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54 **Wall structures.**

57 A wall structure has a main framework of sectional members (6) forming a grid of cells (2). Individual infill panels (4) are mounted in the cells through peripheral frame members (12) secured to the main frame members (4). The peripheries of each panel is sealed by respective loop-form gaskets (78,80) carried by the panel and the peripheral members respectively, the gaskets sliding into engagement with each other when the panel is put in place. The top peripheral member of each cell and the panel have interconnecting suspension means (24,70) that form a hinge pivot for the panel. The panels comprise planar infill members (34) that lie in front of the gaskets (78,80) and the suspension means (24,70) so that the panels can jointly form a substantially flush wall surface.

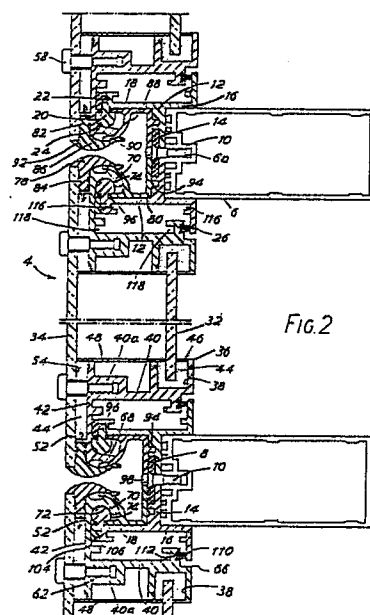


Fig. 2

Description

WALL STRUCTURES

This invention relates to wall structures comprising a framework providing a number of cells in which infill panels, which may be glazing panels or opaque wall panels, are secured. Such structures are employed in particular as curtain walls.

Curtain wall structures have evolved to permit fast erection at site of large wall areas on load-bearing building frames. That advantage can only give benefit if the wall is adequately weather-proof, which requires particular attention to be paid to the sealing of the infill panels in the wall framework. GB 1459401 teaches how a satisfactory seal can be obtained by applying a loop-form gasket around the periphery of a cell before the introduction of the infill panel, the gasket then being clamped against the edge margins of the panel by auxiliary members of the framework to give a continuous seal on both inner and outer faces, while the gaskets of adjoining cells also provide seals between the cells.

This known form of structure has some limitations, however. It is not well adapted to the use of pre-sealed double-glazed panels, for example. Nor is it easy to remove and replace an individual panel after erection. Furthermore, the gaskets and their clamping auxiliary members have a significant width which can make them visually obtrusive in some wall designs.

One object of the present invention is to provide a novel form of structure that is simple to erect on site and that may also facilitate the removal of individual panels if required.

Another object of the invention is to provide a cellular wall structure in which the panels filling the cells can be securely disposed without relying on prominent sealing means around the peripheries of the cells.

According to the invention, there is provided a structure comprising a main frame forming a plurality of cells, at least one said cell being provided with an infill panel supported by the frame, respective loop-form gaskets being secured to the main frame around the periphery of the cell and to the panel around its periphery, said loop-form gaskets interengaging to seal the junction between the panel and the frame.

Such a construction also provides the possibility of setting the panel so that it projects beyond a front or outer face of the main frame. This may be done to enhance the external appearance of the structure and such an arrangement can also make subsequent cleaning of the external face of the structure, especially of glazed panels, easier. In an arrangement of this form, the main frame gaskets can project forwardly to engage panel gaskets that project rearwardly from their panels.

As a result of providing loop-form gaskets on both the panel and the cell in which it fits, the panel can be arranged to be fully assembled together before it is brought to site. In a preferred form of the invention, the panel is mounted on the frame through a hinge connection at a top margin of the panel. Not only

does this provide a simple method of putting the panels in place but it also makes it possible to provide opening lights and access panels where required in the structure without additional constructional complication. The hinge connection is preferably located within the thickness of the panel so that the panel will rest under its own weight in the closed position.

The invention will be described in more detail, by way of example, with reference to the embodiment shown in the accompanying drawings, in which:

Fig. 1 is a schematic front view of a part of a curtain wall structure indicating the section planes II-II and III-III respectively of Figs. 2 and 3,

Fig. 2 being a vertical section through a transom of the main or fixed frame of the structure according to the invention and

Fig. 3 being a horizontal section through a mullion of the main frame showing the sealing joint regions of the adjacent panels, and

Figs. 4 and 5 are front views of a mullion-transom junction of the main frame, and of a corner of a panel frame, respectively.

The curtain wall illustrated in the drawings can be of conventional configuration in that it comprises mullions and transoms forming a grid of rectangular cells 2 which are provided with framed infill panels 4. All the framing elements of the main frame and infill panels and all their gaskets have a constant cross-section and can be produced as extruded sections, the framing being formed in aluminium for example.

The mullions and transoms of the main frame are formed by a common box section 6 which may be of the form shown in European patent application 194779. Clamped to the front face of the box section by strips 8 that are secured by countersunk screws 10 engaging central lengthwise slot 6a in the front face of the box section, are a pair of opposed sections 12 generally of T-form, each with central web 14 and rear limb 16 located against front and side faces of the box member. The T-sections 12 form a frame around the edges of each cell, with their ends mitred and in abutting engagement in the manner shown in Fig. 4, referred to below. The forward limb 18 of each T-section terminates in a pair of projections 20, 22. The projections 20 extend towards each other and each has a part-cylindrical head 24. The projections 22 of the two flanges are T-shaped and extend away from each other. From the rear limb 16 of each T-section there is a somewhat longer projection 26, these two projections also extending away from each other.

The infill panels 4 are prefabricated units mounted in the individual cells 2 defined by the main framework grid. The panels illustrated are framed double-glazed units with inner and outer leaves 32, 34 held in their frames, but it will be understood that the frames can be adapted for any form of infill. The sectional profile of the extruded side and bottom members 36 of the frame comprises a rear channel

providing a trough 38 in which the inner leaf 32 is held, and an angle-form extension consisting of a thicker limb 40 projecting forwards from the channel and a thinner, longer front limb 42 projecting laterally outwards from the front end of the limb 40, parallel to the leaves 32,34. The trough 38 forms a receiving space for the injection of a silicone material 44 that can act as a sealant and adhesive for the edge of the inner leaf. Projecting over the mouth of the trough 38 are an internal spacer element 46 that extends forwards from the rear limb of the channel, and a snap-on spacer strip 48, attached by snap fixings to the member 36. The gap between the spacer element 46 and strip 48 positions the inner leaf and these elements also function to enclose the space to be filled with sealant material for the inner leaf. The spacer strip 48, together with an integral spacer element 52 on the front limb 42, similarly locates the outer leaf 34 of the panel and encloses a channel 54 to be filled with further sealant and adhesive material 44 for the outer leaf.

The drawings also show screw bolts 58 that extend through spacer tubes 60 into channels 62 in the limbs 40 to engage ribbed side faces of the channels and so provide positive fixing for the outer leaf should it be required as a back-up for the adhesive material 44.

The top member 66 of the panel frame has substantially the same cross-section as the members 36 and corresponding features to those already described are indicated by the same reference numbers. The section of the top member differs, however, in that whereas the limb 42 of the member 36 has a terminal spur 68 extending rearwards substantially at right-angles to the limb, in the top member 66 corresponding spur 70 is substantially arcuate; in particular the spur blends with the limb 42 in a part-circular inner face 72 which subtends an angle of nearly 180°.

The top member spur 70 is used to suspend the panel from the part-cylindrical head 24 of the T-section 12 that extends along the upper transom of its cell as shown in Fig.2. The curvature of the inner face 72 of the spur matches closely the curvature of the part-cylindrical head 24 so that a hinge joint is formed therebetween on which the panel is pivotally suspended.

Preferably, provision is made for a small annular gap between the head 24 and the spur 70 in which concentric arcuate sleeve elements 74 can be interposed. By placing such sleeve elements near the lateral boundaries of the cell, the bending moments due to the weight of the panel on the main frame transoms can be reduced. Also, if the suspension mounting is to be used after installation as a hinge, eg. to provide an opening light, the provision of interposed sleeves of a suitable material is a convenient way of reducing the friction of the pivoting movements.

The generally right-angled spurs 68 at the sides and bottom of the panel have inner faces that are inclined slightly outwards. They allow the panel to swing freely under its own weight towards a closed position in which the infill 32,34 lies parallel to the plane of the main frame, by abutment of the panel

frame with the projecting heads 24 of the T-sections around the cell edges, the heads 24 also holding the panel against movement in its own plane by abutment with the spurs 68,70. In this position there is a weather-tight seal made between the main frame and each panel, as will now be described.

As a primary seal between the main frame structure and each panel, a continuous loop-form gasket 78 extends continuously around the edge of the panel frame and cooperates with a further continuous loop-form gasket 80 mounted in the T-section 12 of the main frame structure and extending continuously around the mullions and transoms bounding the cell in which the panel fits. These gaskets, like the pressure sealing gasket to be described below, are extruded from a rubbery material, preferably a silicone rubber.

The panel gasket 78 comprises a barbed root portion 82 held frictionally in a recess 84 formed between the frame members 36 or 70 and the edge margin of the outer leaf 34 by the spacer elements 52. A convex free limb 86 of the gasket 78 is cantilevered rearwards to engage with curved free limb 88 cantilevered forwards from the corresponding main frame gasket 80 and the limb 86 terminates in a reflex-curved tip 90. The gasket section also includes a spur 92 which projects forwards to rest against and protect the edge of the outer leaf 34.

The main frame gaskets 80 of adjacent cells are mounted back to back in the channel-like recess formed between the opposed T-sections 12 secured to each main frame member 6. They are retained in place by having portions gripped frictionally in recesses 94,96 of the sections 12 and by a silicone sealant 98 applied as a liquid after assembly to the small gap between adjacent edges of the sections 12 overlying the strip 8. The curved free limb 88 of the gasket 80 lies between the associated spur 68 or 70 and the panel gasket limb 86, the rigid spur ensuring sealing contact on both faces of the limb 88.

The two loop-form gaskets provide a primary weather seal for their cell. There is also a rear pressure sealing gasket 104 mounted in a slot 106 formed by the inward projection 22 on the forward limb 18 of each Tsection 12. A further auxiliary seal between panel frame and main frame structure is provided by a brush-like strip 110 inserted in a T-slot 112 of the panel frame section. The pressure seal 104 can also be made up in the form of a continuous loop before assembly into its frame, like the primary sealing gaskets.

In the construction of a multi-storey curtain wall using the components described, the main frame structure of box-form sections 6 can be erected in a known manner, eg. with mullions extending continuously through several floors and transoms suspended between the mullions. Because the sections 12, unlike the box-section frame members which are simply butted together, have mitred joints with each other, they continue the engagement and location of the sealing gaskets 80 into the corners of the cells. Fig. 4 shows, however, how the mitres are preferably interrupted so that the T-section forming the lower margin of the transom is only partly cut away so that

it can rest on the corresponding portions of the limbs of the mullion seal carrier below it, which have been given a complementary jointing face, thereby to continue the hinge supports into the width of the mullions. At the mitred joints, the T-sections 12 of each cell can be located relative to each other by angle pieces 114 (Fig. 5) at the cell corners, the arms of the angle pieces each extending across both limbs 16,18 of a T-section to be a sliding fit in opposed recesses 116. After putting the T-sections in place, the loop-form gaskets 80 and the seals 104 can be secured on the main frame. The panel frame members 36,66 mitred to form the corner joints of the frame, are secured together by further angle pieces 114 held in slots 118 in these members. The angle pieces 114 are locked in place by screws (not shown) driven into them through the walls of the frame members.

It may be noted here that the manner in which the T-sections are secured allows the individual sections around a cell to make small movements relative to each other. It is therefore possible to build into the main framework means for relative movement, eg. for thermal expansion or settlement, in known manner, without the freedom for such movements being inhibited by the presence in each cell of the peripheral frame of the T-sections that is required for mounting and sealing the panels.

Pre-assembled individual panels can be brought to the site complete with their gaskets 78 and seals 110 in position and can simply be hung in place on the hinge heads 24 provided by the transom T-sections. Before being mounted in place, the peripheral limb 86 of each panel gasket lies against the adjacent spurs 68,70 but the reflex curvature at the tip 90 provides an entry opening for the front tip of the peripheral limb 88 of the frame gasket. It will usually be simplest to mount the panel slightly tilted, so that the gaskets are engaged first at the hinged edge and around the other edges the limbs 86,88 then progressively interengage as the panel is allowed to pivot inwards against the main frame structure.

In use, the gaskets 78,80 provide a seal against the entry of water from the exterior. It is not necessary, however that they engage together in a water-tight manner if a means of drainage is provided under the bottom panels of a grid of cells; it will be noted that the gasket 80 forms a peripheral channel around its associated panel, so that water driven rearwards through the gap between the opposed limbs 86 at any transom level will flow round the peripheral channel to the bottom of the cell, and will escape through the bottom drainage passages to the outside of the structure. The loop-form strip 104 provides a pressure seal to the interior of the gaskets 96,98 and it is backed by the internal seal strips 110.

The panels can be left freely hinged to the main frame structure to be secured only by their weight, or can be permanently fixed in the closed position by bolts or other securing elements (not shown) preferably inserted from the interior, if they are not required to be opened. This will usually be the case for panels that contain wall plates of a curtain wall

but of course window lights may also be fixed or a mechanism can be provided that allows a limited angle of opening. Using an easily releasable form of locking allows individual panels to be quickly removed for repair or replacement.

It will be noted that the construction illustrated is able to provide a substantially flush and unbroken outer wall surface - the gaps between adjacent outer leaves being minimal, and where the panels are fixed in position it is possible to close these gaps with unobtrusive filler strips. A similar appearance can be achieved whatever the nature of the planar members of the panel infill: for example, single-leaf wall panels of any material and thickness can be used, or if required the frame sections can be simply modified to hold a triple-glazing infill.

Claims

1. A structure comprising a main frame (6,12) forming a plurality of cells (2), at least one said cell being provided with an infill panel (4) supported by the frame and sealed with the frame by loop-form peripheral sealing means (78,80) characterised in that respective loop-form gaskets (78,80) are secured to the main frame around the periphery of the cell (2) and to the panel (4) around its periphery, said loop-form gaskets inter-engaging to form a seal between the panel and the frame.

2. A structure according to claim 1 wherein said main frame comprises means (24) for pivotally supporting respective panels in the individual cells.

3. A structure according to claim 2 wherein said pivotal support means (24) are provided at a top margin of each said cell for suspension of the respective panel therefrom.

4. A structure according to claim 3 wherein at a top margin of each said panel there is provided a frame member (66) projecting inwardly towards the main frame and having a downwardly directed concave face (72) through which the panel can be supported on an upwardly directed convex face of said pivotal suspension means (24).

5. A structure according to claim 4 wherein overlapping abutment elements (24,68) are provided between said panel and the adjoining main frame arranged to inhibit movement of the panel in its own plane when said seal between panel and frame is formed.

6. A structure according to any one of the preceding claims wherein said at least one panel and/or the main frame carries a supplementary loop-form sealing gasket (104) disposed internally of the seal provided by said inter-engaging gaskets (78,80).

7. A structure according to any one of the preceding claims wherein the two inter-engaging loop-form gaskets (78,80) of said at least one panel are provided with portions (86,88) that project inwardly and outwardly respectively

to overlap each other.

8. A structure according to claim 7 wherein the or each said panel comprises a peripheral face (68,70) overlapped by both said gasket portions (86,88) and supporting said portions in contact with each other.

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9. A structure according to any one of the preceding claims wherein the or each said panel projects outwards from the adjacent region of the main frame.

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10. A structure according to claim 9 wherein the or each said panel comprises a peripheral frame (36,66) and has infill means (34) secured thereto to extend over at least substantially the whole of the outer face of the peripheral frame.

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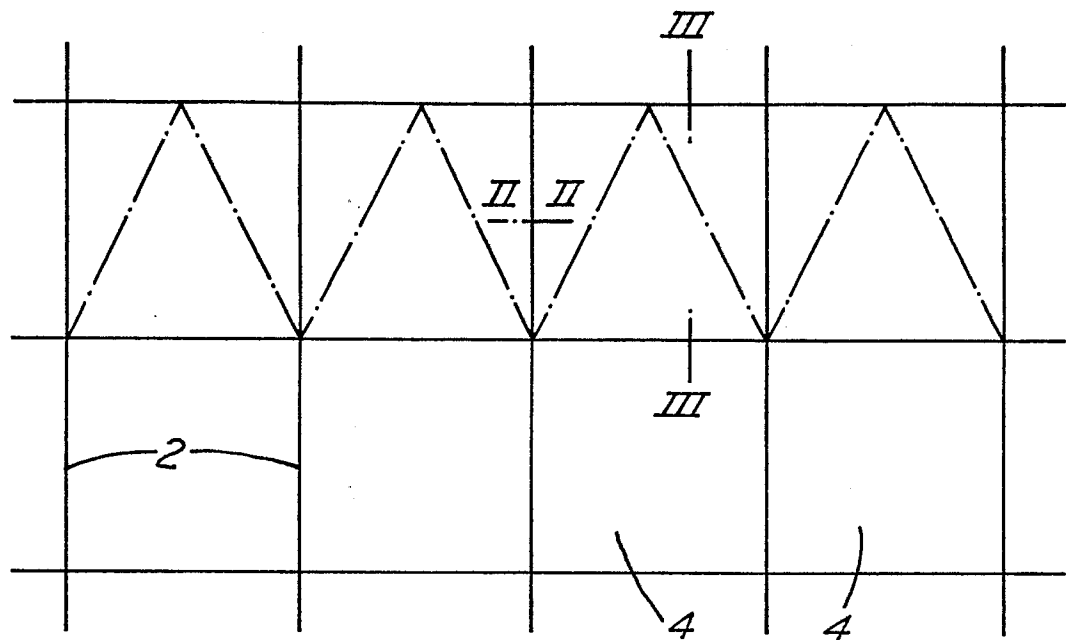


FIG. 1

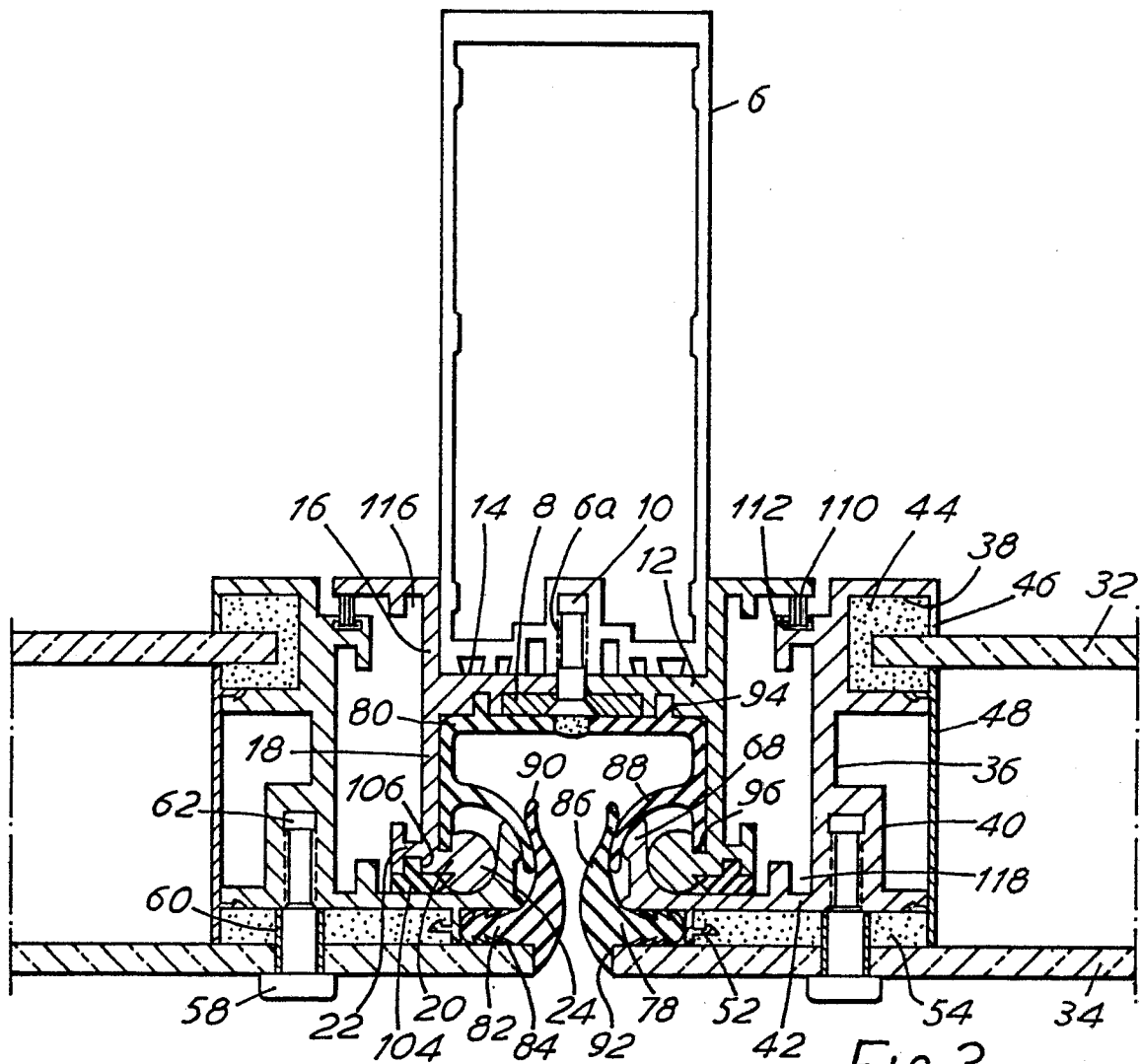


FIG. 3

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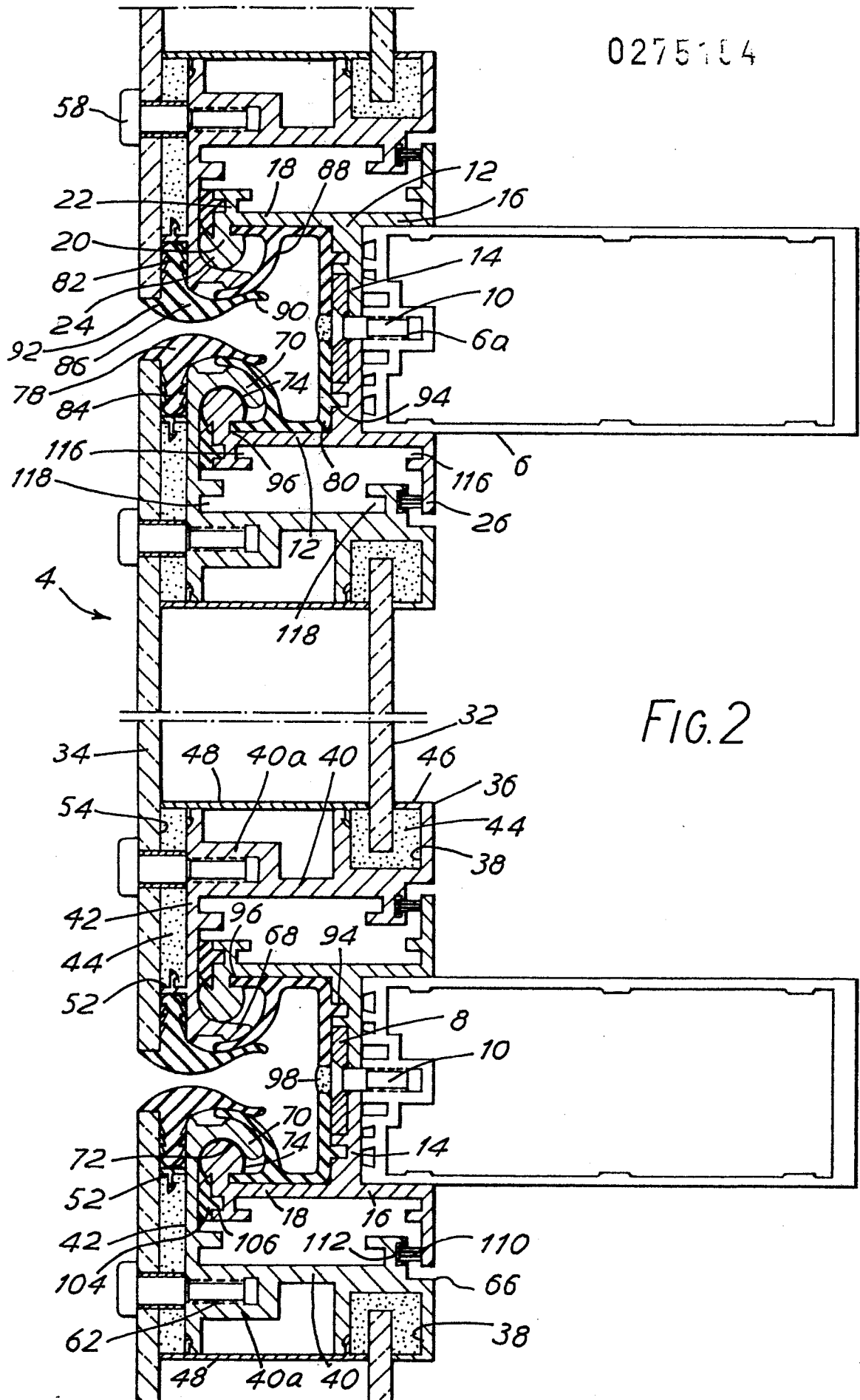
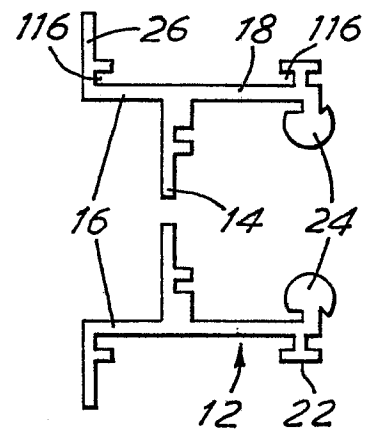
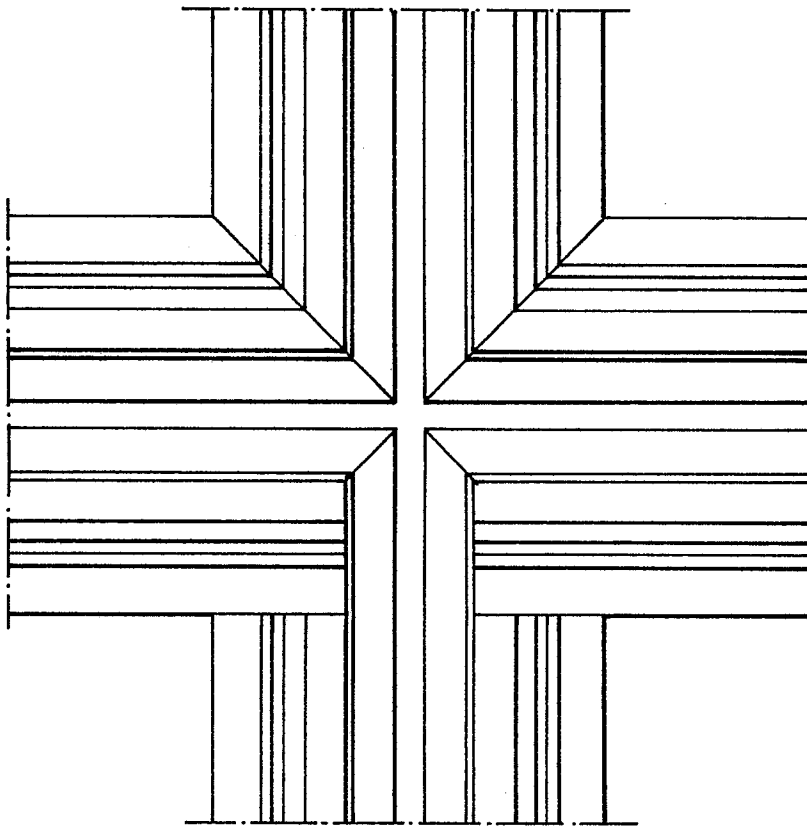


FIG. 4



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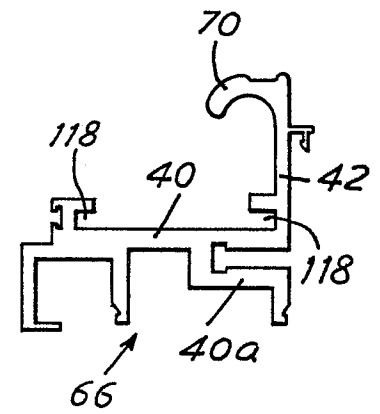
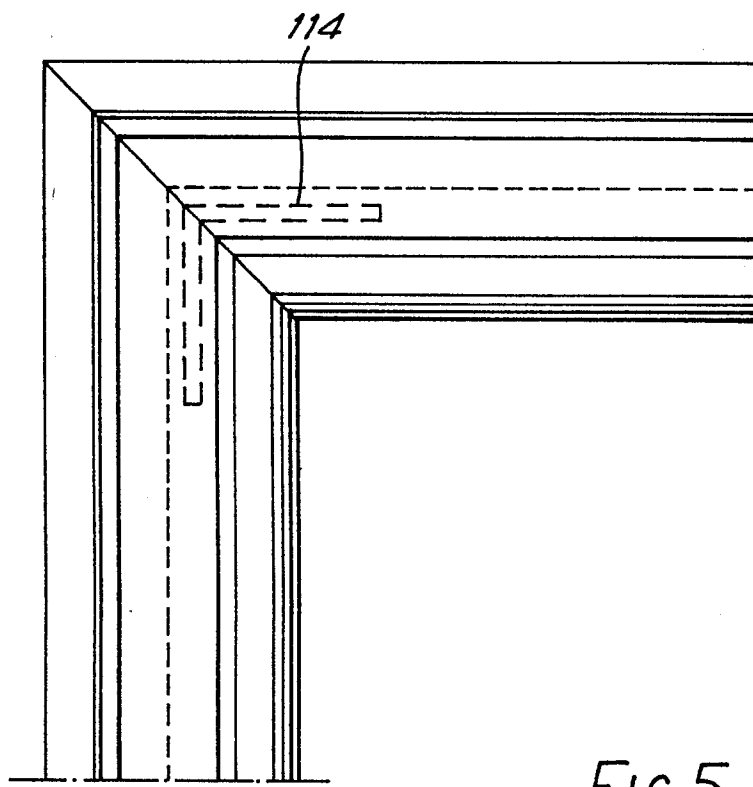
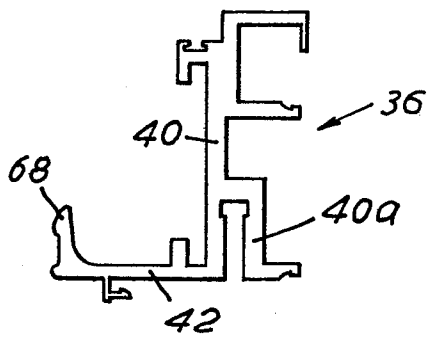


FIG. 5





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 30 0124

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US-A-4 525 963 (GARTNER) * Column 2, lines 14-68; column 3, lines 1-48; figures 1-4 *	1,9,10	E 04 B 2/90
A	GB-A-1 211 882 (ASTRALITE) * Page 2, lines 38-126; figure 3 *	1,7,9,10	
A	FR-A-2 140 336 (VOISIN) * Page 5, lines 1-11; page 7, lines 16-21; figures 1-5 *	3,7,10	
A	US-A-4 308 695 (EHRSAM) * Column 3, lines 3-61; figure *	1,8	
D,A	GB-A-1 459 401 (STOAKES)		
D,A	EP-A-0 194 779 (STOAKES)		
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			E 04 B
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	18-03-1988	SCHOLS W.L.H.	
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	