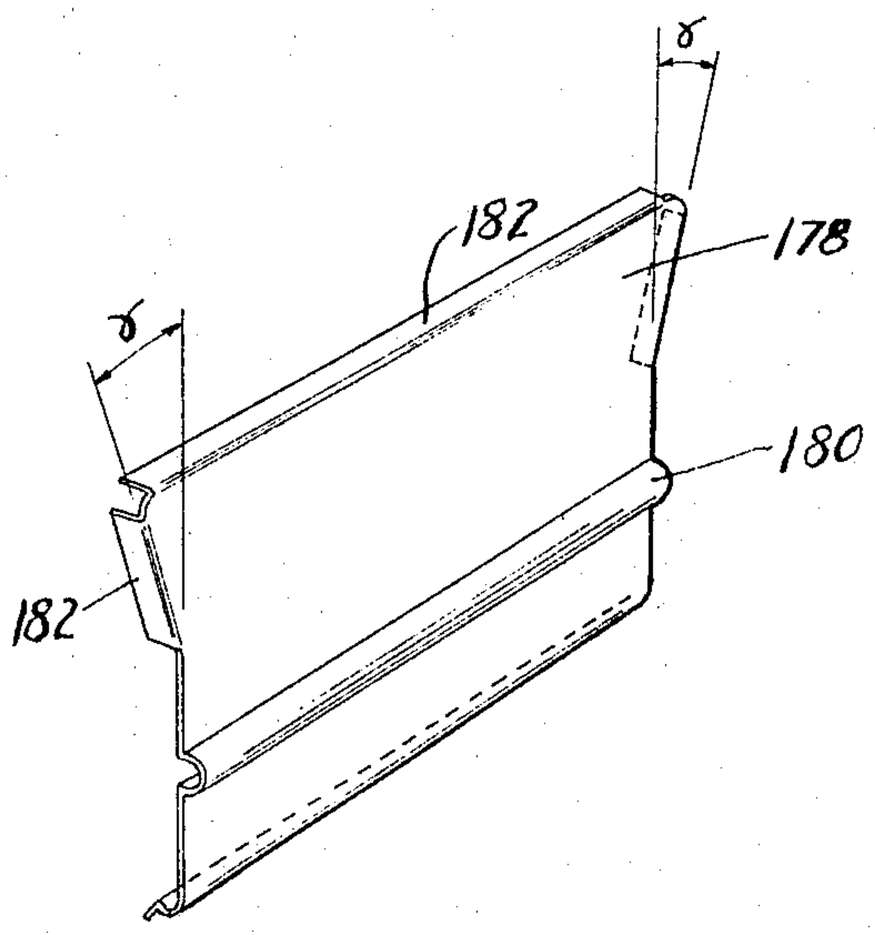

FIG. XXXVIII

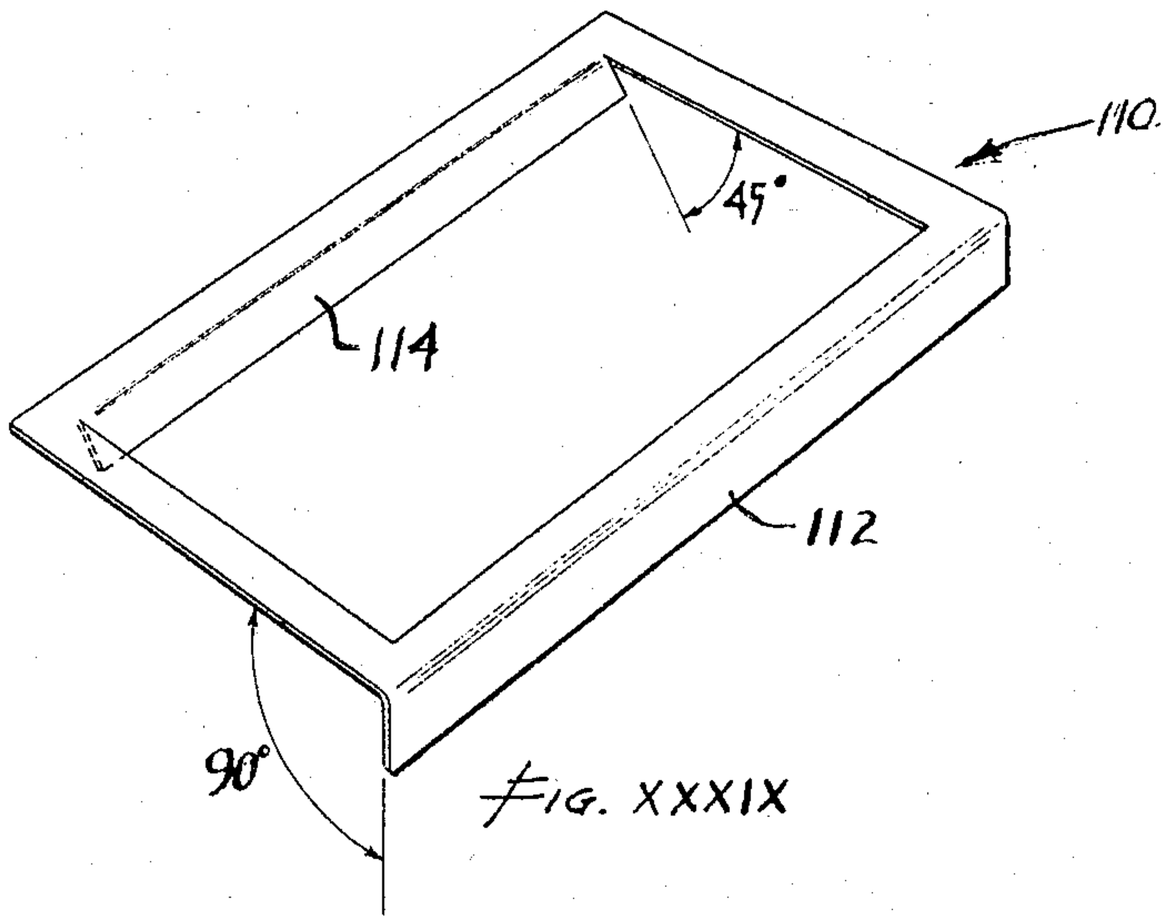

FIG. XXXIX

INVENTOR.
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SHEET PANEL ASSEMBLY AND SUPPORTING MEMBERS THEREFOR

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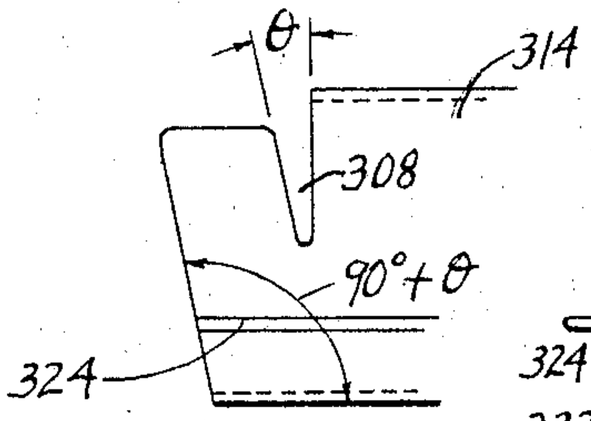

FIG. XXXXII

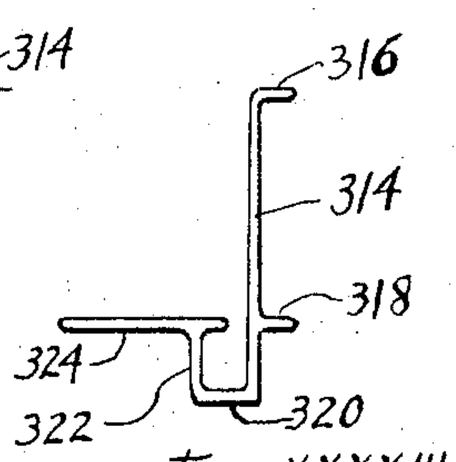

FIG. XXXXIII

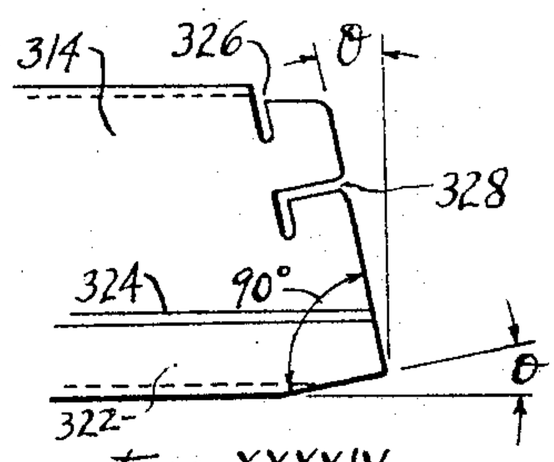

FIG. XXXXIV

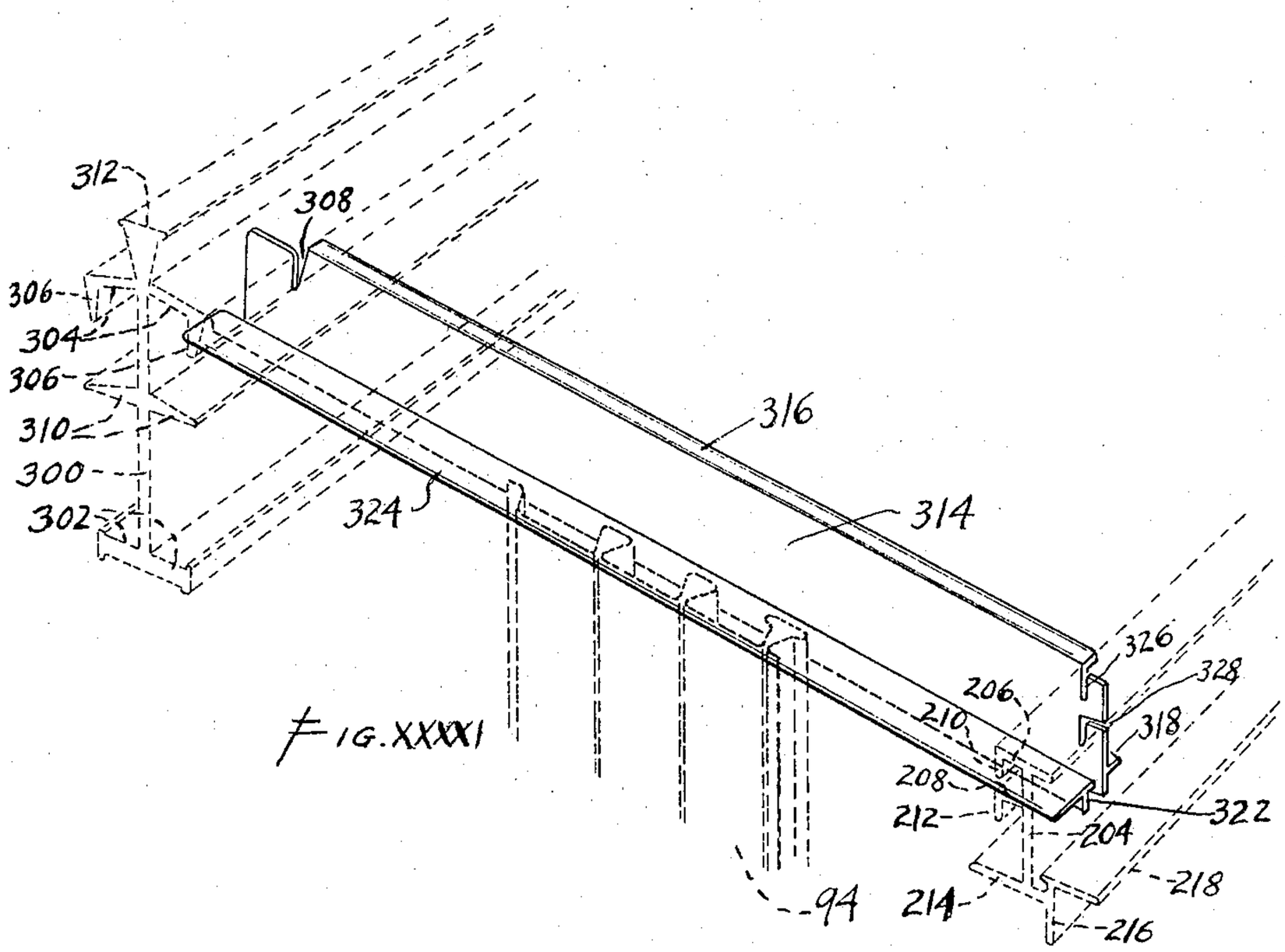

FIG. XXXXI

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SHEET PANEL ASSEMBLY AND SUPPORTING MEMBERS THEREFOR

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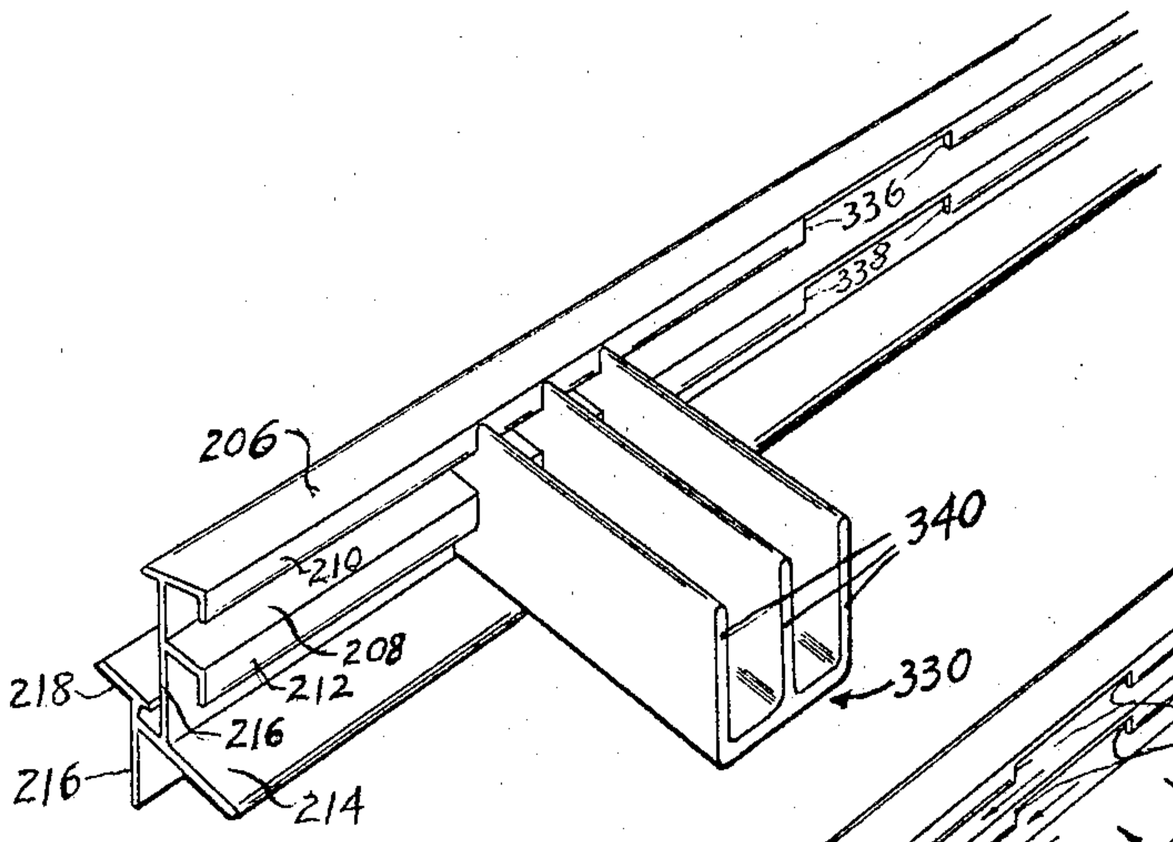

FIG. XXXXV

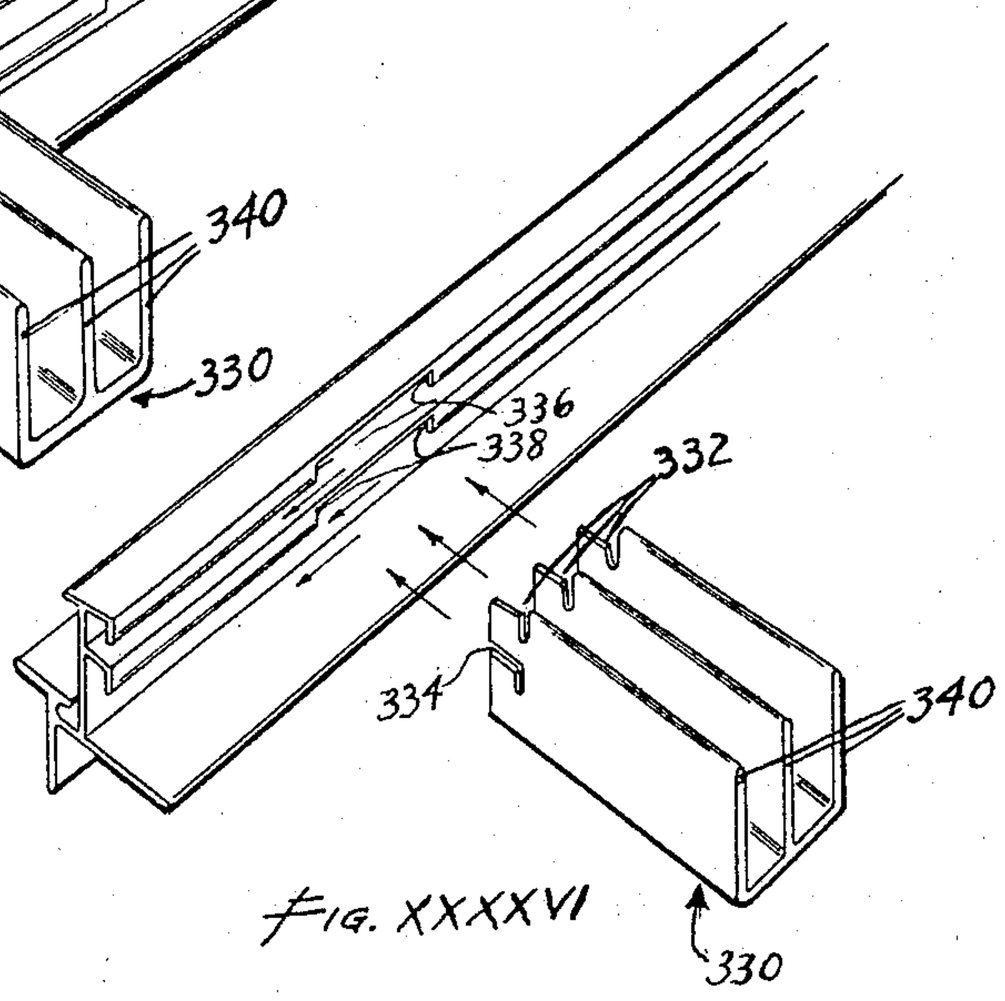

FIG. XXXXVI

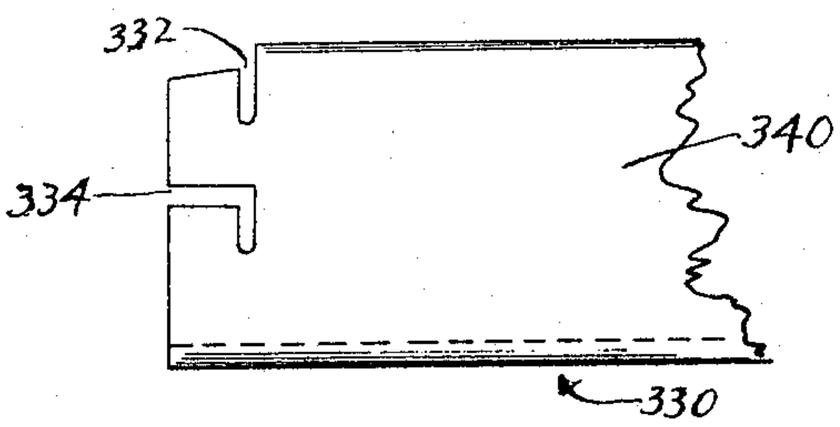

FIG. XXXXVII

INVENTOR.
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SHEET PANEL ASSEMBLY AND SUPPORTING MEMBERS THEREFOR

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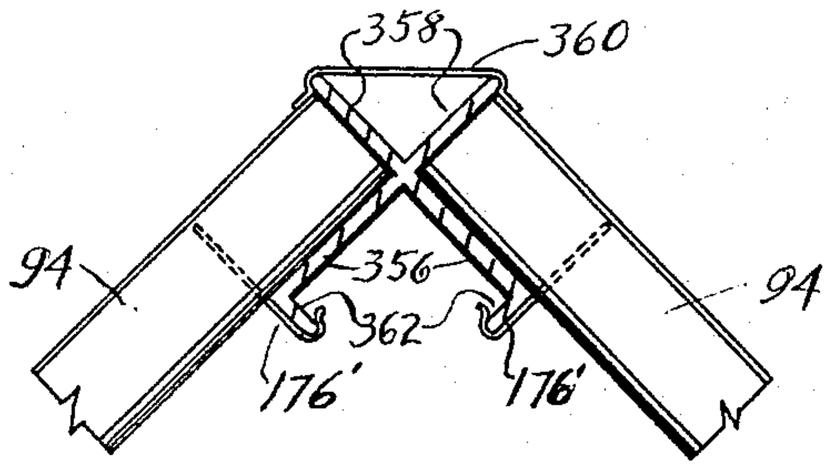

FIG. XXXXVIII

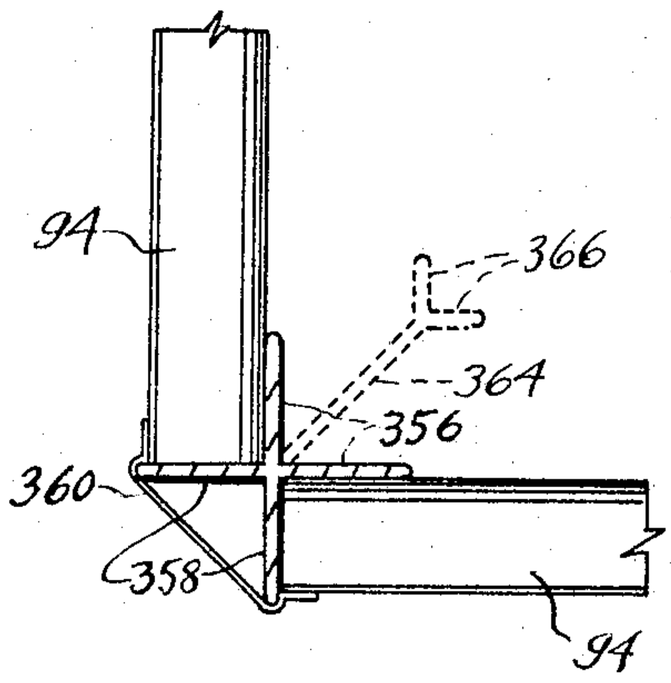

FIG. LI

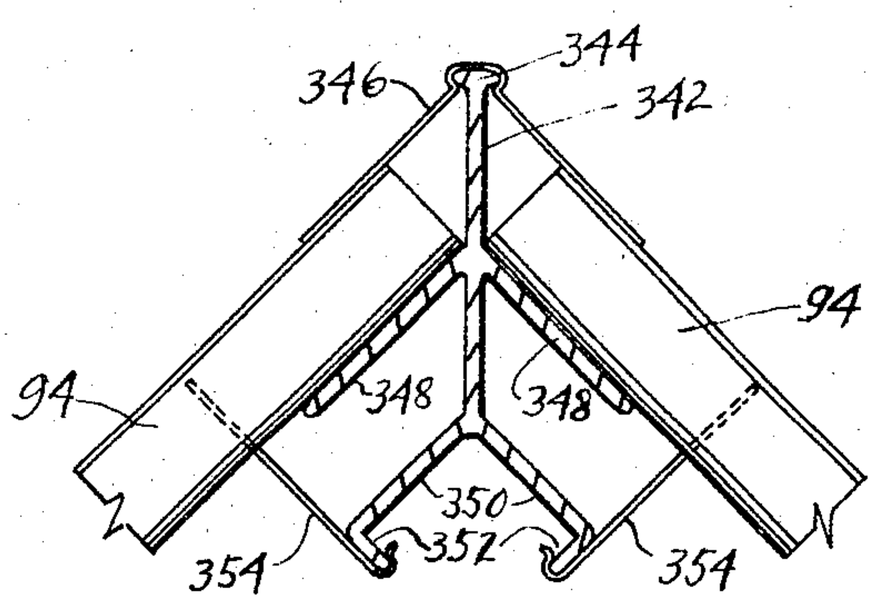

FIG. XXXXIX

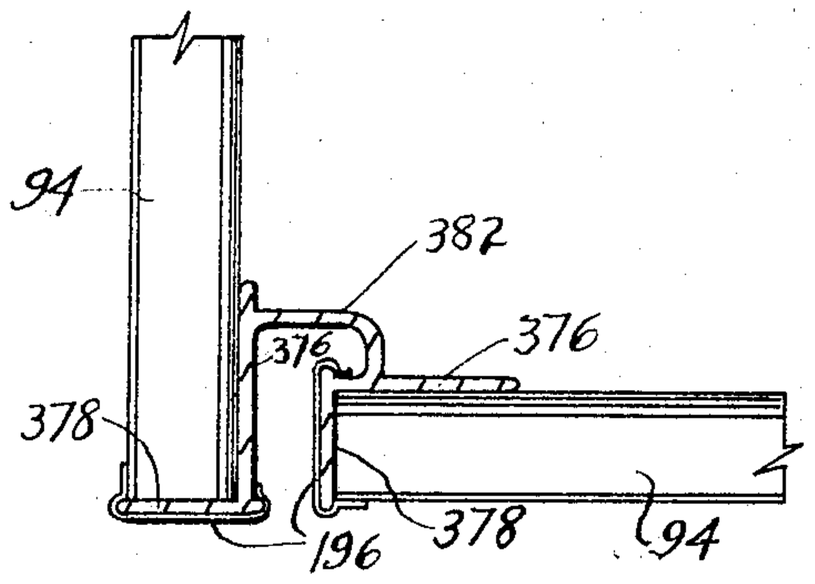

FIG. LII

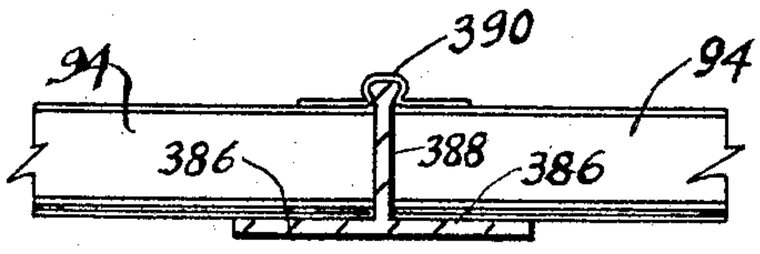

FIG. L

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ATTORNEY.

SHEET PANEL ASSEMBLY AND SUPPORTING MEMBERS THEREFOR

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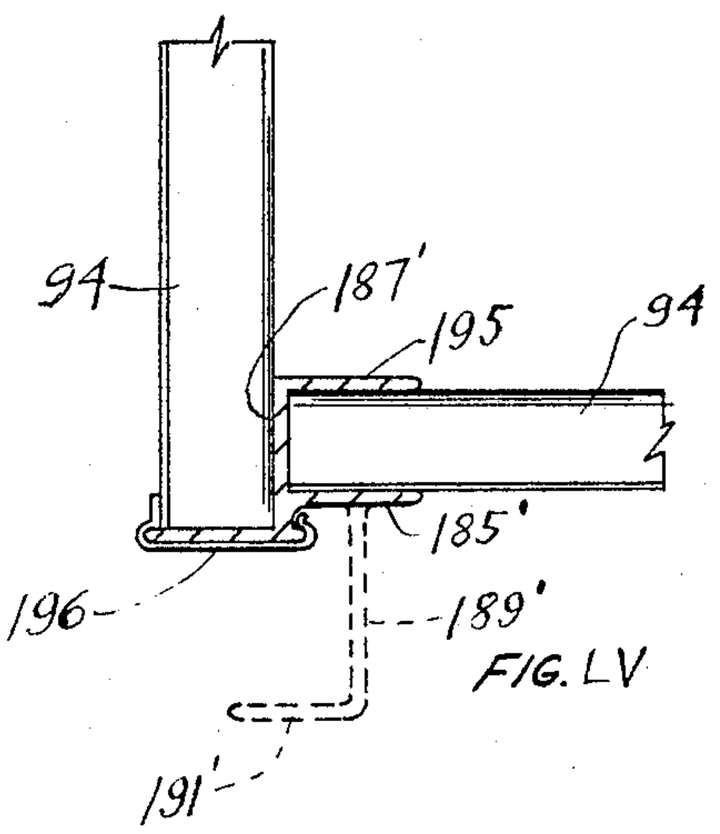

FIG. LV

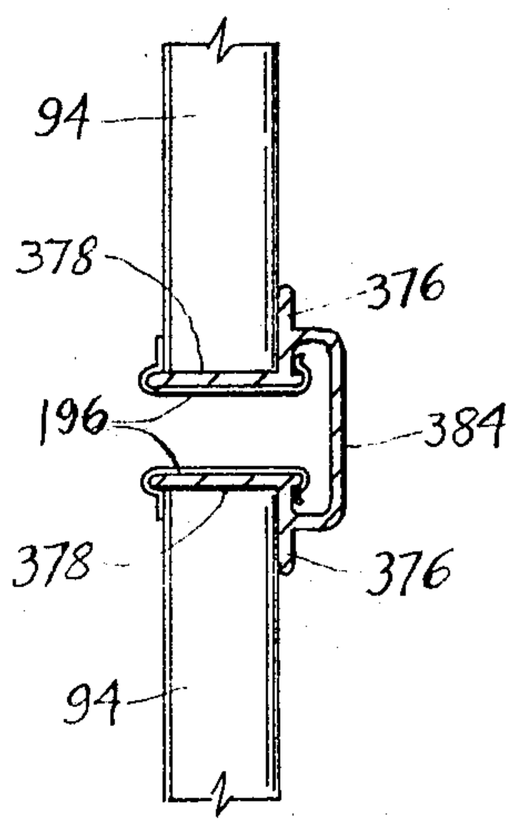

FIG. LIV

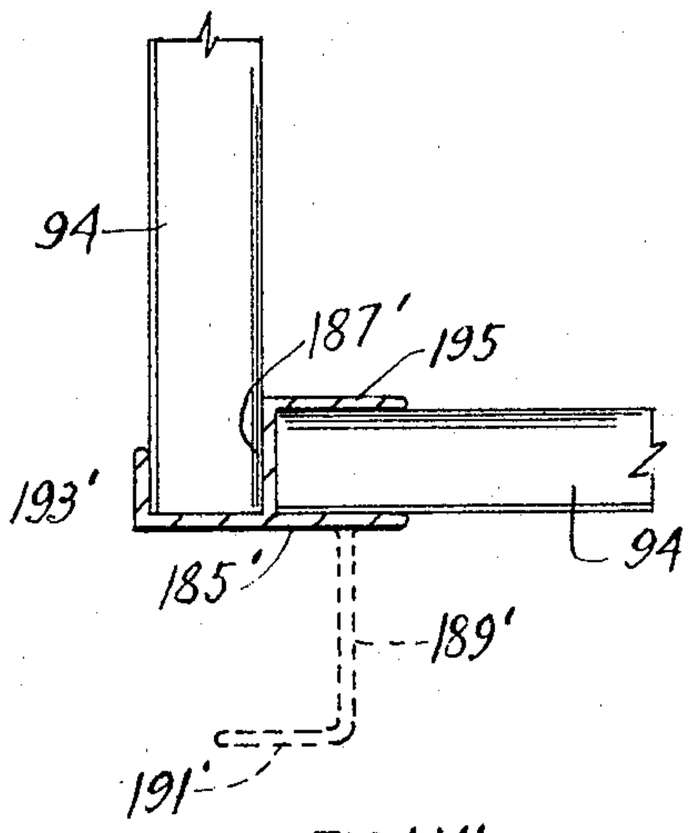

FIG. LVI

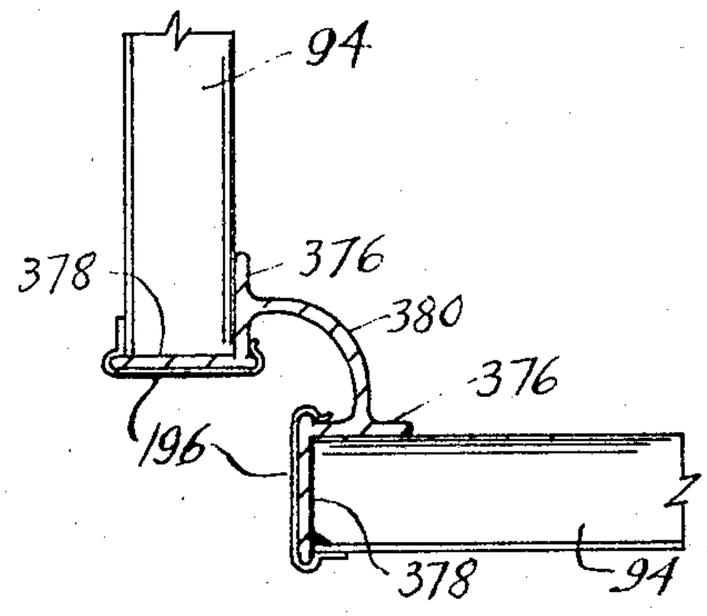

FIG. LIII

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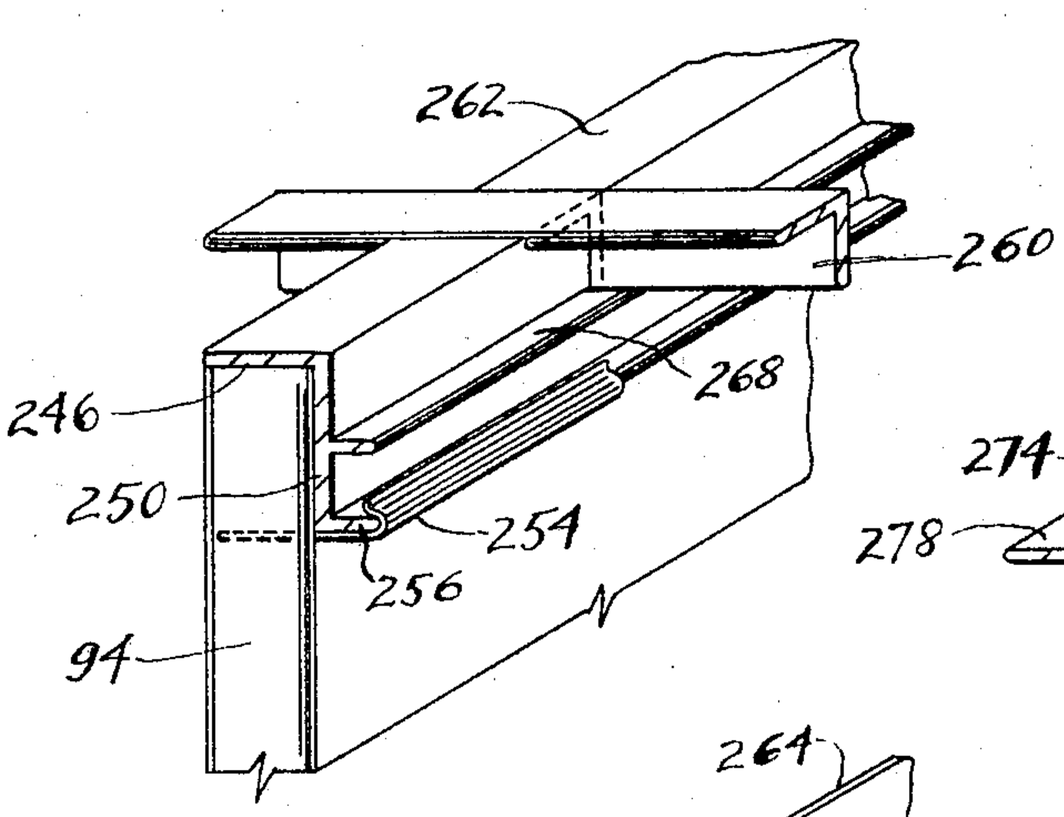

FIG. LVII

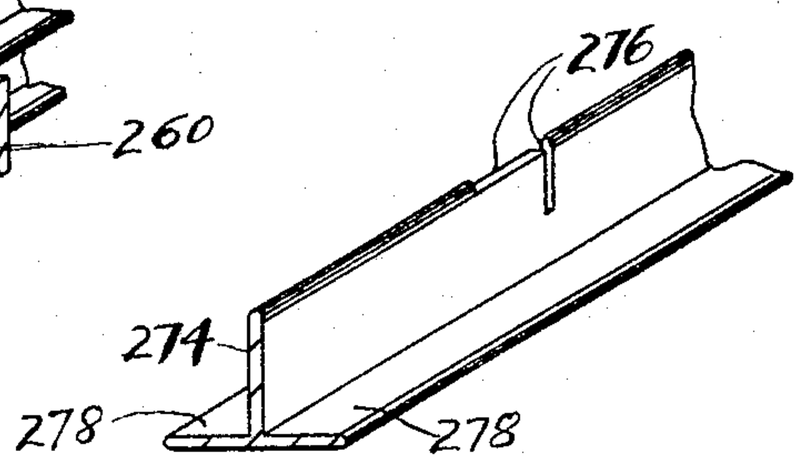

FIG. LVIII

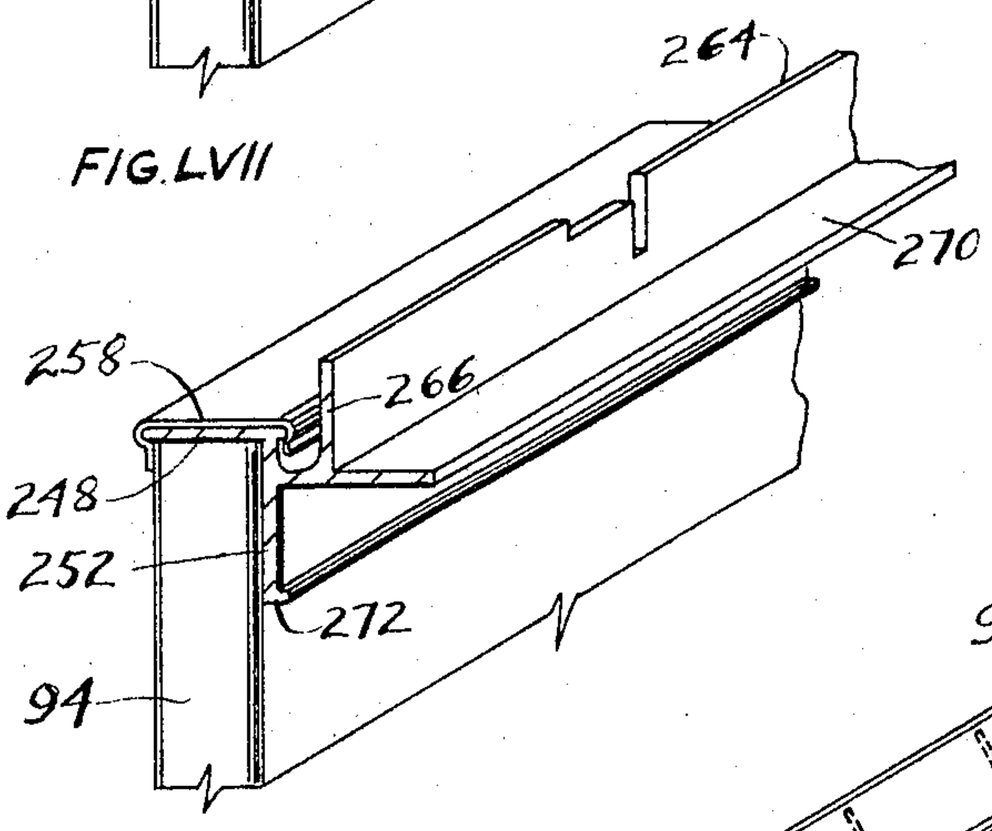

FIG. LIX

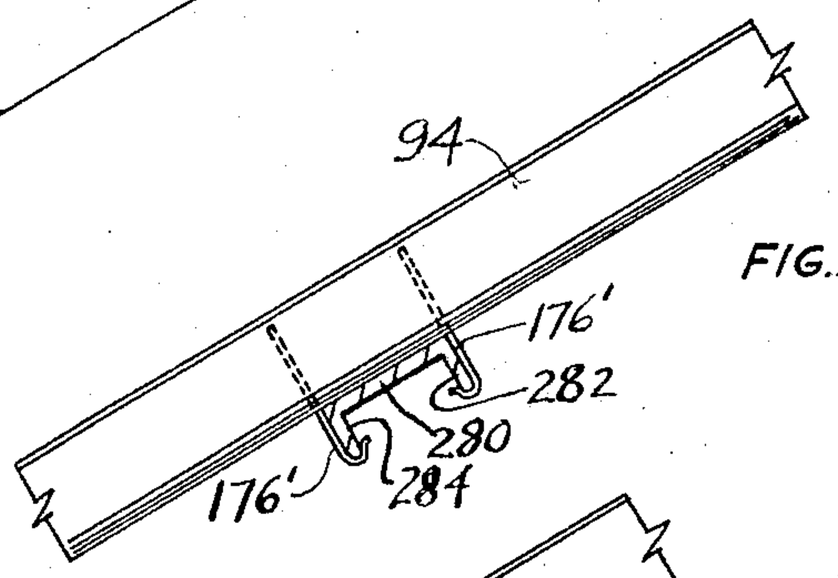

FIG. LX

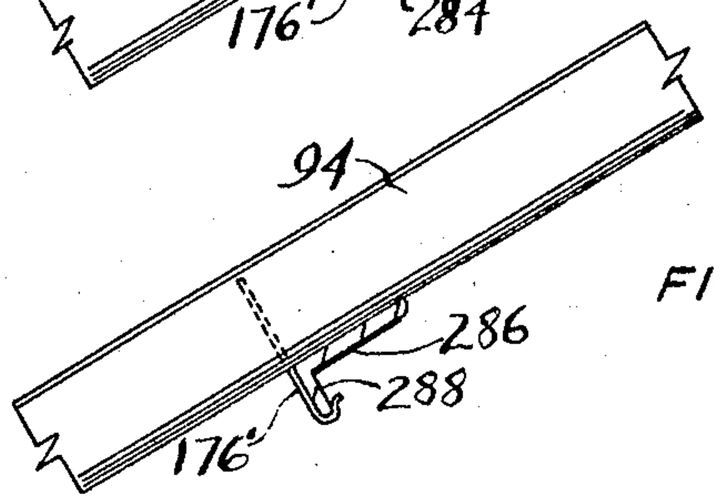

FIG. LXI

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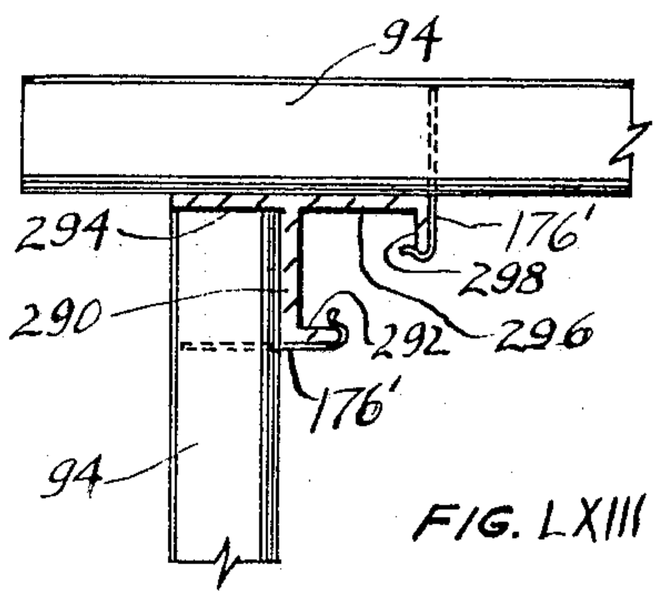

FIG. LXIII

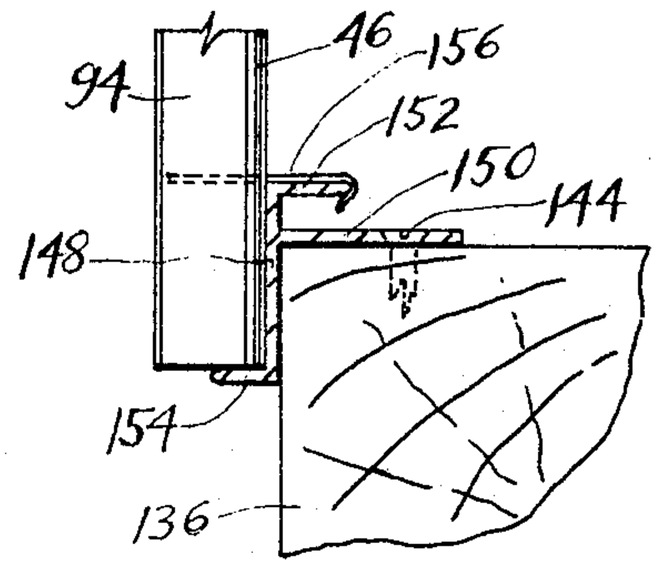

FIG. LXV

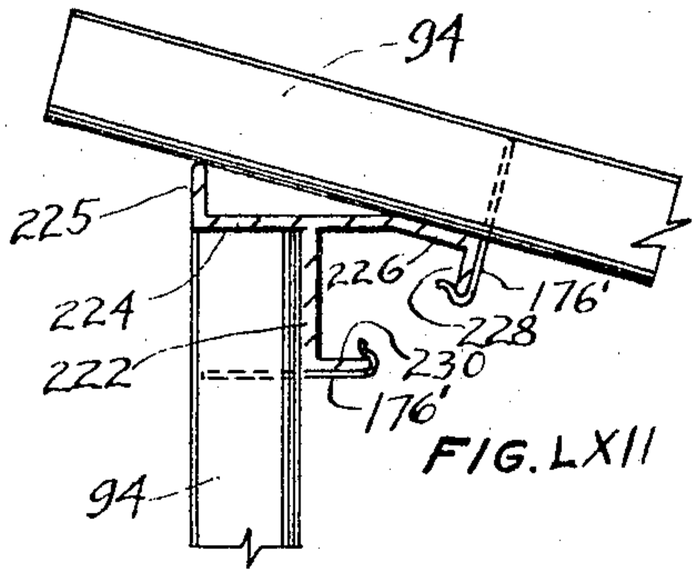

FIG. LXII

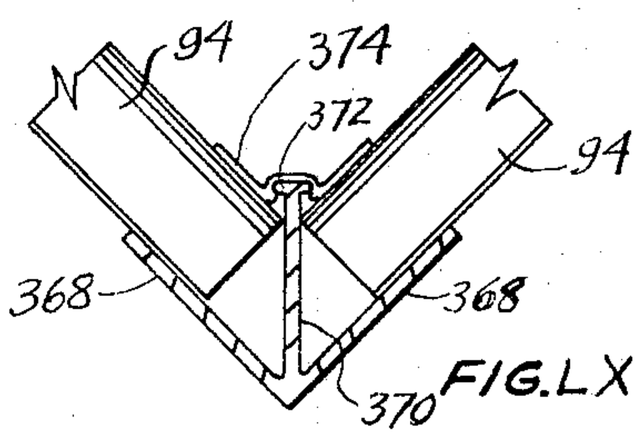

FIG. LXIV

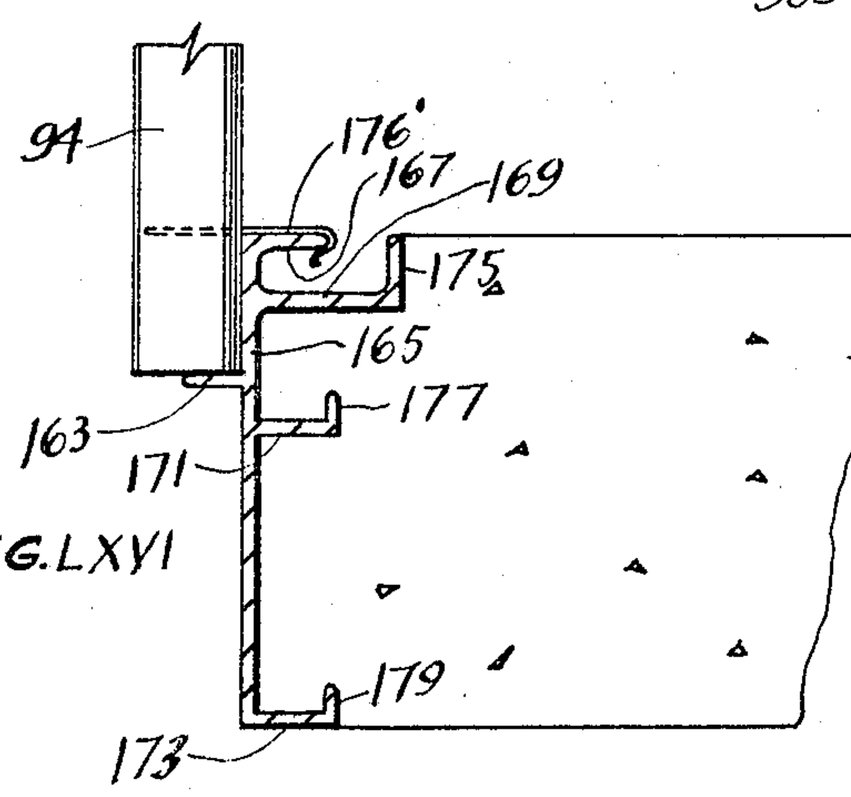

FIG. LXVI

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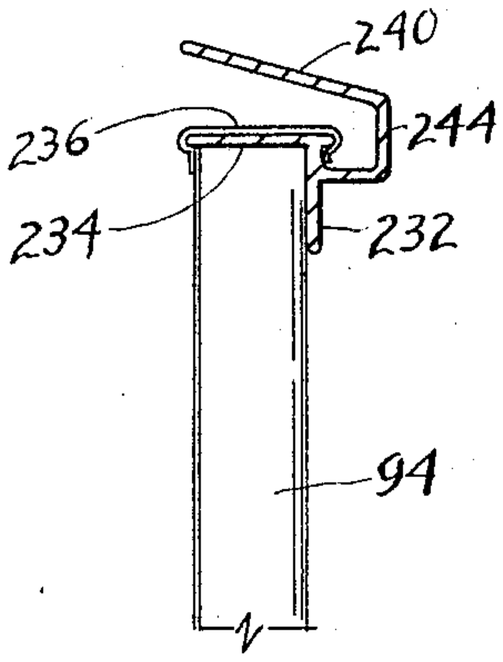

FIG. LXXI

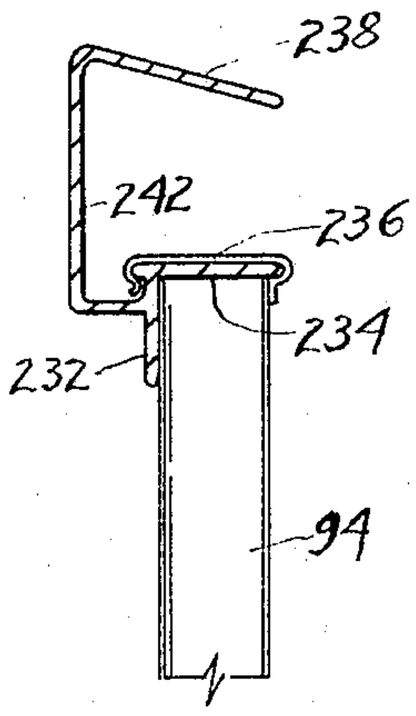

FIG. LXX

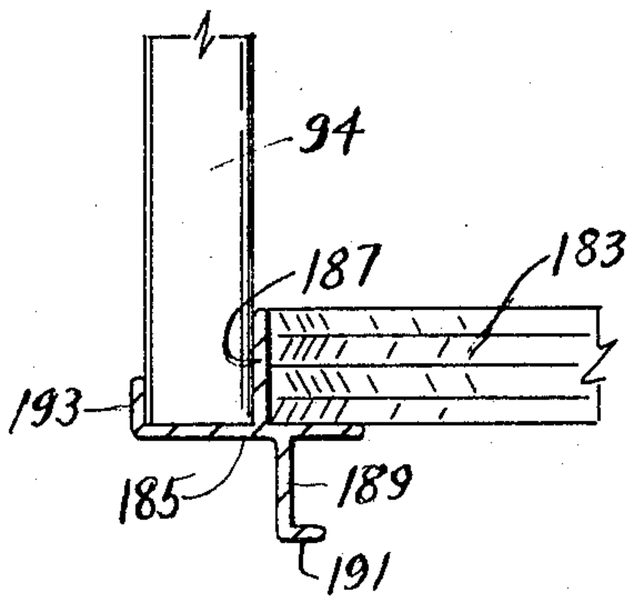

FIG. LXVII

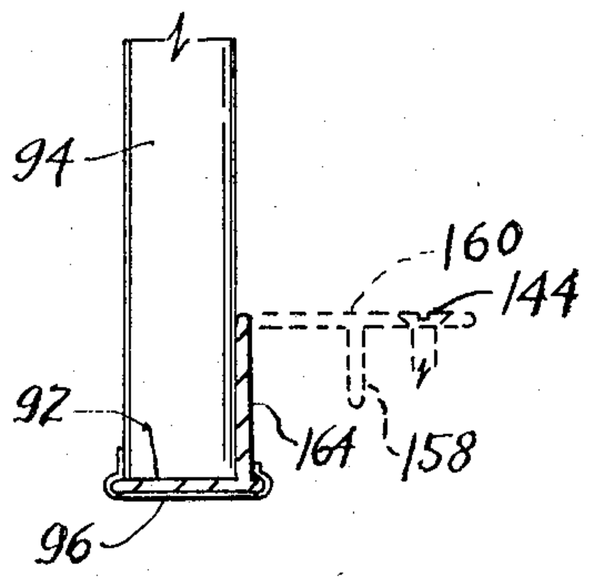

FIG. LXIX

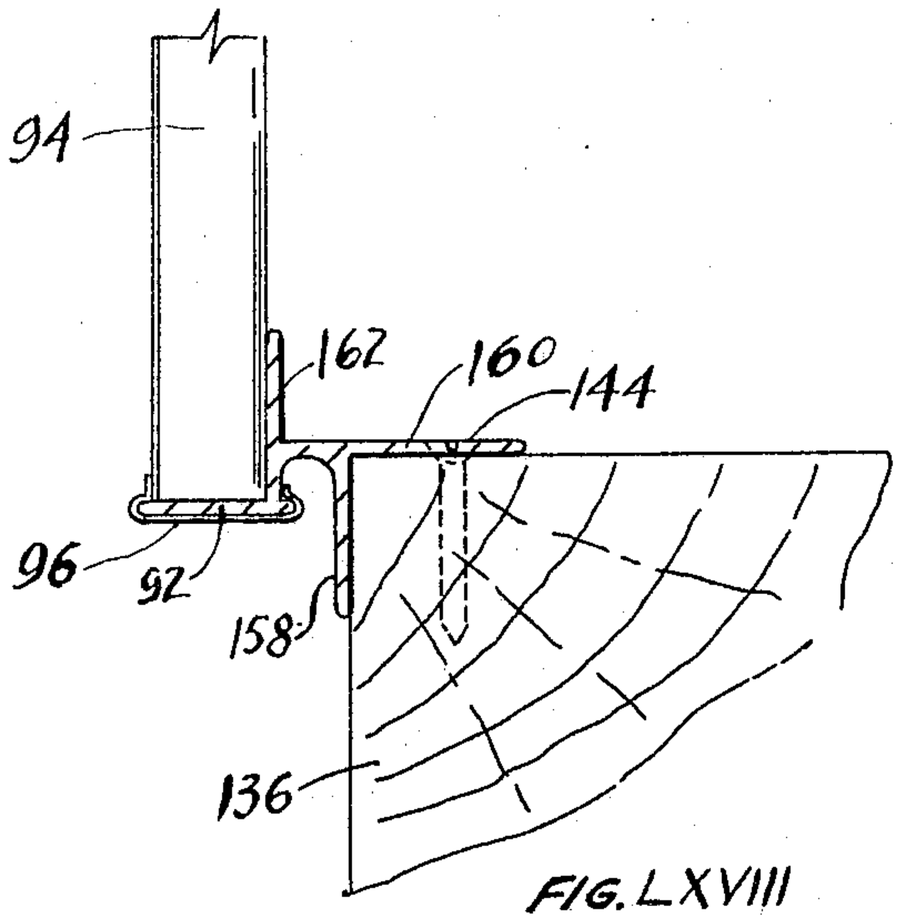

FIG. LXVIII

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SHEET PANEL ASSEMBLY AND SUPPORTING MEMBERS THEREFOR

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Filed June 7, 1962, Ser. No. 200,682

8 Claims. (Cl. 52—169)

This application is a continuation-in-part of prior application Serial No. 194,339 filed May 14, 1962.

This invention relates to a novel housing, container and deck construction, and more particularly to the wall, partition and roof panelling thereof and method of assembly.

A principal object of this invention is to simplify and standardize panelling construction for assembly of wall and roof panels on the site, the panelling being adaptable for continuous rectangular as well as arcuate, cylindrical, and other angular constructions all the way around the housing, requiring a minimum of frame work support.

A further object is to make panelling of suitably stiff sheet material bent to provide a parallel corrugated pattern of alternate ridges and panel recesses on one side of the wall and a substantially continuously flat surface on the other side of the wall where the recess panels are brought close together to substantially close the hollows of the ridge portions on the said one side of the wall so as to give the wall great rigidity in the direction of the ridges and recesses and limited flexibility in the direction normal thereto, sufficient clearance being provided between the adjacent recess panels to allow for expansion of the panels without buckling of the panel portions at high temperatures.

A further object is to provide interlocking edge to edge joints for strips of the above panelling between a ridge edge of one strip, comprising one or more recess panels, and an interfitting edge at the outer end of a recess panel of the other strip, comprising the same or any other number of recess panels, said joints requiring no bolts or other accessory parts or tools to assemble the strips in the construction of the wall or roof on the site by inexperienced hands, and the joints providing interlocking and sealing means without any penetration of either of the interlocking edges.

A further object is to devise a simple method of forming arched walls or roofs after assembly of the required expanse of the panelling, by arching the assembly to the desired total curvature by pulling the opposite edges of the assembly toward each other to the desired distance to be spanned by the arch, and by providing cross braces between alternate ridge portions on the inside of the arch, if more rigidity is required in holding any definite curvature, the contacting surfaces of the joints between the adjacent ridge portions on either side, which are connected by a cross brace, being always under compression, thus remaining tight under wind load or snow load and during temperature changes.

A further object is to construct a cylindrical wall in accordance with the above method.

A further object is to provide end guide clips in the panelled wall assembly to finish off and give cross wise rigidity to the assembly.

A further object is to provide a suitable roof ridge support and eave supports for panel assemblies forming a gable or pitched roof.

A further object is to assemble the vertical walls of an enclosure by starting with one of a number of panel strips of the above type having interfitting edges, and joining the successive strips to each other in one direction all the way around the enclosure and into the opposite edge of one panel strip.

A further object is to provide base and eave supports which include end guides for the ends of the vertically erected panels of a wall conforming to the shape and size of the above structure for receiving the ends of said panel strips and thus rigidizing the wall in its lengthwise direction.

A further object is to modify the form of the panelling by making one edge of the recess panels project from the flat side of the wall to overlap the edge of the adjacent recess panel, for use of the panelling to simulate lap siding for the outside of a building wall, the wall being assembled in this case in a vertical direction, the panel running horizontally.

A further object is to provide within the configuration of the panel, cleats for attaching an interior wall, without adhesives or other fastening devices, preferably of insulating material, supporting said material between the ridge portions of the panel strips, and spaced from the recessed panel portions to provide uninterrupted hollow spaces lengthwise of the panel strips between adjacent ridge portions, in addition to the continuous hollow spaces formed inside each ridge portion.

A further object is to provide a joint of the above mentioned type which has the overlapping edges of the panel strips formed so as to interlock with a leverage between line contacts at the fulcrum line of each overlapping edge of the respective strips against which the overlapping lever edge of the other strip is pressed to bring the two strips into alignment after interlocking said overlapping edges, so as to provide a double line seal between said overlapping edges regardless of the direction in which the joints and the panelling are laid, which will maintain a weather tight fit in vertical, horizontal or inclined walls at any other angle.

A further object is to provide vent spaces between the inner wall of the recess panels and the interior wall cleats to prevent accumulation of moisture and freezing of vapors on said inner wall of said panels, and to reduce the transfer of heat in summer, from said inner wall to said interior wall.

A further object is to coat the contact line surfaces on the interlocking edges of at least one of the panel strips to be joined, so as to form a good water tight joint.

A further object is to devise a simple floating extrusion having an inwardly extending guide ledge for supporting the bottom end of vertically rigid wall panels and providing horizontal rigidity thereto by clipping said bottom end on said ledge against said ledge.

A further object is to provide simple anchoring means for these footing extrusions and means for locking said anchoring means to said extrusions, and then to pour a concrete slab outwardly of said extrusion to the top thereof completely covering said anchoring means.

A further object is to provide vents through the footing extrusion ledge for ventilation through air spaces in said wall panels and for drainage.

A further object is to devise a simple eave supporting extrusion having an outwardly extending guide ledge for the top end of vertically rigid wall panels to provide horizontal rigidity to said wall panels by clipping said top end to said guide ledge.

A further object is to provide simple locking means for the eaves to this supporting extrusion which will at the same time seal off the recess spaces between the panel ridges inside the roof panels, over the top of said eave supporting extrusion.

A further object is to provide vents in the ledge at the top of the wall panels for ventilation of said wall panel recess spaces to the outside atmosphere under the eaves.

A further object is to make the above wall panels with two ridges spaced between the edges of the panel.

A further object is to make the above panels with a right angle bend at one of the ridges which has a quadrangle cross section outwardly of said bend.

A further object is to make a gable support extrusion having clip means for fastening the upper edges of the gable roof slabs to it and for capping across over the slabs to form a seal thereover.

A further object is to form a joint extrusion for joining the ends of two panel slabs at right angles to each other.

A further object is to form a joint extrusion for joining the ends of two panel slabs in abutting relation to each other.

A further object is to form a joint extrusion for joining slightly spaced ends of two panel slabs at right angles to each other.

A further object is to form a joint extrusion for joining slightly spaced ends of two panel slabs in alignment with respect to each other.

A further object is to form a simple eave support extrusion having clip means for anchoring a roof slab thereto.

A further object is to form an eave support extrusion having clip means for anchoring it to the top end of a wall slab and provided with interlocking slot and rail structure for attachment of roof and/or ceiling supports.

A further object is to form an extrusion for joining two wall slabs together at a predetermined angular relation to each other.

Other and more specific objects will become apparent in the following detailed description of the invention as illustrated in the accompanying drawings wherein:

FIG. I is a section of a joint between two panel strips made in accordance with one form of the invention in perspective view,

FIG. II is a similar section in perspective of a modified form of joint,

FIGS. III and IV are sectional views of other modified forms of joints,

FIG. V is an enlarged detail sectional view of the joint shown in FIG. I,

FIG. VI is a perspective view of an assembly of a portion of a wall or roof paneling made of panel strips joined together and having an interior wall,

FIG. VII is an end view of a modified form of exterior wall panel assembly simulating outside lap siding, with interior wall slabs and insulation fitted therein,

FIG. VIII is a perspective view of a portion of a base extrusion, showing how it is installed ready for concrete pouring around the inside,

FIG. IX is a detail view in perspective of a portion of the base extrusion from another angle,

FIG. X is a vertical sectional detail view of a base portion of a wall assembly,

FIG. XI is a vertical sectional and perspective view of an upper portion of a wall and eave assembly,

FIG. XII is a vertical sectional perspective view of another modified wall and eave assembly,

FIG. XIII is a sectional view of a modified extrusion base and wall,

FIG. XIV is a perspective view of a portion of a modified base extrusion and wall assembly adapted for mounting on a wooden base,

FIGS. XV, XVI, XVII, XVIII and XIX show a method of forming an arch or a complete cylindrical enclosure from a panel assembly,

FIGS. XX and XXI show two types of cross braces in elevation for use between alternate ridge portions of panels,

FIG. XXII is a plan view of the cross brace of FIG. XXI,

FIG. XXIII is a detail sectional view taken on line XXIII—XXIII in FIG. XXII,

FIGS. XXIV to XXXI show several different forms of panel strips that may be carried as a standard line,

FIGS. XXXII to XXXVII are six different forms of corner panel strips,

FIG. XXXVIII is an enlarged perspective view of a modified form of clip used for holding down the roof slabs on the eave stringers,

FIG. XXXIX is an enlarged perspective view of a brace used for locking over a wooden stake by a hammer blow on its outer edge,

FIG. XXXX shows a modified conformation for the triangular edge form for a panel strip joint,

FIG. XXXXI shows a perspective view of a rafter that has a guide ledge at one side for receiving the upper ends of wall panels,

FIGS. XXXXII, XXXXIII and XXXXIV are enlarged showings of the side view of the upper end, the end view and the side view of the lower end of the rafter of FIG. XXXXI, respectively,

FIGS. XXXXV, XXXXVI and XXXXVII are illustrations of one form of ceiling beam and its assembly to an eave support extrusion,

FIGS. XXXXVIII and XXXXIX are two forms of gable roof ridge support extrusions having roof ridge sealing clips,

FIG. L is panel butt end joining extrusion and clip,

FIG. LI is a corner post extrusion for joining horizontal panels at the corner,

FIGS. LII and LIII show two forms of corner joint extrusions having spaced guide ledges perpendicular to each other for the adjoining panel ends,

FIG. LIV is a butt end joint extrusion having spaced guide ledges for the adjoining panel ends,

FIGS. LV and LVI are two forms of container corner joint extrusions,

FIGS. LVII and LIX show two forms of flat roof eave support extrusions having roof panel support beam receiving slots,

FIG. LVIII is one form of room support beams,

FIGS. LX and LXI show two forms of panel roof support beams clipped to the under side of a roof panel,

FIGS. LXII and LXIII show simple eave support extrusions for an inclined and a flat roof respectively with locking clips for the panel wall and roof,

FIG. LXIV is a corner joint extrusion to which the ends of adjoining panels may be clipped by an internal corner clip,

FIGS. LXV and LXVI are two forms of base extrusions with clips for fixing the lower ends of wall panels on a partially extending ledge,

FIG. LXVII shows a side base extrusion for a wooden floor.

FIGS. LXVIII and LXIX show forms of base extrusions adopted for mounting on a wooden stringer.

FIGS. LXX and LXXI show roof support extrusions mounted on panels.

The present invention, as illustrated in the drawings, comprises a panelling system of construction of buildings, containers and enclosures having angular, curved or any other form of wall and roof panelling, and having wall base, eave support and other extrusions permitting assembly of panels and extrusions without the use of tools, nails, bolts or screws and providing automatically sealed joints between panels and between the ends of the panels and the extrusions, as well as ventilation through the wall panels.

The present invention includes a simple self-locking and sealing joint for use on any sheet panelling by providing complementary edge formations for the adjacent panel sheeting, one of the edge formations being a groove substantially triangular in section extending to one side of the panel, the triangle having one side extending from the edge of the panel at an acute angle thereto, the base of the triangle extending from the outer end of said one side around a lobe outwardly of the base, which is sub-

stantially parallel to the panel, then around another similar lobe at the other end of the base to the outer side of the triangle which has its upper end adjacent to the edge of the panel but spaced therefrom normally the thickness of the panel sheet to permit passage of the other of the edge formations. The other of the edge formations being an extension of the other panel at an obtuse angle thereto substantially supplementary to the above acute angle, said extension being adapted for insertion into said triangular groove and for interlocking with said triangular groove, so that when the panels are brought into alignment, a leverage pressure at two points of contact between the edge formations provides a double sealing joint between the panels.

The two panels **2** and **4** shown in FIG. I have this type of joint, having edge formations comprising the substantially triangular groove **6** and extension **8** interlocked by insertion of the extension **8** through the open apex of the triangular groove and passing the curved edge **10** of this extension into the far lobe **12** at the base of the triangle, then prying the panel **2** down into alignment with the panel **4**, using the two points at the opposite ends **14** and **16** of the extension as a fulcrum and lever respectively, and springing the edge formations into pressure engagement to form a double seal at these two points.

FIG. II is a modification having a different form of extension **18** which has a kink **20** at its upper end for snapping through the open apex over the apex end **22** of the outer side **24** of the triangular groove **26**. The apex end **22** has its flange end curved over to provide a more concentrated pressure contact line to form the sealing joint at the upper end of the extension **18**.

It will be noted that the leverage pressure at the upper sealing joint is downwardly against the upper end of the outer side of the triangular groove in either of the modifications of FIG. I and FIG. II, as it is also in the modifications shown in FIGS. III and IV. This downward pressure results from reaction of the lower end of the extension as it is pushed downwardly into place under the upper surface of the right hand lobe **28**.

As shown in the enlarged view in FIG. V, the normal distance *a*, between the base **30** and the upper surface of the flange **32** at the upper end of the outer side **34** is made slightly oversize. When the extension **8** is inserted and pressed into position against the inner side **40** of the triangular groove by swinging down the panel **2**, the upper parts are pulled down to the full-line position and the extension **8**, which has a normal angular form as shown in dotted lines, is sprung into its full line position as shown, flush against the inner side of the triangular groove, and its curved lower end is stretched and held under the upper inside surface of the lobe **28**. The base **30** of the triangular groove can remain substantially parallel to the panel if desired, since the resilient deformation of the outer side portion of the triangular groove may be kept confined to the upper part of the left hand lobe **36**, as shown by arrow *c*.

The extension **8** is bent relative to the panel **2** at an oversize angle α and the curved end **38** is bent to an undersize angle β, so that the final angles will correspond to those of inner side **40** and the upper arm of the lobe **28**, so that a firm double seal will result, as explained above, at **14** and **16**.

FIG. III shows a modified joint with the curved end **22** of the outer side **24**, like that shown in FIG. II, and an extension **8** as in FIG. I.

FIG. IV is similar to FIGS. I and III, except that the upper end of the outer side **42** has a straight upper edge.

One form of panel strips is shown in FIG. VI, wherein a groove configuration **6** is formed in substantially triangular shape with lobes extending at each end of the base **30** as previously described, the opposite edge of the panel strip having an extension **8** for insertion into a groove **6** in the adjacent panel strip. This panel strip

has two triangular ridges **46**, although any other number of such ridges may be formed, equally spaced between the edges of the panel strip to form substantially uniform recesses **48** between said ridges and triangular edge formations **6** in a continuous pattern from panel to panel in the assembled wall.

One way of forming and supporting insulating strips **44** in the panel strip is to form cleats **50** fitting around the bases of the triangular configurations **6** and triangular ridges **46**, partially filling the recesses **48**. The strips **44** are slid into place from the ends of the panel strips before joining the panel strips. The inner wall strips **52** are attached to the insulating material **44** to provide a continuous finished interior wall when the panel strips are joined, the edges of the insulating and wall strips are slightly V-shaped as shown at **45** to guide the interior wall of one strip flush with that of the adjacent wall strip.

The modification shown in FIG. VII has a similarly ridged and recessed panel strip as above, except that the outer panels **54** are not aligned, but simulate lap siding, the edge **56** of one panel protruding over the edge **58** of the adjacent panel in overlapping relation, the protruding edge of the edge panel in a panel strip being joined to the inner side of the triangular configuration **60**. The intermediate ridges **62** and the recesses **64** between the ridges **62** and triangular configurations **60** have one long side **66** and one short side **68**. It will be seen that the insulating strip **70** with the cleats **72** and interior wall **74** is practically identical with the corresponding parts in FIG. VI.

The insulating strips may have a ridge **76'** extending from the middle of each cleat to the inside of the recess panel, the inner contour of the cleats being shown in dotted lines in FIG. VI.

FIGS. VIII and IX show one form of base extrusion comprising a vertical web **76** having inwardly extending flanges **78** and **80** at top and bottom, respectively, with their inner edges turned upwardly to form rails **82** and **84**.

The web **76** extends upwardly and outwardly to join a vertical guide strip **86** having an inwardly extending flange **88** with a downwardly turned edge **90**. The vertical strip **86** has a horizontal ledge **92**, slightly wider than the depth of the wall panel, extending outwardly to support the lower end of wall panel strips **94**. A spring clip strip **96** is used in the assembly to hold the wall panels firmly against the vertical guide strip **86**. Slots **98** are provided in the horizontal ledge **92** and openings **100** in strip **96** which register with these slots provide vents for outside air to enter the panel grooves **102** and **104** and be discharged through similar vents under the eaves at the top of the panels, as will be hereinafter explained.

The base extrusions are normally laid on top of the ground **106** and staked in place by driving stakes **108** against the inside of the rails **82** and **84** and a rectangular brace **110** is used around the top of the stake to lock the stake firmly against the rails **82** and **84**. The brace **110** is placed over the top of the stake with the downturned side flange **112** hung over the rail **82** and the edge of the angular internal flange **114** resting against the opposite side of the stake, then a hammer blow on the internal flange side of the brace causes the angular flange edge to dig into the stake and lock it firmly against the rails **82** and **84**. A concrete floor slab **116** may then be poured after the base extrusions have been laid all around the building to be assembled.

FIG. X shows a modified form of base extrusion in which the vertical web is extended upwardly to form a vertical strip **118** which is connected by a horizontal bridge strip **120** to another vertical strip **122** which has an outwardly extending ledge **92** for the bottom of the wall panels which are held against the vertical strip **122** by a spring clip strip **96**. The groove **124** formed between the upper portions of the vertical strips **118** and **122** is adapted to receive the bottom ends of the cleated insulation wall strips **126** similar to the strips **44** of FIG.

VI. Obviously, these insulation wall strips could also be used with the base extrusion of FIGS. VIII and IX, with their lower ends resting on the flange **88**. A finished interior wall covering **128** may be applied to the inside of the insulation strips **126**, and a floor covering **130** may be used on the concrete floor **116** with a base board **132** fixed around the bottom of the wall, as shown in FIG. XIII. The outer surface of the vertical guide strip **86** may have a coating of adhesive applied to it before installing the wall panels, as indicated, to more firmly fix the panels thereto. A seal **134** may be used to provide an air-tight joint between the floor and the bottom of the insulation panels. The openings through the ledge **92** and clip **96** serve not only as air vents but also provide drainage for any condensation in the hollows of the wall panels.

A base extrusion of a modified form adapted for mounting on the outer edge of a wooden base stringer **136** is shown in FIG. XIV. The vertical strip **138** is provided with a base flange **140** extending inwardly over the top of the wooden stringer **136** with a sealing strip **142** mounted in its lower surface. The inner edge of this flange is provided with screw holes for mounting screws **114** adapted to fix the base extrusion on said base stringer. An upwardly extending wall base strip **146** spaced from said vertical strip **138** forms a groove for receiving the bottom of the insulation wall strip **126**.

Other simpler forms of base extrusions adapted for mounting on a wooden stringer may be seen in FIGS. LXV, LXVIII and LXIX. The first of these comprises a vertical strip **148** with a mounting flange **150** extending inwardly over the wooden stringer **136** fixed thereto by screws **144**, and an internally extending flange **152** at its upper end. An outwardly extending flange **154** is narrower than the wall panels **94** so that it does not close off the bottom of the hollow wall, thus providing air flow therethrough. The wall panels are locked against the vertical strip by spring clips **156** which have a portion formed to fit in a wall panel recess **48** so as to wedge between the triangular ridges **46** when the clip **156** is pulled to spring over the flange **150**. The vertical strip **148** is mounted directly against the wooden stringer **136**. In the other two forms a separate flange **158** extending from the inwardly extending base flange **160** is mounted against the outer edge of the stringer **136**. The vertical strip **162** has a ledge **92** for receiving the bottom of the wall panel **94** and a clip **96** for holding the panel against the strip **162**. The vertical strip **164** in FIG. LXIX has a similar ledge **92** and clip **96** and may be used without any mounting flange **158** when used simply for closing off the end of a panel and giving it cross-wise rigidity.

Another form of base extrusion is shown in FIG. LXVI, wherein the vertical guide strip **165** has a partial outwardly extending horizontal ledge **163** for supporting the bottom of the wall panels **94**, which are held against the vertical guide strip by a spring clip **176'** clipped over an inwardly extending rail **167** at the upper end of the vertical guide strip. This spring clip will be more fully described hereinafter.

The vertical guide strip has inwardly extending horizontal ledges **169**, **171** and **173**, spaced, as shown, the uppermost ledge **169** being wider and having an upwardly extending rail **175** at its inner edge. The other two ledges **171** and **173** are not as wide as the ledge **169** and have upwardly extending rails **177** and **179**, respectively. The uppermost rail **175** rises to about the level of rail **167** and establishes the level to which the concrete floor **181** is poured. This base extrusion need not be staked in place, because it will stand on the lowermost rail **173** which extends horizontally from the lower end of the vertical strip **165**.

Some simple side base extrusions for portable containers are illustrated in FIGS. LXVII, LV and LVI. In FIG. LXVII a laminated wooden floor **183** is shown mounted over the inwardly extending portion of the

ledge **185** at the bottom of the vertical guide strip **187** of the extrusion. A rail strip **189** extending downwardly from the ledge **185** and having a foot flange **191** keeps the base of the container spaced from the floor to provide space for a lifting fork arm to be moved under the container for lifting the container and moving it when desired. The outwardly extending portion of the ledge **185** has an upwardly extending rail **193** at its outer edge, to form a guide groove with the vertical strip **187** for the lower end of the wall panels **94**.

A similar side base extrusion is shown in FIG. LVI, wherein the floor of the container is made of the same panels **94** as the walls and a horizontal guide strip **195** extends inwardly from the top of the vertical strip **187'** to form a groove with the inwardly extending portion of the flange **185'**. A leg strip **189'** may be extended downwardly from the flange **185'** and may have a foot flange **191'** if desired for the purpose described.

The base extrusion of FIG. LV is substantially the same form except for the outwardly extending portion of the flange **185'** which is replaced in this extrusion by the type which will receive a spring clip strip **196** for holding the wall panels **94** against the vertical guide strip **187'**.

The eave support extrusion shown in FIG. XI comprises a vertical web portion **166**, having a flange **168** extending outwardly from the top thereof at the angle of the pitch of the roof for supporting the roof panel **170**, and an inwardly extending ledge **172** connected to a vertical rail **174** having a downwardly extending edge for receiving the lower end of spring clip **176** when anchoring the roof down firmly against the flange **168**. The spring clip **176** is similar to spring clip **156** shown in FIG. LXV, except that its panel recess engaging portion **178** is bent to conform to the angle of the roof panel **170**. Details of a modification of this spring clip are shown in FIG. XXVIII, which has an offset ridge **180** to provide more flexibility to the clip in the direction normal to the ridge and more rigidity in the ridge direction. The edges **182** around the recess engaging portion **178** are bent at 90° to provide rigidity to this portion. The angles correspond to the angle which the sides of the triangular ridges make with the recess panel wall.

The lower end of the web portion **166** has an inwardly extending horizontal ledge **184** with a beaded edge **186** for receiving a ridge clip **188** to spring over the beaded edge **186** for the purpose of holding the upper end of the wall insulation **190** in place under the ledge **184** and against the vertical strip **192**, which is joined near its upper end by an outwardly extending bridge strip **194** from the bottom of the web portion **166**.

A cover ledge **196** extends outwardly from the top of the vertical strip **192** and is adapted for mounting over the upper end of the wall panel **94**, and a spring clip strip **198** similar to the strip **96** is used over the ledge **196** to hold the wall panel **94** firmly against the outer face **200** of the vertical strip **192**. An adhesive may be applied to this face previous to assembly in order to strengthen this joint. The spring clip strip **198** is provided with louvres **202** which register with vent slots in the ledge **196** similar to slots **98** in the ledge **92**. The insulation wall board **190** is not cleated into the wall panel **94** in this case, but is applied against the ridges **46** and is cut away at the tap to fit against the inside face of the vertical strip **192**. The ridge clip **188** is then mounted on the beaded edge **186** to hold the wall board firmly in place.

A modified form of eave support extrusion is shown in FIG. XII which comprises a vertical web **204** having an eave support ledge **206** at its top extending inwardly and outwardly therefrom at an angle corresponding to the pitch of the roof, and a horizontal flange **208** extending inwardly and spaced below said eave support ledge **206**. The inner edge of the ledge **206** has a downwardly

protruding rail edge **210**, and the flange **208** has a similarly protruding rail edge **212**. A horizontal flange **214** extends inwardly and outwardly from the bottom of web **204** the outer edge of this flange **214** being extended vertically to form the vertical guide strip **216** with the horizontal outwardly extending ledge **218** for mounting over the top of the wall panels **94** in the same manner as the eave support extrusion of FIG. XI. The same type of spring clip strip **198** is used to hold the panels **94** firmly against the vertical guide strip **216.**

The insulation wall board **44** may have a finished interior wall board **52** attached to its interior surface to present any desired finish. This may be a laminated wall board, veneer, wall paper, or woven fabric, decorated or plain finish. The arrows *d* show the path of air ventilation currents through the hollow panel spaces up through the slotted ledge **218** and registering louvres **202** into the atmosphere under the eaves of the roof panels **220.** The roof panels are held down on the eave support ledge **206** by means of the spring clips **176** which are clipped under the rail **212** in this form of eave support extrusion.

Other simpler forms of eave support extrusions which may be used in the present system of building construction are shown in FIGS. LXII, LXX and LXXI for pitched roofs and in FIGS. LVII, LIX and LXIII for flat roofs or container covers.

The eave support extrusion of FIG. LXII comprises the vertical guide strip **222** with an inwardly extending horizontal flange **224** at its top, the inner edge of the flange having a vertical rail **225** protruding to the pitch line of the roof panel **94.** The horizontal ledge **224** is extended outwardly into the eave support strip **226** which extends along the aforesaid pitch line and has a downwardly extending rail **228** at its inner edge for receiving the spring clip end of a hold down spring clip **176'** of the type previously defined and designated by the numeral **176.** A similar spring clip is used for holding the wall panel **94** firmly against the vertical guide strip **222,** by clipping its end over a horizontally extending rail **230** at the lower edge of the vertical guide strip.

The extrusions shown in FIGS. LXX and LXXI are very much alike in that the vertical guide strip **232** and cover ledge **234** with a spring clip strip **236** are identical portions of the two modifications, and both of the roof support strips **238** and **240** are extensions of angular bracket strips **242** and **244,** respectively, running from the vertical guide strip, except that bracket strip **242** extends horizontally inwardly and upwardly to the roof support strip, whereas bracket strip **244** extends horizontally outwardly and upwardly to the roof support strip, and the roof support strips extend in reversed directions, as shown.

The flat roof eave support extrusions shown in FIGS. LVII and LIX have ceiling and rafter supporting means, and wall panel supported cover ledges **246** and **248** extending outwardly from vertical guide strips **250** and **252** respectively. These ledges are placed over the top of the wall panels **94** and spring clip **254** is used to lock the wall panel **94** against the guide strip **250** by clipping the inner edge of the clip **254** over the inwardly extending rail **256** at the bottom of vertical guide strip **250,** in FIG. LVII, and the spring clip strip **258** is used to lock the wall panel **94** against the guide strip **252** in FIG. LIX.

A rafter **260** comprises a simple angle iron construction and is mounted in similarly shaped grooves cut out of the top of the eave supporting extrusions, so that the upper surface of the rafter **260** will be closely spaced or substantially flush with the top **262** of the extrusion cover ledge **246** in FIG. LVII or the top **264** of the vertical ridge strip **266** in FIG. LIX. The ceiling supporting means in FIG. LVII comprises a horizontal ledge **268** extending inwardly from the vertical guide strip **250.** In FIG. LIX this means comprises the horizontal ledge **270**

extending inwardly from the vertical guide strip **252** and joining the vertical ridge strip **266** at its base. The lower end of the vertical guide strip **252** may have an inwardly projecting bead or ridge **272** if desired for decorating purposes or otherwise.

For long roof spans the rafters **260** may be intermediately supported by beams of the type shown in FIG. LVIII, having an inverted T-section, the vertical ridge portion **274** of which has grooves **276** cut out in its upper edge to receive the rafters **260** just as they are received in the eave support extrusion. The flange portions **278** may be used as ceiling edge supports along with the ledges **268** or **270.**

For long panel slabs whether used for roof or wall intermediate cross-wise rigidity may be provided by beams such as shown in FIGS. LX and LXI. The beam **280** has two flanges **282** and **284** to which spring clips **176'** may be clipped for firmly holding the panels **94** against the inner surface of the beam. The L-beam **286** may be similarly held against the panels **94** by a spring clip **176'** sprung over the flange **288.**

A simple form of eave support extrusion for a flat roof or a shelter cover is shown in FIG. LXIII and comprises a vertical guide strip **290** with an inwardly extending ridge or rail **292** at its lower end and a cover ledge **294** extending outwardly over the top of the wall panels **94** at the upper end, coextensive with the inwardly extending ledge **296** to form an eave support for the roof panels **94.** The inner end of ledge **296** has a downwardly extending rail **298** over which spring clips **176'** may be clipped to hold down the roof panels firmly on the eave support ledge. The wall panels **94** are similarly held firmly against the vertical guide strip by spring clips **176'** clipped over the rail **292.**

FIGS. XXXXI to XXXXIV illustrate a construction of rafter and ridge support extrusions suitable for a low pitch long span gable roof of panel assembled slabs, the rafters being adapted to provide cross-wise rigidity to the roof slabs as well as to the top of wall panels that may be aligned under these rafters.

The ridge support extrusions comprise a vertical center strip **300** having horizontal ceiling support flanges **302** extending symmetrically to both sides at the bottom of the strip **300,** and roof slab guide strips **304** extending to both sides near the top of the strip **300** at the roof pitch angle, the edges of these guide strips being extended downwardly to form tapered inverted ridges **306** to engage correspondingly tapered slots **308** in the upper ends of the rafters. The vertical center strip **300** has another pair of guide strips **310** extending to opposite sides and having upper surfaces inclined at the roof pitch angle for receiving the bottom of the corresponding ends of the rafters. The upper end of the vertical strip **300** forms a flared ridge **312** adapted to receive a spring clip cover strip (not shown) to seal the joint between the center strip **300** and the upper edges of the roof panels, and to hold these panels firmly against the guide strips **304.**

The rafter extrusion comprises a vertical strip **314** having reenforcing flanges **316** and **318** extending to one side and a horizontal bracket strip **320** extending from the lower end of the strip **314** to the other side to a vertical upwardly extending guide strip **322** having a horizontally outwardly extending ledge **324** for receiving the upper ends of wall panels **94** when desired, as partition walls or outside walls, depending on the positioning of the rafter relative to the length of the roof, the end rafters being obviously used for supporting the outside wall panels. The usual spring clip strip of the type illustrated as **196** may be used over the ledge **324** to hold the panels firmly against the guide strip **322.**

FIG. XXXXI shows how the rafters are slidably interlocked with the roof ridge extrusion at the upper ends and with the eave support extrusion at the lower end, so that in assembly they may be inserted at one end of these

extrusions and successively slid into properly spaced positions along the length of the extrusions before assembling the roof panels over them. As already pointed out, the upper end of each rafter is cut and slotted to slidably lock over the ledge **310** and under the ledge **304**, the tapered rail **306** interlocking with the correspondingly tapered slot **308** in the rafter. The lower end of the rafter is cut and grooved as shown to slidably interlock with the eave support extrusion of the type shown in FIG. XII. The bottom of the lower end of the rafter is cut at an angle to rest on the horizontal ledge **214** and this end is cut and slotted at **326** and **328** to slidably interlock under the corresponding ledges **206** and **208** with their edge rails **210** and **212** respectively. When installed, the top of the rafter flange **316** is in a plane coextensive with the roof panel support ledges **304** at the top and **206** at the lower end of the roof. The roof panels may be fixed by spring clips such as **176'** clipped under the rail **306** at the ridge extrusion and under the rails **210** or **212** at the eave support extrusion.

After the rafters are assembled in place, ceiling beams **330** may be installed over **214** and **302**, the ends over the ledge **302** being cut and slotted at **332** and **334** for insertion through cutouts **336** and **338**, respectively, in the rails **210** and **212** for slidably interlocking with these rails under the corresponding ledges **206** and **208**. The beams **330** may have any number of vertical strips **340** as may be required to provide the necessary strength for long spans, three such strips being shown in the illustrated embodiment.

For steeper gabled roofs and for strong corner container and building wall joints a ridge or corner extrusion of the types shown in FIGS. XXXXVIII and XXXXIX may be used. No rafters are needed because the panels run in the direction of rafters and are self supporting in this direction. The ridge extrusion of FIG. XXXXIX comprises a vertical web strip **342** having a flared or beaded ridge **344** for the reception of a clip strip **346** which holds the panels **94** firmly against the oppositely extending angular guide strips **348**. A pair of ledges **350** extend from the lower end of the web strip **342** in parallel relation to strips **348**, and are provided with rail edges **352** for receiving the panel hold-down spring clips **354** to lock the panels more firmly to the guide strips **348**.

A simpler extrusion having similar characteristics is shown in FIG. XXXXVIII wherein the angular guide strip **356** for each panel is extended over the end of the other panel to form a cover ledge **358** therefor, and a ridge cover strip **360** may be clipped over the protruding outer edges of the cover ledges **358** to hold the panels against their respective guide strips. Additional spring clips **176'** may be used to firmly lock the panels by clipping over the rails **362** at the lower ends of the guide strips **356**.

Other modifications for corner joint extrusions may be seen in FIGS. LI, LII, LIII and LXIV. The form shown in FIG. LI is suitable for panel wall fences where a strong corner post extrusion is desired. The corner extrusion is similar to that of FIG. XXXXVIII but does not have spring clip rails for the additional hold-down spring clip. However, it may have a web strip **364** with reenforcing flanges **366** at its end.

The corner extrusion of FIG. LXIV differs from the others in that the panel guide strips **368** are on the outside of the panels **94** and are extended to meet at the outer edge of a 45° web strip **370**, the inner edge of which has a beaded edge **372** for receiving a spring clip strip **374** which holds the panels firmly against their respective guide strips.

The extrusions of FIGS. LII and LIII are similar in that their panel guide strips **376** are on the inside of the panels **94** and have cover ledges **378** for the ends of the panels, with spring clip strips **196** for holding the panels firmly against their respective guide strips. However, the curved web strip **380** in FIG. LIII joining the guide strips **376** positions the cover ledges in spaced relation inwardly of the line of intersection of the planes of the guide strips, whereas the web strip **382** in FIG. LII joining the guide strips **376** positions one of the spaced cover ledges outwardly of the line of intersection of the planes of the guide strips.

A similar construction of extrusion for in-line joints between the adjacent ends of successive panels is shown in FIG. LIV, where the web strip **384** joining the guide strips **376** positions the spaced cover ledges **378** in parallel relationship and the guide strips in a coextensive plane.

A simpler form of straight joint extrusion is shown in FIG. L, wherein the panel guide strips **386** are coextensive and have a common cover ledge **388** at their juncture for the adjoining ends of the joined panels **94**. The outer edge of the cover ledge is beaded for the reception of a spring clip strip **390** for holding both panels firmly against the guide strips **386**.

For building curved walls or arches one or more panels **94** may be joined to form a slab **392** of the required length. The slab is then curved to the required curvature by drawing its ends **394** toward each other, preferably inwardly of the ridged side of the panels, so as to present a substantially smooth outer surface **396**. After obtaining the required curvature, it may be rigidized and strengthened to maintain the ends of the slab at the desired spacing without retaining the interconnecting restraining lines **398** between the ends. To facilitate pulling the opposite ends of the slab toward each other a pair of end strips **400** and **402** having notches **404** and knot holders **406** may be used. These end strips have edge conformations **408** and **410** for joining to the corresponding complementary edge conformations **412** and **414** respectively at the opposite ends of the panel slab **392**. The pulling lines **398** are knotted with a figure eight or other no-slip knot **416** and the lines are passed in the notches **404** and the knots are pulled into the knot holders **406** against the corresponding notches. The ends **394** may then be readily drawn toward each other by means of these lines without any danger of slipping the lines out of the notches **404**.

When the ends **394** are pulled the curvature of the entire slab forms a complete cylindrical enclosure **418**. In such case, the end strips **400** and **402** may be removed and the opposite ends **394** joined together, because they have complementary edge formations.

In order to rigidize any curved slab in a particular curvature, braces between adjacent or alternate panel ridges **6**, **46** on the inner side of the curved panel slab **392**, can be used as shown in FIGS. XX and XXI, at suitably spaced intervals along the length of the slab and staggered along the curvature of the slab.

The braces illustrated are made for a specific amount of curvature. For greater curvature they would be correspondingly shorter. Each brace comprises a straight strip **398** with ends **400** turned up to fit around the bases of two spaced ridges **46** and **46** or **6** and **46**. Strips **398** may be reenforced by outwardly extending flanges **402** along their sides, providing a very light but strong brace. A movable lock strip **404** reenforced by flanged edges **405** is pivoted on the top of strip **398** near each end thereof and has an upturned end **406** or **408** which clamps around the inner side of the base of the corresponding ridge **6** or **46** respectively. A spring clip ear **410** may be formed on the side of strip **404** and adapted to clip over the flange **402** to lock the corresponding end **406** or **408** in clamped position around the corresponding ridge.

A modified form of panel edge ridge conformation is shown in FIG. XXXX wherein the outer half of the triangular configuration with outer lobe at the base of the triangle is eliminated, the outer side **412** of the triangle being extended normally to the base of the triangle and to

the plane of the panel in close proximity to the outer edge of the outer recess panel **414**.

Panel strips used in this building system may be made in different numbers of panel recesses and ridges **6** and **46** of standard dimensions and including corner ridges **416** of quadrangular section, and having complementary joint conformations at their opposite edges so that any desired continuous panel assemblies may be built by joining the edges of successive panel strips to construct a wall or roof slab or an entire enclosure or fence and the like. For corners having the ridges on the inside of the corner, the inwardly extending quadrangular corner ridge **418** is shaped as shown in FIGS. XXXV, XXXVI and XXXVII.

FIGS. XXIV, XXIX and XXXI are three panel strips with three different opposite edge configurations, FIG. XXXI showing the complementary joint edges **6** and **8**, while FIG. XXIV shows the joint edge **6** as one edge of the panel strip and a finished off configuration **420** as the other edge, and FIG. XXIX shows the joint edge **8** and the finished edge **420** as opposite edges of the three panel strip.

FIGS. XXVII, XXV and XXX show similar edge combinations for two-panel strips.

For the one panel strips only the first two edge combinations are shown in FIGS. XXVII and XXVI respectively.

FIGS. XXXII and XXXIV show corner panel strips having two panels at one side of the corner and one panel at the other side of the corner, with the ridges on the outer side of the corner, and the edges **6** and **8** reversed as to the long and short sides of the corner.

A similar reversal of the edges **6** and **8** are shown in FIGS. XXXVII and XXXV, for three-panel corner strips with the ridges on the inner side of the corner.

The forms shown in FIGS. XXXIII and XXXVI having two panels on each side of the corner with edges **6** and **8** may be turned end for end to reverse the relative positions of these edges with respect to the sides of the corner.

For any design of house or other enclosure, all the panels and extrusions required, cut to proper lengths, with openings cut out for doors and windows, may be packaged and sold as a complete kit of parts.

The manner of assembling the panel strips has already been described and their assembly with the extrusions and partition walls without the use of any tools, bolts, screws, or other materials, is obvious from the previous description of the assemblies. No special skills are required to lay the base extrusions, to drive anchor stakes in the ground, to lock them in place, and to assemble the walls, roof slabs, etc., as may be required.

Many obvious modifications in the form and arrangement of parts used in the present construction system may be made without departing from the spirit and scope of this invention, as defined in the appended claims.

What is claimed is:

1. A sheet panel wall assembly comprising

a plurality of sheet panels, each panel having edge formations at opposite side edges of the panel,

said edge formations being complementary in the formation of an interlocking joint of substantially triangular-ridge outer form between adjacent panels in the assembly, said outer form being that of the edge formation of one of said adjacent panels and having an open apex at the terminal edge of said formation, the other of the adjacent panels having a tongue formation extending through said apex into locking engagement therein,

each panel having at least one substantially triangular ridge fold in it at intervals between said opposite side edges, the folds of the panel sheet at the base of each ridge being only slightly spaced sufficiently to provide for expansion and contraction of the panel under normal temperature changes without causing

the flat panel portions between ridges and between the side edges and adjacent ridges to buckle,

said intermediate ridges and said edge formation ridges extending to the same side of the panels in said assembly presenting a substantially continuous flat surface on the other side of the assembly,

said plurality of panels forming a wall having self supporting vertical rigidity in the direction of said ridges,

a footing extrusion member having a vertical guide web portion extending downwardly with a horizontal ledge extending outwardly at the bottom thereof supporting the bottom edge of said wall,

retaining clip means holding said wall on said ledge and biased against said vertical guide web so as to impart the strength and form of said extrusion member to the rigidity of the panel wall at its lower edge,

an eave support extrusion member having a vertical guide web portion extending upwardly with a horizontal ledge extending outwardly at the top thereof and supported on the upper edge of said wall, and

retaining clip means holding said upper edge under said ledge at the top of said vertical guide web portion and biased against said vertical guide web, so as to impart the strength and form of said eave support extrusion member to the rigidity of the panel wall at its upper edge,

whereby a lightweight, strong and easily assembled wall may be built without the use of any tools or additional framework or attachments, such as screws, rivets, nails or bolts.

2. A wall structure as defined in claim **1**,

said footing extrusion having a vertical web extending downwardly from the inner side of said vertical guide web portion,

said downwardly extending vertical web having inwardly extending rail means with anchoring means adapted for cooperation therewith to fix said footing extrusion member to the ground.

3. A wall structure as defined in claim **1**,

an inwardly extending flange at the top of the footing extrusion guide web,

an inwardly extending flange at the bottom of the eave extrusion guide web,

each of said retaining clip means having a wedge plate portion wedged between adjacent ridges of said ridged panel wall at the flange level of each guide web and a tongue portion extending from said wedge plate portion to the corresponding inwardly extending flange and having a curved spring outer edge clipping over the edge of said flange.

4. A wall structure as defined in claim **1**,

said ledges being slightly wider than the depth of said panel wall,

said retaining clip means comprising a thin strip of spring material substantially the width of said ledge with edges turned to clip around the edges of said ledge, the outer edge being biased against the corresponding edge of the panel wall to urge it against its guide web.

5. An assembly as defined in claim **4**,

an insulation slab having cleats fitting around the outer parts of the ridges on each panel assembly and being spaced from the inside of the panels between said ridges to provide hollow spaces therebetween.

6. An assembly as defined in claim **5**,

said cleats having axial ridge members extending to the inside of said panels to provide bracing support to said panels between said ridges.

7. An assembly as defined in claim **6**, and

an interior wall finish sheet attached to the inner surface of said insulation slab.

8. In a building structure, a vertically corrugated panel wall of sheet material having sufficient vertical rigidity

due to said corrugations to support a super-structure over it without requiring any extraneous structural supports, and

a footing extrusion having a vertical guide web portion with an outwardly extending ledge at its bottom supporting the bottom edge of said wall, and a vertical web extending downwardly from the inner side of said guide web portion,

a pair of inwardly extending rails below the top of said downwardly extending vertical web anchored against a supporting stake driven into the ground adjacent thereto,

a guide clip sprung over said ledge and having an upstanding portion on its outer edge positioned to urge the panel wall against said vertical guide web portion thereby holding said wall bottom on said ledge and imparting the horizontal rigidity of said extrusion to said wall, and

anchor means locking over said inwardly extending rails to hold the extrusion firmly in place while a concrete floor slab is poured on the ground against the inside of said downwardly extending web.

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