Oct. 3, 1961 J. L. FOUNTAIN 3,002,235

PREFABRICATED STRUCTURAL MODULES

Filed Jan. 5, 1959 2 Sheets-Sheet 1

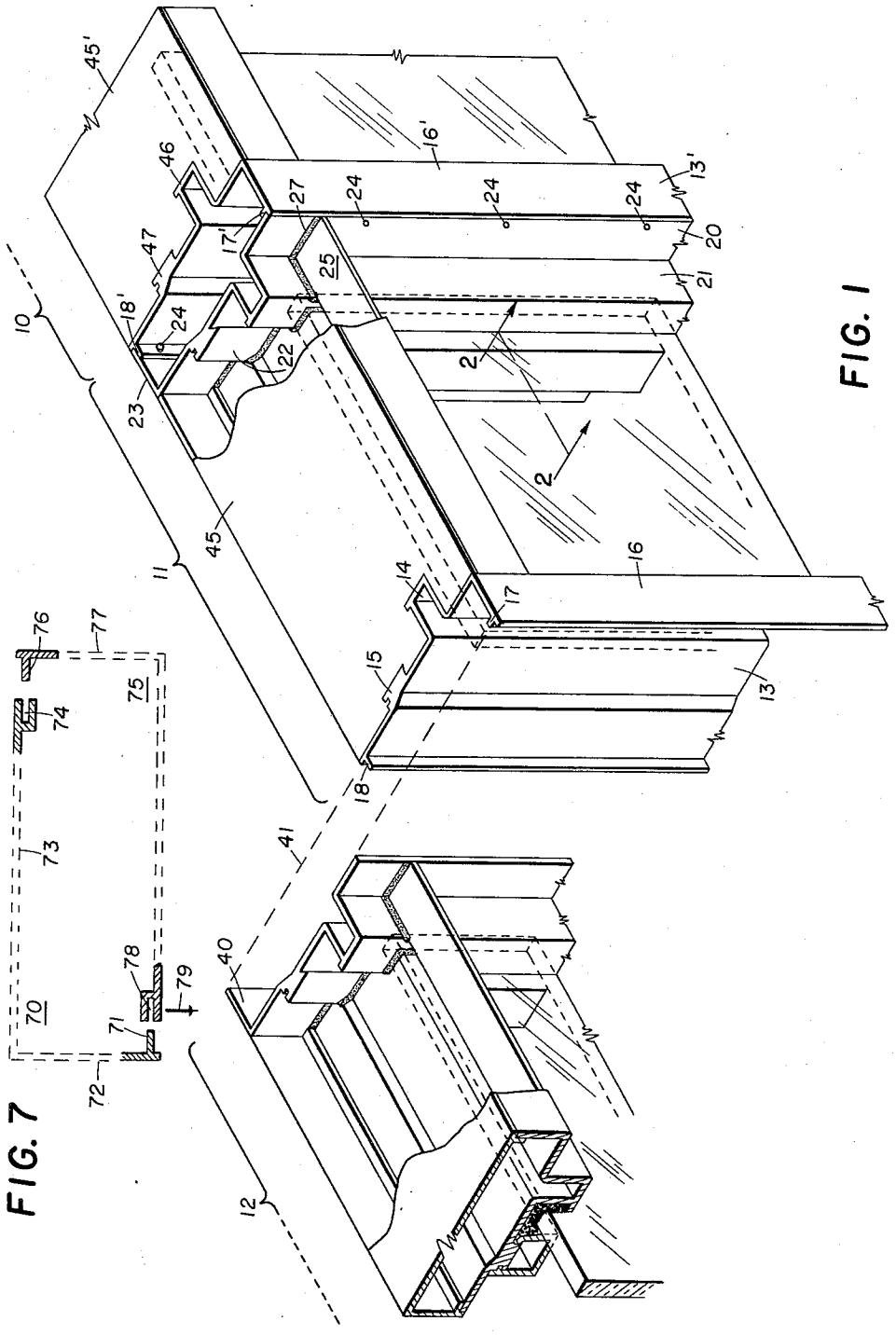


FIG. 1

FIG. 7

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PREFABRICATED STRUCTURAL MODULES

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FIG. 2

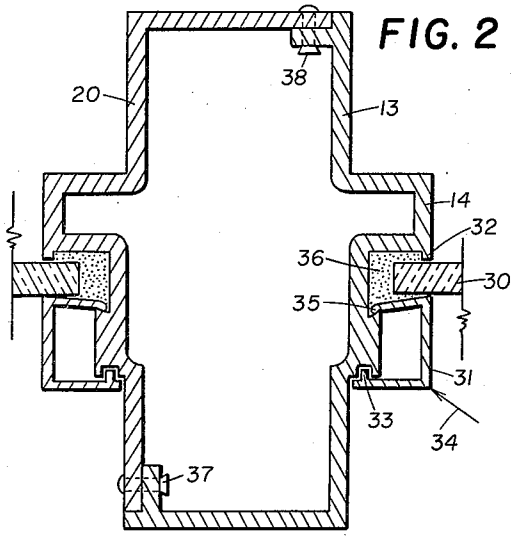


FIG. 3

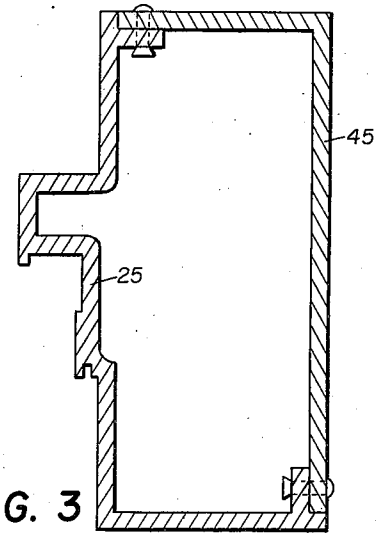


FIG. 4

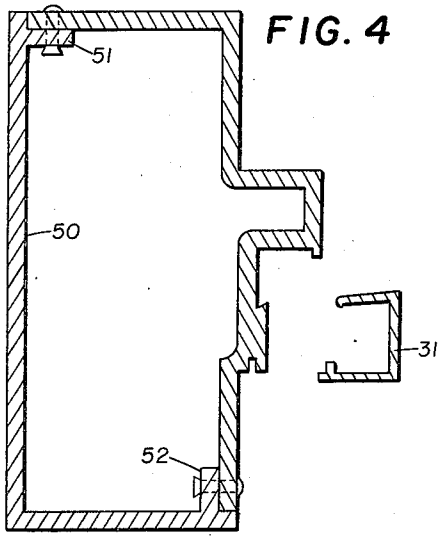


FIG. 5

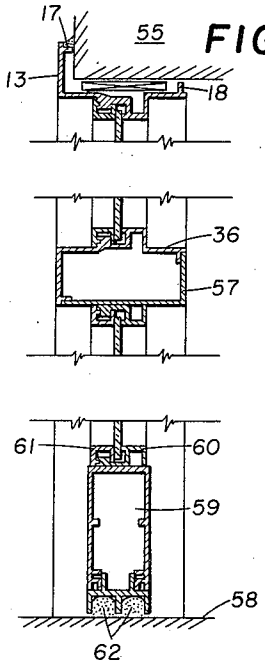
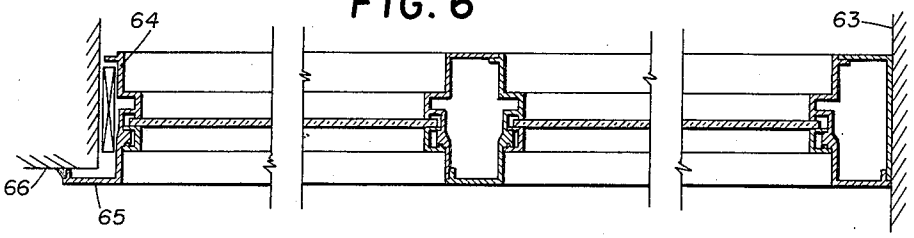


FIG. 6



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3,002,235

PREFABRICATED STRUCTURAL MODULES

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7 Claims. (Cl. 20—11)

The invention relates to a modular unit for forming multipanel structures, and more particularly, to a prefabricated, readily integratable panel.

Contemporary construction employs increasing amounts of glass areas as well as solid pre-cast or preformed structural units. However, there is lacking, prior to the present invention, glaze-type units which may be prefabricated, having as their ultimate purpose, the support of panels such as glass, porcelain, or other structural sheets. Applicants have provided a new structural unit completely prefabricated, wherein it may readily be interconnected to form a multi-panel wall or other structure.

More particularly, in accordance with one aspect of the invention, there is provided a modular unit which comprises a rectangular frame forming an inner bay having a peripheral stop adapted to receive a panel in a zone of intermediate depth in the frame. One edge of the frame is provided with a coupling flange extending away from the frame in a plane parallel to the plane of the stop, and adjacent to a first side of the frame. The edge of the frame opposite to the first edge has a flanged coupling member extending away from the frame in a plane parallel to the plane of said stop, but adjacent to the side of the frame opposite to said first side.

Further, in accordance with the present invention, a support is provided for securing said flange coupling member to complementary units of adjacent frames to form structural rigid tubes, each pair of tubes thus formed supporting a structural sheet secured against the support therein.

In a more specific aspect of the invention, an extruded metal section, preferably of aluminum, is employed to form a frame. The metal section, of given thickness, is provided with a stop and a lock receiving means on one face thereof. A flange is provided, extending away from said face at one edge thereof in a direction opposite to said stop. A coupling rib is set back from the other edge of a distance equal to said thickness, to provide a bearing surface. Similarly, said coupling flange is provided with a longitudinal rib extending the length thereof to provide a bearing surface set back from the edge of the coupling flange a distance equal to said thickness. An opposite side of said frame is formed by an extrusion having a stop and lock receiving means on one face thereof and a coupling flange extending from the face opposite to said stop, the widths of said coupling flange and of said second face being less than the width of the coupling flange and face of said first extrusion respectively, by an amount equal to said thickness.

For a more complete understanding of the present invention and for a further description thereof, reference may now be had to the following description taken in conjunction with the accompanying drawing in which:

FIG. 1 is an isometric view of three modular units adapted to be coupled together;

FIG. 2 is a cross-section taken along lines 2—2 of FIG. 1;

FIG. 3 is a sectional view of a right hand terminal unit;

FIG. 4 is a sectional view of a left hand terminal unit;

FIG. 5 is a vertical wall section embodying the present invention;

FIG. 6 is a horizontal sectional view of a wall embodying the present invention, and

FIG. 7 is a modification of the invention.

Referring now to FIG. 1, there is illustrated the upper portion of a first modular unit **10** coupled to a second modular unit **11**. Modular unit **11** is positioned as to receive and to be coupled to a third modular unit **12**. In unit **11**, the left hand vertical member or jamb **13** is an extruded metal section having an exposed surface on which there is formed a stop which is in the form of a channel-shaped rib **14**, extending perpendicularly from the exposed face of jamb **13**. There also is provided a lock receiving rib **15** which extends the length of jamb **13**, spaced from stop **14**. A coupling flange **16**, forming an integral part of the extruded section, extends perpendicularly from the exposed face of jamb **13** in a direction opposite the stop **14**. Flange **16** is provided with a rib **17** which extends the length of the jamb and is set back from the edge of flange **16** a distance equal to the thickness of the flange. In a similar manner, a rib **18** is provided at the opposite edge of the extrusion, the face of the rib **18** being parallel to the face of flange **16** and set back from the extremity of the extrusion a distance equal to the metal wall thickness.

The side of unit **11** opposite the jamb **13** is formed by a second extrusion **20** which for the purpose of the present description will be termed "complementary" with respect to jamb **13**. More particularly, jamb **20** is provided with a stop **21** extending from the exposed face thereof in the direction of jamb **13**, and is also provided with a lock receiving rib **22**. Jamb **20** is also provided with a coupling flange **23** which extends away from the exposed face of jamb **20** in a direction opposite stop **21**, and for a distance equal to the width of the complementary flange **16'** minus the metal wall thickness. Thus the jamb **20** is positioned adjacent to jamb **13'** of unit **10** with the inside edge of jamb **20** in contact with the inner surface of flange **16'**, and also with the surface of the rib **17'**. The extremity of the coupling flange **23** contacts the surface of the rib **18'** and the edge of jamb **13'**. Jambs **20** and **13'** are secured in the illustrated positions by rivets **24** which extend through and are set in ribs **17'** and **18'**.

A horizontal header member **25** has a cross-section the same as jamb **20**. Member **25** is suitably shaped at each end thereof, as by punching to permit stops **14** and **21** and lock ribs **15** and **22** to nest therein. The contact or abutting zones between member **25** and jamb **20** are welded as indicated by the shaded area **27**. Welding preferably is accomplished using an arc, shielded by an inert gas such as helium to assure fusion of the metals forming the jamb **20** and horizontal member **25**. A similar weld secures horizontal member **25** to jamb **13**. Zones between each jamb and horizontal member wherein a continuous weld cannot be made, preferably will be filled with a suitable caulking compound to assure water-tight construction.

It is to be understood that the other horizontal sill members (not shown, but which complete a given frame) may comprise extrusions having the same cross-section as jamb **20**, and/or complementary thereto.

It will be recognized that jamb **13** has the same cross-section as the right hand member shown in detail in FIG. 2. Corresponding parts have been identified with like reference characters. As viewed in FIG. 2, section **13** has an L-configuration (shown reversed) while section **20** has a 7-configuration (also reversed). The stem and

bar of section **20**, have dimensions complementary to those of the stem and bar of section **13**. It will be seen from FIG. 2 that a pane of glass **30** may be secured in position against stop **14** by a snap lock channel **31**. Stop **14** is provided with a rib **32** to provide a point of contact for the glass **30**. A positioning or lock rib **33** on snap lock channel **31** is registered in a groove in the rib **15**, so that pressure applied to the channel **31** in the direction of the arrow **34** will force tip **35** behind the beveled edge of rib **15**. The space **36** may be filled with a suitable caulking compound or, alternatively, the edge of the glass **30** may be encased in a rubber channel so that, combined with the pressure applied by channel **31**, a fluid-type seal is effected between the glass **30** and the jamb **13**. Rivets **37** and **38** of the self-setting type, secure jamb **13** to jamb **20** so that, together, they form a rigid tube.

Referring again to FIG. 1, it will be noted that module units **10** and **11** are inter-locked whereas unit **12** is positioned to be moved lateraly into place, the illustration representing the relationship of parts as viewed from the inside of the wall being formed. Construction is such that jamb **40** of unit **12** may be moved along direction represented by line **41** to set modular unit **12** in position so that jamb **40** can be secured to jamb **13**, to form a part of the rigid modular wall structure comprised of units **10** and **11**. Horizontal member **25** illustrated in FIG. 3 may be secured to an extruded angle **45** having the same thickness of section as member **25**, and having widths the same as the face of jamb **20** and flange **25** of jamb **20**, respectively. By using the combination shown in FIG. 3, a smooth top is provided for each modular unit. As illustrated in FIG. 1, the angle section **45'** forms a flat cap for section **10**. Cap **45** is formed at each end to receive stop **46** and lock rib **47**, and is welded along the lines of contact therebetween.

It will be recognized that the structure shown in FIG. 3 may also be employed to form the terminal jamb of a modular wall formed by a number of units. Similarly, the combination shown in FIG. 4 may be employed to form the terminal jamb at the opposite end of the same modular wall. Note, however, that the angle unit **50** is provided with ribs **51** and **52** and is adapted to receive and be connected to jamb units such as jamb **20** in FIG. 2. In FIG. 4 the snap lock unit **31** is shown disconnected from the glass stop.

In FIG. 5, there is illustrated a vertical section through a wall which is capped at the ceiling by a section such as section **13**. The rib **17** bears against the face of the wall **55** and when suitably caulked, provides a moisture-proof bond. Horizontal members **56** and **57** have sections the same as jambs **13** and **20**. The unit at the level of the floor **58** is a channel having suitable glass stops **60** and **61**. A floor seal is provided by caulking compound in the zone **62**. Alternatively, the floor unit may be a section with a coupling flange extending down over the edge of the floor, generally, in the same manner as the ceiling connection.

In FIG. 6 a horizontal section of a wall showing two different modes for finishing the terminal sections is shown. On the right hand end a smooth tubular finish is provided for contact with the wall **63**, the unit being the same as shown in FIG. 3. At the left hand end an extrusion **64** is employed where a coupling flange **65** is adapted to extend over the edge of the opening in the wall and to contact the outer face **66** of the wall. Unit **64** and **65** corresponds with section **13** of FIG. 2.

In FIG. 7 there is illustrated a modification of the invention in which the angle-sections have the same configuration. For purpose of simplicity, certain details of the sections have been omitted, showing only the relationship between the edges thereof. Provision is made for securing two angle-sections together to form a rectangular tube by riveting along a single line adjacent to one corner of the tube.

More particularly, a first angle-section **70** is provided having an L-cross-section. A rib **71** extends the length of the strip, located adjacent to the tip of the bar **72**, but set back therefrom a distance equal to the wall thickness. The edge of the stem **73** is of the form of a U-shaped channel. A second angle-section **75** is provided having a 7-cross-section. A rib **76** integral with section **75** and carried by bar **77** is adapted to nest in U-channel **74**. In similar manner a second U-channel, integral with section **75**, is adapted to receive rib **71**. Thus the only visible joints in any completed tube will be along the sides adjacent to opposite corners and will not appear on the faces (bars **72** and **77**) of the tube. A single course of rivets, such as rivet **79**, may be suffcient to secure sections **70** and **75** together where it is desirable to eliminate rivets on one side of a given wall or panel. However, two rows of rivets may be employed, the rows being located adjacent to opposite corners of the tube. It will be recognized that the sections **70** and **75** are identical, except that the stops (not shown) will provide a bearing surface facing the same direction on opposite sides of any given tube.

Having described the invention, it should be appreciated that complete walls or partitions may be prefabricated, fusion welded, and, if desired, glazed before leaving the shop. It has been found preferable, from the standpoint of weight involved, to transport the modules, after fabrication, to a job site before glazing. The units may be secured successively along the length of a wall. Being light of weight, they require a minimum of manpower and in effect permit substitution of machine time in a fabricating shop for manpower otherwise utilized at a job site. The units are particularly adapted to store fronts or units of height such that the jambs can be extruded in single units. However, modules may be stacked one above the other if desired, one jamb and one horizontal member being moved into contact with complementary members as each module is added.

By providing extrusions, coupling one to the other, and having means for coupling them together at points on opposite sides of the plane in which the structural panel is located, complete fabrication is permitted and results in a rigid structure, water-proof in nature, when completely assembled.

Having described the invention in connection with certain modifications thereof, it will be understood that other modifications may now suggest themselves to those skilled in the art and it is intended to cover such modifications as fall within the scope of the appended claims.

What is claimed is:

1. In a wall structure the combination which comprises a pair of frames each of which has sides of integrally preformed elongated elements each having a jamb member and a facing strip disposed at an angle to said jamb member with header members interconnecting the upper ends of the elongated elements of each said pair and sill members secured to the lower ends of each of the elements of said pair, each said jamb member having confronting faces and said sill member having a surface facing a surface on said header member each of said frames having a panel stop extending around the inner periphery thereof on the confronting jamb faces of the jamb members thereof and on the confronting surfaces of said header members and said sill members, said elongated elements in each of said frames being alternately oriented with the said facing strips thereof positioned on opposite sides of the plane of said panel stop, a bearing rib formed on the inner surface of each said facing strip along a line set back from the free edges of said facing strips a distance equal the thickness of the free edge of said jamb members extending from said inner surface toward the plane of said panel stops and means extending through adjacent sides of said pair of frames to interlock them with the free edges of said jamb members bearing on the surface of the bearing ribs to form a rigid

supporting tube at the boundary between said pair of frames.

2. In a structural system in which a pair of panels are to be supported in a common plane on bearing surfaces of peripheral stops in a pair of adjacent modular units the combination which comprises an integrally preformed L-shaped member having a first facing plate and a first jamb plate, which first jamb plate supports one side of a first of said stops with the plane of the bearing surface therof perpendicular to said first jamb plate, an integrally preformed 7-shaped member having a second facing plate and a second jamb plate, which second jamb plate supports one side of the second of said stops with the plane of the bearing surface thereof perpendicular to said second jamb plate and coincident with the plane of the bearing surface of said first stop, supporting ribs on the innner surfaces of said facing plates set back from the free edges thereof a distance equal to the thickness of the free edges of said jamb plates and extending away from said inner surfaces parallel to the planes of said jamb plates, and means for securing said ribs to said free edges of said jamb plates to form an intermediate tubular support between said panels.

3. In a structural system in which a pair of panels are to be supported in a common plane on bearing surfaces of peripheral stops in a pair of adjacent modular units the combination which comprises an integrally preformed L-shaped member having a first facing plate and a first jamb plate, which first jam plate supports one side of a first of said stops with the plane of the bearing surface thereof perpendicular to said first jamb plate, an integrally preformed 7-shaped member having a second facing plate and a second jamb plate, which second jamb plate supports one side of the second of said stops with the plane of the bearing surface thereof perpendicular to said second jamb plate and coincident with the plane of the bearing surface of said first stop, and supporting ribs extending along the inner surfaces of said facing plates set back from the free edges thereof a distance equal to the thickness of the free edges of said jamb plates and extending away from said inner surfaces parallel to the planes of said jamb plates whereby said ribs may support and be secured to said free edges of said jamb plates to form intermediate tubular support between said panels.

4. Frame construction for the sections of a multisectional wall, each section, comprising a header member, a sill member and two side elements secured at the upper and lower ends thereof to said header member and said sill member, respectively, said side elements being of complementary dimensions and each having an inner jamb face, a panel stop means extending around the inside perimeter of said section on the confronting surfaces of said header member and said sill member and extending along each said inner jamb face of said side elements, said stop means having panel supporting surfaces lying in a plane parallel to but intermediate the edges of said elements, each side element provided with an integrally preformed jamb member and a facing member extending at an angle to said jamb member, the facing members each having an outer face parallel to said plane of said stop with one said outer face positioned on one side and at one edge of said section and the other said outer face positioned on the other side and at the other edge of said section, and structure on said side elements for interlocking said section to adjacent sections of said wall secured thereto including fastening means engaging each said side element along the edges of both of said jamb member and said facing member.

5. Frame construction for the sections of a multisectional wall, each section comprising a header member, a sill member and two side elements secured at the upper and lower ends thereof to said header member and said sill member, respectively, said side elements being of complementary dimensions and each having an inner jamb face, a panel stop means extending around the inside perimeter of said section on the confronting surfaces of said header member and said sill member and extending along each said inner jamb face of said side elements to provide panel supporting surfaces lying in a plane parallel to but intermediate the edges of said elements, each side element provided with an integrally preformed jamb member and a facing member extending at an angle to said jamb member, the facing members each having an outer face parallel to said plane of said stop with one said outer face positioned on one side and at one edge of said section and the other said outer face positioned on the other side and at the other edge of said section, and structures on said side elements including upstanding ribs formed on inner faces of said facing members and extending toward and perpendicular with respect to said plane of said panel stop and rooted on said facing members at points spaced from the edges of said facing members a distance approximately equal to the thickness of the edges of said jamb members for providing a bearing and positioning surface for the edges of jamb members of adjacent sections of said wall and adapted to be secured thereto by means extending through said jamb members.

6. Frame construction for the sections of a multisectional wall, each section comprising a header member, a sill member and two side elements secured at the upper and lower ends thereof to said header member and said sill member, respectively, a panel stop means extending around the inside perimeter of said section on the confronting surfaces of said header member and said sill member and extending along confronting jamb faces of said side elements to provide panel supporting surfaces lying in a plane parallel to but intermediate the edges of said elements, each side element comprising an integrally preformed jamb member and a facing member extending at an angle to said jamb member, the facing members each having an outer face parallel to said plane of said stop with one said outer face positioned on one side and at one edge of said section and the other said outer face positioned on the other side and at the other edge of said section, and structure on said side elements for connecting said section to adjacent sections of said wall including an upstanding rib rooted on the inner face of each of said facing members at points set back from the edges thereof a distance approximately equal the thickness of the edge of said jamb member, and a second rib structure extending perpendicular to said plane of said stop along the lengths of said jamb members and rooted therein adjacent the edges thereof but spaced from the inner surfaces of said jamb members distances equal the thickeness of said upstanding ribs for forming channels adjacent the edges of said jamb members to receive and secure upstanding ribs on facing members of adjacent sections of said wall.

7. Construction for a multisectional wall, each section comprising a header member, a sill member and two side elements secured at the upper and lower ends thereof to said header member and said sill member, respectively, said side elements being of complementary dimensions and each having an inner jamb face, a panel stop means extending around the inside perimeter of said section on the confronting surfaces of said header member and said sill member and extending along said inner jamb faces of said side elements to provide panel supporting surfaces lying in a plane parallel to but intermediate the edges of said elements, each side element comprising an integrally preformed jamb member and a facing member at an angle to said jamb member, the facing members each having an outer face parallel to said plane of said stop with one said outer face positioned on one side and at one edge of said section and the other said outer face positioned on the other side and at the other edge of said section, and structure including edge supporting ribs on each of said side elements for interlocking sections of said wall by fastening means extending through each said jamb member with the edge of the jamb members at each junction between sections maintained in predetermined positional

relation with respect to the edge of each facing member by said ribs.

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