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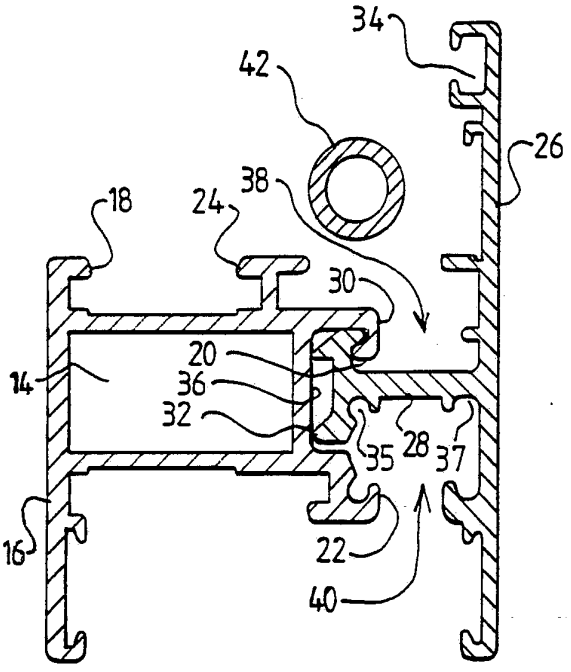
(54) Title: THERMAL BREAK FRAME MEMBER

(57) Abstract

A frame member for a window or door comprises two extruded metal frame elements separated by a thermally insulating resin. The elements (10, 12) are interengaged initially in side-by-side relationship by respective co-operating lips (20 and 30) to define an upper channel (38) and a lower channel (40). A resilient tube (42) is then wedged into the channel (38) to retain the elements as a self-supporting assembly subsequent to which the assembly is inverted and a resin in liquid form is poured into the channel (40). After the resin has set the tube (42) is removed and the channel (40) is "de-bridged" by cutting out a part of its base so that the elements (10 and 12) are connected only by the thermally insulating set resin (44). The invention enables use of metal frame elements having surface finishes and/or colours which differ from one another.



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Title: Thermal break frame member

This invention relates to a thermal-break frame member, and to a method for its production, wherein the frame member is intended for use in the manufacture of door or window frames or the like; the frame member being of the type comprising two elongate extruded, rolled, drawn or folded elements joined together by thermally insulating material.

In GB-A-2 196 369 there is disclosed a composite thermal-break frame member comprising an interior frame element in the form of an elongate plastics extrusion and an outer frame element in the form of an elongate metal extrusion, e.g. aluminium. To produce the frame member, the metal extrusion is initially engaged with the plastics extrusions by means of co-operating formations on the two elements to define an elongate channel therebetween bounded in part by the plastics extrusion and in part by the metal extrusion with the base of the channel being provided by part of the metal extrusion. A liquid resin material is then poured into the channel and, after the resin has cured to a rigid condition, an elongate section of the metal extrusion providing the base of the channel is cut away whereby the plastics and metal frame elements are connected to one another only by the thermally insulating resin material.

In GB-A-2 246 385 there is disclosed a thermal-break frame member comprising two elongate extruded metal frame elements connected to one another only by a thermally insulating resin material. To produce such a frame member, two separate metal extrusions, which may have differing surface finishes or colours are initially interengaged in a self-supporting manner to provide a channel therebetween into which the resin material may be poured. After the resin material has cured the base of the channel is "de-bridged" in a similar manner to that disclosed in GB-A-2 196 369.

It will be appreciated that it is a relatively easy matter to extrude plastics and metal frame elements of the type disclosed in GB-A-2 196 369 to sufficiently accurate tolerances for their respective co-operating formations to be engaged with one another continuously along the length of the extrusions and thus

provide a relatively rigid channel therebetween into which resin material can be poured. In GB-A-2 196 369 the said co-operating formations are provided by a continuous open-mouthed narrow groove of the plastics extrusion within which a continuous ribbed edge of the metal extrusion is engageable. Thus there is provided a somewhat flexible plastics groove to receive the rigid ribbed edge of the metal extrusion. Such an arrangement of co-operating formations could not readily be employed to join together two metal extrusions to define a channel therebetween because the extrusion tolerances would not be sufficiently accurate to enable a continuous ribbed edge of one metal extrusion to be engaged within a narrow-mouthed groove of the other metal extrusion.

In one specific embodiment disclosed in GB-A-2 246 385 the two elongate metal extrusions are initially joined together by a snap action between a continuous elongate headed flange on the one extrusion engaged between two spaced apart elongate headed flanges on the other extrusion. Each of the said spaced apart flanges has some degree of resilience whereby the headed flange on the one extrusion may be continuously engaged with a snap action between the two spaced apart flanges on the other extrusion. As alternatives, there are disclosed in GB-A-2 246 385 the use of external supports for the two extrusions, or the clenching together of the two extrusions to define a channel therebetween into which the resin material is poured.

It is an object of the present invention to provide a thermal-break frame member, and an improved method for the production thereof, wherein two elongate metal frame elements of the frame member are interconnected only by a thermally insulating material.

In accordance with one aspect of the invention there is provided a method of producing a thermal-break frame member comprising two elongate metal frame elements interconnected by a thermally insulating material comprising the steps of:

assembling two said frame elements together in side-by-side engagement with one another to define an elongate first channel therebetween;

engaging releasable engagement means with said elements to maintain the assembled elements in self-supporting relationship with one another;

pouring a thermally insulating material in liquid form into said first channel and allowing said thermally insulating material to cure to a rigid condition;

removing said releasable engagement means; and

removing a part of said first channel to provide a thermal-break frame member wherein the two said frame elements thereof are connected together only by the rigid thermally insulating material.

There is also provided in accordance with the invention an assembly of two elongate metal frame elements and releasable engagement means therefor for use in producing a thermal break frame member by a method as described in the preceding paragraph wherein interengageable formations are provided on said frame elements providing an elongate fulcrum between said elements when engaged with one another in side-by-side relationship, and abutment formations are provided on said frame elements to define a predetermined angular orientation between said elements when they are pivoted about said fulcrum hence to define said elongate first channel between said frame elements.

Also in accordance with the invention there is provided a thermal-break frame member produced by a method as described above.

The said releasable engagement means may comprise one or more resilient clip elements for releasably clamping said assembled frame elements together prior to the pouring of said thermally insulating material in liquid form into said first channel defined between said frame elements.

The said method may include the steps of assembling said frame elements together in side-by-side relationship with one another with said interengageable formations engaged with one another to define a further elongate channel between said elements, and inserting said releasable engagement means in said further channel to maintain the assembled elements in said self-supporting

relationship with one another prior to the pouring of said thermally insulating material in liquid form into said first channel.

In the method described in the preceding paragraph said releasable engagement means may comprise one or more biasing elements in the form of, for example, one or more spring means, or one or more rigid, flexible or resilient elongate elements. In one embodiment of the invention said biasing elements conveniently comprises one or more hollow or solid lengths of an elastomeric material releasably engageable within said further channel defined between said frame elements.

The aforesaid interengageable formations on said frame elements are conveniently configured with respect to one another to provide when engaged with one another a continuous fulcrum between said elements permitting initial loose assembly of the frame elements together prior to the insertion of said releasable engagement means in said further channel. Said frame elements conveniently also comprise mutually engageable abutments whereby, when said interengageable formations are engaged with one another and said releasable engagement means inserted in said further channel, the frame elements are biased about said fulcrum to bring said abutments into engagement with one another in which position the said first channel is defined between said elements.

Thus, when said releasable engagement means comprises a resilient biasing means inserted in said further channel, the frame elements are resiliently biased about the fulcrum provided by said interengageable formations towards the position at which said abutments engage one another.

Each of the metal frame elements conveniently comprises an aluminium extrusion and each said element may be provided with a surface finish or may be of a colour or may have been subjected to a surface treatment which is different from that of the other frame element.

Other features of the invention will become apparent from the following description given herein solely by way of example with reference to the accompanying drawings wherein:

Figure 1 is a transverse cross-sectional view of two extruded frame elements prior to being connected together to produce a frame member in accordance with the invention;

Figure 2 is a similar view to that of Figure 1 but showing the two frame elements initially loosely engaged with one another by their interengageable formations prior to the engagement of resilient releasable engagement means;

Figure 3 is a similar view to that of Figure 2 but showing the resilient means inserted in a channel defined between the frame elements;

Figure 4 is a similar view to that of Figure 3 but showing a first channel which is defined between the frame elements filled with a thermally insulating material; and

Figure 5 is a similar view to that of Figure 4 but with the wedging means removed and a part of the base of the first channel removed to provide the finished de-bridged frame member.

Referring firstly to Figure 1 there are shown two frame elements 10 and 12 each of which conveniently comprises an elongate metal extrusion such as aluminium or an aluminium alloy. Each metal extrusion is conveniently provided with a surface finish or is of a colour which is different from that of the other extrusion and, with reference to all of the drawing figures, the lefthand extrusion is intended for positioning as an exterior frame element whilst the righthand extrusion is intended for positioning as an interior frame element of the finished frame member.

The exterior frame element 10 comprises a box section body 14 one side of which, which would be on the exterior of a building external of a glazing panel, comprises an elongate flange 16. With respect to the orientation shown in the drawings, this flange 16 lies in a vertical plane and extends both above and below the body 14. The upper edge of the flange 16 is provided with a continuous lip 18 extending inwardly of the frame element. At the inner end of the body 14, the upper and lower sides thereof extend beyond the body to provide

a generally channel shaped profile with the free edges having respective continuous lips 20 and 22 thereon. The upper surface of the body 14 is also provided with a continuous flange providing a continuous lip 24 directed towards the lip 18 thereby providing a groove therebetween for the reception of a glazing bead (not shown) to engage the external face of a glazing panel.

The interior frame element 12 comprises a planar member 26 having a web portion 28 extending perpendicularly therefrom intermediate its ends towards the exterior frame element 10. Said web portion 28 is provided at its free end with flange portions extending parallel to the member 26 comprising an upwardly directed flange having a continuous lip 30 extending towards the member 26 and a downwardly directed flange having a continuous lip 32 extending away from the member 26. A further continuous lip 33 extends from the upwardly directed flange in a direction away from the member 26. This upper lip 33 is parallel to and vertically spaced from the lower lip 32, the two lips 32 and 33 extending substantially equidistantly from the member 26. The member 26 also includes a pair of flanges defining a groove 34 adjacent the upper end of the member 26 for the reception of a sealing gasket (not shown) to engage an internal face of a glazing panel.

A continuous radiused undercut groove 35 is provided at the transition between the undersurface of the web portion 28 and that face of the downwardly directed flange remote from the lip 32. A continuous radiused transition 37 is provided between the undersurface of the web portion 28 and the adjacent face of the member 26 below the web portion.

A further continuous lip 39 is provided on the member 26 below the web portion 28 at a position such that, when the elements 10 and 12 are engaged in side-by-side relationship with one another as further described below, the lip 39 on the interior frame element 12 will extend in parallel opposed laterally spaced relationship with the lip 22 on the exterior frame element 10.

In Figure 2 of the drawings the two frame elements 10 and 12 are shown loosely engaged with one another as part of the method of producing the

finished frame member. As will be seen, the lip 30 on the interior frame element 12 is engaged behind the lip 20 of the exterior frame element 10; these two lips 20 and 30 thereby providing a co-operating fulcrum means extending continuously of the length of the frame elements 10 and 12. Also as will be clearly seen from Figure 2, the outer surfaces of the lips 32 and 33 of the interior frame element 12 are in abutting contact with the external surface of the end 36 of the box section body 14 of the exterior frame element 10 and, in this abutment position, there are defined respective upper and lower channels 38 and 40 each bounded in part by each of the two frame elements.

The upper channel 38 is defined between the outer face of the member 26 above the web portion 28, the upper surface of the web portion 28 and the outer end of the flange providing the lip 20. The lower channel 40 is defined between the outer face of the member 26 below the web portion 28, the under surface of the web portion 28 and the respective flanges providing the lips 22 and 32.

Releasable engagement means conveniently comprising a continuous elastomeric hollow tube 42 is insertable within the upper channel 38 as shown in Figure 3 and, when this resilient wedging means has been so inserted as shown, the two frame elements 10 and 12 are retained together in self supporting relationship with the abutments provided respectively by the lips 32 and 33 and the end 36 resiliently biased into contact with one another by the resilient wedging means 42 about the fulcrum provided by the co-operating lips 20 and 30.

The self supporting assembly shown in Figure 3 is then inverted so that the channel 40 is uppermost, and a thermally insulating resin material in liquid phase is poured into this channel 40 and allowed to cure to a rigid condition in known manner. The radiused transitions 35 and 37 facilitate flow of the liquid resin to fill the channel 40 without air entrapment whilst the undercut form of the groove 35 provides a positive mechanical keying of the cured resin thereto. Further enhanced keying of the cured resin to the metal parts of the channel 40 is provided by the free ends of the opposed lips 22 and 39, by continuous ribs 41

provided on the undersurface of the web portion 28, and by serrations or the like (not shown) cut into the resin-contacting surfaces of the channel 40.

The cured thermally insulating material 44 is shown in Figure 4, where the assembly of frame elements 10 and 12 has been re-inverted, and the resilient means 42 is then removed from the channel 38. The assembly is then de-bridged by removing a part of the base of the channel 40 i.e. by cutting out a continuous strip as at position 46 from the web portion 28 of the interior frame element 12 whereby, as shown in Figure 5, the finished de-bridged frame member comprises the two frame elements 10 and 12 rigidly connected together only by the cured thermally insulating resin material 44. The rigidity of the de-bridged frame member is enhanced by the provision of the lip 33 abutted against the opposed face of the end 36 and by the interengagement of the lips 20 and 30 since, as will be seen from Figure 5, such abutment and interengagement will provide resistance against bending apart of the frame elements 10 and 12.

Thus in accordance with the invention there is provided a method of producing a frame member where the two frame elements 10 and 12 thereof each comprise an elongate metal extrusion. However, since the two extrusions do not have to clip or snap or otherwise initially interengage with one another in a self supporting manner it is found that the extrusion tolerances are sufficiently accurate to enable the invention readily to be put into effect. It will be appreciated that the only mechanical interengagement between the two metal extrusions comprises the initial loose engagement between the co-operating means comprising the lips 20 and 30. The two extrusions are then biased about the fulcrum provided by the interengaged lips 20 and 30 to an angular orientation determined by the positioning of the abutments 32 and 36 which defines relatively rigidly the shape of the channel 40 into which the thermally insulating resin material is subsequently poured.

The finished de-bridged thermally-broken frame member shown in Figure 5 is subsequently assembled into a full window or door frame and, in the orientation shown in Figure 5, such a frame member would comprise a lower

horizontal member of the frame. A glazing bead inserted within the groove defined between the lips 18 and 24 on the exterior frame element 10 would engage the external surface of a glazing panel with the internal surface of the panel being engaged by a sealing gasket contained within the groove 34 at the upper end of the member 26 of the interior frame element 12. As mentioned above, the surface finish and/or the colour of the interior frame element may be different from that of the exterior frame element.

In the specific example described herein with reference to the drawings the frame elements 10 and 12 have been described as comprising elongate metal extrusions such as aluminium or an aluminium alloy. However, it should be appreciated that a thermal-break frame member constructed in accordance with the invention may comprise two elongate metal frame elements wherein said elements may comprise an extruded, rolled, drawn or folded section of any appropriate metal.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS

1. A method of producing a thermal-break frame member comprising two elongate metal frame elements interconnected by a thermally insulating material characterised by the steps of:

assembling two said frame elements (10, 12) together in side-by-side engagement with one another to define an elongate first channel (40) therebetween;

engaging releasable engagement means (42) with said elements to maintain the assembled said elements in self-supporting relationship with one another;

pouring a thermally insulating material in liquid form into said first channel and allowing said thermally insulating material to cure to a rigid condition;

removing said releasable engagement means; and

removing a part of said first channel to provide a thermal-break frame member wherein the two said frame elements thereof are connected together only by the rigid thermally insulating material (44).

2. A method according to claim 1 further characterised in that said two frame elements are assembled in side-by-side engagement with one another to define a second elongate channel (38) therebetween, and said releasable engagement means is engaged in said second channel to maintain the assembled said frame elements in said self-supporting relationship with one another.

3. A method according to claim 2 further characterised in that said two frame elements are assembled in side-by-side engagement with one another about an elongate fulcrum provided between said two elements.

4. A method according to claim 3 further characterised in that said two frame elements are biased about said fulcrum by said releasable engagement means into abutting relationship with one another to define said first channel therebetween.

5. A method according to any one of claims 2 to 4 further characterised in that said releasable engagement means is inserted into said second channel.

6. A method according to claims 2 to 5 further characterised in that said releasable engagement means comprises one or more resilient members.

7. A method according to claim 6 further characterised in that the or each said resilient member comprises an elongate hollow or solid member of elastomeric material.

8. A method according to any one of claims 2 to 7 further characterised in that one of said frame elements includes an elongate portion (28) engageable with an elongate portion (20) of the other said frame element to effect said side-by-side engagement of said frame elements with one another, one of said elongate portions being common to both of said channels and comprising a said removable part of said first channel.

9. A method according to any one of claims 2 to 8 wherein said removable part of said first channel comprises a base portion of both of said channels.

10. An assembly of two elongate metal frame elements and releasable engagement means therefor for use in producing a thermal break frame member by a method according to any one of claims 1 to 9 wherein interengageable formations are provided on said frame elements providing an elongate fulcrum

between said elements when engaged with one another in side-by-side relationship, and abutment formations are provided on said frame elements to define a predetermined angular orientation between said elements when they are pivoted about said fulcrum hence to define said elongate first channel between said frame elements.

11. An assembly as claimed in claim 10 further characterised in that a second elongate channel is defined between said frame elements when engaged with one another to define said first channel, and said releasable engagement means is engaged in said second channel to maintain said predetermined angular orientation between the engaged said frame elements.

12. An assembly as claimed in claim 11 further characterised in that said releasable engagement means is insertable in said second channel.

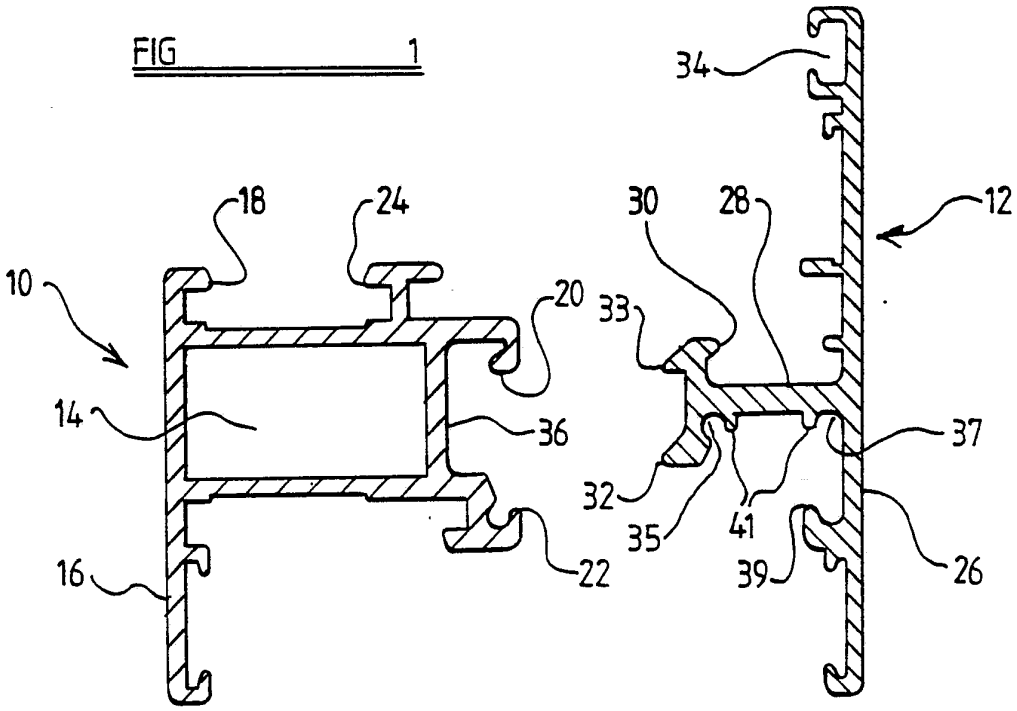
13. An assembly as claimed in either one of claims 11 or 12 further characterised in that said releasable engagement means comprises one or more resilient members.

14. An assembly as claimed in claim 13 further characterised in that the or each said resilient member comprises an elongate hollow or solid member of elastomeric material.

15. An assembly as claimed in any one of claims 11 to 14 further characterised in that one of said frame elements includes an elongate portion (28) engageable with an elongate portion (20) of the other said frame element to effect said side-by-side engagement of said frame elements with one another, one of said portions being common to both of said channels and comprising a said removable part of said first channel.

16. An assembly as claimed in any one of claims 11 to 15 further characterised in that said removable part of said first channel comprises a base part of both of said channels.

FIG 1



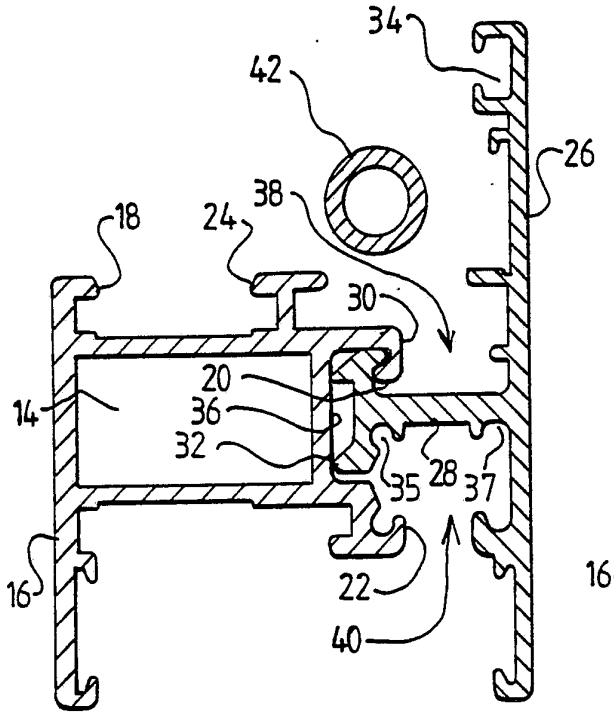


FIG 2

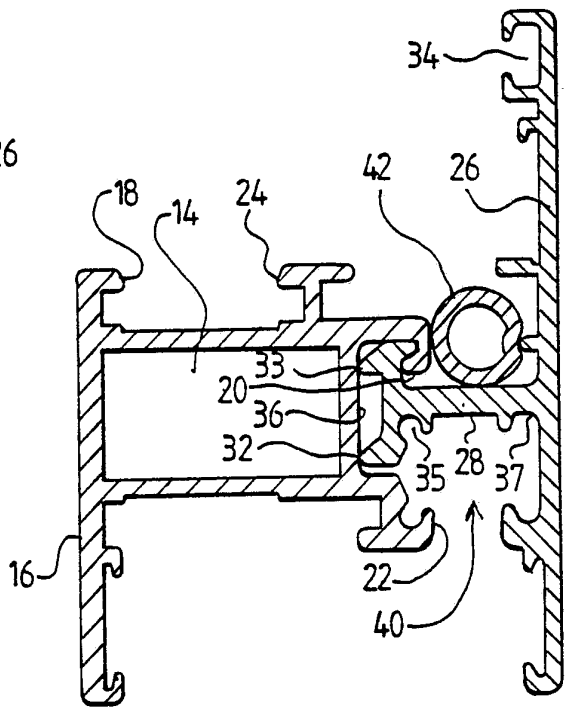


FIG 3

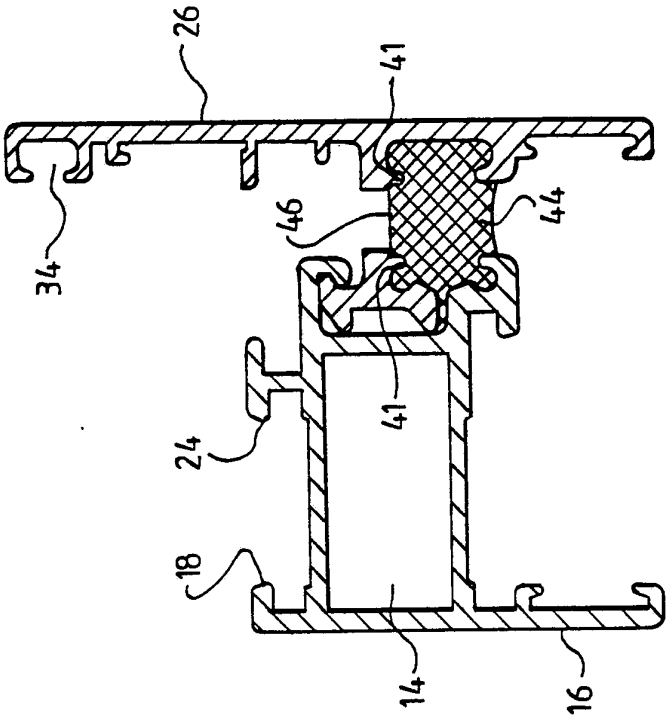

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FIG 5

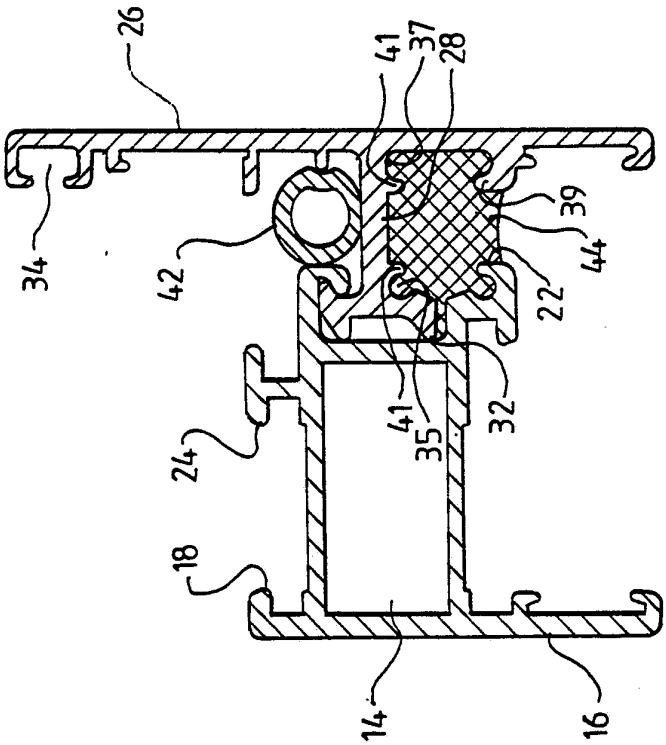
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FIG 4

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 93/00435

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 E06B3/26

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	E06B

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category °	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No.[13]
A	US,A,4 694 552 (ECKER ET AL) 22 September 1987 see column 3, line 64 - column 6, line 50; figures 4-10	1,3,4,8, 10,15
A	EP,A,0 019 427 (REDDIPLEX) 26 November 1980 see page 3, paragraph 4 - page 5, paragraph 3; figure 1	1-7, 10-14
A	US,A,4 018 022 (FINK) 19 April 1977	

° Special categories of cited documents : [10]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
27 MAY 1993	09 -06- 1993
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	DEPOORTER F.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

GB 9300435
SA 70671

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A-4694552	22-09-87	None		
EP-A-0019427	26-11-80	CA-A-	1133762	19-10-82
		GB-A,B	2051193	14-01-81
		US-A-	4304081	08-12-81
US-A-4018022	19-04-77	None		