

[54] STRUCTURAL ASSEMBLIES

[76] Inventor: **Richard Lewis Stoakes**, "Clouds",
Northdown Rd., Woldingham,
Surrey, England

Primary Examiner—Henry C. Sutherland
Attorney, Agent, or Firm—Sandoe, Hopgood &
Calimafde, Nichol M. Sandoe

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[58] Field of Search **52/235, 573, 395, 665,
52/400, 397, 483; 287/189.36 A**

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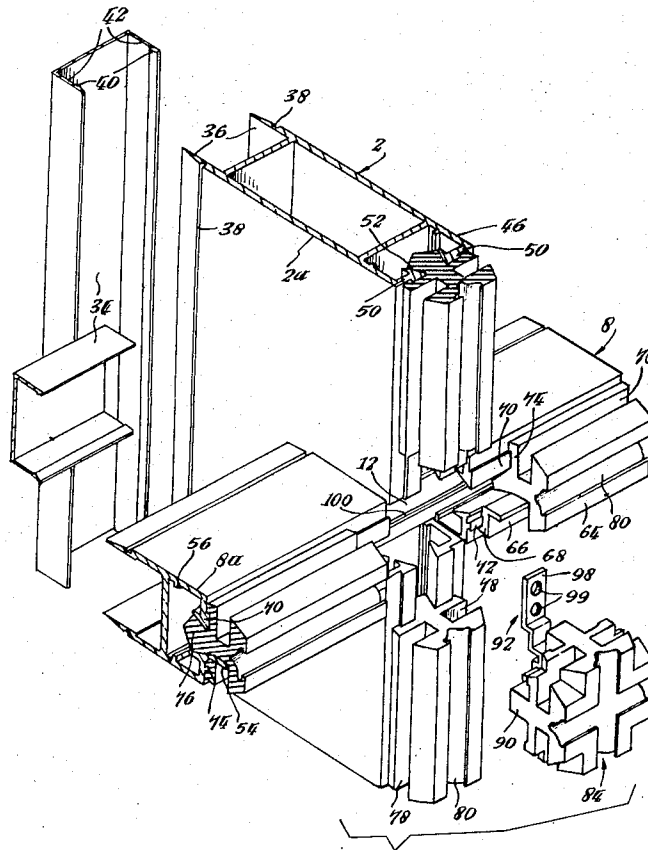
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[57] **ABSTRACT**

A structural assembly comprises a generally planar framework that carries sealing means projecting to one side of the plane of the framework, infill panels or glazing panes being inserted in the sealing means to form a weathertight face therewith. Some of the frame members, particularly those inside the boundaries of the framework, are interconnected by means allowing limited relative movement between the members. The sealing means include unitary sealing members at the junctions of the frame members, sealing strips being held in compression between opposed unitary members to maintain a seal at the abutting interfaces of the sealing members and the sealing strips.

22 Claims, 10 Drawing Figures



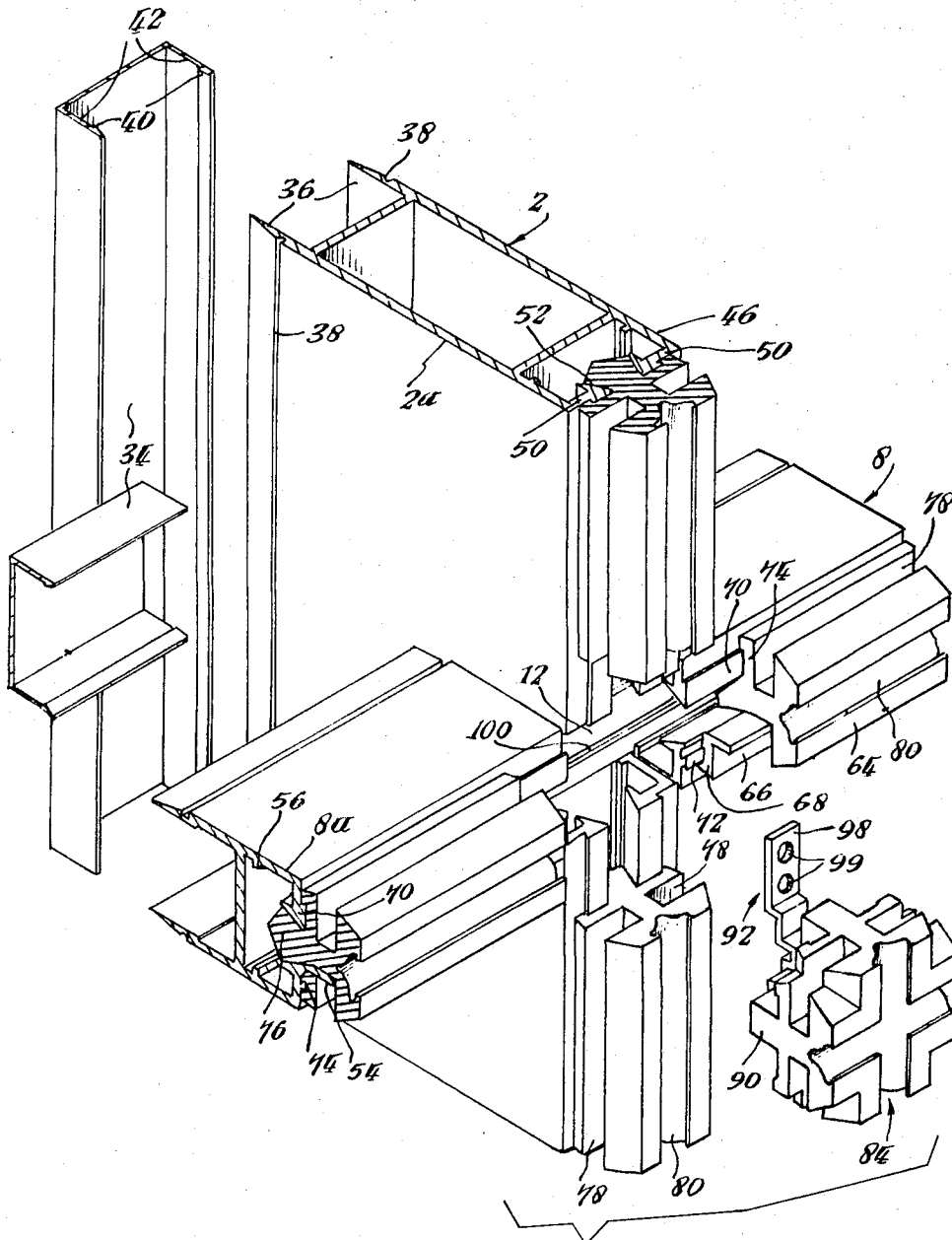


Fig. 1.

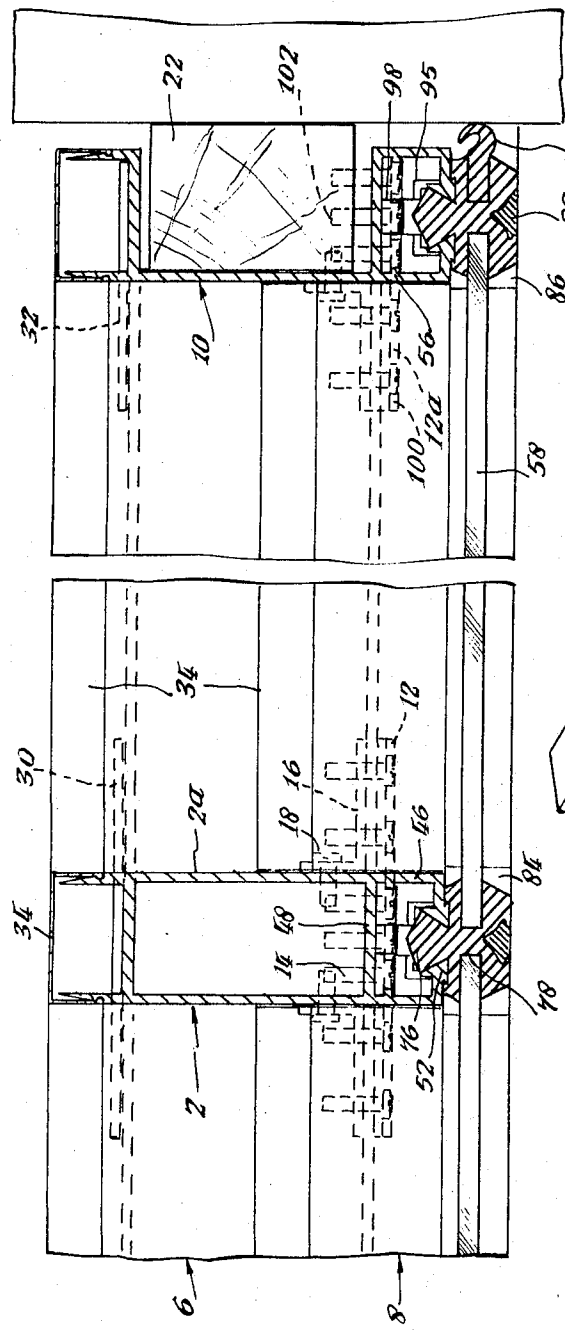


Fig. 2.

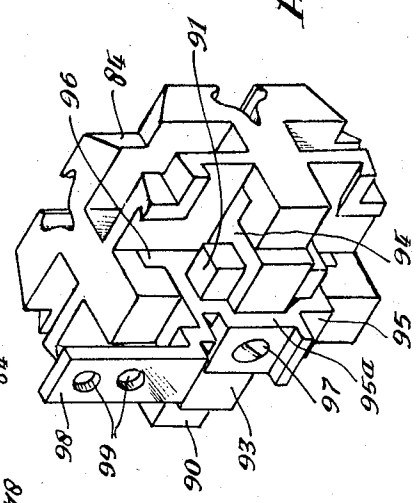
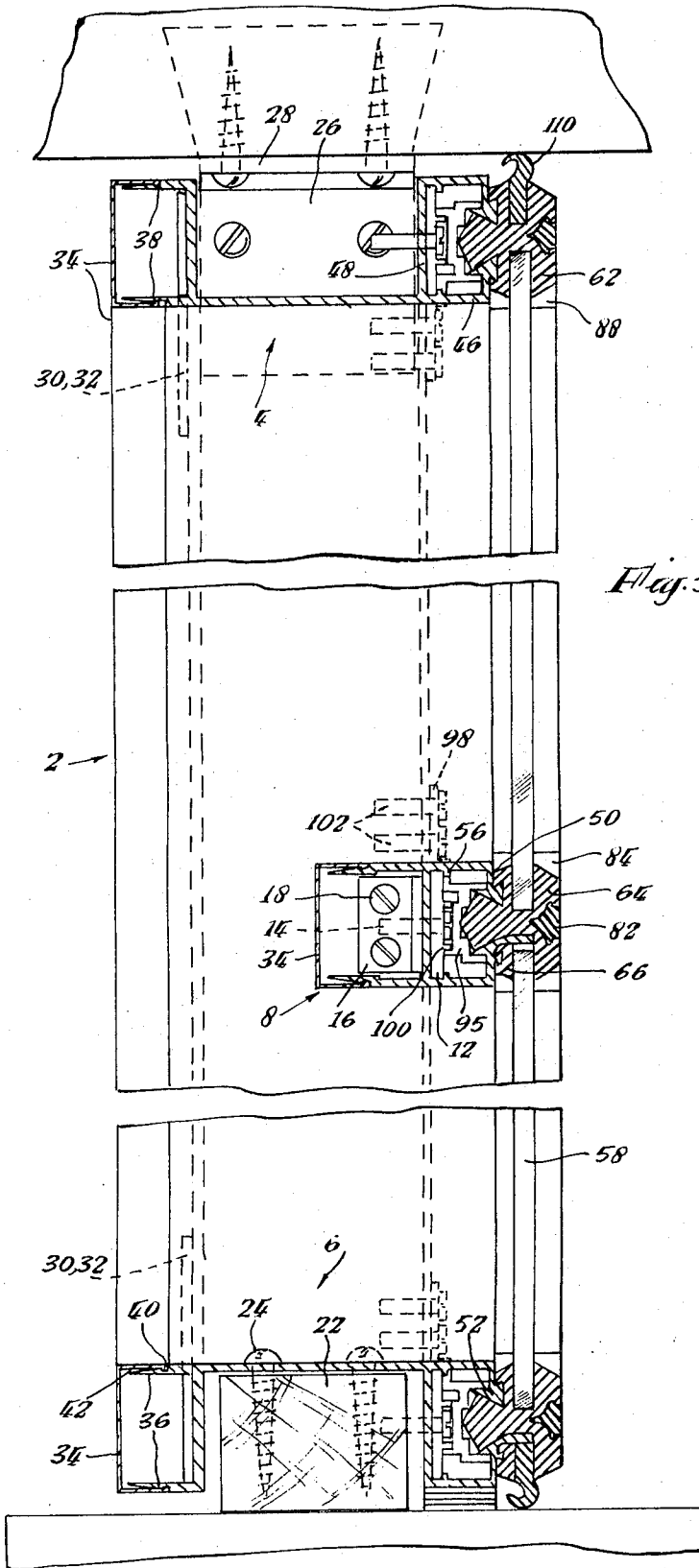


Fig. 4.



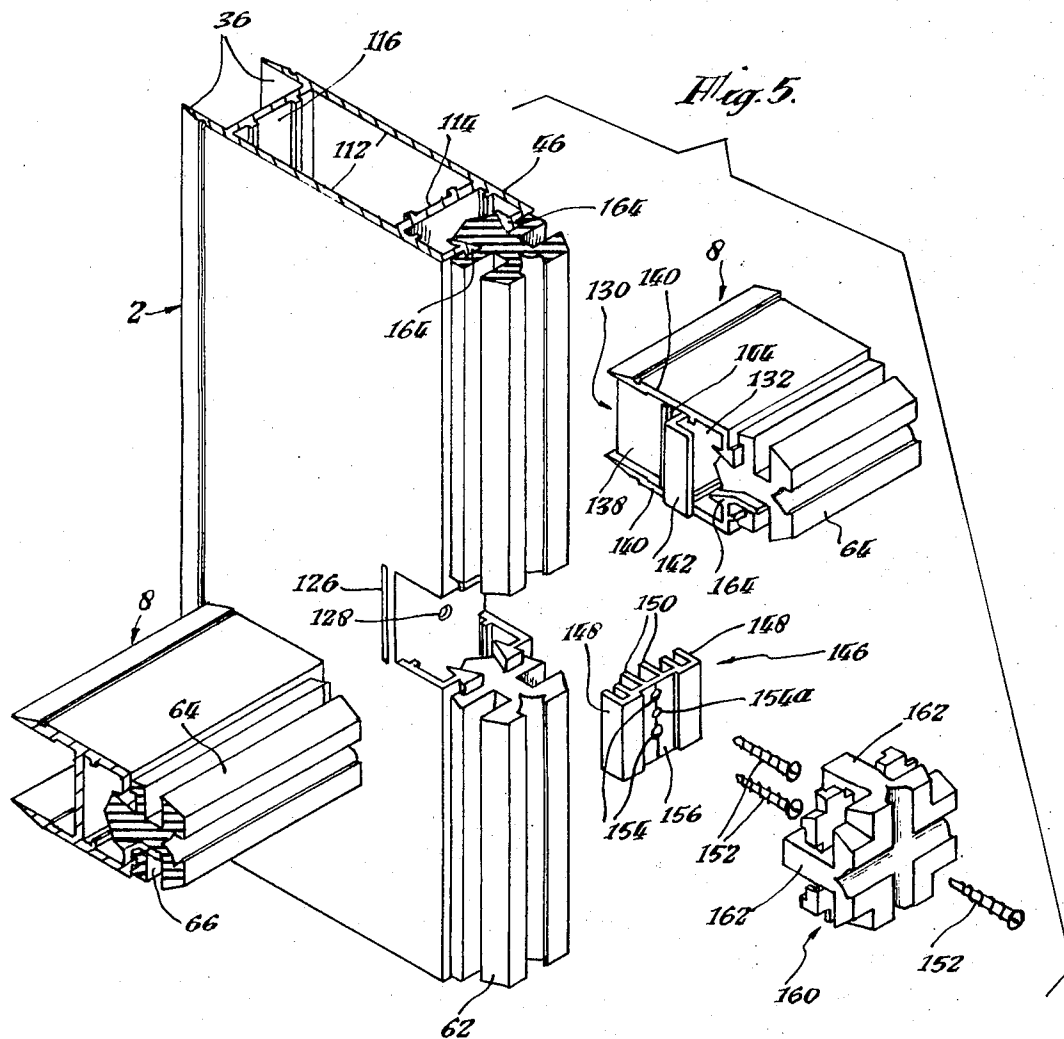
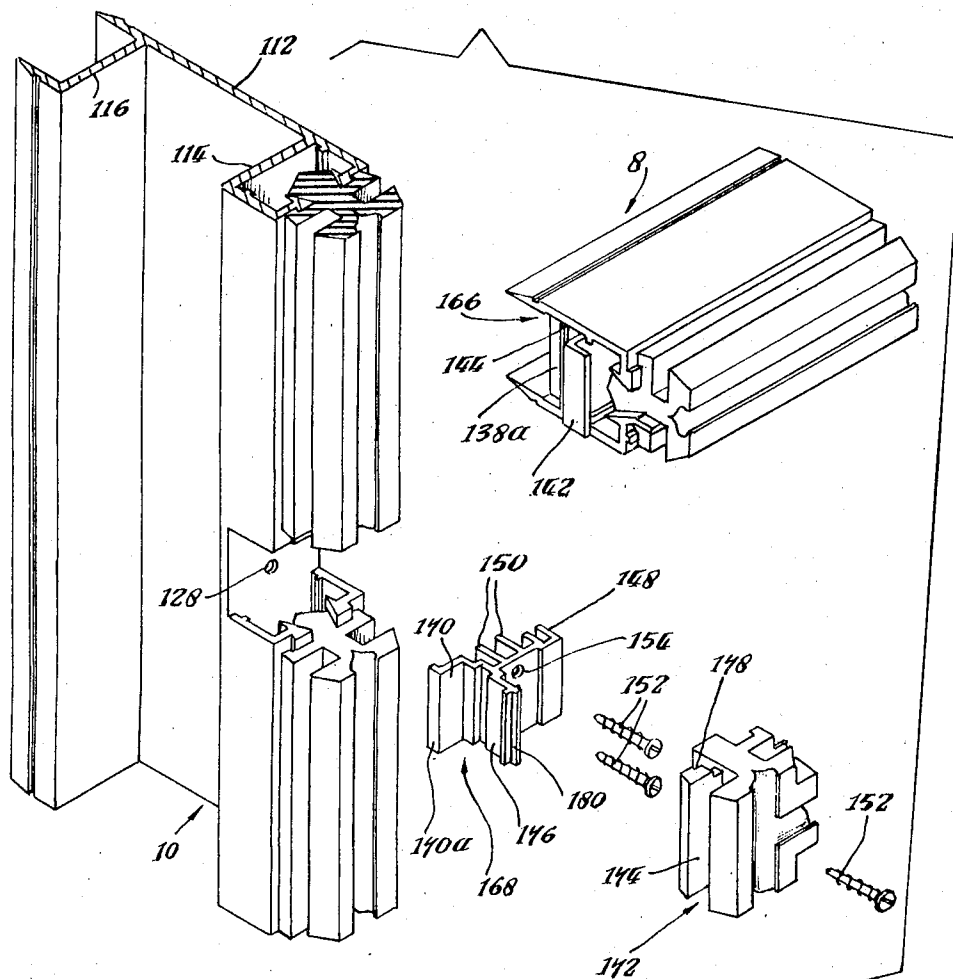
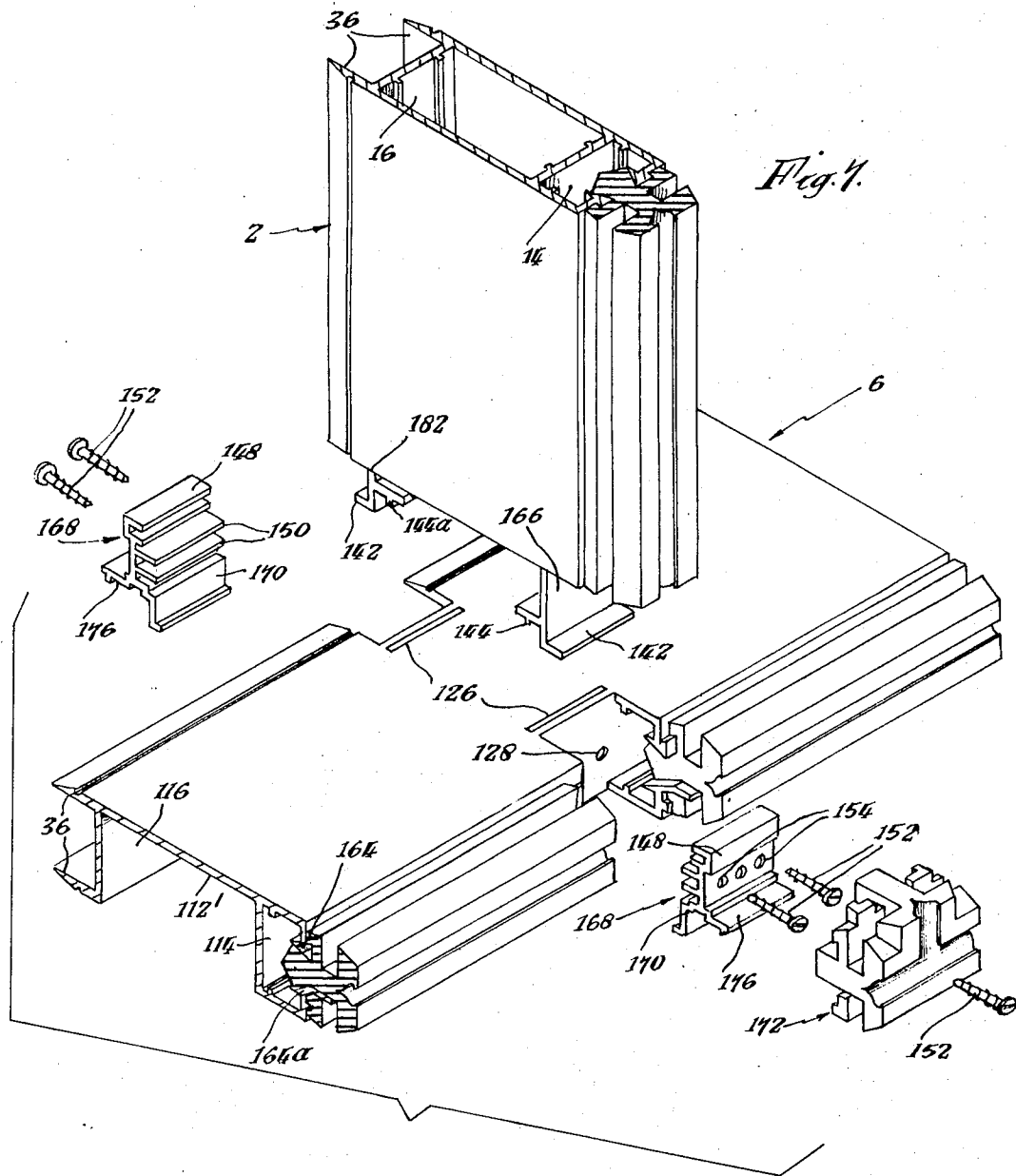
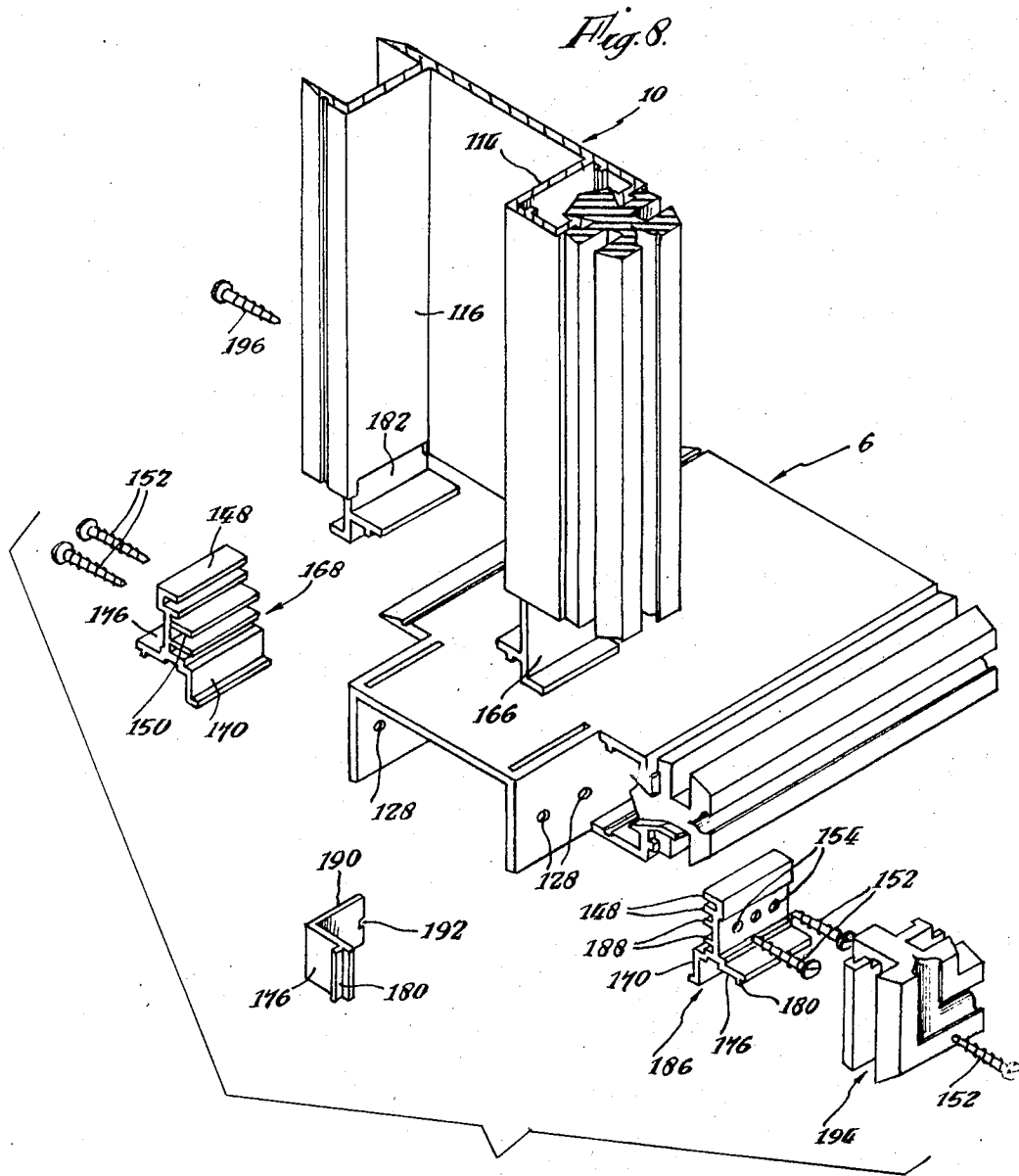
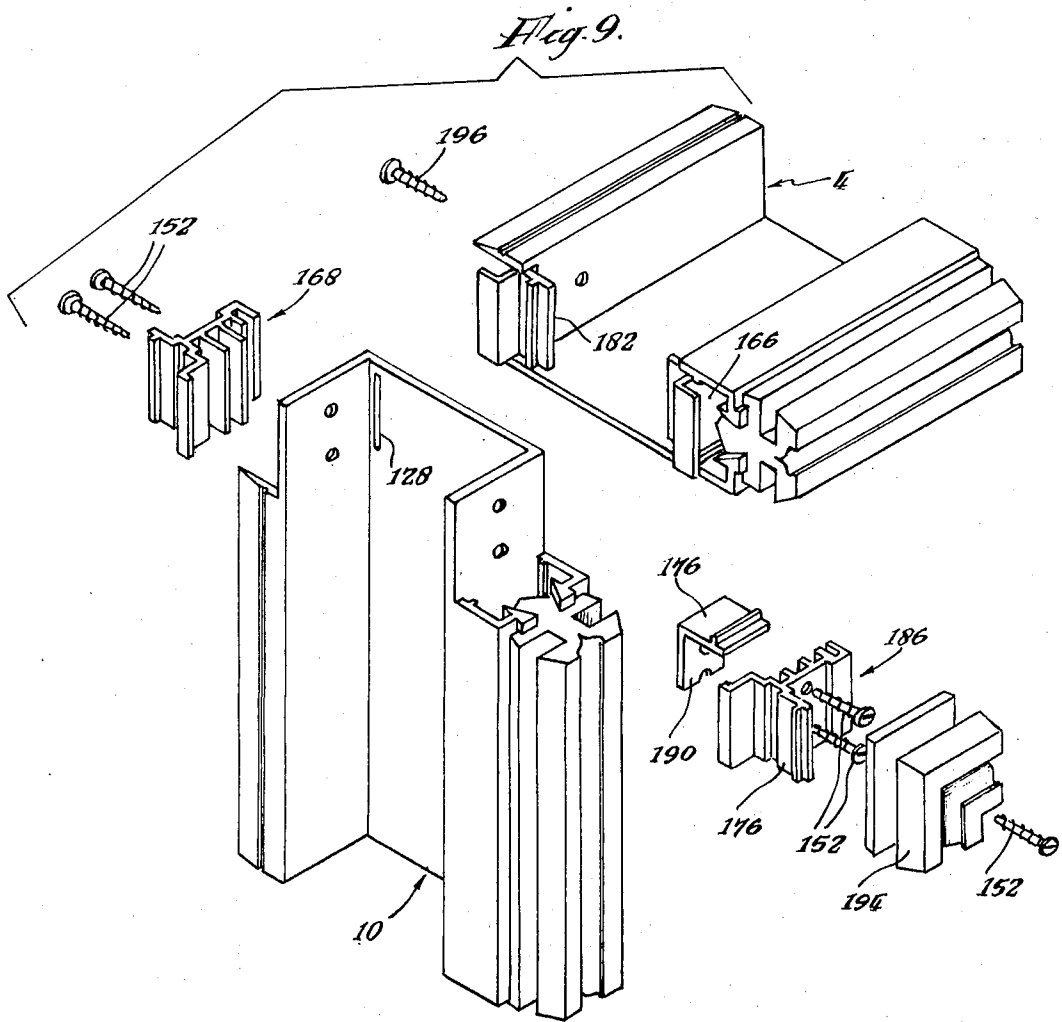


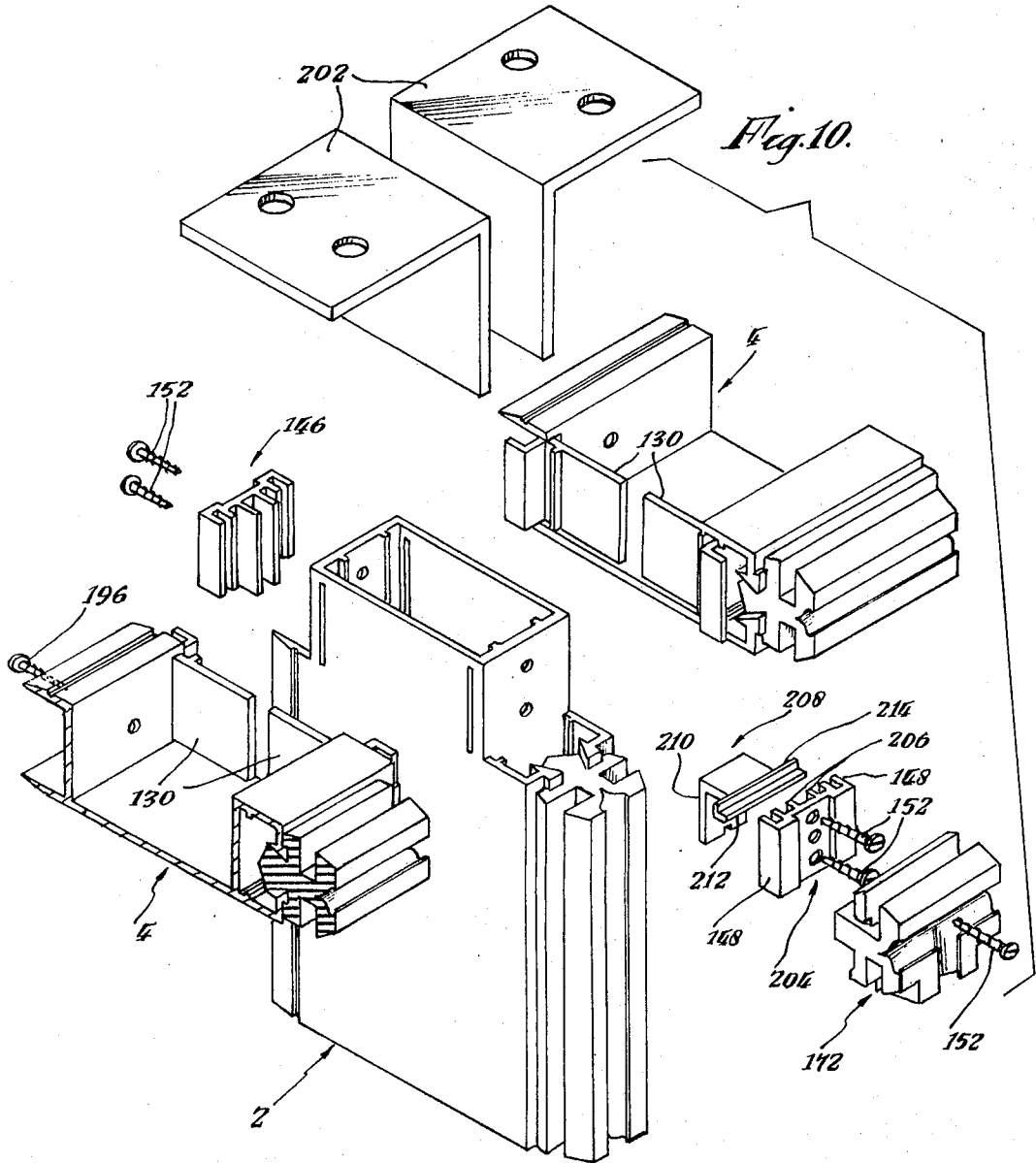
Fig. 6.











STRUCTURAL ASSEMBLIES

This invention relates to structural assemblies for buildings, and is particularly concerned with framed constructions in which a wall or roof area is to be filled using a plurality of smaller panes and/or panels mounted in a frame structure.

Such assemblies are coming increasingly into use in larger sizes, e.g. as curtain walling. One problem that can arise, particularly where larger assemblies are used, is caused by differential thermal expansion since the frame, its surrounding supports, and the infill panes or panels can be expected each to be of different materials. The stresses caused by differential expansion can produce relative shifts between parts of the frame which, although they may be small in magnitude, can result in a loss of weathertightness which at the least will make frequent maintenance and repair necessary.

It is an object of the present invention to provide a structure in which it is possible to allow relative movement of components of the frame without affecting the sealing engagement of the panes or panels carried by it.

According to the invention, there is provided a structural assembly comprising a series of interconnected supporting members carrying flexible sealing strips in which panels or panes can be mounted to provide a watertight face over the area of the frame, said members lying to one side of said face and mutually transverse members being connected to each other at junction regions by means which at least at some said regions permit relative movement between the interconnected members, the sealing strips being arranged to accommodate said relative movement by adjustment of their lengths so as to maintain a continuous peripheral seal for the panels or panes.

In a preferred arrangement of said interconnection means permitting said relative movement between two mutually transverse members, there is provided at least one element projecting from a first of the members and arranged to be slidable axially in said first member to engage with a registering element of the second member for location of the projecting element in the said direction of sliding movement, the projecting element being securable to the second member in said engaged position.

Advantageously, portions of the projecting element and the second member have faces that are arranged to be disposed in a plane parallel to the adjacent face of the frame and said portions abut each other for said securing of the element to the second member. Thus, a clamping member may bear upon said projecting element portion and be connected to the second member by screw or bolt means to secure the projecting element to the second member. Such a clamping arrangement can have location means fixing the position of the projecting element relative to the second member in said axial sliding direction. In a region where a third frame member coaxial with the first member is also joined to the second member, e.g. to produce a T-form or cruciform connection region, the first and third members adjoining opposite sides of the second member and being similarly interconnected to the second member, there can be a common clamping member bearing upon opposed projecting elements of the first and third members.

A clamping arrangement, as referred to above, can perform other functions in the assembly; for example, it can provide support for the adjacent sealing member in a direction parallel to the face of the structural assembly. This may be particularly important at the sides and the bottom of the frame where there could otherwise be unbalanced compression and gravity forces tending to distort the boundaries of sealing, and here the clamping means may have one or more forwardly projecting portions providing an end abutment for the adjacent portion of the sealing means so as to prevent displacement of the sealing means and to maintain compression in the adjacent sealing strip or strips.

Conveniently, at least one supporting member has associated therewith at least two lengths of sealing strip which abut one another with the extent of the member, the or each mutually abutting pair of strips being held in compression to provide a watertight seal at their junction and to maintain said seal with movement of said supporting member relative to another supporting member.

In a preferred arrangement, the junction regions between at least those of the supporting members that are relatively movable to each other are each provided with a unitary sealing member comprising limbs in the form of respective sealing strip lengths extending along the portion of each supporting member adjacent said junction region and arranged to be abutted with further sealing strip lengths extending along portions of the respective supporting members more distant from said junction region. Thus, when the supporting members are arranged as a rectangular grid, there can be unitary sealing members having L-form, T-form, and/or cruciform configurations.

Preferably also the supporting members and the sealing strips have co-acting tongue and groove engagement means arranged to prevent displacement of an engaged sealing strip length outwardly from said one side of the face of the frame. For ease of assembly, however, the unitary sealing members may have portions entering into slots in the supporting members for said tongue and groove engagements, said portions having a smaller cross-section than the associated portions of the sealing strip lengths whereby they are not gripped by said slots.

The invention will be more particularly described with reference to the accompanying drawings, in which:

FIG. 1 is an exploded perspective view of an intermediate mullion-transom junction in a structural frame assembly according to the invention,

FIGS. 2 and 3 are sectional views in horizontal and vertical planes respectively, of a part of the frame of FIG. 1,

FIG. 4 is a perspective view, from the rear, of a cruciform sealing member used in the assembly shown in FIGS. 1 to 3, with its mounting means attached,

FIG. 5 is an exploded isometric view of the region of the joint between mullion and transom members of another embodiment of structural assembly according to the invention,

FIGS. 6, 7, 8, 9 and 10 are similar exploded views of respective joints of the structural assembly of FIG. 5; FIG. 6 showing a jamb mullion/transom member joint, FIG. 7 showing a mullion/cill member joint, FIG. 8 showing jamb mullion/cill member joint, FIG. 9 show-

ing a jamb mullion/head member joint, and FIG. 10 showing a mullion/head member joint.

Referring to FIGS. 1 to 4 of the drawings, the frame is in the form of a rectangular grid comprising a series of supporting members including vertical mullion members 2 that each extend continuously between the head of the frame, where adjacent mullion members are joined by head members 4, and a continuous cill member 6 at the bottom of the frame. Transom members 8 that form horizontal bars of the frame extend between adjacent mullion members 2 and to jamb mullion members 10 at the side edges of the frame.

Adjoining co-axial transom members are secured together by bridge pieces 12 attached to the mullion members 2 and the transom members 8 by self-tapping screws 14 (or by bolts) the holes in the transom members receiving these screws being elongated horizontally, i.e. parallel to the longitudinal axes of the members, so that some slight relative movement of the members is possible, e.g. to take up thermal expansion. The front regions of the mullion members are cut away in the region of the transom members to accommodate the bridge pieces and the transom members are also attached to the mullion members 2 and jamb mullion members 10 by angle brackets 16 secured by the self-tapping screws 14 of the bridge pieces so that they are rigidly fixed to the bridge pieces, and by further screws 18 entering tapped holes in the mullion members. Shorter bridge pieces 12a are used at the jamb mullion members.

In the illustrated example, the mullion members 2 and the transom member 8 each have closed-box section body portions 2a and 8a respectively. The head and cill members 4, 6, and the jamb mullions 10 have a sectional form similar to the mullions 2 save that the body portions are of open channel form, the outer side flange being omitted. This provides recesses for timber sections 22 at the bottom and side edges of the aperture carrying the frame, these timber sections providing level and square boundaries for the frame and having the frame secured to them by screws 24. At the top of the frame, this open face of the head members 4 is used to accommodate angle brackets 26 that are secured to the aperture upper wall, with the interposition of packing 28 if required, and are screwed to the mullion members 2 at the side walls of their boxsection bodies.

The body portions of these outer members of the frame, and of the intermediate mullions, are deeper than the transom body portions and T-form and L-form junction pieces 30, 32 are secured at the rear of the body portions of the members to attach them together at these junctions. The increased cross-sectional size in the mullion members 2 increases their load-carrying capacity which can be further augmented by reinforcing members extending along the mullion members inside their box-form bodies. To conceal the junction pieces at the rear of the frame, channel-form cover strips 34 are snap-fitted to the members which have flanges 36 projecting rearwardly from the body portion and recesses 38 that are engaged by ribs 40 on flanges 42 of the cover sections. Similar cover strips and connection means therefore are provided on the transom members to conceal the screw or bolt fixings described above.

Where the frame structure does not have to carry any significant load, smaller section supporting mem-

bers, for example having the depth of the illustrated transom members 8, can be used throughout.

The cross-sectional forms of the front regions of all the frame sectional members are similar and include flanges 46 projecting forwardly from a web 48 of the body portion, the front ends of the flanges having in-turned lips 50 terminating in jaws 52 having inclined faces directed towards each other provide a forwardly tapering opening. The section of the transom members 8 and cill members 6 also has a panel-supporting spur 54 projecting forwardly from the lower one of jaws 52. In all the sectional members, ribs 56 are formed on the inner faces of the flanges 46, providing receiving channels for the bridge pieces 12 that attach adjacent transom members together.

The forward regions of the frame members support resilient neoprene sealing strips that, together with unitary resilient sealing members of multiple-limbed form at the junction regions of the frame members, form seals around infill panels or panes 58 to provide a weatherproof face to the outside of the grid of supporting members. On the mullion members 2, 10 and the head members 4, a symmetrical form of sealing strip 62 is used. On the transom and cill members 6, 8 two forms of sealing strips 64, 66 are used jointly, they being separated by the spur 54, the combined profile of these elements with the spur being the same as that of the strips 62. Dovetail tongues or wedges 70, 72 on the frame member front lips 50 are gripped by complementary recesses 74 on the sealing strips, while the strips 62, 64 have rearwardly projecting wedge portions 76 that are held between the jaws 52 of the frame members, which have inclinations corresponding to those of the side faces of the wedge portion. The sealing strips form, along each frame member, opposed slots 78 to receive the edges of the infill panels or panes 58 for the structural assembly and a central front recess 80 receives a conventional compression or zipper strip 82.

The strips 62, 64, 66 (and the spurs 54) terminate short of the junction regions of the frame grid members where the sealing is continued by unitary sealing members such as the cruciform member 84 shown in FIG. 1 (similar L-form and T-form unitary sealing members 86, 88 being used at the junction regions around the edge of the frame). The limbs of these members are in the form of short lengths of strip having a similar cross-sectional form to the strips 62 except that the wedge portion 76 is replaced by a rectangular section portion 90 having a width substantially equal to the width of the neck of the slot formed between the jaws 52 of the frame members so that there is no wedging interengagement between the unitary sealing members and the frame members. At the central junction region of each unitary member there is a rearwardly projecting bearer portion 91 of square form the depth of which is equal to that of the portions 90 and which is separated from the main part of the member by a smaller square section portion whereby a peripheral recess is formed around the bearer portion between it and the main portion of the member.

A first or auxiliary mounting element 93 is of channel form with end flanges 94 and can be slid on to the bearer portion to grip it with its end flanges projecting into opposed sides of the peripheral recess. A second or main mounting element 95 comprises a substantially channel section portion 95a also with a pair of end

flanges 96 but having a somewhat deeper channel profile so that it can be slid into position to embrace both the bearer portion 91 and the first element 93 with the end flanges 96 of the second element engaging in the two remaining sides of the peripheral recess. A screw 97 locks the elements in position on the sealing member and a cranked limb 98 projects from one flange of the channel section portion of the second mounting element and has holes 99 on its end region by means of which the element can be secured to the web 48 of a mullion member 2 by screws 102 to support the unitary sealing strip member 84 therefrom. Ribs 100 formed on the bridge pieces 12 provide a location for the rear of the mounting elements clear of the screw heads attaching the bridge pieces to the mullion members.

In the assembly of the structural frame and its infill panels and/or panes, the members 2 to 10 are cut to size and portions cut away at the intended junction regions, e.g., at the forward flanges 46 of the mullion members and the spurs 54 of the transom members. The cill member is then fixed in position on its prepared timber member 22, all the timber members having previously been attached to the walls of the aperture, and this is followed by the mounting of the mullion members and the head members of the frame.

It is then possible to complete the frame grid by mounting the transom members, following this by assembling all the sealing strips and sealing members in position and finally adding the panes or panels, or alternatively the assembly of the transom members and the flexible sealing means can be completed at each level, working upwards from the bottom region of the frame so that the sealing means are added with their associated line of transom members.

In the assembly of the flexible sealing means, the straight strips intermediate the junction regions are slid into position first using the gaps at the junction regions to feed in these strips. The strips will be cut slightly oversize so that the resulting gaps are narrower than the widths of the unitary sealing members that are to fit into the junction spaces. The required unitary sealing members have their mounting elements attached to them and the sealing strips are slid away from the junction regions, compressing them as required, the unitary sealing members then being located and fixed in position.

Once the sealing means have been assembled to the frame grid, the panes or panels can be inserted and the sealing member slots at the outer edges can receive resilient edge seal elements 110, the locking or zipper strips 82 then being forced into place to cause these inserts to be gripped securely and in a sealing manner. The insertion of the locking strips also increases the gripping force between the sealing strip wedge portions and the jaws 52.

In order to improve the seal between the ends of each sealing strip and its abutting unitary sealing members, the locking strip is pushed into place, using an appropriate hand tool, from a central region of the strip. Thus, a locking strip cut to the required length has one end inserted into the front recess 80 of the sealing strip at said central region and is pushed along to the frame junction region at one end of the sealing strip. With half the length of the locking strip thus positioned, the free end of the locking strip is now inserted into the front recess 80 adjacent the entry point of the first end, and is pushed along to the junction region at the opposite

end of the sealing strip to complete the location of the locking strip in place. As each half of the locking strip is forced along the sealing strip recess, it tends to stretch the intermediate region of the sealing strip from its centre portion and so increases the compression force at the abutting engagement with the unitary sealing member towards which it is being urged, so that a firmer sealing engagement is obtained there.

It is to be noted that in the completed assembly the transom members are able to make slight displacements because of their slotted engagements with the screws 14 and that this does not affect the seal at the closed outer face of the assembly formed by the sealing strips and members and the inserted panes and panels, because the compression of the sealing strips and members during assembly ensures that their abutting ends remain in close contact and the jaws 52 of the frame members do not fit the sealing strips so closely as to prevent such independent movement of the transom members.

Through the presence of the spurs 54, the weight of each row of panes or panels is taken directly by its underlying line of transom members, thus preventing the development of any accumulated sag in the assembly. Because of this effect, the unitary sealing members transmit little if any weight load through their mounting elements but these elements do ensure positive location of the sealing members in the direction transverse to the plane of the frame.

The structural frame of FIGS. 5 to 10, as in the example described above, is in the form of a rectangular grid and the frame members have the same cross-sectional forms as the extruded members of that first example. Cover strips 34 may be snap-fitted to the rear of the members as in the first example.

Referring to FIG. 5, similarly to the first example, the mullion member 2 is prepared for the connection of opposed transom members 8 by cutting away its front flanges 46 flush with the front web 114 of its box-section body portion and, at the same level, milling slots 126 in side wall 112 of the body portion immediately behind the front web. Two holes 128 (only the lower one is visible in FIG. 5) are drilled along the centre line of the web 114 in the cutaway region.

Members 130 act as connectors to join the pre-cut transom members to the mullion member and each connector has a main limb 132 which can slide into a guide channel formed by web 134 and parallel ribs 136 of the transom member. A side flange 138 of the connector is able to be retracted into the transom member between its side walls 140, the transom member web 134 being recessed from the end face of the member to accommodate the flange thus. The main limb 132 of the connector projects beyond the flange 138 and terminates in a transversely directed limb 142. A rib 144 projects from the flange parallel to the main limb 132.

When attaching the transom members to the mullion member, the connectors 130 are mounted in their fully recessed positions within the ends of the transom members. The transom members are then presented to the mullion member and the connector slid out to engage with the mullion member. The ribs 144 seat in the slots 126 to provide positive location longitudinally of the mullion member and transversely to the plane of the frame.

A clamp 146 then has its forked pairs of side flanges 148 fitted over the ribs 142 of the two opposed connectors that are thus permanently held in engagement with the mullion member. A central pair of longer flanges 150 bear on the mullion member web 114 when the clamp is fixed in place by panhead screws 152 driven through the two holes 154 in central web 156 and into the prepared holes 128 in the mullion member front web 114. With each transom member similarly secured to both ends, it is thus firmly mounted on and supported by the mullion members but is able to move slightly along its own axis because of the sliding fit it has with its connectors.

As in all the frame members yet to be described below, flexible sealing strips 62, 64, 66 are provided and those strips mounted in the jaws of the mullion and transom members are located there before the assembly steps described above and are held in a compressed state by removable tapes (not shown) that embrace them lengthwise, the compression shortening the strips to keep their ends clear of the junction regions between the members. The form of the engaging parts of the strips 62, 64, 66 and of the frame members is as described in FIGS. 1 to 4.

With the transom members now mounted in position, a cruciform sealing member 160 can be inserted over the clamp 146 once that has been screwed down, and the sealing member is fixed into position by a third screw 152 that is driven through it into central hole 154a in the clamp, the web 114 behind the clamp providing an end stop that prevents overtightening of the screw. The limbs of the sealing member 160 project into the end regions of the jaws of the frame members adjoining the junction region, the rectangular section rear portions 162 of the member 160 being able to slide into jaws 164 of the frame members from the front, and a square bearing pad (not shown) at the centre of the rear face of the member 160 bears on the clamp 146 and the heads of the screws 152 fixing the clamp 146 to the mullion member. With the cruciform sealing members 160 secured in position to opposite ends of a sealing strip held by any one of the frame members, the tape embracing and compressing the length of the strip can be released to allow the strip to extend but it is arranged that the space available is less than the free length of the strip so that it then bears compressively on the sealing members and ensures a sealing engagement therewith.

FIG. 6 shows the junction at a side of the frame between jamb mullion member 10 and a transom member 8. The member 10 has the same cross-sectional form as a mullion member 2 save that the front and rear webs 114, 116 are joined only by the inner side wall 112 so that the member has a section that opens to the outside edge of the frame. Before assembly of the transom members to it, the jamb mullion member will normally be fixed in position by screws (not shown) driven through its side wall 112 into a timber (not shown) at the edge of the aperture that the frame structure is to fill, analogously to the example in FIGS. 1 to 4.

The transom member carries a connector 166 that is generally similar to the connector 130 of FIG. 5 but that has a shorter side flange 138a, the purpose of which is to ensure that the connector does not foul the heads of any of the jamb mullion fixing screws when the connector is slid into position. The connector 166 is held on the jamb mullion member 10 by another form

of clamp 168. This has one pair of side flanges 148 to engage the rib 142 of the connector and a pair of longer flanges 150 that bear on the web 114 of the jamb mullion member. By way of further location of the clamp, there is a side limb 170 that also bears on the web 114 and that has a lip 170a that hooks over the outer edge of the web 114.

The procedure for assembly of a transom member to a jamb mullion member is similar to that for mounting opposed transom members to a mullion member and the screws and the apertures illustrated in FIG. 6 are given the reference numbers used in FIG. 5. When the frame members are secured in place, a T-form sealing member 172 is inserted at their junction and is fixed in place by a screw 152 in the same manner as the sealing member 160. In the outer margin of the sealing member 172, slot 174 receives no pane or panel but simply a supplementary edge sealing element (illustrated at 110 in FIGS. 2 to 4) to bear against the wall of a surrounding aperture (not shown) filled by the frame. In this embodiment of the invention, additional support is provided for said outer margin and this is done by a forward limb 176 of the clamp 168. For this purpose the front edge of the limb 176 seats in recess 178 of the sealing member outer margin and rib 180 on the limb 176 bears on the rear face of the sealing member outer margin adjacent to the recess 178. Of course, where the extremities of the opposite limbs of the sealing member overlap the ends of the jamb mullion member front flanges, said recess fits the dovetail form of the outer faces of the jaws 164 of the member.

In FIG. 7 there is shown the connection of a mullion member 2 of the frame to a cill member 6 which is of the same cross-sectional form as a jamb mullion member except as regards the lower jaw 164a of the jaws that hold the sealing strips. Like the jamb mullion member, the cill member may first be screwed to a timber (not shown) and the connection should not foul any projecting screw heads. In contrast to the joints already described in which narrower transom members are connected to deeper mullion and jamb mullion members, the two members shown here are attached together both at their front and rear regions, their respective front webs 114 and their rear webs 116 being co-planar to each other.

For making this joint, over the width of the mullion member, the front and rear extensions projecting from the webs of the cill member are cut away flush with the webs and side wall 112' has slots 126 formed in it adjacent each web. A first connector 166 is slid into the forward region of the mullion member. A second connector 182 is located at the rear region of the mullion member, this connector being generally similar to the connector 166 but being slightly narrower due to a difference in the space available between the walls of the front and rear projections 46, 36 of the mullion member. The rear connector 182, unlike the forward connector 166, is fixed in position once it has been correctly located, by an attaching screw 196 between it and the rear web 116. As in the joints already described, ribs 144 of the connectors seat in the slots 126 and clamps 168 are then engaged with the limbs 142 of the connectors.

A T-form sealing member 72 is attached to the forwardly facing part of the junction region between the cill and mullion members when they are interconnected. No sealing is required at the rear region, of

course, where, like all the other members of the frame, the cill and mullion members have cover strips (not shown) snapped over their rear extensions 36 to give a neat appearance to the frame from the interior.

The junction between the cill member 6 and a jamb mullion member 10 is shown in FIG. 8. The cill member front and rear extensions are cut away here to make the joint and connectors 166, 182 are inserted into the jamb mullion member. In this drawing there can be seen the recessing of the rear web 116 that allows the connector 182 to move to a fully recessed position, a feature which is present in all the connector mountings of the illustrated construction, although, like the other rear connectors of the illustrated construction, it is fixed in its final engaging position by an attaching screw 196.

The rear connector 182 is held to the cill member by a clamp 168. The front connector 166 is held by a clamp 186 that is similar in most respects to the clamp 168 but flanges 188 terminate in the same plane as the side flanges 148. This is to allow for a retainer 190 to be inserted under the clamp when the clamp is initially attached to the cill member by a screw 152 through the innermost of the holes 154 of the clamp as illustrated, the retainer and clamp then being secured in place by a further screw driven through the outermost of the holes 154. For its attachment, the retainer has an end notch 192 engaged by the first of these screws and an aperture (not shown) through which the second screw passes. It will be appreciated that the members 186 and 190 could be replaced by a composite unitary clamping member but if this were done in all places where the retainers 190 are used, the number of differently shaped parts required would be increased.

The corner of the frame thus has respective forward limbs 176 of the clamp and retainer forming a right-angled support for an angle sealing member 194 to take the compressive forces transmitted by both the sealing strips in the cill member and in the jamb mullion member. The sealing member 194 is secured by a single screw 152 similarly to the outer sealing members, driven through it, the clamp 186 and the retainer 190, and has its outer rear region engaged by the limbs 176 analogously to the T-form sealing member 172.

At the top of the frame, head members 4 (FIGS. 9 and 10) run between adjacent jamb mullion and mullion members. FIG. 9 shows the junction between a jamb mullion member 10 and an outer head member which, it will be seen, has the same cross-sectional form as the jamb mullion member. As in the joint between the jamb mullion and cill members, connectors 166, 182 are used in conjunction with clamps 168, 186 and a retainer 190. This figure also shows the assembly of a further angle sealing member 194 to the joint in the same way as is done in the assembly of the joint of FIG. 7. Relative movement between the joint members is not to be provided for here either and a clamping screw 196 likewise fixes the rear connector 182.

FIG. 10 shows the junction between two adjoining head members 4 and a mullion member 2. The aperture surrounding and filled by the frame structure will have a heading (not shown), e.g., of timber, to which brackets 202 are screwed, and these fit slidably into the box-section of the mullion member to engage opposite side walls 112 so as to locate the mullion member longitudinally of the head members. The lower ends of each mullion member will be fixed (FIG. 7) in this direction

also by the connectors 166, 182 joining them to the cill member 6 since the cill member will itself be secured to the lower edge or a timber footing of said aperture. Relative movement between the mullion members and the aperture upper edge is possible in the vertical direction because of the sliding engagement of the brackets 202 with the mullion members although, as FIG. 7 shows, the mullion members are fixed in the vertical direction relative to the cill member by the screws 196 that engage the rear connectors at the bottom jointing regions of the mullion members and by the use of the clamps 168 to secure these connectors to the cill member.

At the top of each mullion member 2, the head members carry front and rear connectors 130, 130a, the rear connectors 130a being slightly narrower than the front connectors 130 in analogy to the connectors 166, 182 at the bottom of the mullion member. The rear connectors 130a of adjoining head members 8 are secured to the mullion member by clamps 146 (first described in FIG. 5), the manner of attachment being analogous to that described in the earlier figures. As at the jamb mullion members, relative longitudinal displacement of the head members to the mullion member is prevented by screws 196. The front connectors 130 of the head members are secured to the mullion member by a clamp 204 that differs from the clamp 146 in that central flanges 206 are of the same depth as the side flanges 148. A retainer 208 is held under the front clamp, under the inner ones of the side flanges 148 and between the opposed connectors 130, to provide support for the outer edge of T-form sealing member 172 in the manner already described with reference to FIG. 6.

The retainer 108 is generally similar to the retainer 190 of FIGS. 8 and 9 and is similarly secured in place to lie under the inner ones of the flanges 148 of the clamp 146. Front edge 212 of the body portion of the retainer and its associated rib 214 are of greater width than the limb 176 and rib 180 of the retainer 190, however, in order to give additional support to the T-form sealing member 172.

It will be clear how, in the construction described above, the transom members are able to expand and contract independently of the frame members to which they are connected. This will be required only to absorb movements in the grid framework itself since expansion and contraction of the infill panes and panels can normally be accommodated by leaving a clearance around their edges relative to the sealing gasket slots receiving the panels or panes. In very large structures, however, it may be necessary to make further provision of thermal expansion movements. For example in very tall assemblies, the mullions can have expansion joints at two-storey intervals, cleats bridging said joints having slotted engagements with the members on opposite sides of the joints and preferably being attached also to the load-bearing structure on which the frame is mounted.

It will be appreciated that in both constructions illustrated, the nature of the infill panes or panels is not restricted by the arrangement of the frame and sealing members described: for example, in glassed areas it is possible to provide opening lights or windows, or fixed or adjustable louvre panels.

Many modifications of the structural assembly itself are possible within the scope and spirit of the present

invention. For example, depending upon the requirements of particular installations, the transoms may be made the main load-bearing components of the frame, for example, in which case the mullion members can be of interrupted form to allow continuous transom members to extend across the width of the frame.

What I claim and desire to secure by Letters Patent is:

1. A structural assembly comprising, in combination, a series of supporting members, means interconnecting said members to form a grid-like frame, a series of resiliently flexible sealing members mounted on said supporting members to receive panels or panes and to form peripheral seals around said panels or panes and provide a watertight face over the area of the frame, and said supporting members lying to one side of said face, mutually transverse ones of said supporting members being secured together by said interconnection means at least at some of the junction regions of mutually transverse supporting members permitting relative movement between the interconnected members, said sealing members comprising respective unitary members at said junction regions, each of said unitary members having integral limbs in the form of respective sealing strip lengths extending along the portions of the interconnected supporting members adjacent said junction region, the sealing members comprising further sealing strip lengths extending along the portions of the interconnected supporting members further from each said junction region and abutted with the sealing strip lengths defined by the limbs of the unitary sealing members, the abutment of the sealing strip lengths mounted on the relatively movable interconnected supporting members holding them in compression in the direction of said relative movement whereby the lengths of the sealing members are variable with said relative movement while their abutting contact is maintained so as to preserve said peripheral seals around the panels or panes, slots being provided on the supporting members to engage said further sealing strips in a manner preventing displacement of an engaged sealing strip away from the frame, the limbs of the unitary sealing members entering into said slots in the supporting members, said limbs having a cross-section matched to the cross-section of said slots such that said limbs can be located in the slots by insertion transversely to said face of the frame, securing means being provided on each unitary sealing member in the region of the junction of its limbs for securing the member to a supporting member.

2. A structural assembly according to claim 1 wherein a unitary sealing member is provided at least at one junction region between the interconnected supporting members, said sealing member comprising limbs in the form of respective sealing strip lengths extending along the portions of the interconnected supporting members adjacent said junction region and said lengths being abutted with further sealing strip lengths extending along portions of the respective supporting members more distant from said junction region.

3. A structural assembly according to claim 1 wherein the supporting members are arranged as a rectangular grid and there are unitary sealing members having respective configurations selected from the group including L-form, T-form and cruciform configurations.

4. A structural assembly according to claim 1 wherein said securing means comprising rigid mounting elements attached the unitary sealing members to secure them to the supporting members.

5. A structural assembly according to claim 4 wherein attachment elements on the unitary sealing members project to said one side of the face of the frame to secure the mounting elements to the sealing members.

6. A structural assembly according to claim 5 wherein at least one mounting element comprises a flanged channel-form portion embracing said attachment element and a vertical limb of the mounting element extends from said portion and secures the mounting element to its supporting member of the frame.

7. A structural assembly according to claim 4 wherein at least one mounting element comprises a screw-threaded element projecting through its unitary sealing member.

8. A structural assembly according to claim 1 wherein co-acting tongue and groove engagement means connect the supporting members and the sealing strips to prevent displacement of an engaged sealing strip length outwardly from said one side of the face of the frame, respective co-acting elements of said engagement means being integral with the supporting members and the sealing strips.

9. A structural assembly according to claim 1 wherein the supporting members have a cross-sectional form comprising a pair of limbs extending from a root portion, the limbs forming a slot adapted to receive an associated sealing strip, inwardly widening oblique faces on inner portions of the limbs defining said slot, and a wedge-form portion of the profile of the associated sealing strip being engaged by said faces.

10. A structural assembly according to claim 1 wherein said interconnection means comprise joining brackets, screwed engagement means securing said brackets to the supporting members, holes in the brackets and the members having said screwed engagement means passing through them and at least some of said holes being elongated to allow relative sliding movement between the connected brackets and members.

11. A structural assembly according to claim 10 wherein further interconnection means extend between said interconnect coaxial supporting members at opposite sides of a junction where said relative movement is permitted between interconnected members.

12. A structural assembly according to claim 11 wherein said further interconnection means comprise at least one strip element, guides in said co-axial members slidably receiving said strip element which is attached by the same screwed engagement means as said joining brackets.

13. A structural assembly according to claim 1 wherein, for the interconnection between at least two of the mutually transverse supporting members there is provided at least one element projecting from a first of the members and slidable axially in the first member, a registering element of the second member being engaged by said one projecting element to locate the projecting element in said direction of sliding movement, means securing the projecting element to the second member in said engaged position.

14. A structural assembly according to claim 13 wherein said registering element is disposed in a region

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of the second member facing an adjacent end of the first member.

15. A structural assembly according to claim 13 wherein a tongue and slot engagement is formed by said projecting and registering elements.

16. A structural assembly according to claim 13 wherein co-acting faces are provided on respective portions of the projecting element and the second member in a plane parallel to the adjacent face of the frame, said faces abutting each other for said securing of the element to the second member.

17. A structural assembly according to claim 16 further comprising a clamping member bearing upon said projecting element portion to urge said faces into abutment and screwed engagement means securing the projecting element to the second member.

18. A structural assembly according to claim 17 wherein location means are provided on the clamping member to fix the position of the projecting element relative to the second member in said axial sliding direction.

19. A structural assembly according to claim 18 wherein a third supporting member co-axial with the

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first member is also connected to the second member, the first and third members adjoining opposite sides of the second member and corresponding interconnection means locating them relative to the second member, a common clamping member bearing on the projecting elements of said interconnection means of the first and third members.

20. A structural assembly according to claim 17 wherein at least one forwardly projecting portion is provided on the clamping member to form an end abutment maintaining compression in a sealing strip or strips extending to the region of the associated interconnection.

21. A structural assembly according to claim 17 wherein each unitary sealing member is secured to an associated clamping member.

22. A structural assembly according to claim 17 wherein location means are provided on the clamping member to engage the clamping member with a supporting member and locate it thereon in at least one direction parallel to the plane of the frame.

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