United States Patent

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[54] **FRAME STRUCTURE FOR GLASS OR SOLID PANEL WALLS**
8 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** **52/397,** 52/235, 52/476, 52/732
[51] **Int. Cl.** **E04b 2/88**
[50] **Field of Search** ..... 52/397-—400, 498—501, 235, 731, 732, 476

[56] **References Cited**
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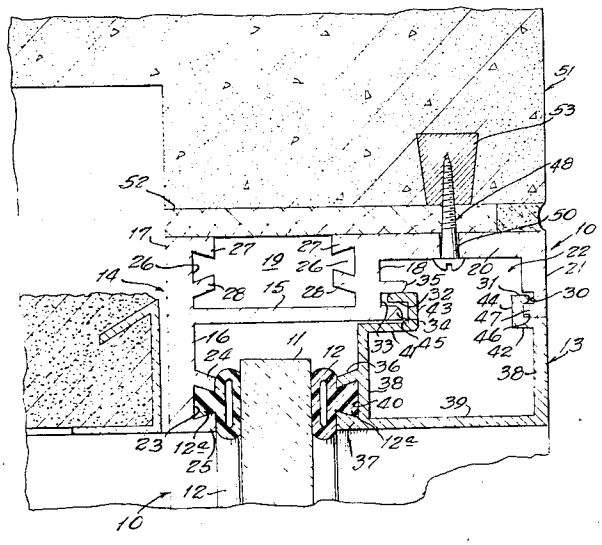
ABSTRACT: A frame structure for glass or solid wall panels providing for the arrangement of the glass or other type panels in a common plane an in such manner as to prevent lateral movement thereof due to vibrations caused by traffic movement, wind pressures, and other factors, minimizing the framing profile and the number of parts comprising the structure by providing a single frame element and panel retention means of unique design for fabricating all parts of a frame structure.



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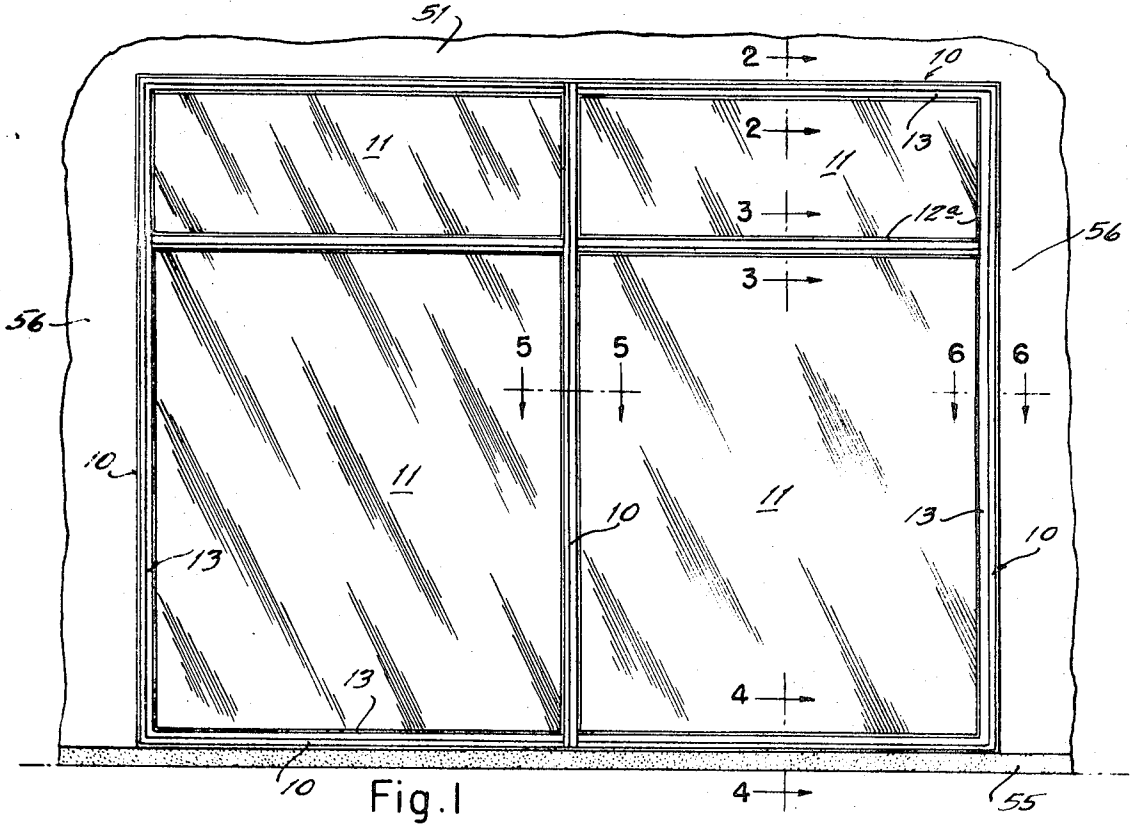

Fig.1

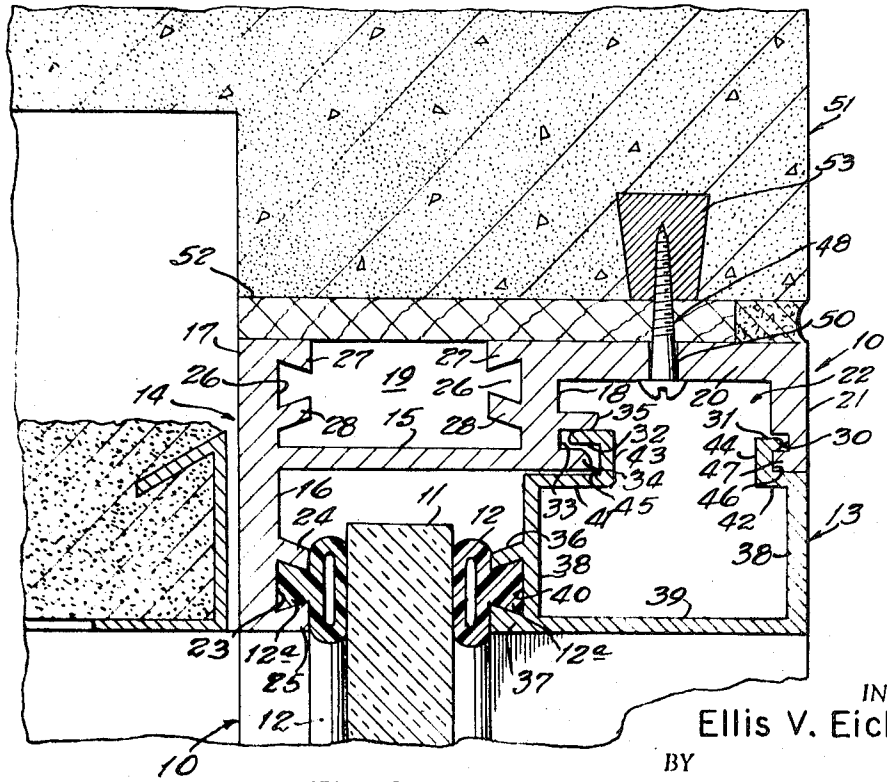

Fig.2

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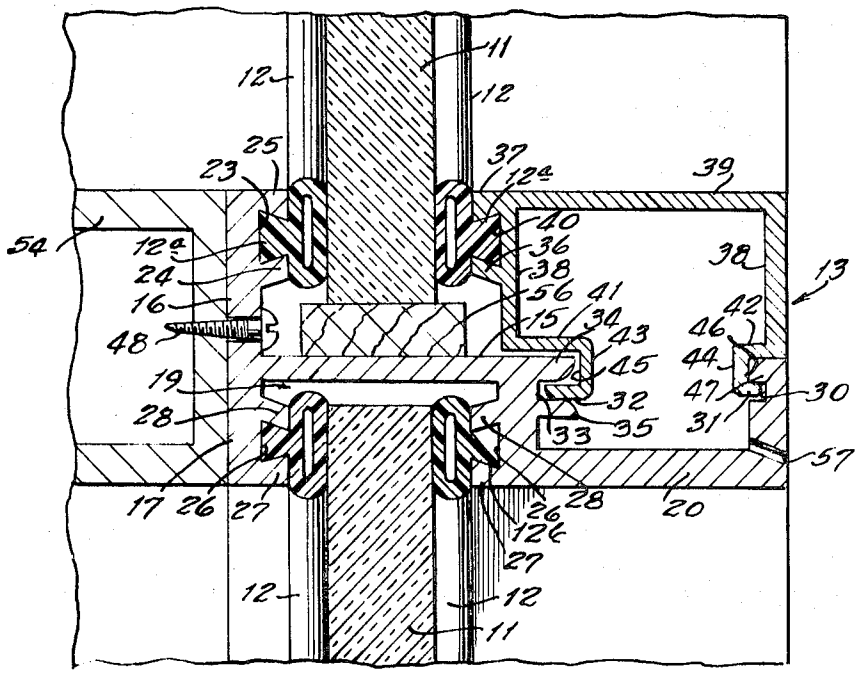

Fig. 3

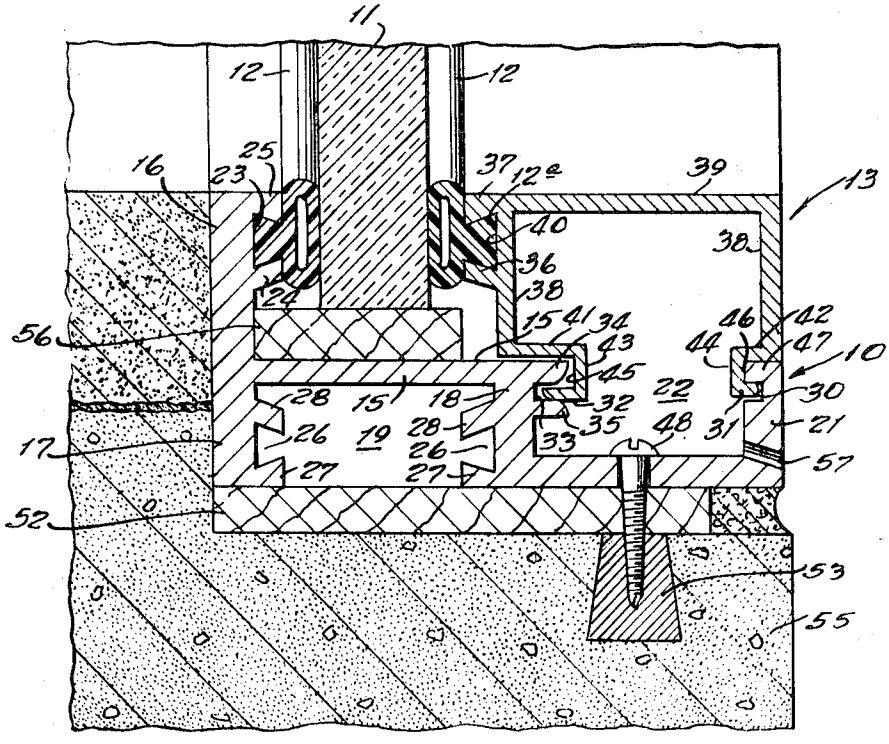

Fig. 4

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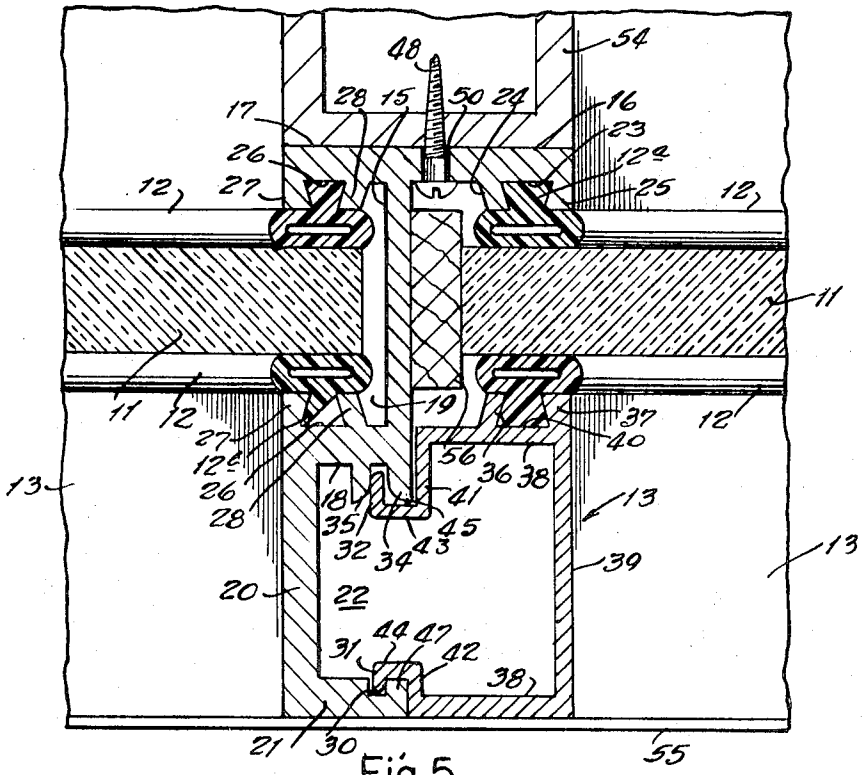

Fig.5

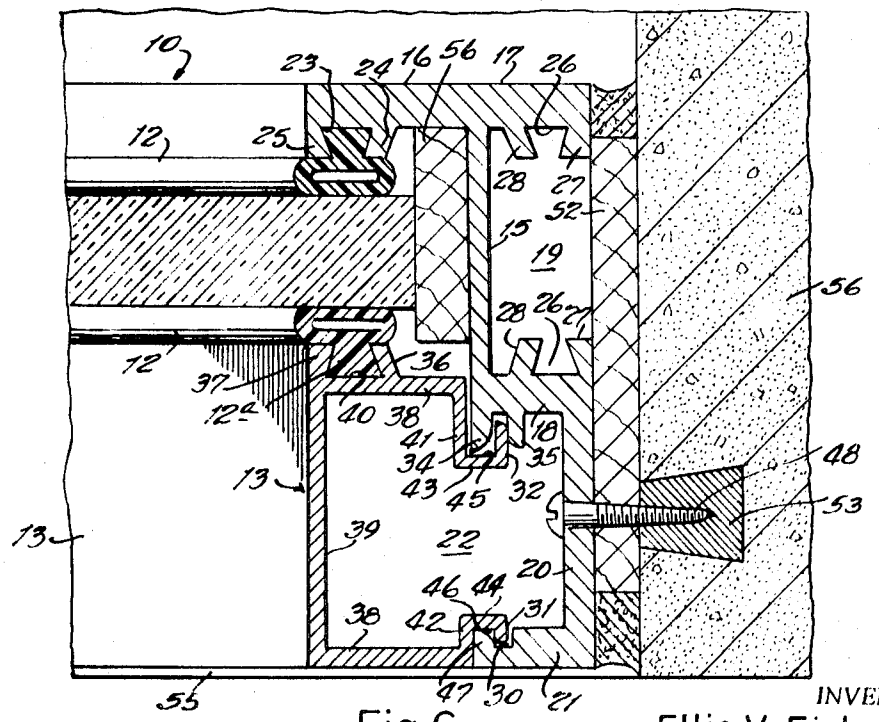

Fig.6

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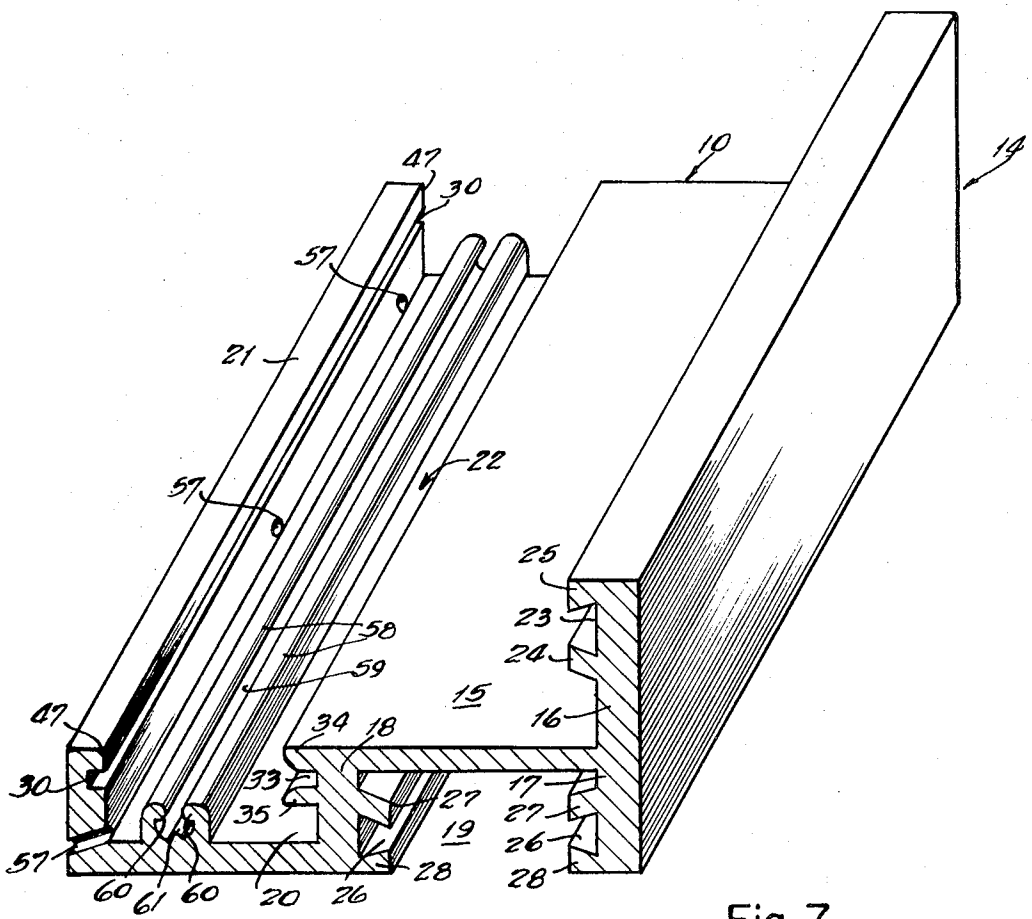

Fig. 7

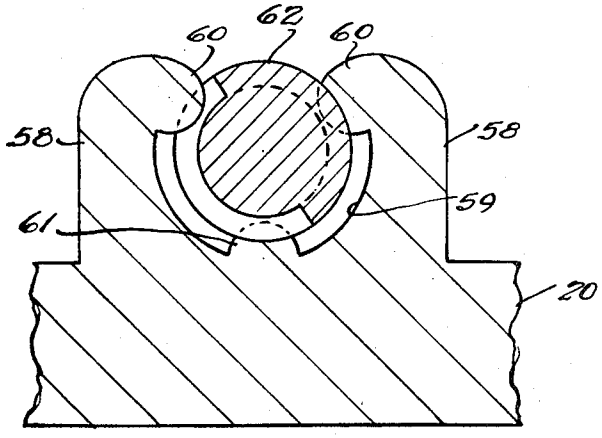

Fig. 8

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FRAME STRUCTURE FOR GLASS OR SOLID PANEL WALLS

BACKGROUND OF THE INVENTION

Architectural framing for glass and solid wall panels, such as used in the erection of building facades or curtain walls, has been employed for a number years in a variety of forms, the most common of which involves the use of aluminum extrusions of various cross-sectional configurations defining longitudinal channels, grooves, and other accommodations for receiving the marginal edges of glass or architectural panels, and sealing elements, and in the main such structures comprise framing members especially adapted for certain areas thereof, i.e., headers, mullions, sills, and the like, thus needlessly multiplying the number of parts required in the installation resulting in nonessential increased costs in material and consequential increased labor costs due to the necessity for the preparation and proper location of the several framing elements having different cross-sectional designs.

Such conventional wall structures are generally of such character that the frame profile presents a bulky appearance due to the variety of shapes of the retaining elements and the arrangement of the accommodations therefor.

The invention is designed to materially minimize the number of parts of different cross-sectional configurations required in such frame structures, providing an extrusion capable of embodiment therein at all marginal portions of the frame structure and a uniform retention element for mating therewith, each having corresponding grooves for receiving vinyl sealing strips.

SUMMARY

This invention relates to framing structures for glass and architectural wall panels in the erection of building facades and curtain walls, and has reference to subject matter described in my U.S. Pat. No. 3,403,491, dated Oct. 1, 1968.

A prime object of the invention resides in the provision of a frame structure for glazed or solid panel walls in which the panels can be adequately secured in place while substantially minimizing the lateral and depth dimensions of the frame members so as to present a profile which is aesthetically attractive and which can be produced and erected at a minimum of expense.

Another object of the invention is that of providing a glazed or paneled frame structure comprising a single extrusion, of aluminum or other suitable material, complemented by a tensile retention element for securing the panels in position in a common plane, and providing means for stabilizing the panels, particularly glazing panels, to prevent lateral movement thereof in the frame which could be caused by wind or by vibrations resulting from traffic movements, and the like.

Broadly, the invention seeks to provide a frame structure for glazed or solid panel walls which, by reason of its simplicity of design, can be quickly and easily installed and in which the panels can be set and secured with a minimum of effort, obviating the necessity for mechanical hoisting or handling equipment usually required in the installation of such panels, especially glass panels, in conventional frames for like purposes.

While the foregoing objects are paramount, other and lesser objects will become apparent as the description proceeds, when considered in connection with the appended drawings wherein:

FIG. 1 is an elevational view showing a typical frame installation embodying the invention.

FIG. 2 is an enlarged transverse sectional view, on line 2–2 of FIG. 1, showing the configurations of the primary extrusion embodying the invention, and the complementary retention device, a glass panel being fragmentarily shown.

FIG. 3 is another enlarged sectional view, on line 3–3 of FIG. 1, fragmentarily showing a pair of glass panels aligned in superposed relation in a horizontal divisional frame member, or header.

FIG. 4 is still another enlarged sectional view, on line 4–4 of FIG. 1, showing the embodiment of the invention in a sill portion of the frame, a glass panel being fragmentarily shown installed therein.

FIG. 5 is yet another enlarged sectional view, on line 5–5 of FIG. 1, showing the embodiment of the invention as a vertical divisional frame member, and fragmentarily showing a pair of horizontally aligned glass panels supported therein.

FIG. 6 is another enlarged sectional view, on line 6–6 of FIG. 1, showing the invention as applied to a vertical marginal frame member and fragmentarily showing a glass panel supported therein.

FIG. 7 is an enlarged fragmentary perspective view of the extrusion embodying the invention, and including an integral screw boss formed internally with a plurality of spaced contact ribs, and

FIG. 8 is a fragmentary transverse sectional view through the screw boss, shown in FIG. 7, showing the manner of threading a screw thereinto.

The invention primarily comprises an extruded bar 10 of aluminum, or other suitable materials, having a plurality of configurations in transverse section defining channels and grooves for receiving the marginal edges of plate glass panels 11, or conventional architectural panels, and sealing strips 12, as well as tensile retention devices 13 for the panels 11.

The obvious advantage in utilizing the extruded bar 10 is the ease with which an entire frame structure can be fabricated, each member thereof having a common cross-sectional configuration adapted to provide the necessary vertical and horizontal channels to receive the panels 11, the sealing strips 12 and the retaining element 13, in the manner shown in the several illustrations.

The bar 10 may be formed in any desired length to be cut to the required dimension, and by reason of its unique form can be embodied into a typical frame structure, such as shown in FIG. 1, in any vertical or horizontal arrangement and properly related to companion members of the assembly.

The cross-sectional form of the bar 10 is best illustrated in FIG. 7 and is defined by a facing or mounting portion 14 having a planar web 15 formed therewith and extending perpendicularly therefrom approximately intermediate the edges thereof, defining opposing flanges 16 and 17 on each side of the web 15, the latter having an integral right-angular body portion 18 extending therefrom parallel to and coextensive with the flange 17 of the portion 14 defining a channel 19 therebetween, a second web 20 being formed with the body portion 18 and extending therefrom in a plane parallel to that of the web 15, terminating in a right-angular wall 21 opposing the body portion 18 to define a second channel 22 approximating the depth of the first channel 19 and in opposing arrangement therewith.

The flange 16 of the portion 14, whose lateral dimension is slightly greater than the flange 17, is formed internally with a dovetail groove 23 which is formed between a pair of ribs 24 and 25 longitudinally of the flange 16, and near the outer edge thereof. Like grooves 26 are formed between the ribs 27 and 28 internally of each opposing wall of the channel 19, the grooves 23 and 26 providing means for retaining the sealing strips 12 on each surface of a panel 11 supported in the channels 19 and 22, in the manner shown in FIGS. 2 to 6, inclusive.

A groove 30 is formed in the internal surface of the outer wall 21 near its outer edge to receive one engaging flange 31 of the resilient retention member 13 for the panels 11, as shown in FIGS. 2 to 6, inclusive, while the opposing engaging flange 32 of the member 13 is received in a groove 33 formed longitudinally of the body portion 18 within the channel 22 between the contiguous extension 34 along the web 15 and a rib 35 spaced therefrom toward the web 20. The retention member 13 is substantially angular C-shaped in transverse section and may comprise an aluminum extrusion, or formed of other suitable materials, having the required tensility or resilience.

As shown in FIGS. 2 to 6, inclusive, the retention member 13 is formed with a pair of ribs 36 and 37 along one of its narrower walls 38, the rib 37 being coextensive with the outer wall 39, to form a dovetail groove 40 to receive a sealing strip 12 in opposing relation to a like strip in one of the dovetail grooves 23 and 26, as shown in FIGS. 2 to 6, inclusive. The engaging flanges 31 and 32 of the retention member 13 are formed with the narrower wall portions 41 and 42 thereof, opposite the outer wall 39 and which define the open side of the C-shaped structure, and spaced from the wall portions 41 and 42 by relatively narrow webs 43 and 44 forming opposing channels 45 and 46 which receive the contiguous extension 34 of the web 15 and the spline 47 which defines the outermost side of the groove 30 in the outer wall 21.

The principal elements of the invention, therefore, are the extruded bar 10 and the retention member 13 which may also be extruded. As indicated these members can be assembled in a variety of arrangements to support the panels along all marginal edges, as depicted in FIGS. 2, 4 and 6, and in planar alignment, as shown in FIGS. 3 and 5.

FIG. 2 is a transverse sectional view, on line 2–2 of FIG. 1, showing the member 10 installed horizontally as a header to support the top edges of the panels 11, one of which is fragmentarily shown in section, and in this position the panel 11 is installed between the flange 16 of the member 10 and the wall 38 of the retention element 13 in which the groove 40 is formed, sealing strips 12 having been arranged in the grooves 23 and 40 and which are preferably formed of vinyl plastic materials and tubular in transverse section, having an integral dovetail-shaped rib 12*a* formed longitudinally thereof to be conformably received in the dovetail grooves.

In the typical installation shown in FIG. 2 the member 10 is secured by screws 48, arranged through apertures 50 in the web 20, to the lintel portion 51 of the building structure, shown in fragmentary section in FIG. 2, and which may be of concrete or other form, a wooden pallet 52 being interposed between the member 10 and the lintel portion 51, if desired, and providing some type of screw retaining block 53 embedded in the concrete structure. In this installation (FIG. 2) the channel 19 is not utilized but faces the pallet 52.

FIG. 3 shows the members 10 and 13 as applied in a horizontal position for supporting vertically arranged panels 11, and is a sectional view on line 3–3 of FIG. 1. Such arrangement may be employed in an installation requiring a spandrel or upper narrower panel, or where a plurality of superposed panels are found desirable. Installed in this manner the member 10 is attached to a horizontal supporting element 54 by the screws 48 through the flange 16 so that the channel 19 is faced downwardly to receive the upper edges of the lower panels 11, the lower edges of the upper panels 11 being supported on the web 15 in the channel-shaped space defined between the flange 16 and the retention member 13, and between the sealing strips 12 in the grooves of the respective members.

FIG. 4, which is a fragmentary sectional view on line 4–4 of FIG. 1, shows a typical base installation in which the member 10 is attached horizontally to the sill portion 55 of the opening, the member 10 being secured thereto in a manner similar to that in which it is applied to the lintel portion 51, as indicated in FIG. 2, the panel 11 being supported on the web 15 and between the flange 16 and the retention member 13 and in the same manner as that of the panel 11 illustrated in FIG. 3.

In the arrangement shown in FIG. 5, which is a transverse sectional view through the mullion assembly, on line 5–5 of FIG. 1, the member 10 is attached by screws 48 through the flange 16 to a supporting element 54 so that the panels 11 are aligned in a common horizontal plane in the same manner as the panels 11 in FIG. 3 are aligned in a common vertical plane, the relationship of the members 10 and 13 being identical in both arrangements although in different planes.

FIG. 6 illustrates, in transverse section on line 6–6 of FIG. 1, a jamb or stile assembly wherein the member 10 is attached by screws 48 to a wall or column 56 defining one vertical side of the opening. The manner of attachment is similar to that shown in FIGS. 2 and 4, the panel 11 being supported between the flange 16 and the retention member 13, the sealing strip 12 being applied in the same manner.

The panels 11 can be installed with a minimum of effort in any of the marginal supports by first seating one marginal edge of the panel into the channel 19, formed between the body portion 18 and the flange 17 of the member 10, as illustrated in FIGS. 3 and 5, after the innermost sealing strips 12 are arranged in the grooves 23 and 26, and then moving the opposing marginal edges of the panel 11 against the strips 12 in the grooves 23 in the flange 16 and applying the resilient retention member 13 thereto after inserting the sealing strips 12 into the grooves 40 therein, as illustrated in FIGS. 3, 4, 5 and 6.

Since the sealing strips 12 applied to the exterior surface of the panels 11 should be inserted into their grooves 26 after the panels are positioned in the channel 19 their application can be expedited by modifying the strips 12 by chamfering one side of the longitudinal rib or spline 12*a* formed therewith and dovetail shaped in transverse section to conform to the dovetail shape of the grooves 23, 26 and 40, as indicated in FIGS. 3 and 5. The modified rib 12*b* can be easily inserted into its respective groove after the panel 11 is arranged in the channel 19.

One of the unique features of the invention is that of providing means for restraining the panels 11 from lateral movements in their frames occasioned by vibrations caused by wind, traffic movement, or other factors, and this is accomplished by edge blocking the panels 11, or installing strips or blocks 56 of wood, or other materials having some degree of resilience, along the vertical and supported edges of the panels, as shown in FIGS. 3, 4, 5 and 6. These elements can be positioned against the web 15 between the flange 16 and the retention member 13, as shown in FIGS. 3, 4, 5 and 6, and also in the channel 19 if desired.

Arranged in horizontal positions, the extruded member 10 may be provided with drain holes 57 spaced along the base of the wall 21, as shown in FIGS. 3, 4 and 7, to drain off water which may accumulate in the channel 22 due to precipitation or condensation.

FIGS. 7 and 8 show a modified form of the extruded bar 10 in which is provided a longitudinal screw boss formed with the web 20, shown fragmentarily in transverse section in FIG. 8, comprising a pair of spaced ribs 58 whose inner faces are arcuate, defining therebetween a substantially circular bore 59, the ribs 58 having longitudinal embossments 60 formed therewith and directed inwardly into the bore 59 which has a similar longitudinal boss 61 formed therein, the bosses 60 and 61 being equidistantly spaced to receive a self-threading screw 62, in the manner shown in FIG. 8, for joining the member 10 to suitable supporting devices.

The embossments 60 and 61 provide a plurality of contact points for the threads of the screw 62 whereby the latter can form its own threads with lesser friction and driving effort than would be encountered if the bore 59 should be formed with a smooth inner wall. The ribs 58 have some degree of yieldability so that the driven screw 61 will force them apart and exert some tension thereon to aid in preventing loosening of the screw 62 due to vibration or other factors.

The invention as shown and described may obviously be modified in structure and design without departing from the spirit and intent thereof.

I claim:

1. In a frame structure for glass or architectural wall panels, a unitary combination comprising an extrusion of indeterminate length and a resilient retention element for said panels, the said extrusion having a transverse sectional configuration defined by a facing portion in one plane having a web formed coextensively with and perpendicular to one surface thereof between its longitudinal edges, forming first and second opposing right-angular flanges on each side of said web, a right-angular body portion formed coextensively with said web near

its inner edge parallel to and spaced from said first flange defining a first channel for receiving a marginal edge of a panel, said first flange and said body portion each having a longitudinal groove in said first channel, a second web formed with and extending from said body portion beyond the inner margin of said first web, in a plane spaced from and parallel thereto, and terminating in a right-angular wall opposing said body portion defining a second channel opposing said first channel, the said body portion and said right-angular wall having longitudinal grooves internally thereof, and a resilient retention element having means thereon for engaging the grooves in said second channel, and in opposing relation to the said second flange, the said retention element and said second flange together defining a third channel for receiving the marginal edge of a panel.

2. In a frame structure as described in claim 1, the said resilient retention element having an angular C-shaped form in transverse section, and having a flange formed with each wall of its open side engageable with the grooves in said second channel.

3. The frame structure described in claim 1, the said second flange having a longitudinal groove formed in its inner face for a sealing strip.

4. In a frame structure as described in claim 3, the said resilient retention element having ribs formed along one of its walls defining a groove for a sealing strip opposing the groove in said second flange when said element is applied to said second channel.

5. The structure of claim 1, the said second web having a bore formed longitudinally thereof intermediate its marginal edges defined by a pair of ribs, each having arcuate inner faces and having its upper edge turned inwardly, the said bore being substantially semicircular in transverse section, and having a boss formed longitudinally thereof and spaced equidistantly from the inwardly turned upper edges of said ribs, the said bore providing a receptacle for a self-threading screw, the said upper edges of said ribs and said longitudinal boss together forming a plurality of contacts for the threads of a screw.

6. A framing element for glass and architectural wall panels, a metal extrusion of indeterminate length characterized by a cross-sectional configuration defining first and second oppositely arranged channels, each having an internal groove formed along each wall thereof, the grooves in said first channel being dovetailed shaped for receiving sealing strips for engaging the surfaces of a panel in place therein, a flange formed in planar alignment with the outer wall of said first channel and opposing said outer wall thereof, and having a dovetailed-shaped groove formed along its inner surface for a sealing strip, the said grooves in said second channel providing means for attaching a resilient retention element for a panel opposing said flange.

7. The structure of claim 6, the second channel having a pair of spaced ribs formed longitudinally thereof intermediate its opposing walls defining a substantially circular bore for receiving a self-threading screw in one of its ends, the said bore having a plurality of equidistantly spaced bosses formed internally and longitudinally thereof which together define thread contacts for said screw.

8. The structure of claim 7, the said ribs being yieldable and having arcuate inner faces forming the inner wall of said bore whereby the latter is expandable under the tension imparted thereto by a screw driven thereinto.