Nov. 14, 1967 H. B. NEAL 3,352,078

TWO-PIECE FRAME ASSEMBLY WITH EXPANSION JOINT

Original Filed June 14, 1962 2 Sheets-Sheet 1

FIG. 1

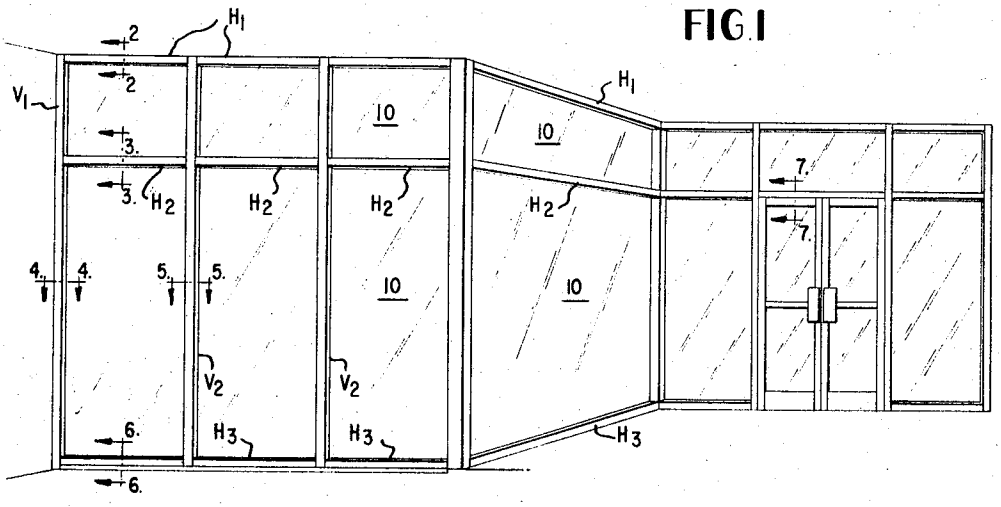
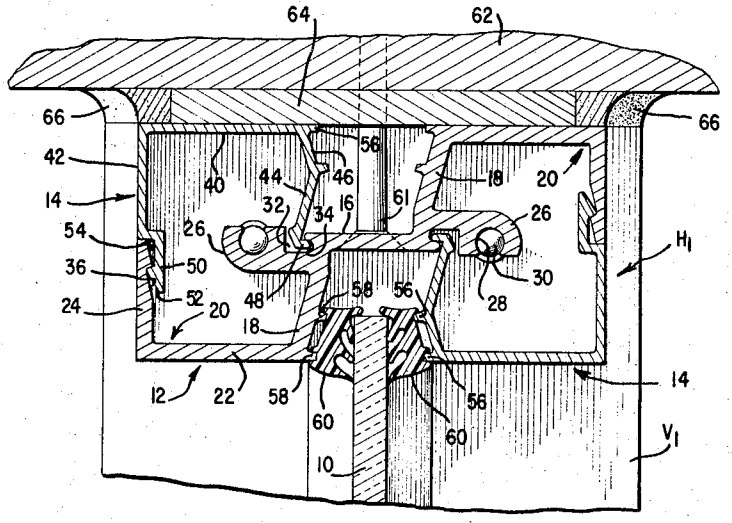


FIG. 2



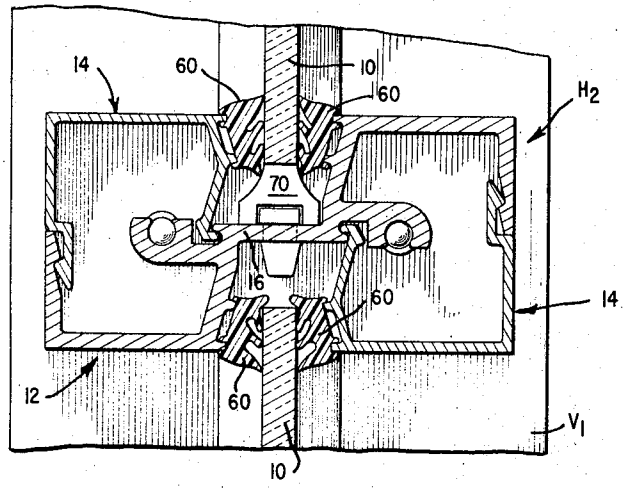


FIG. 3

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FIG. 4

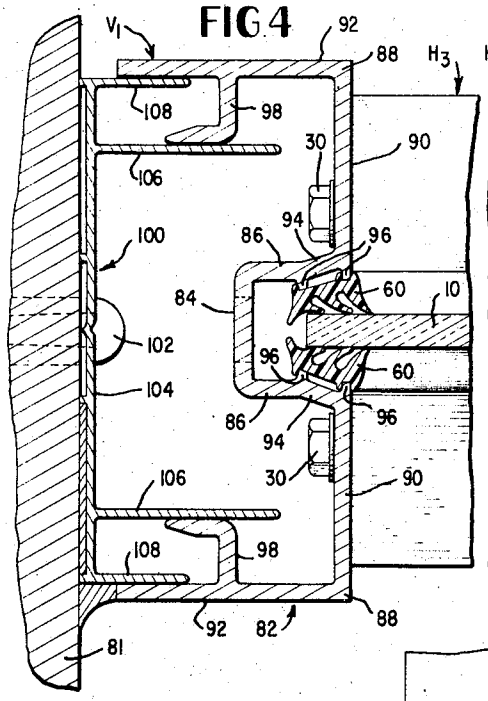


FIG. 5

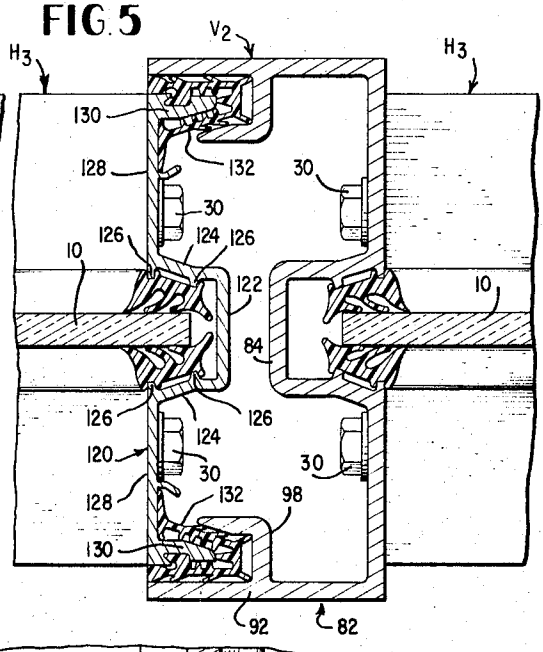


FIG. 7

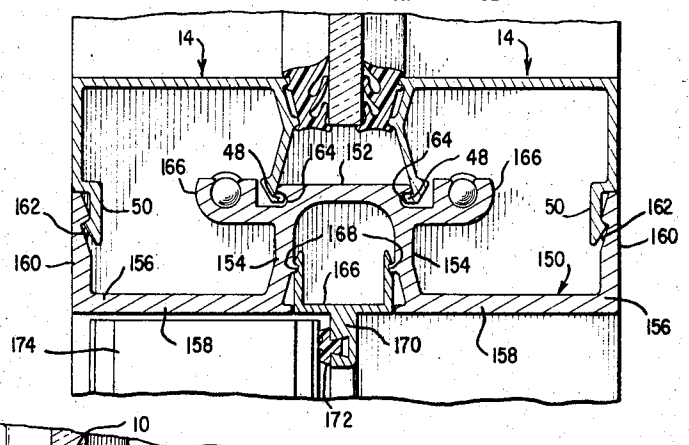
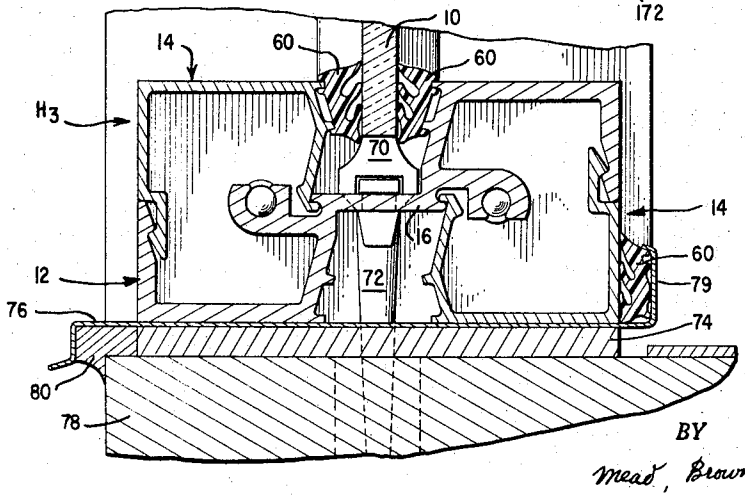


FIG. 6



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TWO-PIECE FRAME ASSEMBLY WITH EXPANSION JOINT

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Continuation of application Ser. No. 202,589, June 14, 1962. This application Feb. 2, 1966, Ser. No. 536,485
1 Claim. (Cl. 52—573)

This is in continuation of my co-pending application Ser. No. 202,589, filed June 14, 1962, and now abandoned.

This invention relates to wall structures, and more particularly to wall structures of the type wherein sheet-like wall panel members are retained and supported by a system of horizontal and vertical division bars within which the peripheral edges of the panels are seated.

Wall structures of the type with which the present invention is concerned are primarily employed to construct non-load bearing wall sections where a large glass area is desired, the most familiar example being the so-called store front construction. In constructions of this type, a maximum glass area is desirable and hence the designer attempts to combine glass panels of maximum size with supporting division bars and mullions of minimum size. Although the wall structure is not a load bearing wall, the division bars and mullions, in addition to possessing sufficient strength to support the static weight of the relatively large glass panels, must also possess sufficient structural rigidity to resist the substantial wind loading applied to the relatively large glass area. Because of the relatively large sized glass panels conventionally employed, an additional problem arises by virtue of the difference in thermal expansion characteristics between the glass panels and the metallic frame members which retain and support them.

It is therefore an object of the present invention to provide a wall structure of the foregoing type wherein a number of different horizontal division bars and mullions adapted for specialized placement within the structure may be readily assembled from a relatively small number of standardized extruded modules.

Another object of the invention is to provide a wall structure of the foregoing type for firmly supporting relatively large area panel members by peripherally extending frame member assemblies which permit relative movement between the panels and frame members to accommodate for thermal expansion and contraction.

Other objects and features of the invention will become apparent by reference to the following specifications and to the drawings.

In the drawings:

FIG. 1 is a perspective view of an exemplary form of store front construction embodying the present invention;

FIG. 2 is a cross-sectional view taken on line 2—2 of FIG. 1 showing details of one form of horizontal frame member assembly;

FIG. 3 is a cross-sectional view taken on line 3—3 of FIG. 1 showing another form of horizontal frame member assembly or division bar;

FIG. 4 is a detailed cross-sectional view taken on line 4—4 of FIG. 1 showing one form of vertical frame member assembly or mullion embodying the invention;

FIG. 5 is a detailed cross-sectional view taken on line 5—5 of FIG. 1 showing another form of vertical frame member assembly or mullion;

FIG. 6 is a detailed cross-sectional view taken on line 6—6 of FIG. 1 showing still another form of horizontal frame member assembly; and

FIG. 7 is a detailed cross-sectional view taken on line 7—7 of FIG. 1 showing a horizontal frame member assembly forming a transom member of a door frame.

In FIG. 1, a typical wall structure embodying the present invention is disclosed in the form of a store front in which the wall structure is constituted by a plurality of glass panels such as **10** which are retained and supported by horizontal and vertical frame member assemblies, such as H_1, H_2, H_3, V_1 and V_2, which receive the peripheral edges of the glass panels in a manner described in more detail below. The frame member assemblies are, in the usual case, constructed from two or more elongate extruded metal members and, when assembled, are substantially identical in outward appearance. However, as is apparent from the drawings, the various members differ in their cross-sectional configuration and will be described individually.

Referring first to FIG. 2, a horizontal frame member assembly H_1, which forms the top frame member assembly of the wall structure, is shown as being made up of a first frame member designated generally **12**, and a pair of like second frame members designated generally **14**. Frame members **12** and **14** are aluminum extrusions and hence are of uniform transverse cross-section throughout their entire length.

Frame member **12** includes a generally planar horizontal central web **16** from which inclined intermediate web members **18** extend as shown in FIG. 2. Because intermediate webs **18** are identical in shape, a common reference numeral has been applied to both intermediate webs, the two intermediate webs **18** differing solely in that one is inclined upwardly from the horizontal general plane of central web **16**, while the other intermediate web **18** is inclined downwardly.

Frame member **12** further includes a right angled section **20** made up of a face portion **22** integral with the lower edge of the left-hand intermediate web **18** in FIG. 2, and a side portion **24** integral with the longitudinal edge of face portion **22** at its edge remote from the associated intermediate web **18**. Face portion **22** of right angled section **20** lies in a general plane parallel to the horizontal general plane of central web **16**, while side portion **24** lies in a vertical plane which projects from face portion **22** in a direction toward the general plane of central web **16**. Another right angled section **20**, differing only in orientation, is integral with the upper or right-hand intermediate web **18** of FIG. 2.

Adjacent the juncture of each intermediate web **18** and central web **16**, oppositely facing outwardly projecting ribs **26** are formed as an integral part of first frame member **12**. Each rib **26** is formed with a substantially circular recess **28** which extends the entire length of the rib and is adapted to receive the threaded portion of a screw **30** by means of which first frame member **12** may be fixedly secured in position to an abutting vertical frame member assembly such as V_1 or V_2. Adjacent their respective inner ends, ribs **26** are formed with a recess **32** which undercuts central web **16** as at **34**. Recess **32**, **34** and a notch **36** in the adjacent side portion **24** of right angled section **20** enable a second frame member **14** to be attached to first frame member **12** in a manner described more fully below.

Each of second frame members **14** is identical and hence a description of one is equally applicable to the other, the frame members **14** in FIG. 2 differing solely in their orientation. Each frame member **14** is of channel shape and includes a planar channel web **40** and a generally planar channel side member **42** integrally joined to one longitudinal edge of web **40** and perpendicular to the general plane of web **40**. At the opposite longitudinal edge of web **40**, an angled channel side member **44** projects from web **40** in the same general direction as does side **42**, side **44** having a portion **46** which is inclined outwardly from web **40** as shown in FIG. 2. A toe **48** at the distal edge of side **44** is engageable within the under-

cut recess 34, while a hooked projection 50 on side 42 is engageable within notch 36 in right angle portion 24 of the first frame relationship with the first frame member. Second frame member 14 is of generally U-shaped cross-section and sides 42 and 44 possess sufficient resiliency to enable the channel shaped second frame member 14 to be snapped into assembled relationship with frame member 12 by hooking toe 48 in undercut recess 34 and then swinging side 42 toward right angle portion 24 to seat hook shape projection 50 in notch 36. To assist movement of frame member 14 into its assembled position, hooked shape projection 50 is beveled as at 52, while right angle portion 24 of first frame member 12 is likewise beveled as at 54.

As seen in FIG. 2, when the two frame members 14 are assembled on the first frame member 12, the resultant transverse cross-sectional configuration of assembly H_1 is in the form of a rectangle having a recess formed in each of the opposed longer sides of the rectangle. Central web 16 defines the inner wall of both recesses and, in the FIG. 2 embodiment, the opposite side walls of the recess are respectively defined by an intermediate web 18 and the opposed side 44 of a second frame member 14.

Portion 46 of side 44 is formed with a pair of projections 56 which are similar to a pair of projections 58 on each of the intermediate webs 18. Projections 56 and 58 serve as supports for a pair of vinyl glazing strips 60 which, in turn, engage and support glass panel 10 within the lowermost recess of the FIG. 2 embodiment. Frame assembly H_1 is secured to the fixed frame of a building by a series of screws, such as 61, which pass upwardly through central web 16 into a building frame member partially indicated as at 62. A mounting plate 64 is disposed between building frame 62 and the upper surface of the assembled frame assembly, and caulking 66 is employed to seal the joints.

Insofar as the embodiments of horizontal frame member assemblies H_2 and H_3 shown in FIGS. 3 and 6 are concerned, the basic frame assembly structure is identical with that of FIG. 2. The embodiments of FIGS. 2, 3 and 6 differ only in their location relative to the wall panel or panels which are retained and supported by the respective assemblies. As described above the assembly H_1 of FIG. 2 is employed to retain the upper edge of a panel 10 relative to an overlying horizontal building frame member such as 62. The assembly H_2 of FIG. 3, a division bar assembly, is employed to extend between and to support with respect to each other the upper edge of one panel 10 to the lower edge of a second panel 10.

Thus, in the FIG. 3 arrangement, both the upper and lower recesses of frame member assembly H_2 are employed to receive and retain the horizontal peripheral ege of a glass panel 10. The panel 10 retained in the uppermost recess is supported upon a plurality of spaced support blocks 70 which, in turn, rest upon the upper surface of central web 16. Vinyl glazing strips 60 are employed in the upper as well as the lower recess of frame member assembly H_2.

The FIG. 6 embodiment shows a frame assembly H_3 employed as a lower sill wherein the lower edge of a glass panel 10 is supported in the upper recess of the frame assembly, support block 70 and glazing strips 60 being employed as in assembly H_2. Bolts 72 pass downwardly through central web 16 to secure first frame member 12 in position on a sill plate 74. A moisture guard 76 is located between sill plate 74 and the lower surface of the frame assembly, the outer or exterior side of guard 76 overhanging the front of base 78 to form a recess which is filled with sealing compound as at 80. The rear or interior side 79 of guard 76 is projected outwardly beyond the frame member assembly to provide a pocket for receiving a glazing strip 60 which acts as a moisture seal.

In the three embodiments of horizontal frame member assemblies described above, the first or primary frame member 12 is formed in a manner such that the right angled sections 20 define two diagonally opposed corners of the over-all rectangular cross-sectional configuration. The two remaining corners are in turn defined by the generally U-shaped channels or second frame members 14, the cooperative relationship between the respective frame members being such that the frame member assembly is formed with two recesses, each of which is adapted to receive a panel member which is supported within the recess by glazing strips 60 and, where necessary, support blocks 70. As is apparent from a comparison of FIGS. 2, 3 and 6, either or both of the recesses may be employed to receive, retain and support the horizontal edge portion of a glass panel. Vinyl strips 60 not only provide a moisture tight seal, but also permit cushioned movement of the panel relative the frame member assemblies, e.g., toward or away from the assemblies.

Referring now to FIGS. 4 and 5, two forms of vertical frame member assemblies or mullions V_1 and V_2 are disclosed.

The FIG. 4 embodiment is employed to retain and support one vertical edge of a glass panel 10 adjacent a vertical building frame member such as 81. The mullion V_1 of FIG. 4 includes a first frame member 82 which is formed with a central web 84 having integral intermediate webs 86 projecting transversely from each longitudinal side edge. Right angled web sections 88 extend outwardly from the outer longitudinal edges of the respective intermediate webs 86, each web section 88 including a generally planar face portion 90 integral at one edge with the associated intermediate web and integral at its opposite edge with a side portion 92 lying in a general plane perpendicular to the general plane of face portion 90. In mullion V_1, central web 84 defines the inner wall of a wall panel receiving recess while intermediate webs 86 define the opposed side walls of the recess. The outer end portions of intermediate webs 86 are outwardly divergent from each other as at 94 and are formed with projections 96 which are employed to seat a vinyl glazing strip 60, identical with the glazing strip 60 employed in the previously described embodiments, to receive the vertical peripheral edge portion of a glass panel 10.

A right angled flange 98 is integrally formed on the inner side of each side portion 92 to form a means for mounting first frame member 82 on a one piece second frame member 100 which is secured to the vertical building frame 81 as by bolts 102. Second frame member 100 includes a generally planar main web 104 having spaced parallel inner and outer mounting flanges 106 and 108 projecting perpendicularly from the general plane of main web 104 at each longitudinal edge. Inner mounting flanges 106 are substantially longer than outer flanges 108, and the respective flanges 106 and 108 are spaced from each other as shown in FIG. 4 to slidably receive the side portions 92 and right angle flanges 98 of first frame member 82. This interengagement between first frame member 82 and second frame member 100 locks the two frame members against movement relative to each other in a direction parallel to the general plane of main web 104, but permits relative movement between the two frame members in a direction parallel to the planes of flanges 106 and 108.

Referring now to FIG. 5, a frame member assembly V_2 for retaining and supporting adjacent vertical edge portions of adjacent panels 10 is disclosed. The mullion V_2 of FIG. 5 is constructed from a first frame member 82 which is identical with the frame member 82 of FIG. 4 and hence a description of member 82 of FIG. 5 will not be repeated.

The second frame member 120 of mullion V_2 is a one piece member which includes a central web 122 integral along each longitudinal edge with an intermediate web 124, central web 122 and intermediate webs 124 defining the inner opposed side walls of a panel receiving recess. The depth of the recess in second frame member 120 is somewhat less than the depth of the corresponding recess

in the associated first frame member **82**, but the outer portions of intermediate webs **124** are divergently inclined and formed with glazing strip retaining projections **126** in the same fashion as intermediate webs **86** of frame members **82**. The reduction in depth of the recess in second frame member **120** provides a space between central web **122** of frame member **120** and the opposed central web **84** of the first frame member **82**.

Projecting from the outer longitudinal edges of each intermediate web **124** are flat face portions **128** which lie in a common plane and are formed at their outer longitudinal edges with a retaining flange **130** formed to receive and retain a vinyl sealing strip **132**. Sealing strips **132** are in turn formed to be received within the recess defined by side portion **92** of the associated first frame member **82** and the right angled flange **98** which projects therefrom.

In the assembled wall structure, the various horizontal frame member assemblies H_1, H_2 and H_3 are secured to the vertical frame member assemblies or mullions V_1 and V_2 by bolts such as **30** which pass through the opposed webs or web portions of the mullions and are threaded into the recessed ribs **26** of the horizontal division bars as best seen in FIGS. 2, 3 and 6. Thus, in an assembled wall structure, the first frame member **82** of mullion V_1 of FIG. 4 would be fixedly coupled through a horizontal frame member such as H_3 to the second frame member **120** of an adjacent mullion V_2. Because the thermal expansion characteristics of a glass panel **10**, whose opposite vertical edge portions are supported by member **82** of mullion V_2 and member **120** of the adjacent mullion V_2, differ from the thermal expansion characteristics of the aluminum horizontal frame members H_2 and H_3, the panel and frame members will move relative to each other depending upon the temperature conditions. This movement is accommodated by sealing strips **132** and also by glazing strips **60**. Movement of the frame members relative to the glass panels is permitted primarily by glazing strips **60**, while the expansion of horizontal members, as between two fixed vertical building frame members, such as **81**, is taken up at each intermediate mullion of the type of FIG. 5 by the resiliency of sealing strips **132** in a direction parallel to the longitudinal extent of the horizontal members.

In FIG. 7, still another form of horizontal frame member assembly is disclosed, the FIG. 7 embodiment being employed as a transom bar to define the upper horizontal edge of a door frame. In the embodiment of FIG. 7, a first frame member **150** is formed with a central web **152** and intermediate webs **154**, the arrangement of central and intermediate webs in the FIG. 7 embodiment being similar to that employed in frame member **82** of the embodiment of FIGS. 4 and 5. Right angled sections **156** project outwardly from the lower edges of the intermediate webs **154**, each section **156** includes a face portion **158** lying in a plane parallel to the general plane of central web **152** and an integral side portion **160** which projects normally from the outer longitudinal edge of first portion **158** towards the general plane of central web **152**. Side portions **160** are similar to side portions **24** of the embodiments of FIGS. 2, 3 and 6, and are formed with retaining notches **162** which are adapted to receive and retain the hook-like projections **50** of a second frame member **14** identical in construction to the second frame members **14** of the embodiments of FIGS. 2, 3 and 6. Undercut recesses **164** are formed at each longitudinal edge of central web **152** to receive and retain the toe portions **48** of second frame members **14**. As in the case of the embodiment of FIG. 2, outwardly projecting recessed ribs **166** are integrally formed on the opposite sides of central web **152**.

The primary difference between the embodiments of FIGS. 2 and 7 is that in the FIG. 2 embodiment, the right angled sections **20** form diagonally opposed corners of the over-all rectangular cross-section of the frame member assembly, whereas in the FIG. 7 embodiment, the analogous right angled web sections **156** form adjacent corners at opposite ends of the side within which the recess defined by central web **152** and intermediate webs **154** is present. The recess formed by webs **152** and **154** is, as is apparent from a comparison of FIGS. 2, 4 and 7, adapted to receive a glass panel and glazing strip **60** assembly. However, in the FIG. 7 embodiment, the recess is actually employed to receive a channel-like weatherstrip supporting member **166** which is clipped to the inner glazing strip mounting projections **168** on the inner walls of intermediate webs **154**. A downwardly projecting flange **170** on member **166** supports a weatherstrip sealing element **172** below the lower surface of the frame member assembly for engagement with the upper edge of a door **174**.

From the foregoing description, it is seen that several variant forms of horizontal and vertical frame member assemblies may be readily fabricated from a relatively few number of standard frame assembly components or modules. All of the frame member components are in the form of extruded members which permits the convenient assembly of a panel containing wall structure at the building site by merely cutting standard lengths of the various extrusions to the desired lengths.

Relative movement between the glass panels and metallic frame members occasioned by thermal expansion and contraction is readily accommodated by the vinyl glazing strips which maintain a moisture tight seal around the panel edge portions at all times. The space between the opposed central webs **122** and **84** of the intermediate mullion V_2 is sufficient to allow the addition of a steel reinforcing member having an offset central section adapted to pass between the two central webs and end portions which may be bolted at spaced intervals to the right-hand sides of right angle flanges **98** as viewed in FIG. 5.

While certain specific embodiments of the invention have been described in detail above, it will be apparent to those skilled in the art that the disclosed embodiments may be modified. Therefore, the foregoing description is to be considered exemplary rather than limiting and the scope of the invention is that defined in the following claim.

I claim:

For use in a wall structure having a wall panel member retained and supported by frame members extending along the peripheral edge portions of said panel member; an elongated hollow frame member assembly having a uniform transverse cross-sectional shape in the form of a rectangle wherein two opposite and parallel walls of the rectangle have smooth, unbroken external surfaces and at least one of the other rectangle walls has an externally exposed recess therein adapted to receive a peripheral edge portion of a panel supported by said assembly, said frame assembly comprising a first elongated frame member having a longitudinally extending generally planar central web defining the inner wall of the aforementioned recess, a pair of like intermediate webs integral with and projecting transversely from the opposite longitudinal edges of said central web to define the opposite side walls of said recess, a pair of like right-angled sections each having a face portion integrally joined along one longitudinal edge to one of said intermediate webs, the respective face portions of said right-angled sections lying in a common general plane parallel to the general plane of said central web, a side portion of each right-angled section projecting perpendicularly from the longitudinal edge of its associated face portion remote from the intermediate web and in a direction toward the general plane of said central web, each of said side portions having a smooth unbroken external surface constituting the external surface of one of said opposite and parallel walls of said rectangle throughout the entire extent of such wall and

said right-angled sections defining the two adjacent corners of the rectangular transverse cross sectional shape of said frame assembly at the respective ends of one wall of the rectangle, a substantially right-angled flange integrally formed on the surface of each of said side portions which is opposite the smooth unbroken external surface thereof, each respective side portion and the flange formed thereon forming a generally rectangular trough having an open side facing in the direction away from said one wall, one piece detachable second frame member means mounted on said first frame member and cooperating with said side portions to complete the rectangular transverse cross sectional shape of said frame assembly, said second frame member defining the wall of said rectangular transverse cross sectional shape opposite to said one wall, and mounting means on said second frame member including a pair of flanges, there being a flange integrally formed on each longitudinal side edge of said second frame member, said flange projecting into the trough positioned opposite thereto and

including means for retaining a resilient glazing strip in position to engage the interior of said trough to detachably mount said one piece second frame member upon said first frame member and permit movement of said second frame member relative to said first frame member in a direction parallel to the respective side portions of said first frame member right-angled sections.

References Cited

UNITED STATES PATENTS

1,883,871	10/1932	Bohnsack	52—495
2,706,541	4/1955	Crown	52—721
3,016,993	1/1962	Owen	52—397
3,023,859	3/1962	Muessel	52—720
3,037,591	6/1962	Pulling et al.	52—397
3,147,518	9/1964	Horgan	52—397 X

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