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(54) Forming structures.

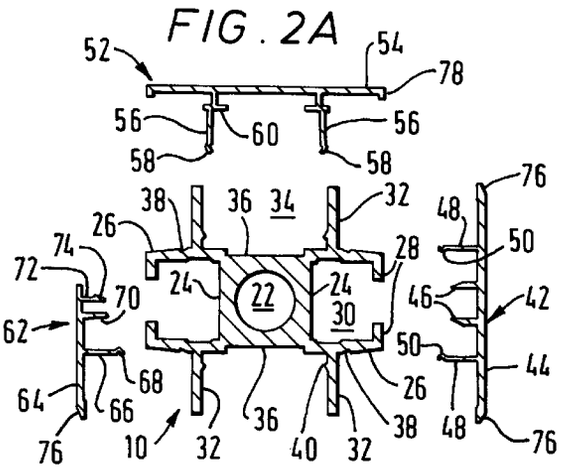
(57) A structure and method of making same is described, which comprises at least four elongate members (10), joined to form a rectangular framework for supporting panelling (90), the join between pairs of elongate members (10) is provided by locating in an axially extending bore (22) of one of them an expansion element (100) which is engaged by a bolt (102) passing through an aperture formed to extend transversely of the axis of the other of said pair.

Each elongate member (10) may have two axially extending parallel bores (22, 22′) formed therein with pairs of expansion elements (100, 100′) and bolts (102, 102′) used with them. The elongate members (10) are formed with walls (26, 36) defining cavities (30, 34) extending parallel to the or each bore (22) therein. The walls (26, 36) are adapted to engage legs (46, 48, 56) of elongate cover elements (42, 52) to be fitted to said members (10). The walls and cover elements may be used to define sets of slots running parallel to said cavities (22) of the elongate members, in which slots edges of panelling (90) are received.

The panelling may comprise a rectangular cut piece of solid material with lugs at each edge received in said slots, or be two laminar layers (90) (possibly glass) the edges of which are fitted said slots. The volume between layers (90) may be void or filled with insulating material. Resilient inserts may be placed in the slots to hold edges of panelling received therein. The slots may be used to support brushes or other sealing elements.

One form of cover element (150) described for use on a door structure has a part (162) extending past the elongate member (10) on which it is supported and itself supports a resilient sealing strip (170) engagable with a surface of a cover element (54) of an elongate member (10′) adjacent the door when the door is closed.

FIG. 2A



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The invention relates to forming structures and construction systems, in particular a construction system enabling the ready fabrication of thermally and/or acoustically insulated structures.

Until now the fabrication of a thermally and/or acoustically insulated structure has required that the design of the structure and its fabrication thereafter be from specially designed parts which must be made for it.

As a result the design and the assembly of such structures requires the use of skilled designers and operatives including very often the manufacture of one-off parts to form the structure.

Attempts to overcome this drawback which has in our view unnecessarily increased the cost of such structures have been made, however, none to our knowledge has at the present time been wholly effective and they in general require significant cutting, drilling, folding, welding, grinding, sawing and/or punching operations to be carried out during the manufacture or on site.

These operations all cause noise and dust contamination problems.

A major problem which arises in the construction of such structures is in physically joining together the members which form a framework for the structure. Difficulties particularly arise in ensuring that the frame members are properly aligned before they are bolted, clamped or otherwise fixed together.

One object of the invention is to provide a novel system of linking together elongate frame members for such structures which may be more readily and easily effected than has until now been the case and can be easily assembled and/or manufactured at high speed by non- skilled personel and which, furthermore, meets the requirement of the food industry (amongst others).

The particular arrangements now proposed provide alternatives for what is known to us for use in this field and structures comprising extruded aluminium frame elements which, when completed, have smooth outlines and contours which are readily kept clean.

The main framework provided by the arrangement of the present invention can accept panels of different material specifications and thickness to suit any particular customer requirement.

A further object of the invention is to provide a modular or systematised approach to the construction of such structures - in particular thermally and/or acoustically insulated structures - enabling to a large extent, the relatively small number of differently shaped parts to be used to form any desired size or shape of structure.

In one aspect of the invention a method of forming a structure including elongate members joined in pairs such that the axis of one of each pair extends normally of the axis of the other of each pair, the method comprising the steps of forming a bore extending axially of one elongate member from one end thereof at least partially along the length thereof, placing in said bore of threaded expansion element, forming in said other elongate member an aperture extending transversely of the axis thereof, at a position it is desired to join the members one to the other, passing a bolt through said aperture and into the bore to a position in which it engages said expansion element and causes it to expand and hold the two elongate members together.

A plurality of elongate elements may joined to form a rectangular framework for supporting panelling.

In a second aspect the invention provides an elongate member for joining to another, similar, member at right angles thereto, the elongate member being formed of a bore extending axially thereof from one end thereof at least partially along the length thereof.

The elongate member may be provided with said bore extending along the length thereof; and the member be formed by extruding aluminium.

A structure comprising at least four elongate members, each as defined above and joined to form a rectangular framework for supporting panelling, provides that the join between pairs of elongate members is provided by locating in the axially extending bore of one of them an expansion element which is engaged by a bolt passing through an aperture formed to extend transversely of the axis of the other of said pair, and that said members supporting panelling therebetween.

Each elongate member may have has two axially extending parallel bores formed therein, the join between pairs of elongate members being provided by locating in the axially extending bores of one of them expansion elements which are engaged by bolt passing through apertures formed to extend transversely of the axis of the other of said pair of members.

The elongate members may be formed with walls defining cavities extending parallel to the or each bore therein.

The walls are preferably shaped and adapted to engage legs of elongate cover elements to be fitted to said members.

The walls and cover elements advantageously define slots running parallel to said cavities of the elongate members, in which slots edges of panelling supported by the framework formed by the elongate members are received.

A structure in the form of a panel member preferably provides that each elongate member is provided with two elongate cover elements thereon, to define two sets of slots which lie in parallel planes, either or both of the sets of slots receiving the edges of a panelling forming the main part of the panel member.

In such a panel member the panelling may comprise a rectangular cut piece of solid material with a

pair of lugs at each edge thereof, which lugs are received in said two sets of slots.

Alternatively, said panelling may comprise two generally laminar material layers the edges of which are fitted in respective ones of each of said two sets of slots.

The volume between the laminar layers may be filled with acoustically and/or thermally insulating material.

The laminar layers may be held in said slots by resilient inserts located between walls of the elongate members and the cover elements attached thereto and having inner dimensions adapted such that the inserts receive and frictionally engage edges of the laminar layers.

A structure in the form of a window preferably provides that the panelling is in the form of one or two panes of glass or other transparent material held in one or both of said slots by resilient inserts fitted between walls of said elongate members and the cover elements attached thereto, the inserts having inner dimensions adapted to receive and frictionally engage edges of said pane(s).

The slots defined by walls of, and cover elements attached to, the elongate members are adapted to support brushes or other sealing elements.

A structure in the form of a door may be provided with a cover element having a part extending past the elongate member on which it is supported and which itself supports a resilient sealing strip engagable with a surface of a cover element of an elongate member adjacent the door when the door is closed.

The above and other aspects, features and advantages of the invention will become apparent from the following description of embodiments thereof now made with reference to the accompanying drawings, in which:-

Figure 1 diagramatically illustrates a wall of a structure embodying the invention and which includes a door and a window,

Figure 2 shows at A and B schematical sectional views of first and second forms of elongate members embodying the present invention, together with other elements which may be used in the method of the invention,

Figure 3 shows schematic sectional views drawn on the lines III-III of Figure 1,

Figure 4 shows schematic sectional views drawn of the lines of IV-IV of Figure 1, showing at A and B first and second forms of elongate member embodying the present invention and in particular illustrating methods of joining the elongate members of the present invention together, and at C another method of joining those members together,

Figure 5 shows at A and B views illustrating forms of hinge which may be used in arrangements falling within the scope of the invention,

Figure 6 illustrates a form of seal for a door embodying the invention,

Figure 7 shows schematic sectional views drawn of the line VII-VII of Figure 1, illustrating at A and B first and second forms of elongate member embodying the present invention and in particular illustrating forms of glazing which may be used in an arrangement embodying the present invention,

Figure 8 illustrates a further method of joining elongate members embodying the invention, in particular showing a method in which the joint between those members may be reinforced.

Figure 9 illustrates in a roof section for an enclosure formed in accordance with the invention, and

Figure 10 illustrates a sliding door arrangement falling within the scope of the invention.

With reference now to the drawings, Figure 1 illustrates a wall of an acoustic enclosure formed in accordance with the invention. The wall includes extruded aluminium elongate members 10 forming a framework for and surrounding panelling 12, a glazed area 14 forming a window and a door 16 which is hinged to the wall at 18.

Although not shown in the Figure the enclosure includes a roof as well as four walls - such that a complete acoustic enclosure is provided.

Figure 2A illustrates a section through an member 10 forming part of the wall shown in Figure 1. As can be seen from Figure 2A member 10 is generally square in section and provided with a central bore 22. Two opposed walls 24 of member 10 have extending from their edges walls 26 the outer ends of which terminate in return walls 28 which extend towards one another to define a cavity or recess 30 above each wall 24. The outer surfaces of the walls 26 are provided with arms 32 defining a cavity or recess 34 above the other two walls 36 of member 10.

Adjacent the arms 32 outer surfaces of walls 26 are provided with V-shaped notches or indentations 38, and the facing surfaces of the arms 32 are provided with upstanding V-shaped protrusions 40 as shown.

The other extruded alumiunium elements shown in Figure 2A may, in particular circumstances, be used with the member 10.

The first of these, element 42, comprises a generally planar part 44 extending from one side of which are two shorter legs 46 the spacing of which is such that the distance between outer surfaces of legs 46 is the same as the spacing between the ends of return walls 28 of member 10.

Planar element 44 is further provided with two longer legs 48 the free ends of which are shaped as shown, that is to say the inner, facing, surfaces are formed as V-shaped protrusions 50 as shown. The spacing of each leg 48 from the leg 46 is substantially

equal to the outer dimension of the return wall part 28.

The length of the legs 48 - the distance of protrusion 50 from planar part 44 - is such that the protrusion is received in the notch 38 if the element 42 is located with a leg 46 and 48 lying to either side of the return wall 28 and then pushed home.

Figure 2A shows a further element 52 to comprise a planar part 54 having two legs 56 the length of each of which is substantially the same as that of the walls 32 of member 10. The free ends of legs 56 are shaped as shown, i.e. their outer surfaces are formed with V-shaped protrusions 58.

The spacing of legs 56 is substantially equal to the spacing of the walls 32 of member 10 so that element 52 can be fixed in position on member 10 - legs 56 being passed between walls 32 - and then pushed home until the V-shaped protrusions 58 engage behind the V-shaped protrusions 40 formed on the inner surfaces of arms 32.

As can be seen from Figure 2A the walls 56 are provided with inwardly extending flanges 60.

Figure 2A further shows a element 62 comprising a planar part 64 extending therefrom a first leg 66 the free end of which is shaped as shown and provided with a V-shaped protrusion 68. Element 62 is further provided with a second, shorter leg 70 spaced from leg 66 by the outer length of the return walls 28 of member 10 and with a third leg 72 shorter than legs 66 and 70 and the free end of which is shaped as shown with a V-shaped protrusion 74.

The spacing of leg 72 from leg 70 is such that when member 62 is fitted onto member 10 shown in Figure 2A with legs 66 and 70 on either side of the return wall 28 leg 72 will extend into the cavity 30 lying approximately halfway between the ends of the return walls 28, thereof.

The purpose of element 62 is to enable glazing to be incorporated in arrangements embodying the present invention as will be described in more detail below.

The elements 42 and 52 are attachable to member 10 and it will be appreciated that in that condition the ends of the planar part 44 of element 42 come into abutment with the ends of the planar part 54 of element 52.

To enhance the aesthetic appearance of a construction formed with members 10 and these elements the two ends of planar part 44 and one end of part 62 are bevelled or rounded as shown at 76 and, slightly, thickened in those regions where they abut the square cut ends 78 of planar part 54 of element 52.

A second form of elongate extruded aluminium member 10 is shown in Figure 2B which effectively comprises two members 10 as shown in Figure 2A joined by webs or flanges 80 running between the outer surfaces of the outermost ends of the walls 26.

Other features of member 10 shown in Figure 2B are essentially the same as the member 10 of Figure 2A and are given the same reference numerals but distinguished by a prime.

Figure 2B shows elements of 42′, 62′ which are essentially similar to the element 42 and 60 of Figure 2A save that the spacing of the legs 46′ of element 42′ are extended to accomodate the width of web 80 - that is to say element 42′ is placed on member 10 of Figure 2B and legs 46′ will bear against the ends of the two outermost return walls 28 of member 10.

Similarly, with the legs 70′ and 72′ of element 62′ are spaced apart by an amount additional to that shown for the element 62 of Figure 2A equal to the length of the web 80 of member 10 in Figure 2B, such that when member 62′ is located on member 10 with its legs 66′ and 70′ on either side of a return wall 28 (in the Figure, the lowermost return wall 28) leg 74′ will extend into the upper cavity 30 and lie approximately halfway between the return walls 28 of that cavity.

It will be appreciated that the element 52 shown in Figure 2A may be used with the member 10 of Figure 2B, and that the spacing of the walls 26, arms 32 and positioning of the recesses 38 and notches 40 in the two members are the same.

Figure 3A is a sectional view drawn on the line of III-III of Figure 1 and shows a member 10 as illustrated in Figure 2A acting as part of a frame for panels 90.

Each panel 90 may be of any suitable material for example stainless steel and extends between each of the elements 10 forming a rectangular section of wall as shown in Figure 1. The volume between the panels 90 is filled with a foamed acoustic and/or thermally insulating material as indicated at 92, perhaps with interposition corrugated spacing elements 94 to ensure the outer edges of panels 90 bear against the members 54 of element 52. This action may be achieved and/or augmented by placement of foam or similar rubber inserts between the walls 6 and panel 90.

The spacing of the two panels 90 is substantially the same as the spacing of the outermost ends of arms 32 on opposed sides of member 10.

When forming a wall the insulating material 92 may be located between each of two panels 90 and then panels 90 may be aligned with the outermost ends of the walls 32 of member 10.

Thereafter elements 52 are located on the top and bottom of member 10 (as viewed in the Figure) such that the legs 56 extend between the walls 32. The elements 52 are then pushed home to clamp the panels 90, and the insulating material 92 therebetween - i.e. between the outermost ends of the planar parts 54 of the elements 52.

The elements 52 are held in position by the action of protrusions 58 on the ends of the legs 56 engaging behind the protrusions 40 formed on the walls 32, and the panels 90 are located in the slots formed between the planar parts 54 of elements 52 and the walls 26

of members 10.

It will be appreciated that in different conditions different volumes of insulating material 92 may be provided and this can be accomodated within arrangement embodying the invention by varying the thickness of the material layer 92 and of the corrugated spacer elements 94 lying between the panels 90 - the spacing between the panels 90 being retained substantially constant.

If desired the panels 90 and insulating material layers 92 may be formed as one - being suitably cut and shaped from a solid block of material such that each side edge has two lugs on its outer surface which are placed on either side of the walls 26 of member 10 before the elements 52 are located in position on that member.

Preferably, however, the insulating material 92 is provided separately from the outer panels 90 - it may be provided again cut from a block and placed in position as the structure is assembled.

Figure 3B illustrates a section through an extruded aluminium member 10 of the form shown in Figure 2B. The features of this arrangement are substantially as described with reference to Figure 3A and are given the same reference numerals but distinguished by a prime. It is to be particularly noted that the dimensions of the cavities 30 and 34, of the walls 26 and 32 and the positioning of the notches 58 and protrusions 40 are the same as for the member 10 of Figure 3A and that the additional distance between the elements 52 attached to the member 10 of Figure 3B is due to the additional bore 22 and central void between the webs 80.

It will be seen from Figure 3B that the fixing of the panels 90 to member 10 is in substance the same as is discussed with reference to Figure 3A but that the thickness of the layer of acoustic insulating material 92 provided between the panels 90 is greater.

Typically the element 10 of Figures 3A will have an overall dimension of 60mm and provide for a thickness of insulating material 92 of 50mm; whilst member 10 of Figure 3B will have an overall dimension of 110mm between the outer surface of elements 52 and be usable with a thickness of insulating material 92 of 100 mm.

Arrangements of the invention provide this variation in size of extruded aluminium members 10 to take account of the desired different thicknesses of insulating material layers required for any given structure.

An alternative method of fixing the panels 90 in position makes use of elastic insert elements located within the slots formed between the walls 26 and planar parts 54 - the outer dimensions of which insert elements conform to the dimensions of the slots so formed and the inner dimensions of which are such that they receive and frictionally engage and hold panels 90 in position.

With such an arrangement the void between the panels 90 may, if desired, be left empty or be filled as described above with any suitable acoustic or thermally insulating material.

It is possible further when using this modified form of construction that the insulating material layer be provided in situ - as a blown foam formed between two panels 90 within a framework of members 10.

It will be appreciated that with the arrangements described with reference to Figure 3 the panels 90 may be of any suitable material - for example any suitable plastics or metal other than the stainless steel described.

Figure 4A is a sectional view drawn on the lines IV-IV of Figure 1 illustrating the way in which two members 10 such as shown in Figure 2A are joined together.

Figure 4A shows a first member 10 cut to length with a square end abutting a second member 10′ at the position at which the two members 10 and 10′ are to be joined. Once they are in this position an operative locates an expansion element 100 in the bore 22 of member 10. Element 100 may comprise a standard expansion collar used in the construction industry to fixing bolts in concrete.

The operative then drills from the cavity 30 of member 10′ remote from member 10 through both walls 24 and across the central bore 22 - and thus into the recess 30 of member 10′ adjacent member 10.

Thereafter the operative passes a bolt 102 through the drilled apertures until the threaded end 104 of the bolt engages the expansion element 100 in bore 22 of member 10.

By tightening bolt 102 expansion element 100 expands in bore 22 of member 10 until member 10 is firmly gripped by it. Thereafter, further tightening of bolt 102 in the expansion element 100 will cause the two members 10 and 10′ to be drawn tightly together - with member 10′ fixed at right angles to member 10.

Elements 52 are then positioned on members 10 and 10′ to provide a decorative finish. It will be seen that the square cut ends of the planar parts 54 of the elements 52 placed on the members 10 and 10′ abut one another to provide a smooth joint. After these elements have been fixed in position an element 42 is positioned as shown to cover cavity 30 - and the head of the bolt 102 therein.

By using bolts longer than those shown in Figure 4A it is possible for an operative to pass a bolt transversely through two members 10 which extend side by side and have their bores 22 in parallel planes and into the ends of a bore 22 of a third member 10′ at right angles thereto. In this way it is possible for three members 10 to be joined at a point for example with their axis extending mutually orthoginally.

It will also be seen that the drilled aperture for bolt 102 may, if required, be drilled through the walls 36, and central bore 22 to effect fixing of two members 10 together and to allow fixing to the structure of any de-

sired item (e.g. a bracket, catch or the like).

Figure 4B illustrates the fixing together of two members 10 and 10′ such as are shown in Figure 2B.

It will be seen that two bolts 102 and 102′ are used engaging respective expansion elements 100 and 100′ located in the bores 22 and 22′ of the member 10. In other respects the fixing shown in Figure 4B is similar to that described with reference to Figure 4A and will not be further described save to say that with the arrangement of Figure 4B elements 52 and 42′ will be used to provide a decorative finish to the members 10 and 10′.

An alternative method of fixing together two members 10 and 10′ is shown in Figures 4C. In this arrangement the members 10 and 10′ are cut at an angle of 45° to provide for a mitred join between them rather than the butt joints shown in Figures 4A and 4B.

A collar 100 is then inserted in the bore 22 of one of the members and a bolt 102 passed through an aperture drilled in the walls 24 (or 36) of the other member and into that bore so it is received in the collar 100. Desirably, with this arrangement an L-shaped in section piece 106 is provided beneath the head of the bolt 102 - which L-shaped piece overlies and contacts walls 24 (or 36) of the members 10 and 10′ as shown.

After fixing two members together in this way elements 42 and/or 52 may be used to provide a decorative finish to the assembled joint and cover the head of the bolt 102. Such joints are preferred when clearly visible, e.g. when making a frame for a door or window.

Figure 5A is a sectional view of one form of hinge 18 for a door 16 or window 14 as shown in Figure 1.

A member 10 of the framework of the doorway supports the hinge 120 which is in turn attached to member 10′ of the door 16 or window 14 (in the Figure the hinge is supporting a frame 10 for a window).

Hinge 120 is fitted in the following way.

Before the panels 90 are attached to the members 10 and 10′ of the wall and window respectively an element 52 (or 42 depending upon the orientation of the member 10) is placed in position on the member 10 in the previously described.

An operative then drills through the walls 24 to either side of the bore 22 of member 10 and through the element 52.

Bolts 122 are passed through the walls 24 and into pre-cut threaded holes in hinge leaf 126. There are normally a number of holes in hinge leaf 126 and an operative would drill apertures through the walls 24 of member 10 and the element 52 to allow the bolts 122 to be passed to each of holes 124.

The other hinge leaf 128 is fixed to the member 10′ in substantially the same way - apertures being drilled in the walls 24 to allow bolts 122′ to be passed through member 10 and into a threaded hole in hinge leaf 128.

In the arrangement shown hinge leaf 126 is disposed vertically above hinge leaf 128 and as can be seen lands 130 and 132 are provided on them both to reduce their aluminium content and to enable the hinge leaves to be fitted onto an element 52 formed along its length with one or more decorative and/or sealing strips.

The element 52 may be omitted as seen to the right of Figure 5A and the hinge leaf 128 fixed directly to member 10 - that is to say abutting return walls 28 or the ends of arms 32. In such an arrangement elements 52 may thereafter be cut to size to butt against the edges of the hinge leaves 126 and 128 to provide a finish for the arrangement.

A hinge element for use with a member 10 such as is shown in Figure 2B will in substance be the same as already described with reference to Figure 5A save that the leaves thereof will be substantially wider, and, if desired, the hinge could be fixed to the member 10 and 10′ of the window frame by two sets of bolts 122 and 122′ respectively.

A hinge element for use in an arrangement embodying the present invention may take any suitable form.

Other types of hinge may of course be used e.g. types of hinge in which the faces of the leaves abut when the door or window they support is closed.

Figure 5B shows a modified form of hinge 140 particularly (but not exclusively) used for mounting an outwardly opening door at a corner of a structure embodying the invention. Hinge 140 has a leaf 142 bolted onto a member 10 forming part of a door (as shown the leaf 142 is bolted onto the outer surface of an element 150 (see detaial Figure 6A) on the member 10). The fixing of element 142 onto member 10 is as described above with reference to Figure 5A.

Leaf 142 extends, as can be seen, considerably past the edge of the member 10 and has hingeably connected to it a second hinge leaf 146. Hinge leaf 146 is smaller both horizontally and vertically extent (as viewed in the Figure) and is receivable in an aperture 148 formed in leaf 142 when the door is closed. Hinge leaf 146 is fixed to a member 10′ forming part of the frame of the doorway and a corner post of the structure.

It will be seen that with this arrangement the member 10 of the door 16 will lie, when the door is closed, in abutment with the front surface of the member 10′. That is to say a door mounted in this way lies, when closed, on the surface of the wall including the doorway is not flush with that wall.

Figure 6 illustrates one form of door seal which may be used with the arrangements embodying the invention and shows at A a sectional end view of a first extrudued aluminium element 150 used in the arrangement. Element 150 is used in place of a cover element 42 and comprises a first planar part 152 having two depending legs 154 with return ends 156 substantially as shown.

One side of planar part 152 has upstanding therefrom a shoulder 158 the upper edge of which carries a further planar part 160. Planar part 160 runs in a plane substantially parallel to the plane part 152.

The end of planar part 160 remote from shoulder 158 has a depending adjacent legs 162 and 164 which extend normally thereof. The legs 162 and 164 are provided with return walls 166 and 168 respectively as shown.

A sealing piece 170 which is in the form of a T (in section) is provided with its upper arms received between the return walls 166 and 168, and the planar part 160 as shown. It will be noted that the root of T piece 170 extends past the plane of the part 152 of element 150. Piece 170 may be of any suitable resilient material (e.g. natural or synthetic rubber).

Element 150 is held in position on member 10 making use of an extruded aluminium fixing insert 172 as shown in section in Figure 6B. Insert 172 comprises a pair of arms 174 at the uppermost (as viewed in the Figure) end of the insert - each arm extending generally normally of the vertical axis of the insert. The arms 174 are sized and adapted to be received between the return walls 156 and the planar part 152.

Extending from the arms 174 insert 172 has a root portion 176 gradually widening as it moves away from the arms 174 and the insert terminates in a bottom wall 178 the extent of which is substantially equal to the extent of a wall 26 (or 34) of member 10.

Wall 178 may be pierced by plurality of blind holes 180 each lying on the centre line of the insert 172. The holes 180 may, if desired, be formed with threads cut in them. Alternatively and as shown the holes 180 may be replaced by a serrated slot running the length of member 172.

Figure 6C shows the assembled sealing arrangement and in particular shows an element 150 mounted on fixing insert 172 which in turn is held in a member 10 of framework forming a wall 12 adjacent a door 16.

The method of fixing insert 172 and element 150 on member 10 is substantially as has been described before. An operative drills aperture through the walls 36 of member 10 and passes a screw 182 through those apertures and the central bore 22 until it reaches a hole 180 formed in the insert element 172.

As noted above the holes 180 formed in element 172 may be threaded to receive the screw 182 or may be smooth sided and adapted for use with self taping screws. The other exposed faces of member 10 are covered, as has been described already, making use of elements 42 and 52.

Figure 6C additionally shows a member 10′ of a door 16 fitted with an identical sealing system - parts being given the same reference numerals but distinguished by a prime.

With the particular sealing arrangement described it will be noted that when the door 16 is closed (as shown in Figure 6C) the roots of the two T-pieces 170, 170′ rest on the outer surfaces of the elements 52 of the other member 10′ or 10 of the frames of the wall and door.

Figure 7 illustrates sectional views drawn on the lines VII-VII of Figure 1 and in particular shows at Figure 7A a arrangement in which member 10 as shown in Figure 2A is used to support glazing.

The right side of Figure 7A illustates a method by which a single pane of glass or other suitable transparent/translucent material may be supported by the member 10 whilst the left side of Figure 7A illustrates the way in which the arrangement may be adapted for use with double glazed units.

The right side of Figure 7A shows member 10 supporting a pane 190 of glass. Pane 190 is supported by providing a rubber or other elastic material insert 192 generally of the form shown.

To mount pane 190 an insert 192 is layed along the upper (as viewed) wall 36 of the member 10 and pane 190 placed into the cavity formed within the insert. An element 52 is then placed in position with its legs 56 between the arms 32 of the member 10 as shown.

Element 52 is held in position (by the interaction of the protrusions 58 and 40) and acts to grip the rubber insert 192 between the planar part 54 and wall 36.

Insert 192 has a tail 194 shaped generally as shown which passes across return wall 28 and into cavity 30 of member 10.

In a single glazing arrangement the tail 194 of insert 192 is trapped in cavity 30 by using an element 62 (see Figure 2A) the legs 66 and 70 of which pass to either side of the return wall 28. It will be appreciated in this position the leg 72 of element 62 will pass into the cavity 30 and hold the tail 194 of insert 192 in position - the protrusion 74 on the end of legs 72 acting to grip the tail 192 against the end of return wall 28.

It will be seen that with use of different sized inserts it is possible for an arrangement embodying the invention to make use of different thicknesses of panes.

In a single glazed arrangement the lower (as viewed) face of member 10 is covered by a element 52.

As noted the left side of Figure 7A shows an arrangement in which two glazing panels have been used to form a double glazed unit.

The first of these glazing panels 196, is supported by a resilient insert 198 of substantially the same form as the insert 192. It will be seen, however, that panel 196 is thinner than panel 190 and to accomodate this the web 200 of insert 198 resting on wall 26 is thicker than the corresponding part of insert 192. Insert 198 has a tail 202 which passes across return wall 28 and into cavity 30.

The double glazing unit is completed by a glazing

panel 204 - which in the Figure is shown to be thicker than glazing panel 190. The glazing panel 204 is held in position by a resilient insert 206 generally of the form shown and having a web 208 resting on wall 26 of member 10 which is thinner than the corresponding part of insert 192. Once again insert 206 has a tail 210 which passes across the associated return wall 28 and into cavity 30.

In the double glazed arrangement shown to the left side of Figure 7A an extruded aluminium member 212 having the form shown in section is passed between the ends of the tails 202 and 210 to urge them to bear against the ends of the return walls 28 - and thus hold the inserts firmly in position.

Figure 7B shows an arrangement similar to that described with reference to Figure 7A save that it makes use of member 10 of Figure 2B. Parts of the Figure which are the same as Figure 7A are given the same reference numerals but distinguished by a prime.

The right side of Figure 7B is shown to support a single glazing panel and is completed by making use of an element 62′ (as shown in Figure 2B) which extends across the central web 80′ of member 10′.

As noted the left side of Figure 7B shows an arrangement in which two glazing panels have been used to form a double glazed unit and makes use of an extruded aluminium element 220. Element 220 has a planar part 222 with depending legs 224 the ends of which form protrusions 226 as shown. It will be seen that after the inserts 198′ and 206′ have been placed in position as shown element 220 may be passed across the central web 80 and pushed such that its legs enter each of the cavities 30 of the member 10′ and act to bear against the tails 202′ and 210′ of the inserts 198′ and 206′ forcing them against the end of the return walls 28′ to hold the tails of the inserts firmly in position.

In certain circumstances it may not be possible to use the bolt fixing arrangement described with reference to Figure 3 to join two members 10 together. Such a situation arises when, for example it is desired to join to both sides of a first member 10 the cut ends of two other members 10′ and 10″ at the same position along the length of member 10.

It will be seen that in such an arrangement it is possible, before the member 10″ is placed in position, for an operative to join members 10 and 10′ together in the way described with reference to Figure 3. Once this has been done however, it will not be possible to use the same method for fixing member 10″ to member 10.

In such circumstances we propose member 10″ be fixed to member 10 making use of element 250 as shown in Figure 8A.

Element 250 of Figure 8A comprises a base part 252 which is generally rectangular in section and sized to fit within a cavity 30 of a member 10. From one surface of base part 252 the element extends via a neck 254 to a outer portion 256 formed with two V slots 258 and 260 terminating in respective rounded apertures 262 and 264.

If base part 252 of element 250 is placed in cavity 30 of member 10 it will be held therein by the return walls 28. It is then possible for the outer portion 256 of the element to be passed into the end of the cavity 30 of member 10″.

Before doing this an operative will pre-drill holes in the walls 24 of member 10″ at appropriate locations to enable self tapping screws 266 (one is shown) to be passed through the rounded apertures 262 and 264 of element 250 and into the wall 24.

It is preferable in practice if the centres of the holes drilled in the walls 24 of member 10″ are offset slightly from the centres of the rounded apertures 262 and 264 of element 250. The action of passing screws 266 through the apertures 262 and 264 of element 250 and into the drilled holes in the walls 24 will then, as the screws are tightened, cause the element 250 to pull member 10″ more tightly onto member 10.

It will be seen that the outer position 256 of element 250 may be passed into a cavity 34 of member 10″if the orientation of the member is so required.

After the element 250 has been used in this way to join two member 10 and 10″ together it will be seen that it will be hidden from sight by an element 52 or 42 thereafter fitted to the member 10″.

It will be appreciated that the element 252 may, if desired, be used to reinforce a joint made with a bolt such as is described in the Figure 3 - the element 252 being provided to run generally parallel to the axis of the bolt.

Figure 9 illustrates a way in which roof of an acoustic enclosure embodying the invention may be manufactured from the parts so far described.

As can be seen from the Figure the roof includes at least one member 10 of the form shown in Figure 2B mounted away from a wall 290 of the enclosures.

Member 10 is provided with an additional support bar 292 substantially in the form shown. Support bar 292 has a part 294 adapted to fit within the cavity 34 of member 10 and is provided in its upper surface with a serrated slot 292 running along its length.

To assemble a roof an operative drills through the walls 36 of the member 10 to allow bolts 298 to be passed therethrough and into the holes 296.

It will be noted that the roof support bar 292 has two surfaces 300 which, when the bar 292 is fixed to member 10 run away from the part 294 to either side and extend substantially past the ends of the return walls 28 and the web 80 of member 10.

The support bar 292 is completed by walls 302 depending from the outer edges of the walls 300 which converge and then are joined by a bottom wall 304. It should be noted that the outer, upper (as viewed in the Figure) ends of the walls 300. In con-

structing an acoustic enclosure the member 10 - after the roof support bar has been attached thereto by the bolts 298 - is mounted on the upper ends of other members 10 (not shown) which stand vertically and form part of the walls of the enclosure. The method of joining the member 10 to the vertically extending members 10 is as described with reference to Figure 3.

Figure 9 also shows a members 10′ of the form shown in Figures 2A used as a roof edge bar - a bar running along the top edge of a wall of the wall 290. Members 10′ is carried on a member 10′ forming a top part of a wall framework and as shown in Figure 2A. As seen in the Figure the cavity 34 of upper member 10′ receives the legs 56 of an element 52. Element 52, it will be appreciated, is trapped between the members 10′ and 10″.

To construct a roof after the framework has been assembled a panel 90 is laid on the upper surface of the wall 300 and the planar part 54 of the elements 292 and 52 respectively. Thereafter an insulating material layer 92 is placed on the panel 90 (perhaps with the interposition of a spacer element 94) and finally an upper panel 90 is layed on layer 94.

The enclosure is completed by placing lower elements 52 on the the members 10, 10′ and 10″ as shown and, and an element 42′ on the outer exposed surface of the member 10′ forming the roof edge bar.

Figure 10 illustrates how a sliding door arrangement may be provided using the system of the present invention and shows a door 310 supported on a running track 312 carried on a member 10A itself carried on a member 10B running across the top of the doorway - and to the side thereof - with an interposed extruded aluminium spacer 314.

Door 310 is formed with four members the top 10C and bottom 10D of which are shown in section.

The members 10A, 10B, 10C and 10D are each as shown in Figure 2A.

Door 310 is carried on track 312 by means of bolts 314 which are fixed to the bottom sections of U-shaped members 316 the upper arms of which carry wheels 318 resting on the upturned lower edges 326 of depending side arms 328 of track 312 as shown. Track 312 is supported on member 10A by bolts 330 and member 10A is supported on member 10B by extended bolts 332 which pass through the spacer elements 334.

An element 42 is provided on the top and bottom of member 10A and on the bottom of the member 10B. It will be appreciated that the element on the bottom of member 10A is interposed between that member and the running track 312.

The upper return walls 28 of member 10C at the upper edge of the door 310 are cut as appropriate to receive upstanding arms 316 as indicated.

Elements 54 are provided on each side of the members 10C and 10D. The elements 54 provided on the member 10C act to trap inserts 336 of the form shown which retain and hold in position brushes 338, which extend upwardly to brush against the lowermost edge of the side arms 328 or track 312.

Member 10D at the bottom of the door receives in its lowermost cavity 30 guides 340 upstanding from a slot 342 in a base plate 344 mounted on the floor, or a lower frame element, beneath the door 310. The sides of the base plate 344 have mounted thereon brushes 346 which extend upwardly and are received between the planar parts 54 of the elements 52 on member 10D and the arms 26. It will be noted that the method of fixing the door to the U-shaped members 322, track 312 and member 10A, and the method of fixing member 10A to the member 10B is in principle the same as has been described above with reference to Figure 3A.

It will again be noted that the brush elements 338 and 346 provided at assist the sealing of the gaps around the door when it is closed and keep the running parts of the arrangement clean.

It will be appreciated that with the various embodiments described it is possible to vary the form of the elements attached to the member 10 for decorative or structural reasons, for example the elements 42 and 52 may be provided with any decorative or functional extension. The elements 42 of a door and door frame which abut when the door is closed - may be provided with rubber sealing strips if desired.

Whilst the load bearing members which have been described are said to be of extruded aluminium they may be of any other suitable material. Where appropriate the materials of any of the member described above may be altered as desired - that is to say members said to be of aluminium may be of plastics and/or rubber, if appropriate and vice versa.

From the foregoing it will be appreciated the invention provides a construction system utilising extruded aluminium members and elements of particular shapes which is a significant advantage in achieving the noted features of the system.

In particular the arrangement provides that the outer faces of the finished product are smooth ensuring that parts of a structure are both aesthetically pleasing and readily kept clean.

It will be particularly noted that with all the arrangements described the bolts used to clip or hold the members together are hidden from view in the finished system.

From the foregoing description it will be readily appreciated that the members 10 (either as shown in Figure 2A or Figure 2B) enable quick and ready assembly of an acoustic or thermally insulating enclosure, which may be contain fixed panels, hinged or sliding doors and single or double glazed windows. Furthermore, the walls, doors and windows may be of different thicknesses - may be formed of single or double panels (which themselves may be of different

thicknesses) and incorporate acoustically and or thermally insulating material of various types and thickness.

Although foamed insulating material is described above for use in structures which embody this invention it will be appreciated that any other suitable acoustically or thermally insulating material may be used.

It will further be seen that the various sealing arrangements described provide for adequate thermal and/or acoustic insulation of the gaps surrounding the doors, or windows of the system when the doors are closed.

It will be noted that the arrangement embodying the invention provide that the only operations required to be performed on site, or in a workshop, are simple cutting and/or drilling - there is no need for the welding, grinding, sawing or punching which has normally to be carried out on site and can cause noise and often production problems; and increase cost.

Finally it will be seen that the structure embodying the present invention can be made much more rapidly than has heretofore been the case - with relatively less skilled labour and at a reduced cost.

Claims

1. A method of forming a structure including elongate members joined in pairs such that the axis of one of each pair extends normally of the axis of the other of each pair, characterized by comprising the steps of forming a bore (22) extending axially of one elongate member (10)from one end thereof at least partially along the length thereof (100), placing in said bore a threaded expansion element, forming in said other elongate member an aperture extending transversely of the axis thereof, at a position it is desired to join the members (10,10′) one to the other, passing a bolt (102) through said aperture and into the bore to a position in which it engages said expansion element (100) and causes it to expand and hold the two elongate members together.

2. A method as claimed in Claim 1, wherein a plurality of elongate elements (10) are joined to form a rectangular framework for supporting panelling.

3. An elongate member for joining to another, similar, member at right angles thereto, characterized in that the elongate member (10) is formed with a bore (22) extending axially thereof from one end thereof at least partially along the length thereof.

4. An elongate member as claimed in Claim 3, wherein said bore (22) extends along the length thereof.

5. An elongate member as claimed in Claim 3 or Claim 4, when formed of extruded aluminium.

6. A structure comprising at least four elongate members, each as claimed in Claim 3, Claim 4, or Claim 5, joined to form a rectangular framework for supporting panelling, characterised in that the join between pairs of elongate members (10, 10′) are provided by locating in the axially extending bore (22) of one of them an expansion element (100) which is engaged by a bolt (22) passing through an aperture formed to extend transversely of the axis of the other of said pair (10′), said members (10, 10′) supporting panelling (90) therebetween.

7. A structure as claimed in Claim 6, wherein each elongate member has two axially extending parallel bores (22, 22′) formed therein, the join between pairs of elongate members being provided by locating in the axially extending bores of one of them expansion elements (100, 100′) which are engaged by bolt (102, 102′) passing through apertures formed to extend transversely of the axis of the other of said pair of members (10).

8. A structure as claimed in Claim 6 or Claim 7, wherein said elongate members (10) are formed with walls (26, 28, 32) defining cavities (30, 34) extending parallel to the or each bore (22) therein.

9. A structure as claimed in Claim 8, wherein said walls (26, 28, 30) are shaped and adapted to engage legs (46, 48, 56) of elongate cover elements (42, 52) to be fitted to said members (10).

10. A structure as claimed in Claim 9, wherein said walls (26, 36) and cover elements (42, 52) define slots running parallel to said cavities (30, 34) of the elongate members (10), in which slots edges of panelling (90) supported by the framework formed by the elongate members (10) are received.

11. A structure as claimed in Claim 10, in the form of a panel member, wherein each elongate member (10) is provided with two elongate cover elements (52) thereon, to define two sets of slots which lie in parallel planes, either or both of the sets of slots receiving the edges of panelling (90) forming the main part of the panel member.

12. A panel member as claimed in Claim 11 for use as a wall or door, in which the panelling comprises a rectangular cut piece of solid material with a pair of lugs at each edge thereof, which lugs are received in said two sets of slots.

13. A panel member as claimed in Claim 11, wherein said panelling comprises two generally laminar material layers (90) the edges of which are fitted in respective ones of each of said two sets of slots.

14. A panel member as claimed in Claim 13 wherein the volume between the laminar layers (90) is filled with acoustically and/or thermally insulating material (92).

15. A panel member as claimed in Claim 13 or Claim 14, wherein said laminar material layers (90) are held in said slots by resilient inserts located between walls of the elongate members and the cover elements (52) attached thereto and having inner dimensions adapted such that the inserts receive and frictionally engage edges of the laminar layers.

16. A panel member as claimed in Claim 11, for use as a window, in which the panelling comprises one or two panes of glass (190, 196, 200) or other transparent material held in one or both of said slots by resilient inserts (192, 198, 206) fitted between walls (26) of said elongate members (10) and the cover elements (52) attached thereto, the inserts having inner dimensions adapted to receive and frictionally engage edges of said pane(s).

17. A panel member as claimed in any one of Claims 11 to 18, wherein slots defined by walls (26) of, and cover elements (52) attached to, the elongate members are adapted to support brushes or other sealing elements.

18. A panel member as claimed in any one of Claims 11 to 17, adapted for use as a door and which is provided with a cover element (150) having a part (160) extending past the elongate member (10) on which it is supported and which itself supports a resilient sealing strip (70) engagable with a surface of a cover element (52') of an elongate member (10) adjacent the door when the door is closed.

FIG. 1

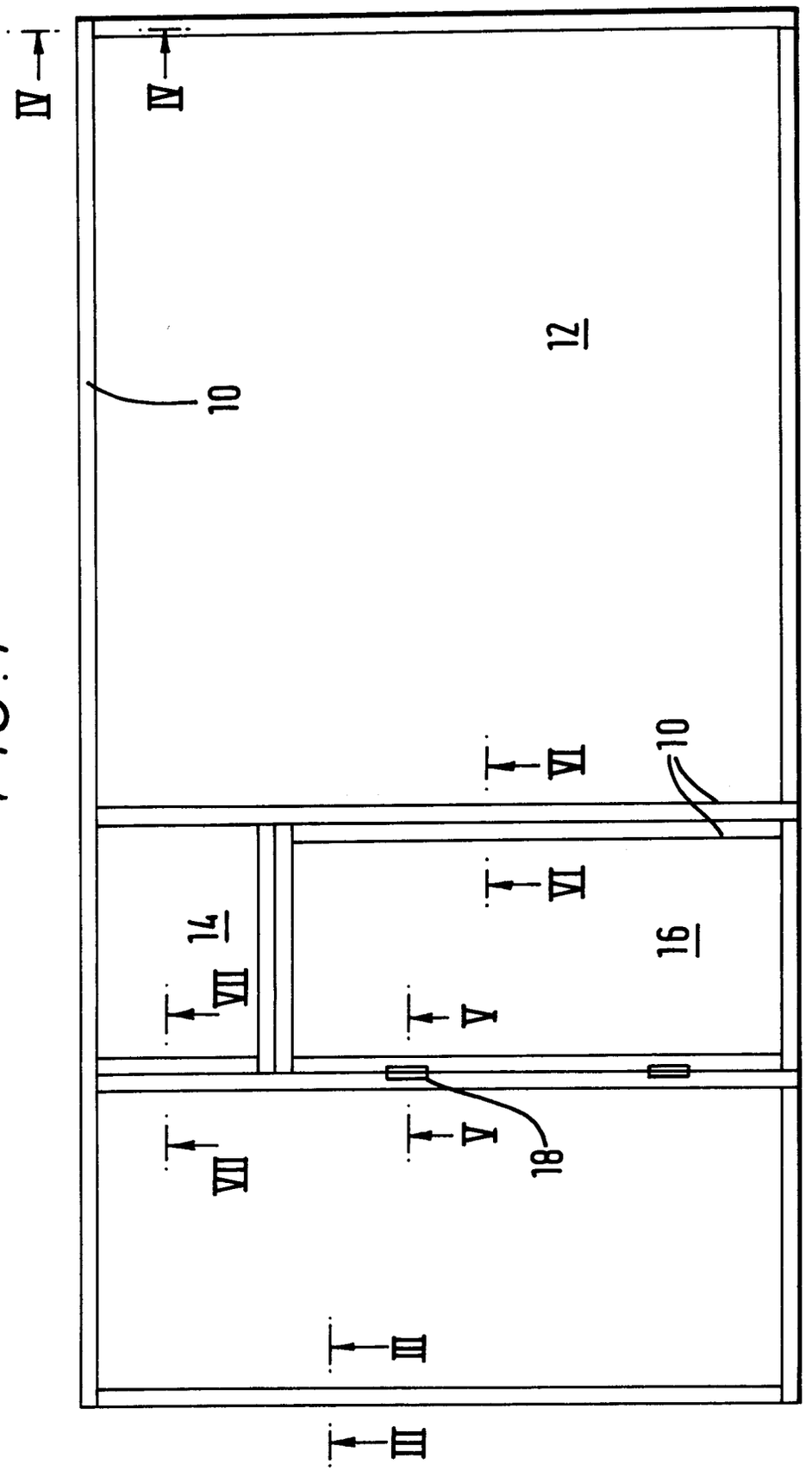
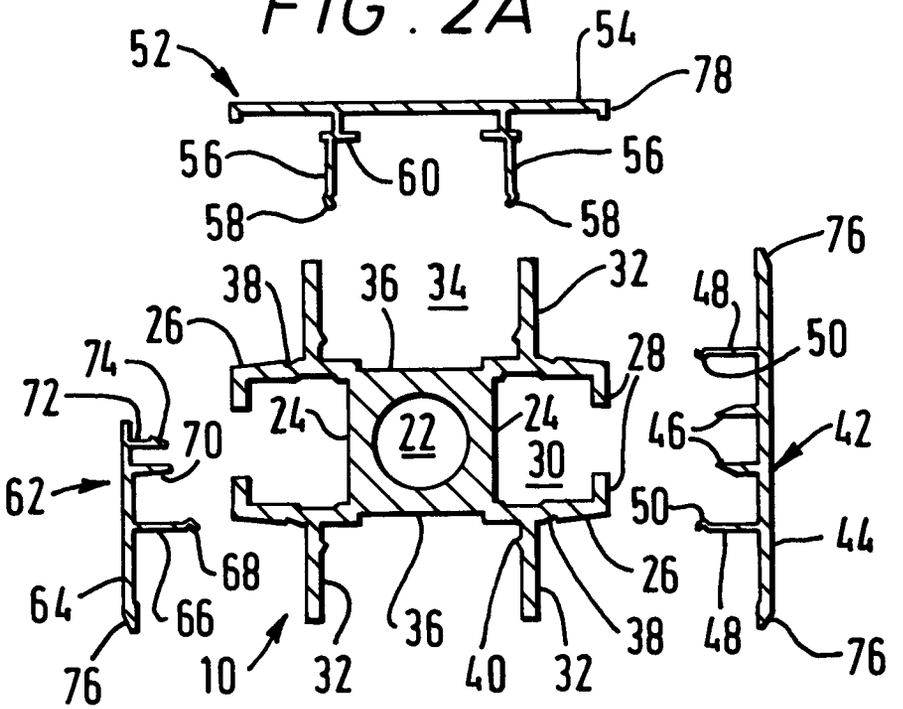


FIG. 2A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46
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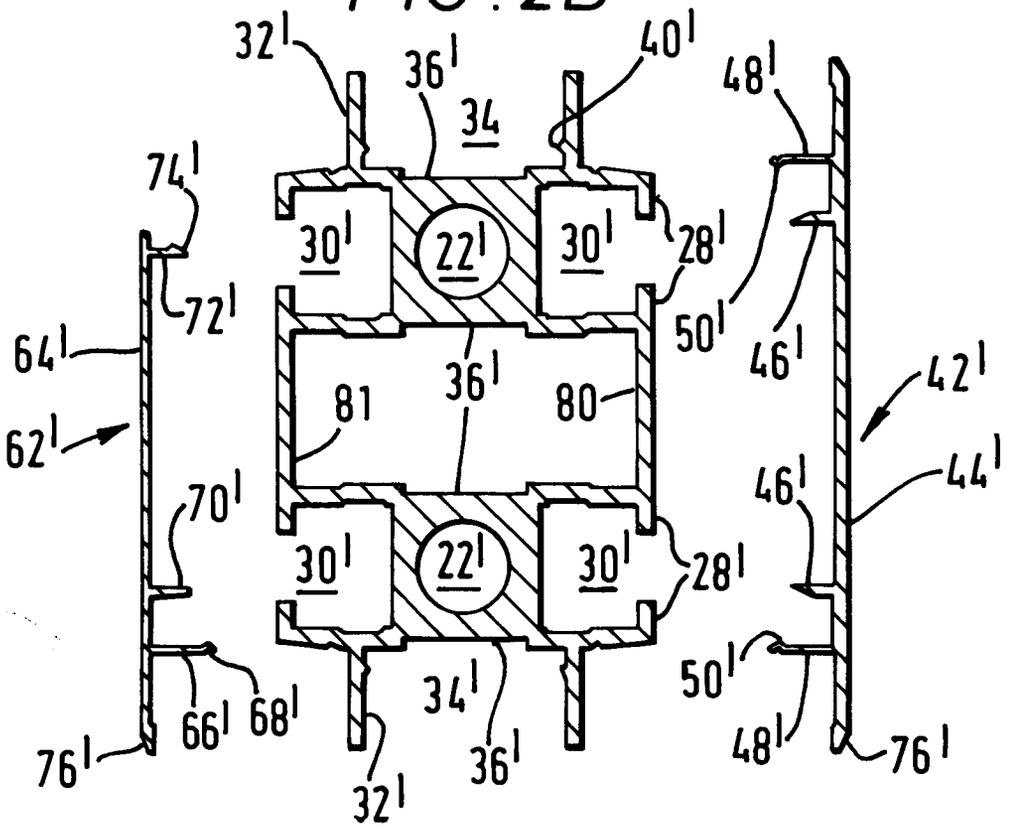
32

FIG. 2B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80
62'
44'
70'
46'
30'
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32'

FIG. 3A

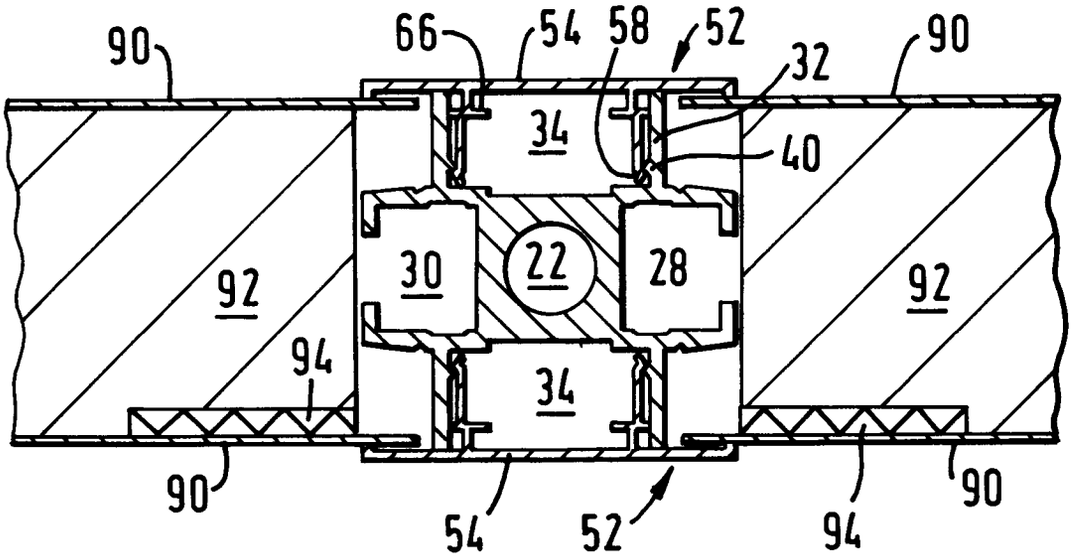
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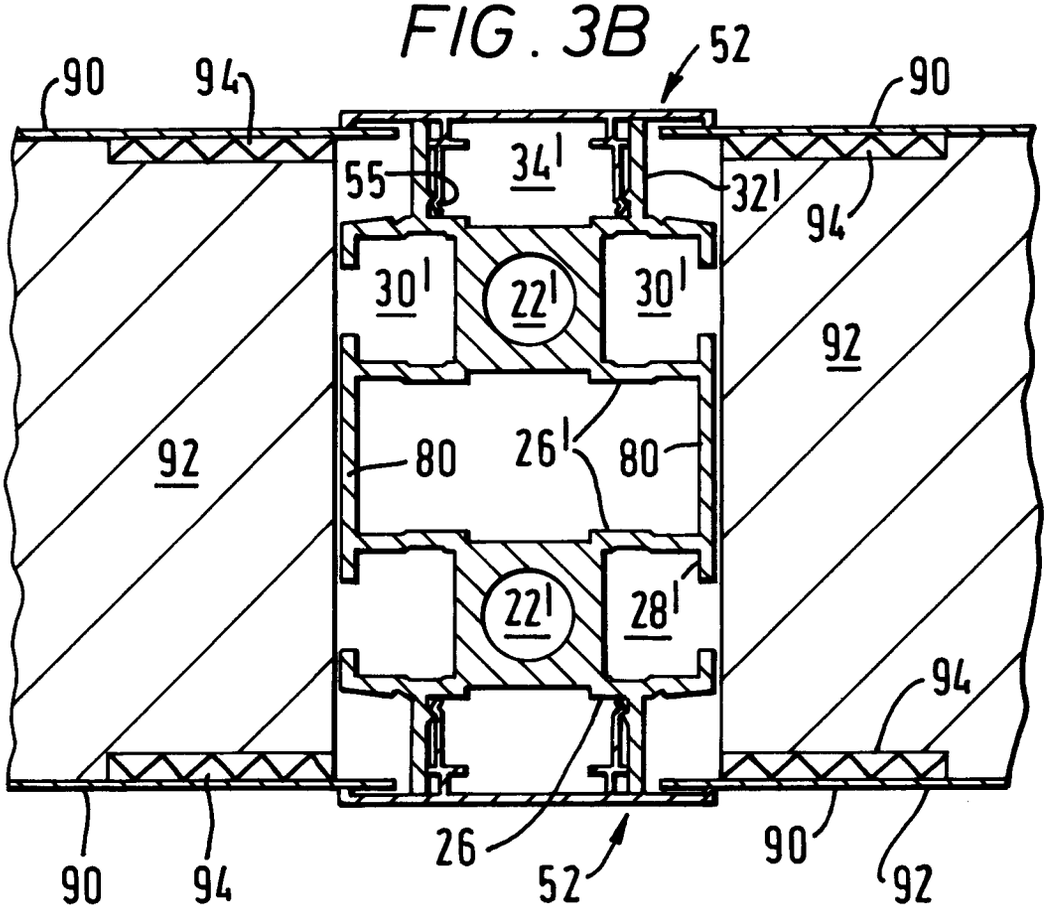
FIG. 3B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22'
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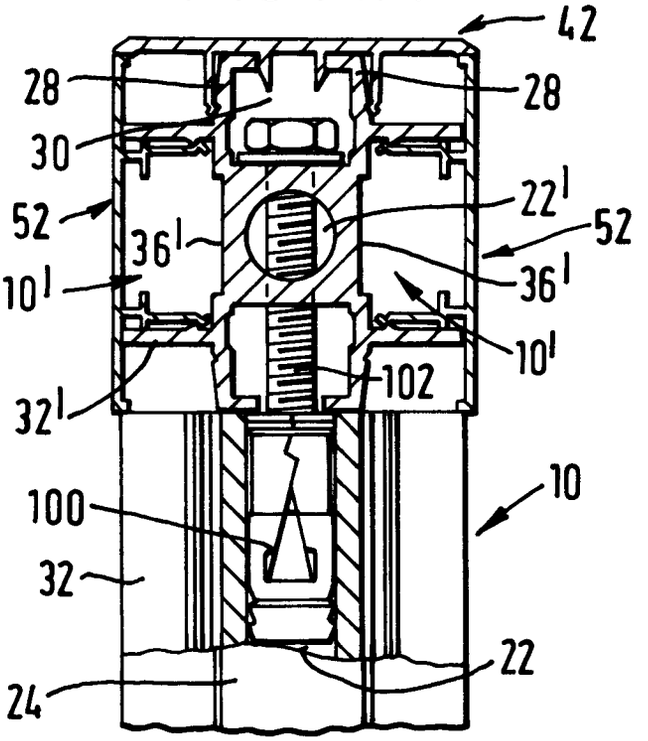
94
90
94
26
52
90
92

FIG. 4A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102
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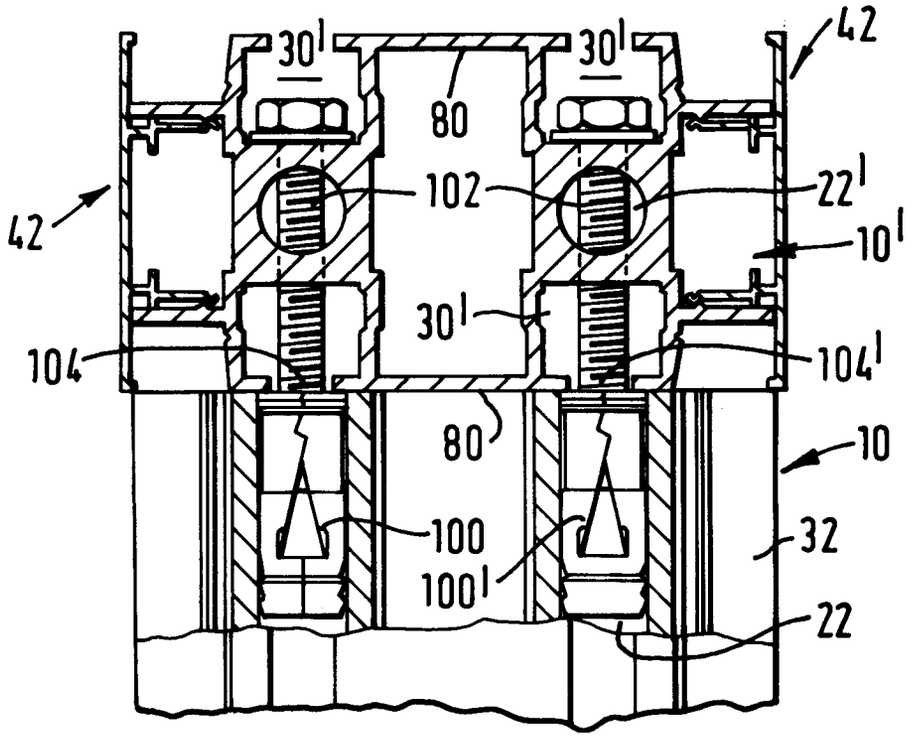
32
22
24

FIG. 4B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22

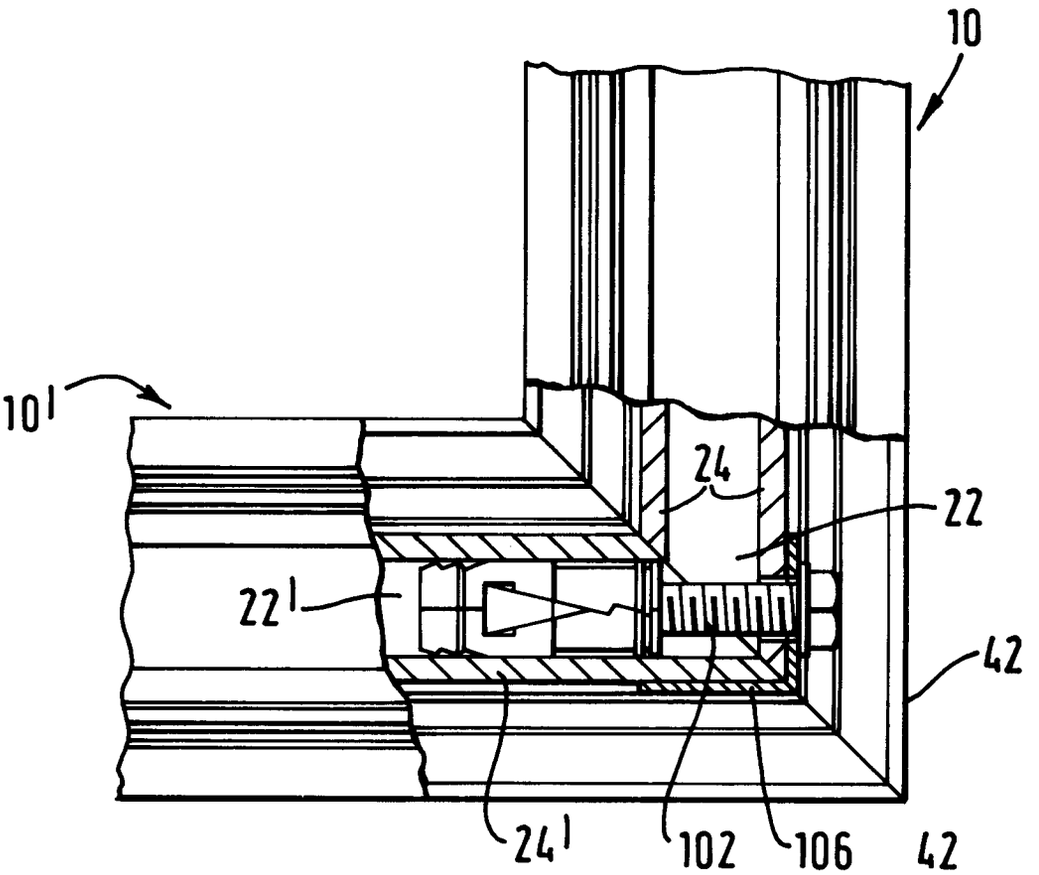
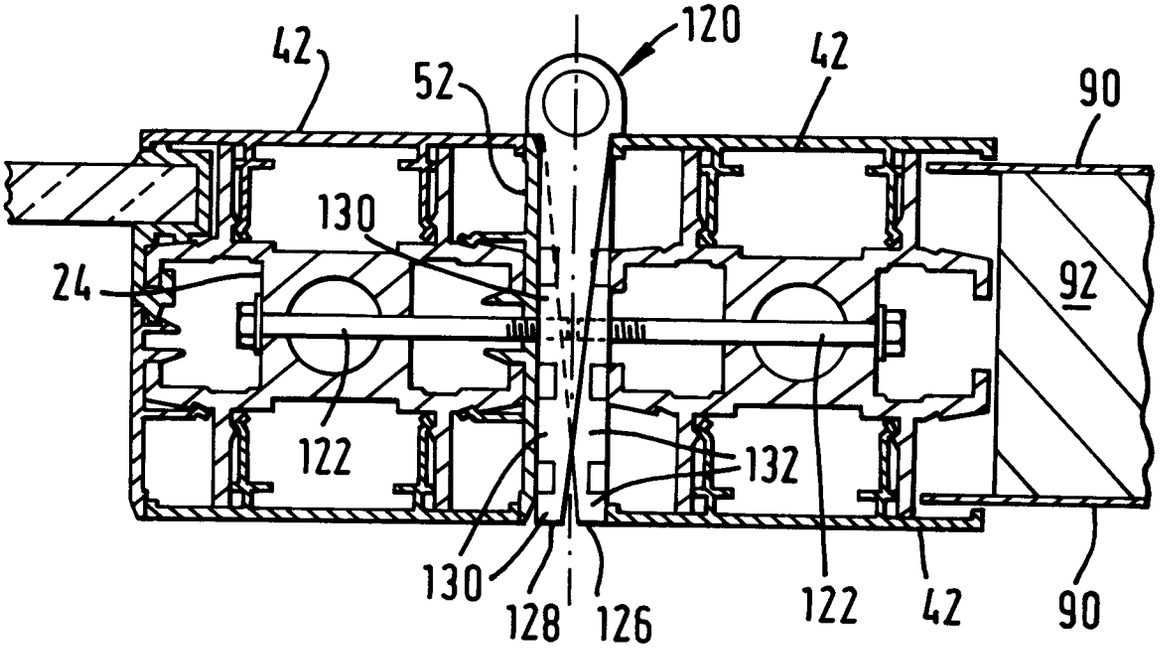


FIG. 4C.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42
90

FIG.5A.

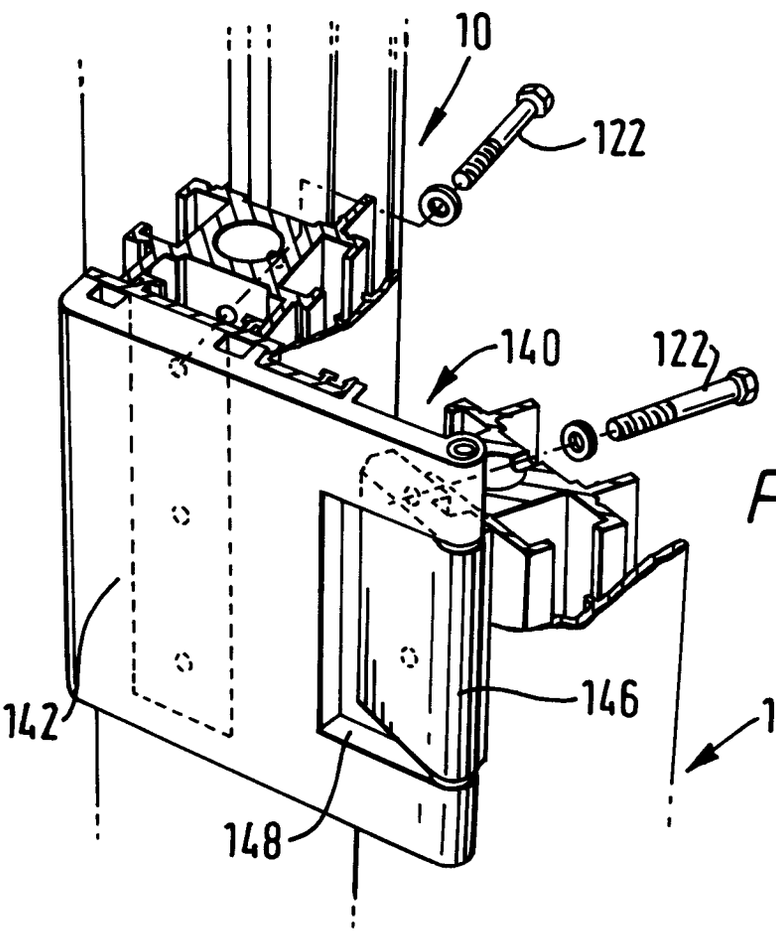
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FIG.5B.

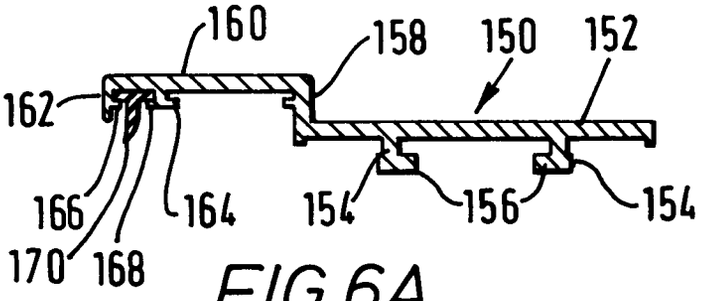


FIG. 6A.

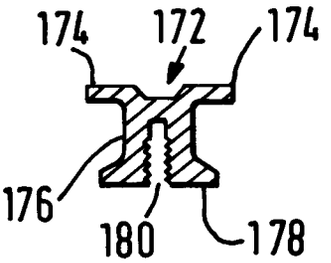


FIG. 6B.

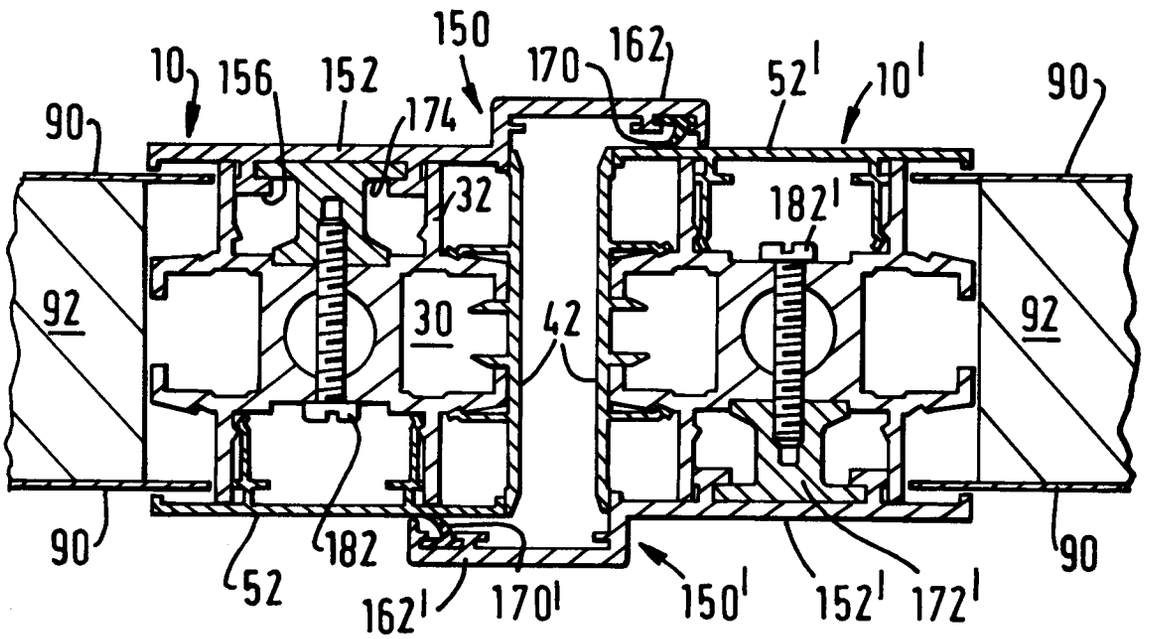
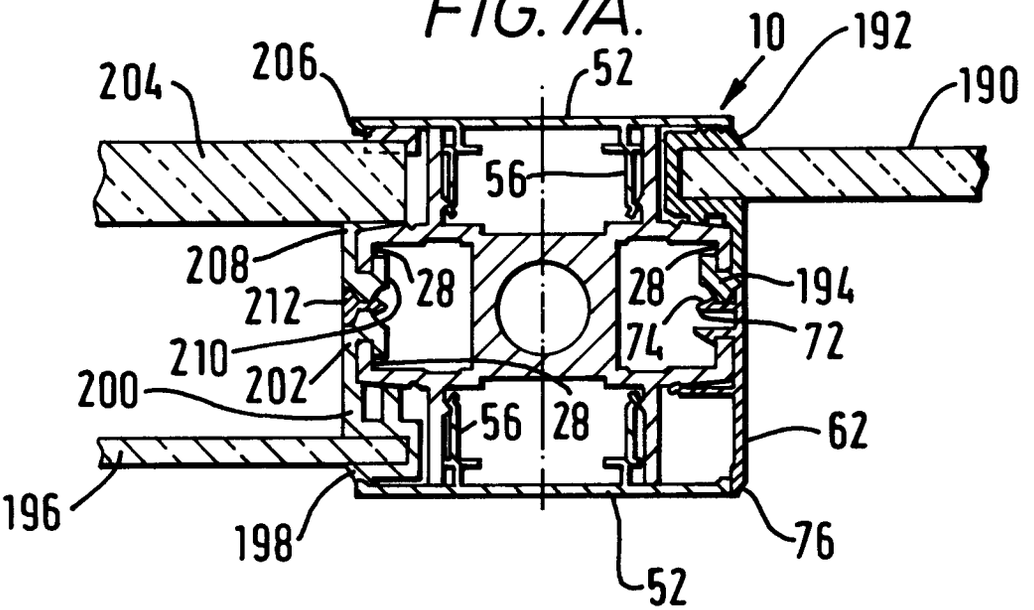


FIG. 6C.

FIG. 7A.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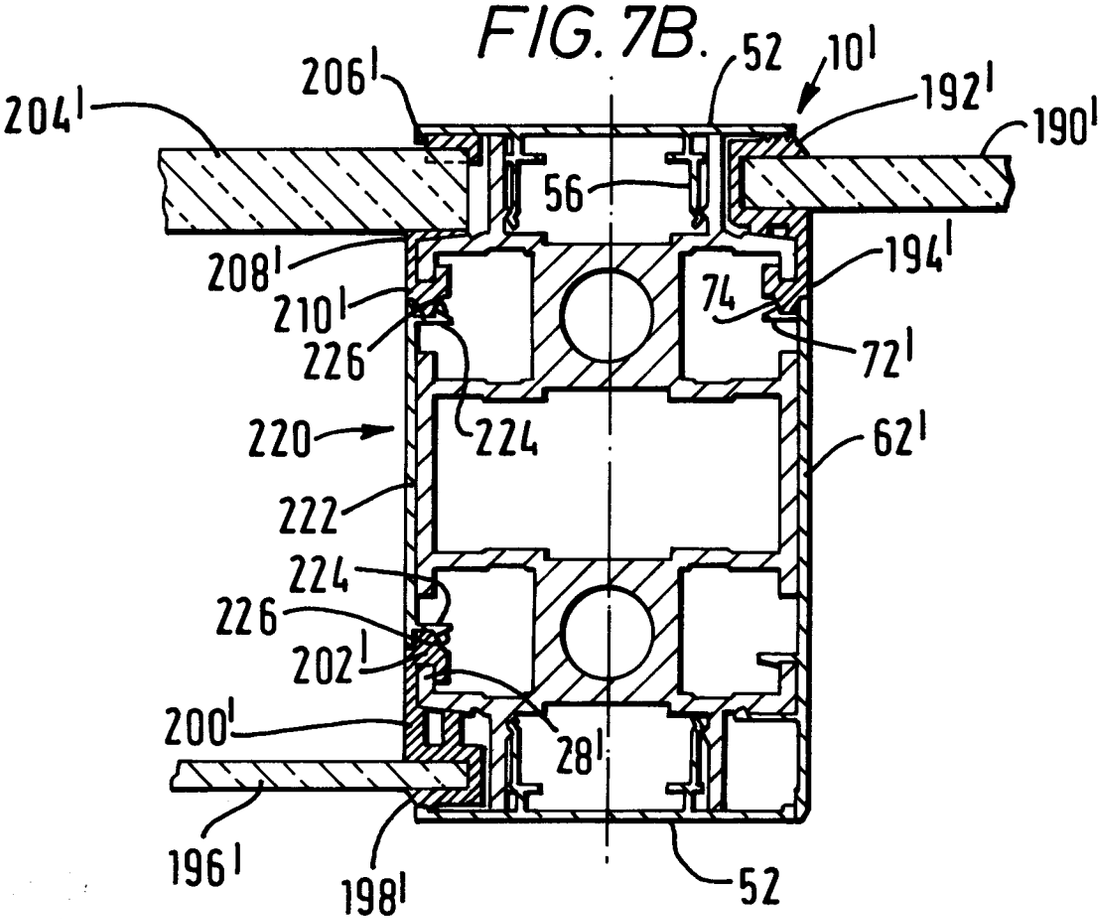
52

FIG. 7B.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198'
52

FIG.8A.

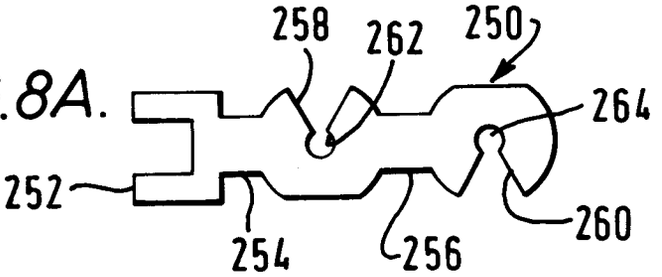


FIG.8B.

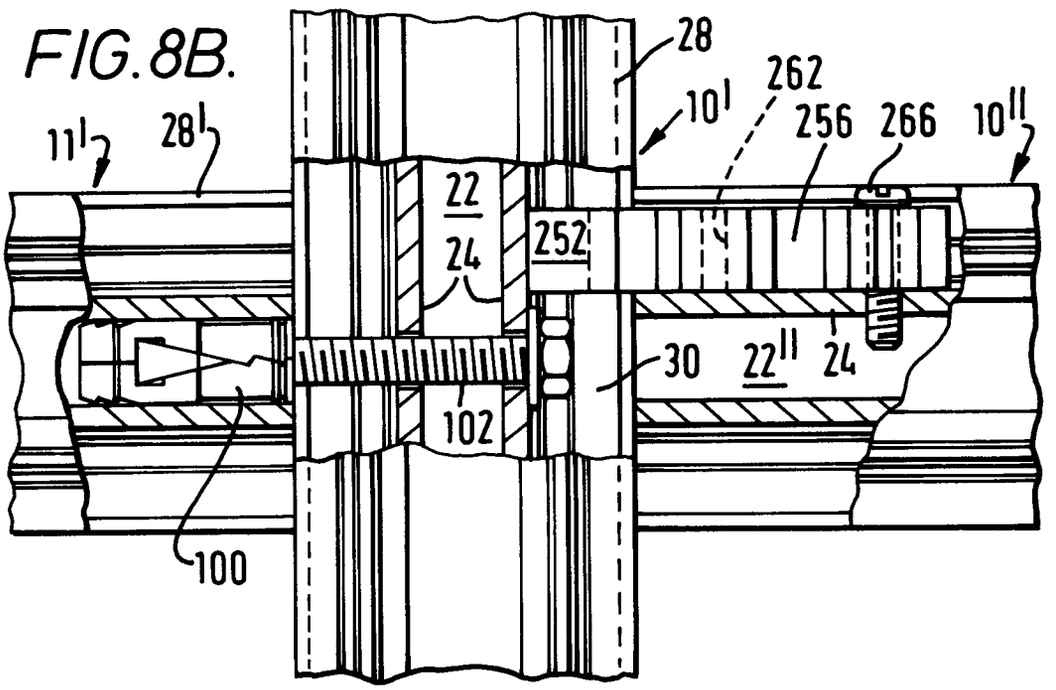
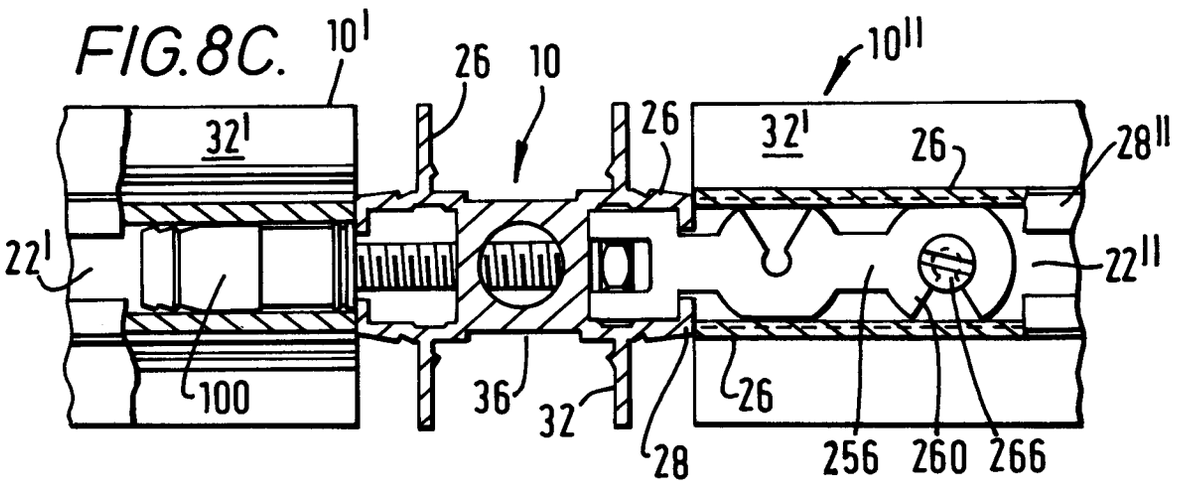
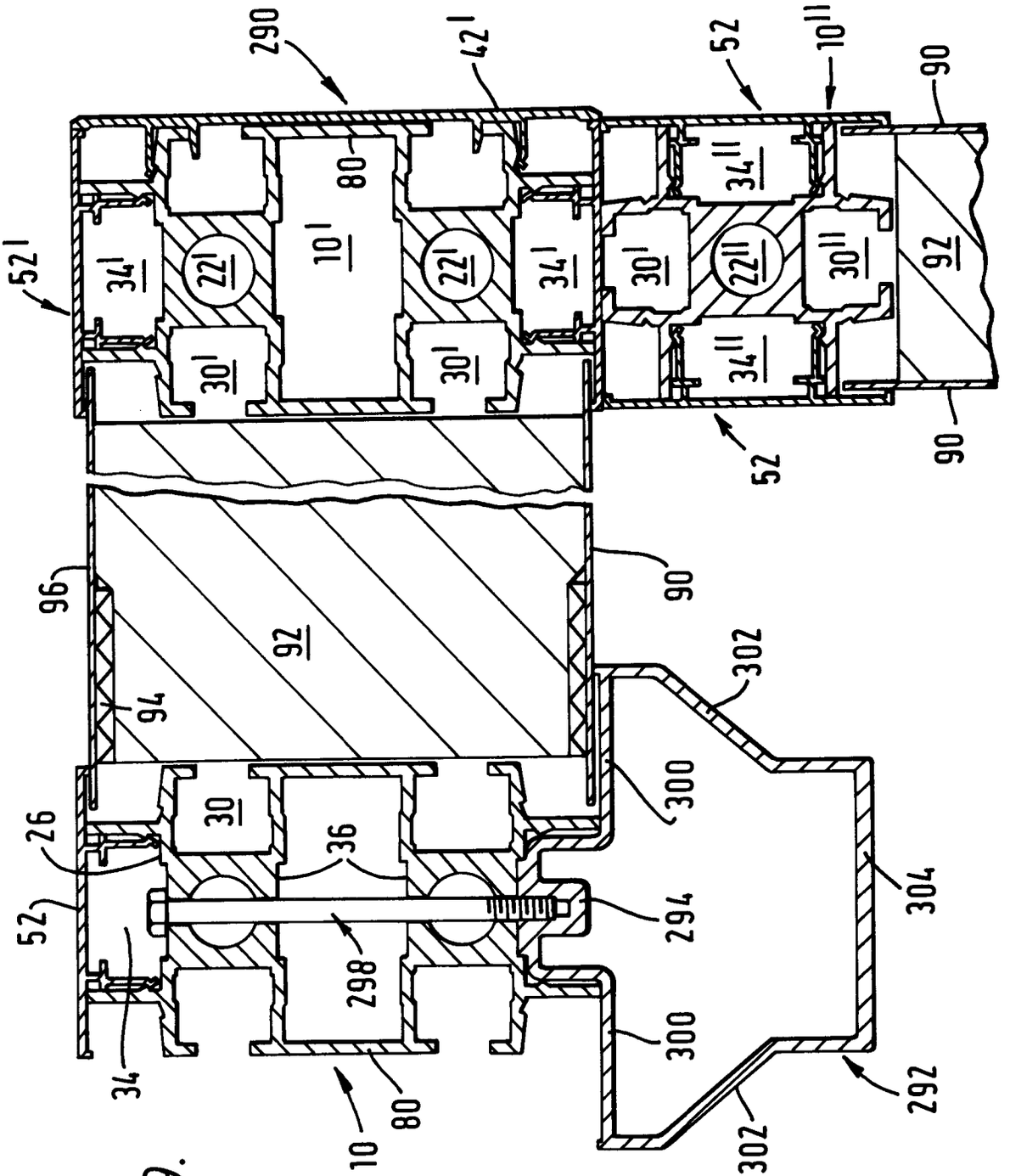


FIG.8C.

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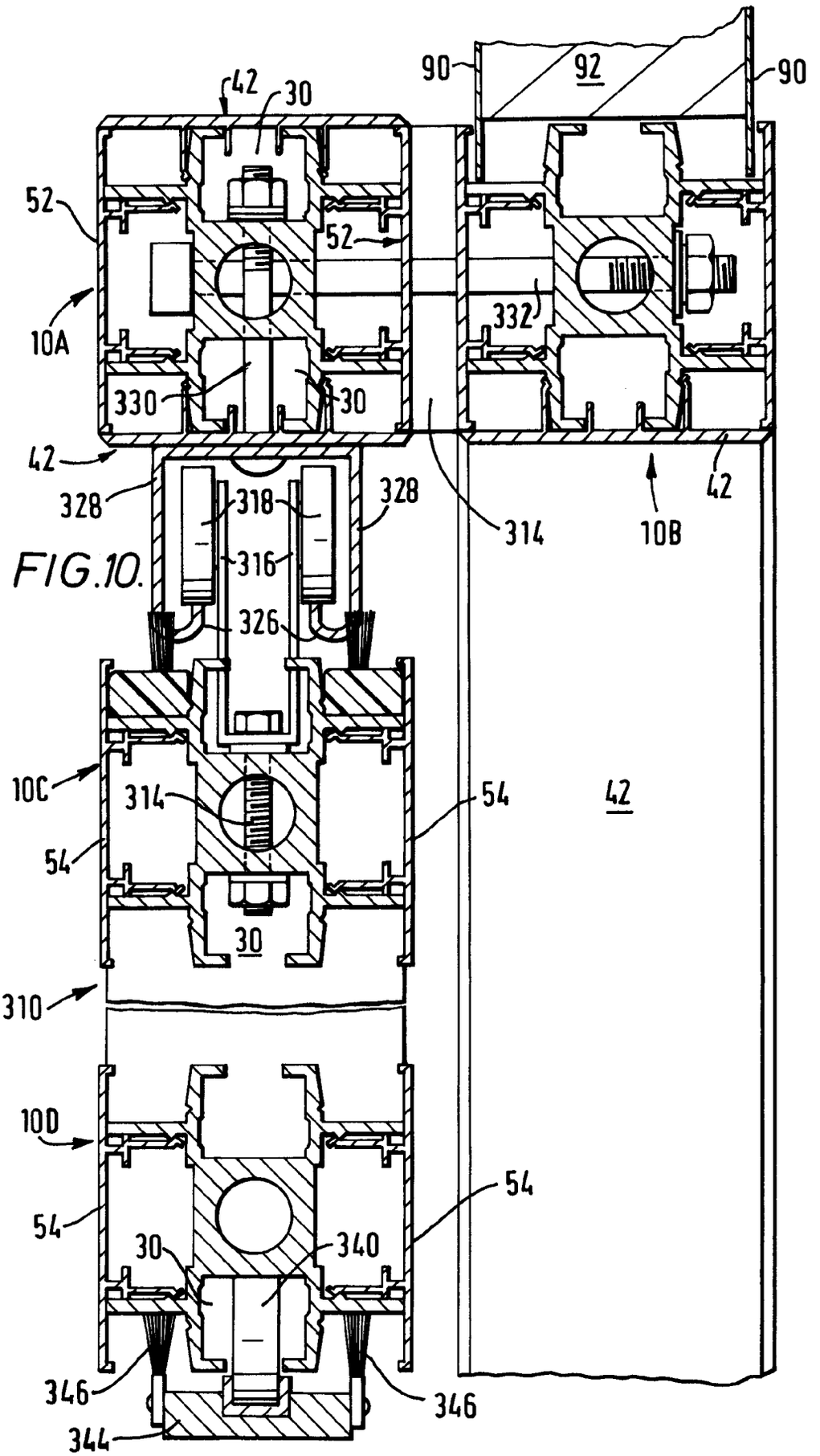
292
10

FIG.9.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10B
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10C
314
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54
30
310
10D
54
54
30
340
346
346
344

FIG.10.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 92 30 6307

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.5)
X Y	DE-A-2 053 058 (PASCHE) * page 7, line 1 - line 4 * * page 15, line 11 - line 30; figure 6 *	1-4,6 5,8-12, 16,17	E04B2/76 E06B3/96 E06B3/08
Y A	FR-A-2 587 053 (MECANOBLOC) * page 7, line 3 - page 9, line 36; figures 1-10 *	8-12,16, 17 15	
Y A	FR-A-1 400 453 (L' ISOLATION RATIONNELLE) * page 2, column 1, line 14 - column 2, line 18 * * page 2, column 2, line 56 - page 3, column 1, line 7 * * page 3, column 1, line 35 - column 2, line 45 * * page 4, column 1, line 5 - line 9; figures 1-5,8,9,11 *	5 12-14	
A	FR-A-2 508 966 (SUIRE) * page 1, line 17 - page 2, line 13; figures 1-4 *	7	TECHNICAL FIELDS SEARCHED (Int. Cl.5) E04B E06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	02 OCTOBER 1992	BARBAS A.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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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

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