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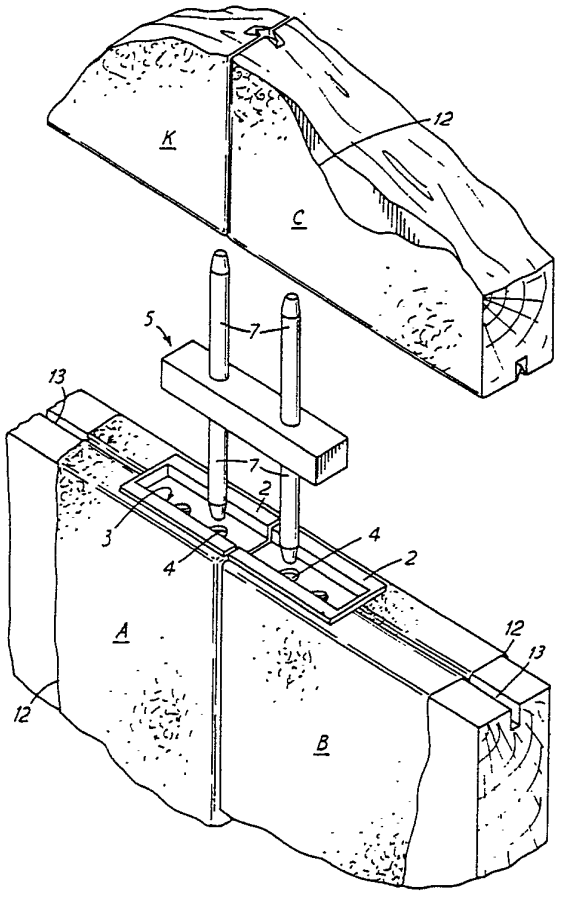
(54) Title: PANEL STRUCTURES

(57) Abstract

A panel structure in which vertical-standing panels are abutted together side by side and one on top of another by means of connectors (5) each of which has a body (6) which fits a channel-section region in an edge of a panel and a plurality of pins (7) which enter sockets in the channel-section regions. The connector members are wholly concealed to give a flush panel structure.



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PANEL STRUCTURES

The invention relates to panel structures formed of interconnected panels. Examples of the use of such panel structures are in providing screens for dividing exhibition or open-plan office areas.

It has been the practice for some time to provide free-standing screens on exhibition stands, largely for the support of printed posters, photographs and other publicity material. For convenience, such screens are built to incorporate panels which may typically be one metre or so square. Hitherto, such screens have generally included a metal frame-work into which the panels fit. An example of such an arrangement is shown in British patent specification No. 2142058. A disadvantage of this arrangement is that the frame members render the screen surface discontinuous and severely restrict the size, shape and disposition of material which can be mounted on the screen.

Other arrangements have been proposed in which panels are mounted in a structure by means of connecting members which engage the panels or frames therefor at their edges and which link the panels in spaced-apart fashion. Examples of such an arrangement are shown in British patent specifications Nos. 1211538; 1354720 and 1371860. These arrangements suffer not only from the disadvantage of discontinuous surfaces but also have spaces which detract from the sound-obstructing quality of the screen. This quality is important when the screens are used as office dividers. The present invention seeks to provide a panel structure which overcomes these disadvantages.

According to the invention there is provided a panel structure comprising a plurality of panels each with channel-section regions at the ends of a top edge of the panel; a socket in the base of each channel-

section region; and a set of connectors each having at least two elongate portions each of which fits closely in a respective channel-section region and at least two pins which lodge in respective sockets, the connectors being effective to hold abutted panels together, the pins providing registration of the connectors with respect to the panels and thus registration of the panels with respect to each other, and the elongate portions lying within the channel-section regions and co-operating with the edges thereof to prevent twisting of the panels with respect to each other.

Preferably, each channel-section region is defined by a reinforcement member which is inset in the respective end of the edge of a panel, the reinforcement member having a hole in its base which constitutes the mouth of the socket.

In order for panels to stand on and be linked to lower panels, the lower edges of the panels may also be provided with channel regions and sockets, which sockets receive upstanding pins from the connectors. Thus, an 'H'-shaped connector can be used to link four panels in abutting fashion while being totally concealed.

The body portions of the connectors may be straight for in-line panels, or bent at a predetermined angle for allowing adjacent panels to be set at an angle with respect to each other.

The channel regions may be discrete and set apart from each other at the ends of the respective edges. Alternatively, each upper and perhaps lower edge of each panel may be channelled along its length. A panel channelled at all four edges may readily be covered with fabric which is received and fixed in the channels.

The invention will further be described with

reference to the accompanying drawings, of which:-

Figure 1 is a perspective view of a panel structure embodying the present invention;

Figure 2 is a perspective view of part of a panel and a connector of the structure of Figure 1;

Figure 3 is a perspective view illustrating the assembly of four panels together;

Figure 4 is a perspective view illustrating the connection of two panels at right-angles;

Figure 5 is a perspective view of a top connection of two panel at right-angles;

Figure 6 is a perspective view of a top connection of two panels end-to-end;

Figure 7 is a perspective view of two panels at the end of the panel structure;

Figure 8 is a set of diagrams of connectors;

Figure 9 is a pair of diagrams of corner connectors;

Figure 10 is a diagram of a reinforcement member;

Figure 11 is a diagram illustrating an alternative form of connector member;

Figure 12 is a perspective view of a corner of a panel with an alternative form of reinforcement member;

Figure 13 is a perspective view illustrating the assembly of four panels together having the kind of reinforcement member of Figure 12;

Figure 14 is a perspective view of a top connection of two panels at right-angles using the kind of reinforcement members of Figures 12 and 13;

Figure 15 is a diagram of a 135° corner connector;

Figure 16 is a set of diagrams of right-angle corner connectors; and

Figure 17 is a set of diagrams of

corresponding corner reinforcement members.

Referring to Figure 1 there is shown a free-standing screen composed of a structure of panels A, B, C, D, E, F, G. A corner of the screen has a channel piece H which may be used to house an electrical lead for lighting purposes, for example. The end of the structure has an end channel J which similarly may conceal an electrical lead.

The structure shown is useful as a screen for an exhibition stand or as an office partitioning for example. The panels in this example are covered with fabric which not only has a decorative and sound-deadening function but which also allows photographs, advertising material etc. to be fixed easily. It is to be noted that the panels fit flush with each other and there are no frame members to interfere with the surface, which is virtually continuous. The structure is assembled with the use of connectors which are totally concealed and which nevertheless offer ease of assembly and good structural stability.

Referring now to Figure 2 there is shown a panel A which has a cut-out at the end of a top edge. A reinforcement member 2, which may be of metal or moulded plastics, is set into the corner by being screwed by screw 1. The top of the reinforcement member defines a channel region 3 at the base of which is a hole 4. The hole leads to a socket in the panel.

A metal connector 5 has a body 6 and two pairs of pins 7. Each pin fits into a respective socket in a panel.

Figure 3 shows four panels A, B, C, and K being coupled by the connector 5. Abutting corners of the four panels are equipped with reinforcement members and the arrangement is such that the pins 7 locate the panels together so that they abut to

present a flush surface for the panel structure. The body of the connector is wholly concealed in the channel portions defined in this embodiment by the reinforcement members at the corners of the panels. The connector 5 is an intermediate connector and each channel region 3 is slightly deeper than half the height of the body 6.

It is important to note that the pins provide registration of the connector member in the channel-section regions and rigidity of the structure is enhanced by the close fitting of the body portion 6 in the reinforcement member, co-operation of the body with the walls of the channel-section region preventing twisting.

Figure 4 shows an arrangement whereby two panels B and E are coupled at right-angles to each other by a right-angled connector 10 having pins 11 which are located in corresponding sockets in the panels. A pair of short pins 8, 9, respectively locate upper and lower sections of the corner channel piece H, of which only the lower section is shown in Figure 4.

Figures 5 and 6 show the top edge of the panel structure at a corner and at an end-to-end abutment respectively. It will be seen that at the top the connectors have no upstanding pins. Also, the depth of the body 6 is half the depth of the body of the intermediate connector, so that the body is wholly concealed in the channel portions. Similar half-height connectors are used in the bottom edges of the panel structure at floor level.

Figure 7 shows detail of the end of the panel structure. A connector 5 has two pins. The channel piece J is a springy U-section member which fits the end of the panel and is retained resiliently.

The fabric covering 12 for the panels is

stretched over the panel surface and tucked into a slot 13 formed in each panel edge. The corners of the fabric are retained beneath the reinforcement members. Glue is used also.

Referring now to figure 8 there is shown at (a), (b) and (c) the elevation and plan views of straight connectors for intermediate central connection; intermediate end connectors; and top or bottom central connectors respectively.

Figure 9 shows at (a) and (b) an intermediate corner piece and a top or bottom corner piece respectively;

Figure 10 shows a reinforcement member in plan at (a); in end elevation from one end at (b); in end elevation from the other end at (c); in side elevation at (d); and from beneath in (e)

Figure 11 shows an alternative form of connector. Here the pins 7a are rectangular and the connector member is of uniform depth. The hole 4a is modified to be square in shape. Modifications can be made to this kind of connector to correspond with the various forms of connectors described above - namely corner pieces and top and bottom pieces.

Figure 12 shows an alternative form of reinforcement member. Here an 'L'-shaped cut-out is formed at each corner of each panel. The reinforcement member is in this example an aluminium corner piece 14 with a socket 15. The straight connectors 5 are the same as described above. Figure 13 shows the junction of four panels A1; B1; C1 and K1 with these corner pieces.

Figure 14 shows a corner junction between panels C1 and D1. The corner differs from that described with reference to Figure 5 since the end of one panel (C1) abuts the face of the other (D1). A cut-out is therefore necessary in the side of the

channel of piece 14a of panel D1 to accommodate the corner connector 16.

Right-angle corners are not the only possible corners. For example, a 135° connector is illustrated at 17 in Figure 15.

With the kind of corner arrangement described in Figure 14, it is necessary to provide right-and left-hand corner connectors and also right-and left-hand reinforcement pieces. Figure 16(a) shows plan and elevation views of a left-hand connector; Figure 16(b) shows similar view of a right-hand connector; both for top or bottom; and Figure 16(c) shows similar views for a right-hand intermediate connector.

Figure 17 shows at (a) plan and elevation views for a left-hand reinforcement member; at (b) for a right-hand reinforcement member and at (c) for a straight reinforcement member. The cut-outs are shown at 17.

The connectors described above are made of steel, and the reinforcement members of plastics or aluminium. However, other suitable rigid materials may be used, such as other metals, ceramics, wood, glass-fibre etc.

The panels may be made of various materials. For example, a rectangular structure of wooden battens may be filled with a cardboard honeycomb and covered with a hard-board skin. The panels may be moulded of plastics with perhaps a plastics foamed filling. In this case the sockets would be moulded. Other combinations of plastics, metals and wood may be used.

The invention is not restricted to the details of the embodiments described above with reference to the drawings. Connectors may be provided for any required connection angle. A range of fixed connectors of different angles may be provided. Alternatively, it is envisaged that a hinged connector

may be provided to accommodate any required angle. Possibly such a hinged connector may be lockable in the required position.

Special connectors may be used for mounting the panel structure by way of feet or castors at the base and for supporting lamps at the top.

Additionally it is envisaged that the invention may be used in assembling panel structures to make furniture such as desks or wardrobes. Suitable panel structures may also be used in conjunction with the invention to fabricate huts and other panel-type buildings. Various toys of modular panel construction may employ the invention.

CLAIMS

1. A panel structure comprising a plurality of panels each with channel-section regions at the ends of a top edge of the panel; a socket in the base of each channel-section region; and a set of connectors each having at least two elongate portions each of which fits closely in a respective channel-section region and at least two pins which lodge in respective sockets, the connectors being effective to hold abutted panels together, the pins providing registration of the connectors with respect to the panels and thus registration of the panels with respect to each other, and the elongate portions lying within the channel-section regions and co-operating with the edges thereof to prevent twisting of the panels with respect to each other.

2. A panel structure as claimed in claim 1 wherein each channel-section region is defined by a reinforcement member which is inset in the respective end of the edge of a panel, the reinforcement member having a hole in its base which constitutes the mouth of the socket.

3. A panel structure as claimed in either of the preceding claims wherein the panels are provided with channel-section regions at the ends of their bottom edges also, and there is a set of intermediate connector members for holding panels abutted vertically one on top of another, the intermediate connector members having elongate portions for fitting closely in respective channel-section regions of the vertically abutted panels with at least one upstanding pin for location in a socket of the upper panel and at least one depending pin for location in a socket of the lower panel.

4. A panel structure as claimed in claim 3

wherein the intermediate connector members are wholly concealed, the lower parts of the elongate members being located in the channel-section regions of the lower panels and the upper parts being located in the channel-section regions of the upper panels.

5. A panel structure as claimed in claim 3 or claim 4 wherein, in addition to the intermediate connectors, there are provided top and bottom connectors which connect the panels at the top and bottom of the structure and the bodies of which, in use, reside wholly within the respective channel-section regions.

6. A panel structure as claimed in claim 5 wherein the connectors include straight connectors for coupling panels end to end and corner connectors for connecting panels at an angle to each other.

7. A panel structure as claimed in claim 6 wherein the corner connectors include right-angle corner connectors for connecting panels at right-angles to each other, edge corner to edge corner.

8. A panel structure as claimed in claim 7 wherein there are provided corner channel sections for filling exposed edges of the panels at the corners, the corner connectors being adapted to hold the corner channels in position.

9. A panel structure as claimed in claim 6 wherein the corner connectors include right-angle corner connectors for connecting panels at right-angles to each other with the edge of one panel abutted to the face of the other, the channel regions having cut-outs to accommodate the bodies of the corner connectors.

10. A panel structure as claimed in any of the preceding claims wherein each connector is of uniform thickness throughout and wherein the pins are flat-sided.

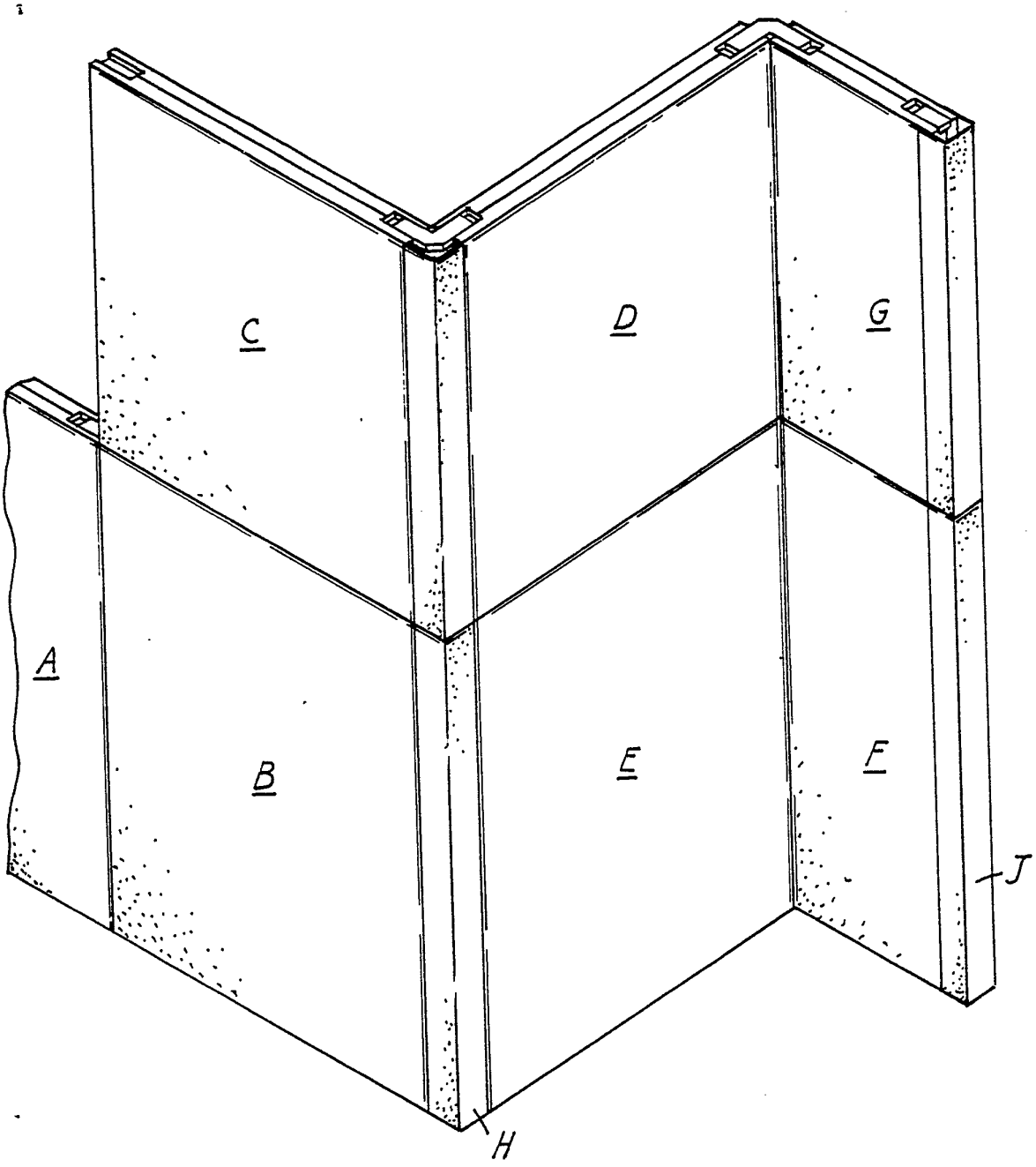


FIG. 1

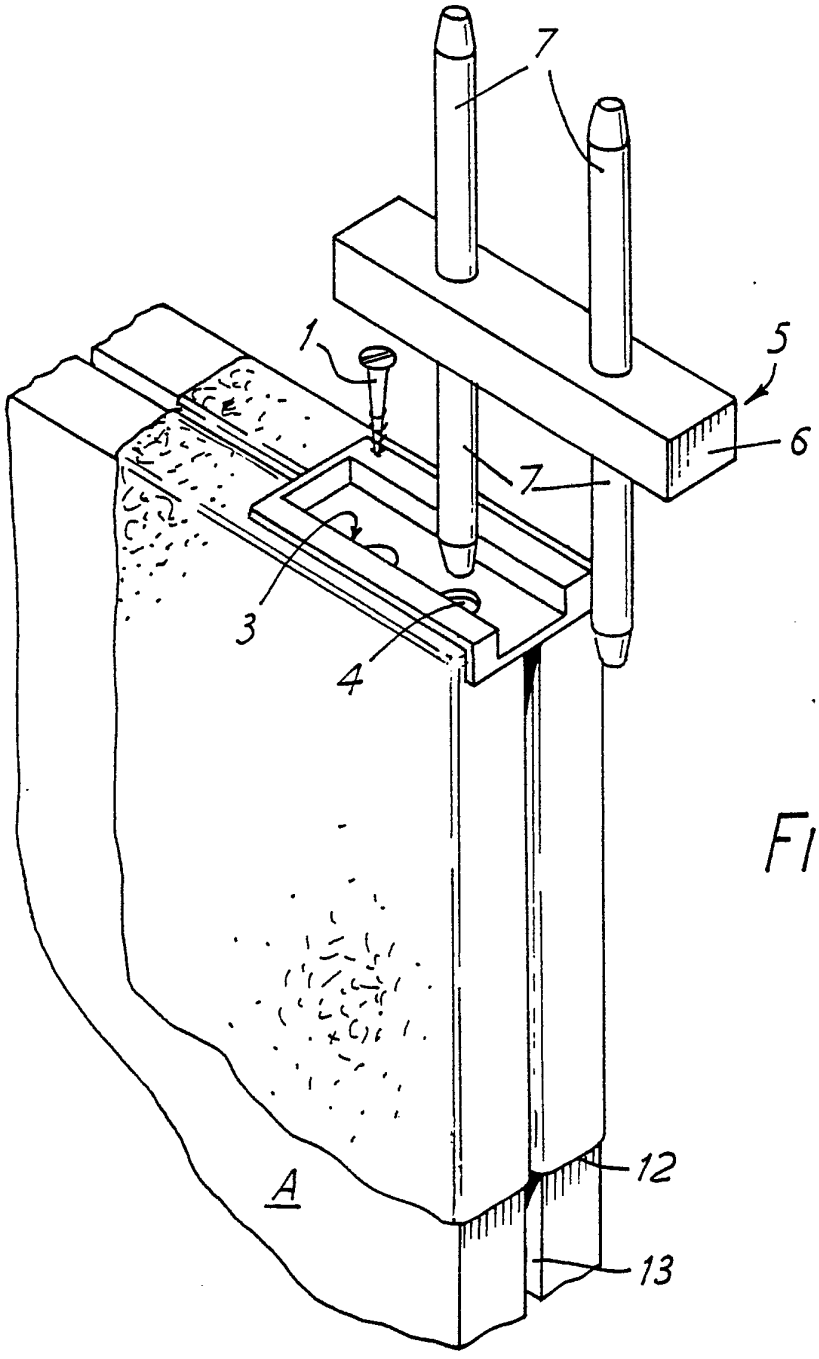


FIG. 2

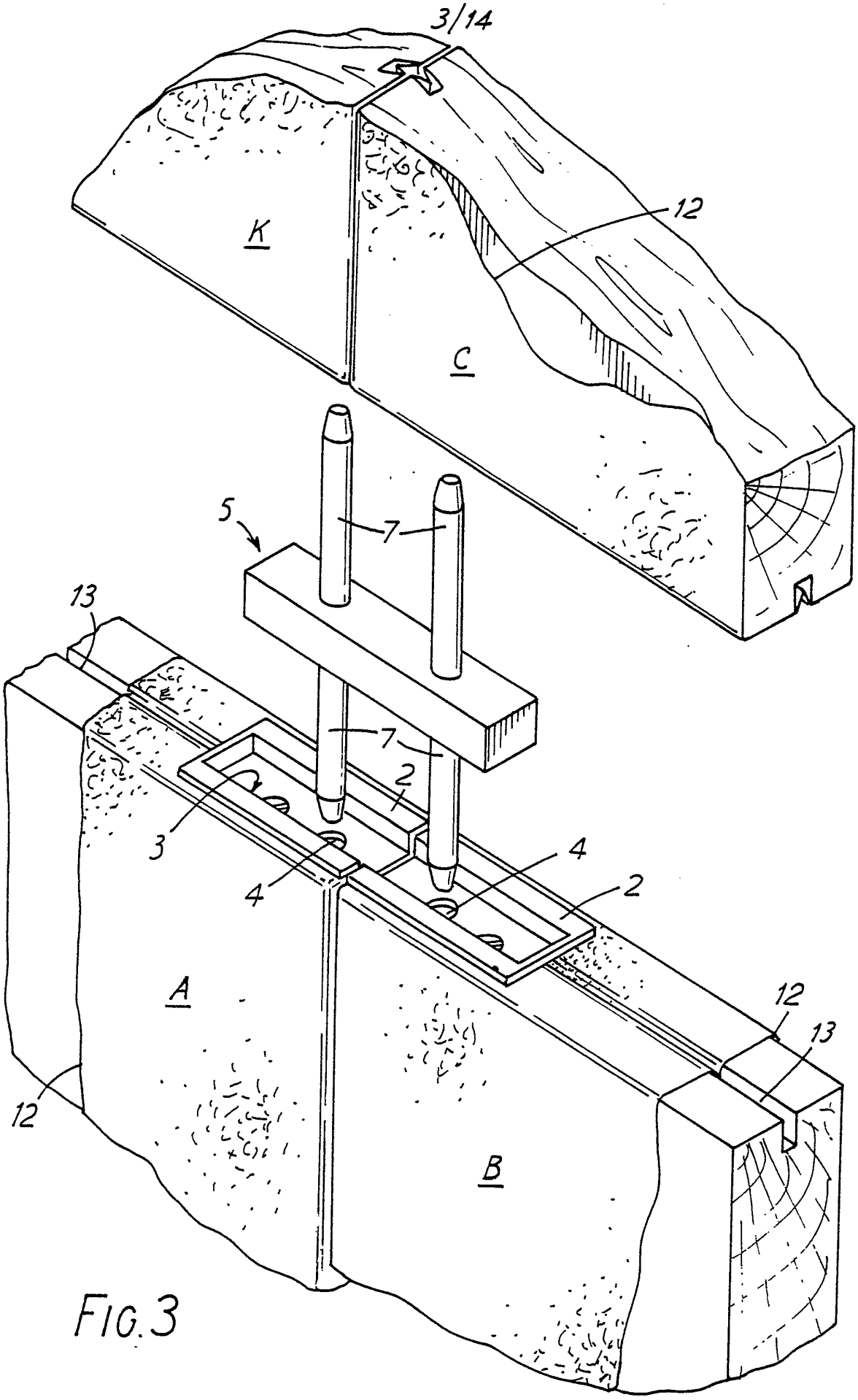


FIG. 3

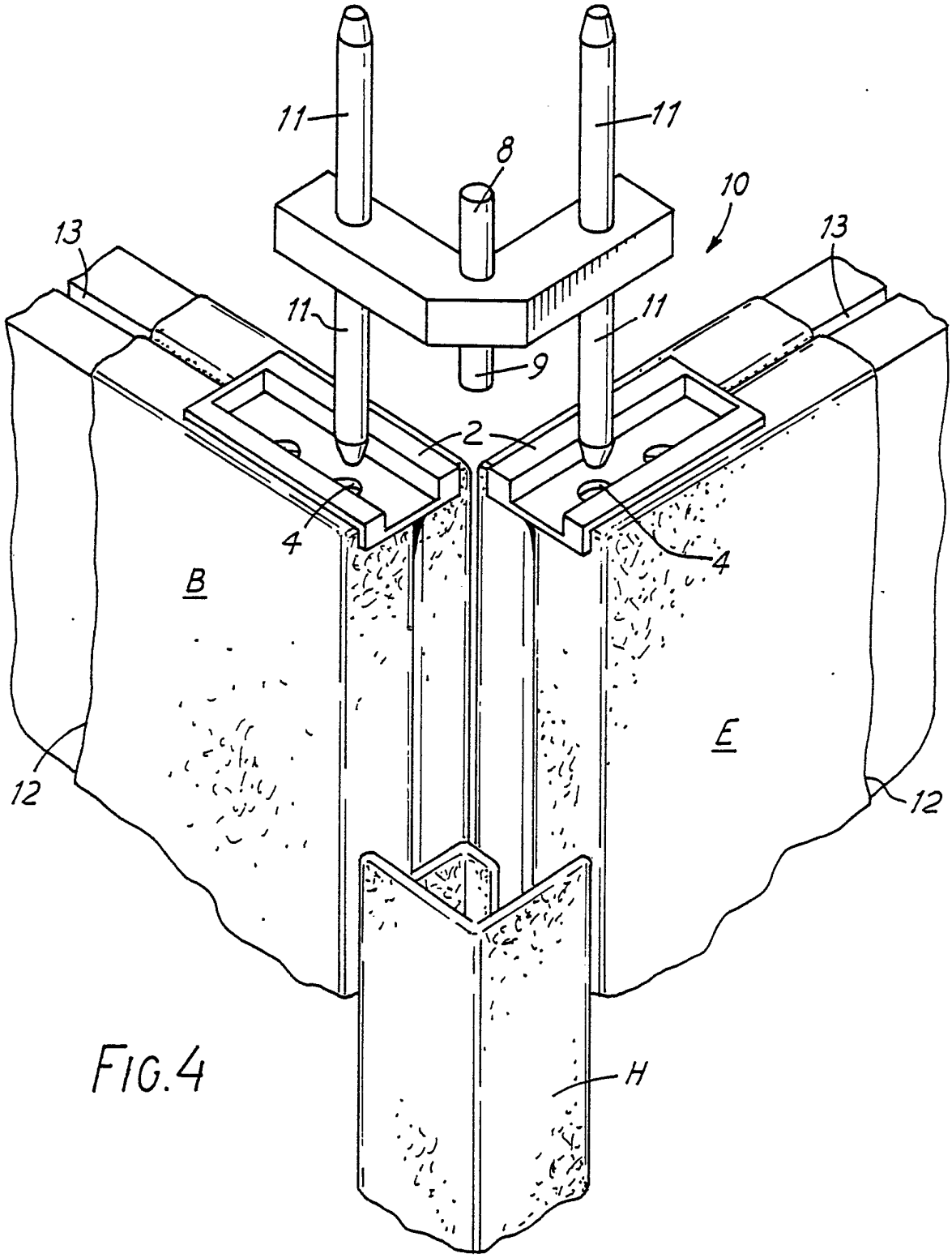


FIG.4

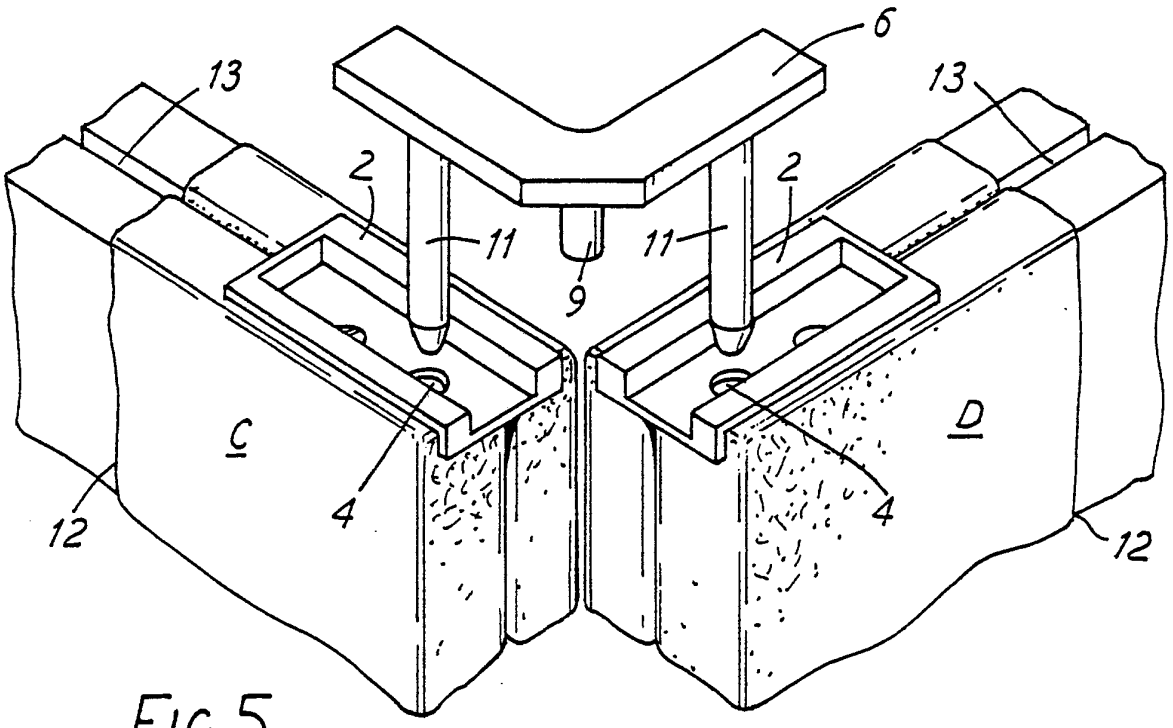


FIG.5

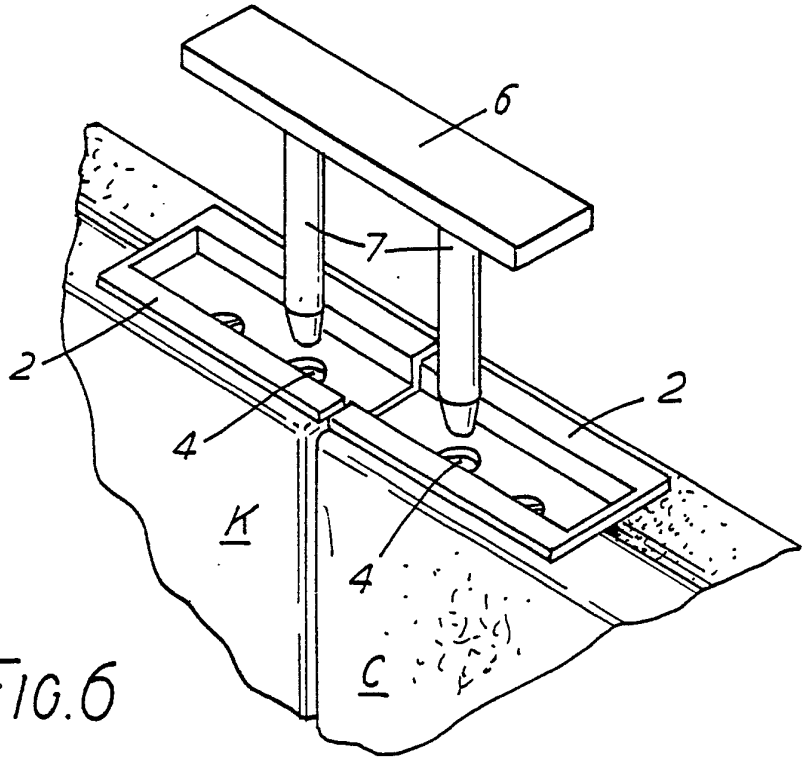


FIG.6

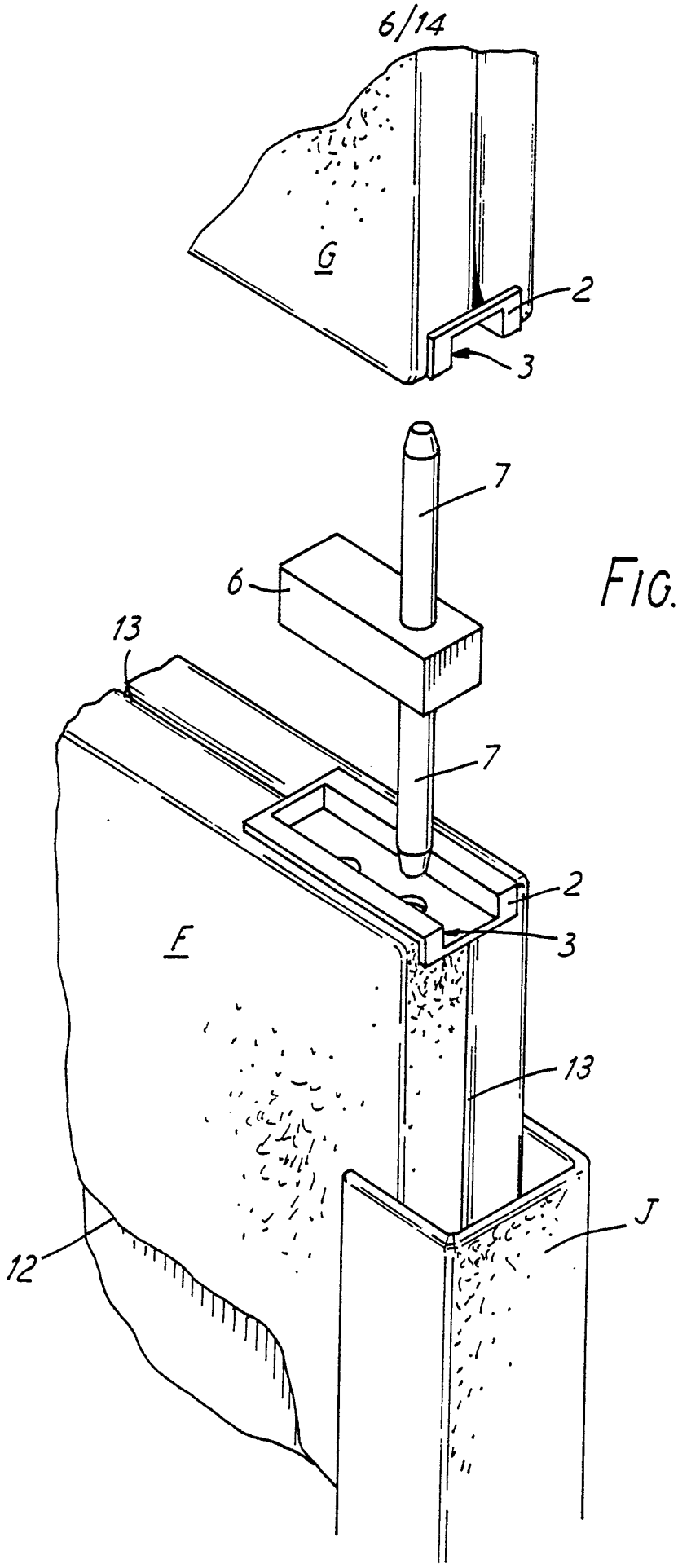
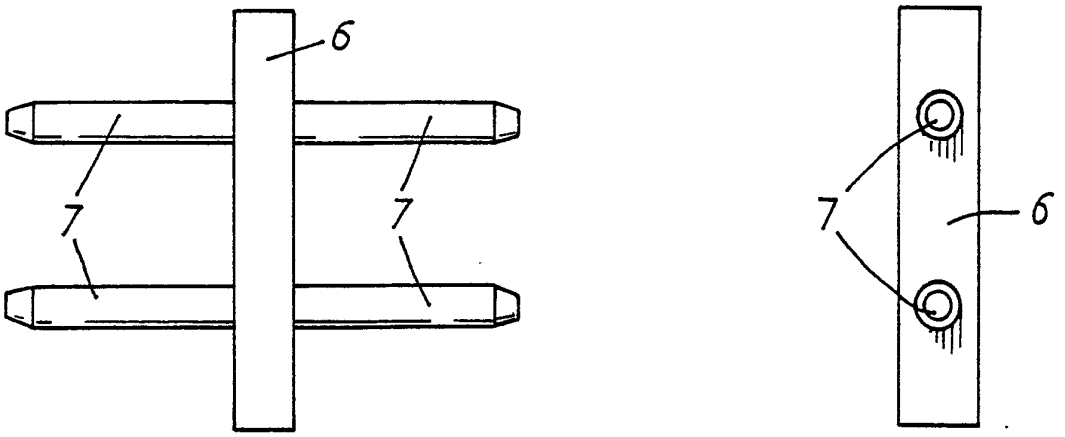
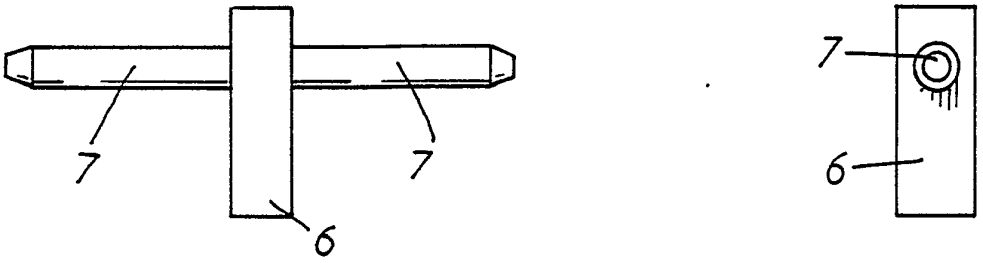


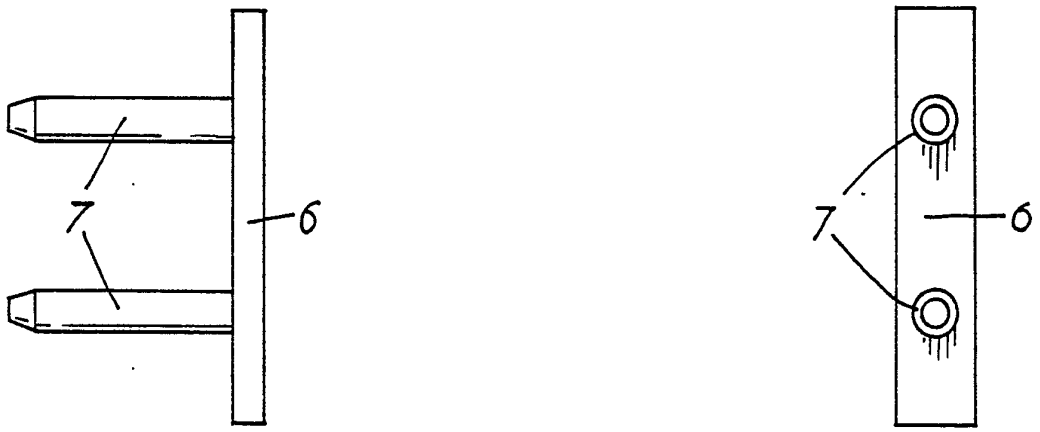
FIG. 7



(a)



(b)



(c)

FIG.8

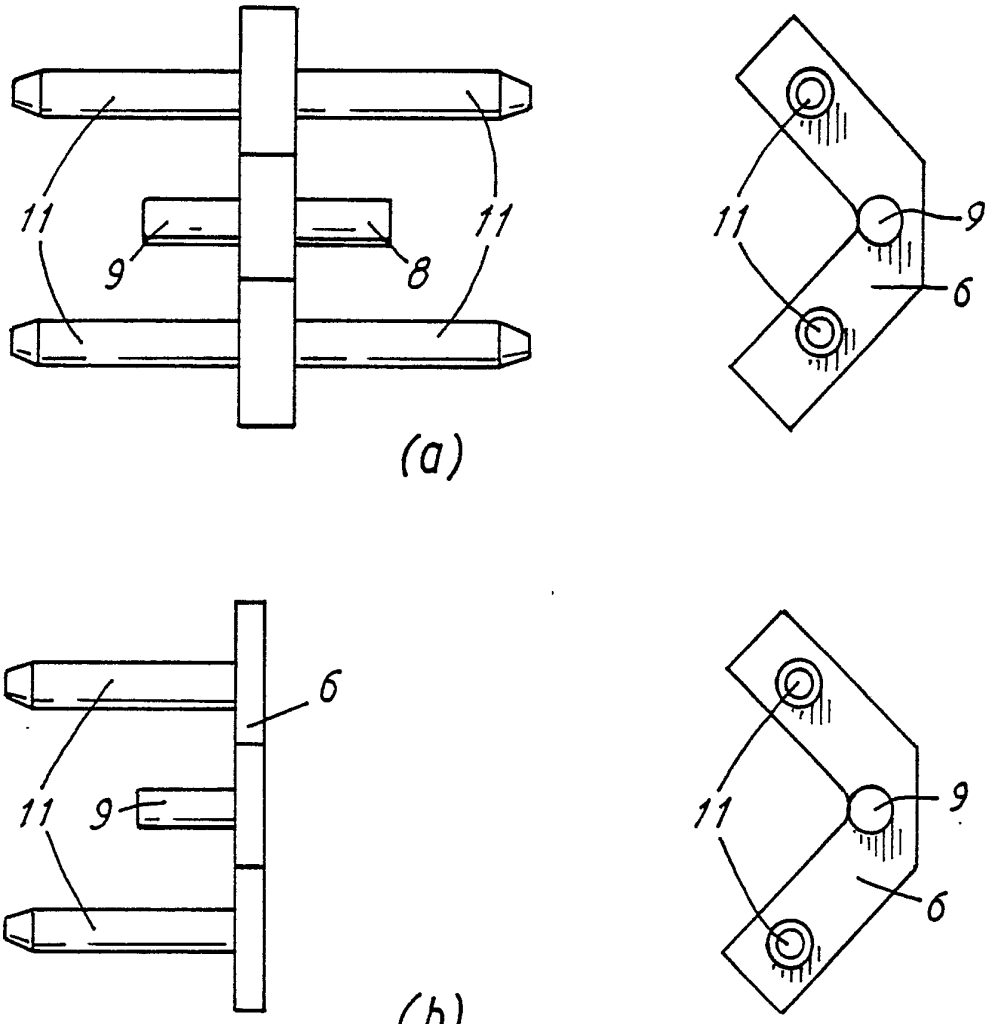


FIG.9

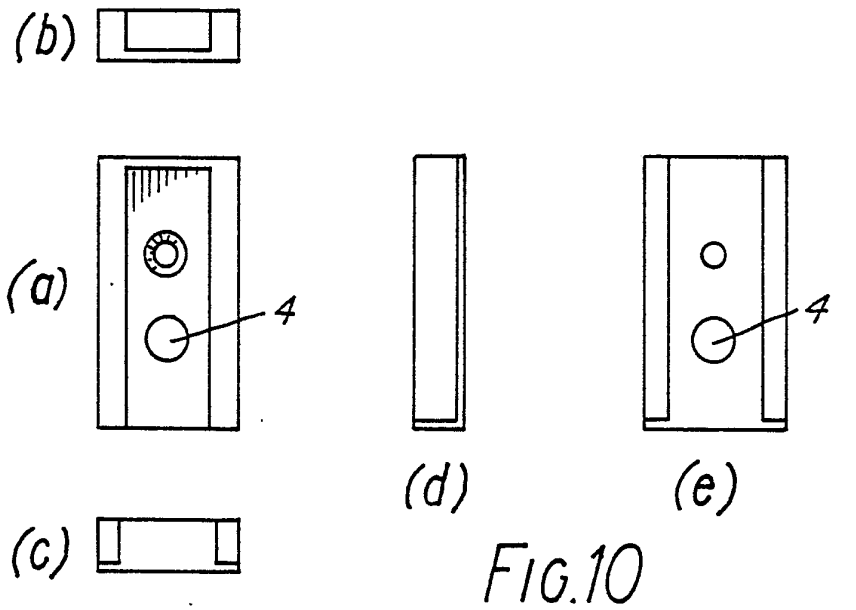


FIG.10

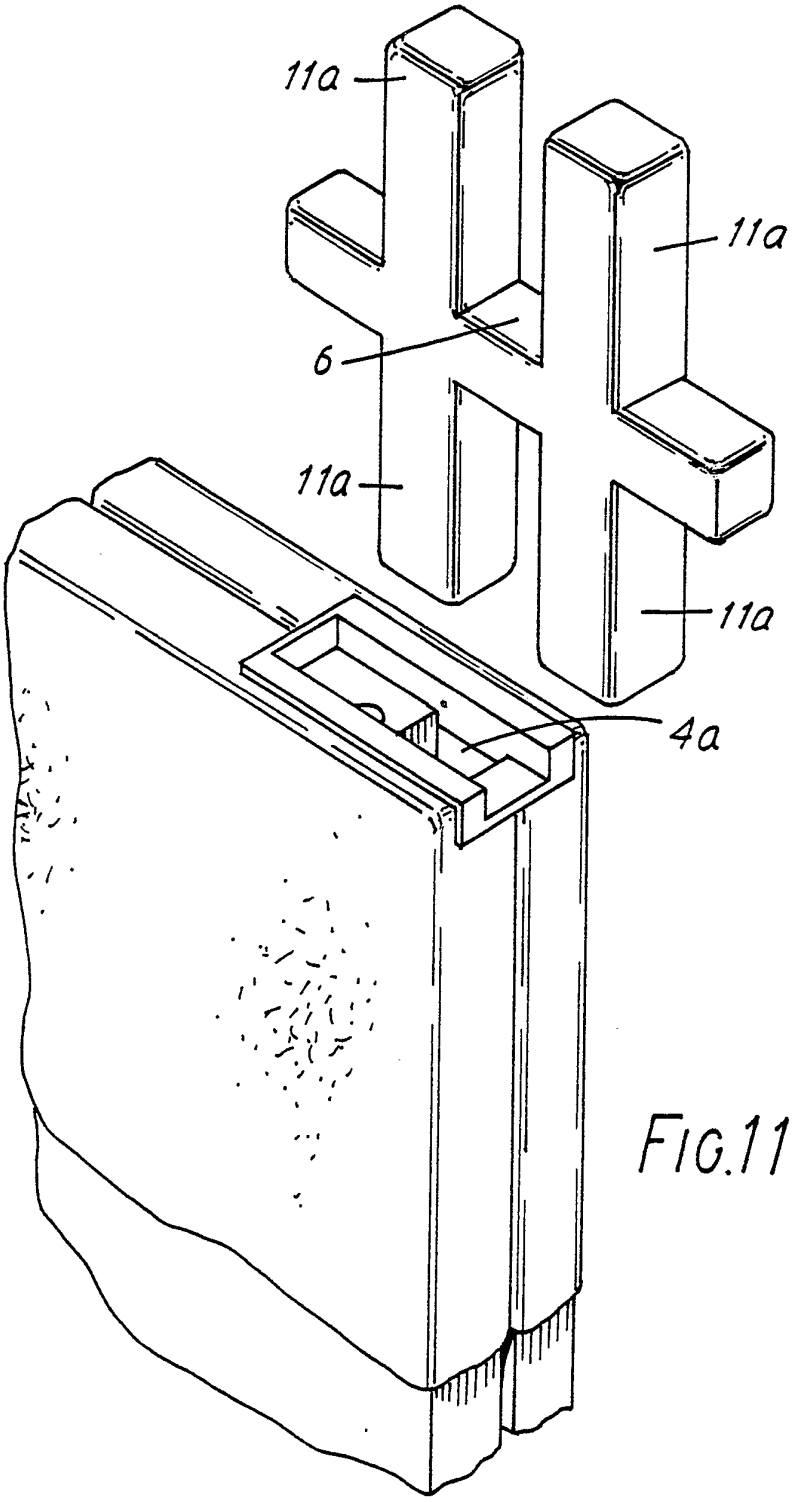


FIG.11

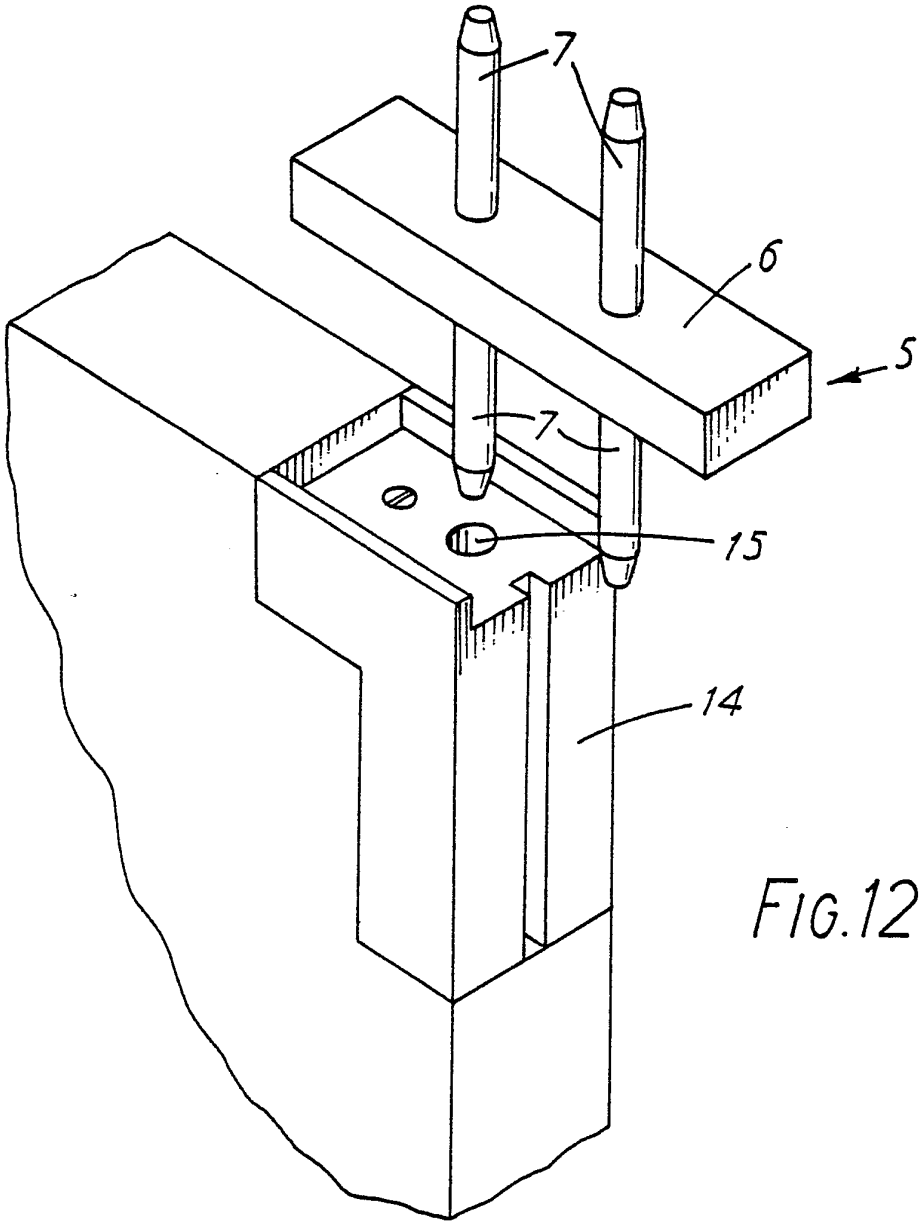


FIG.12

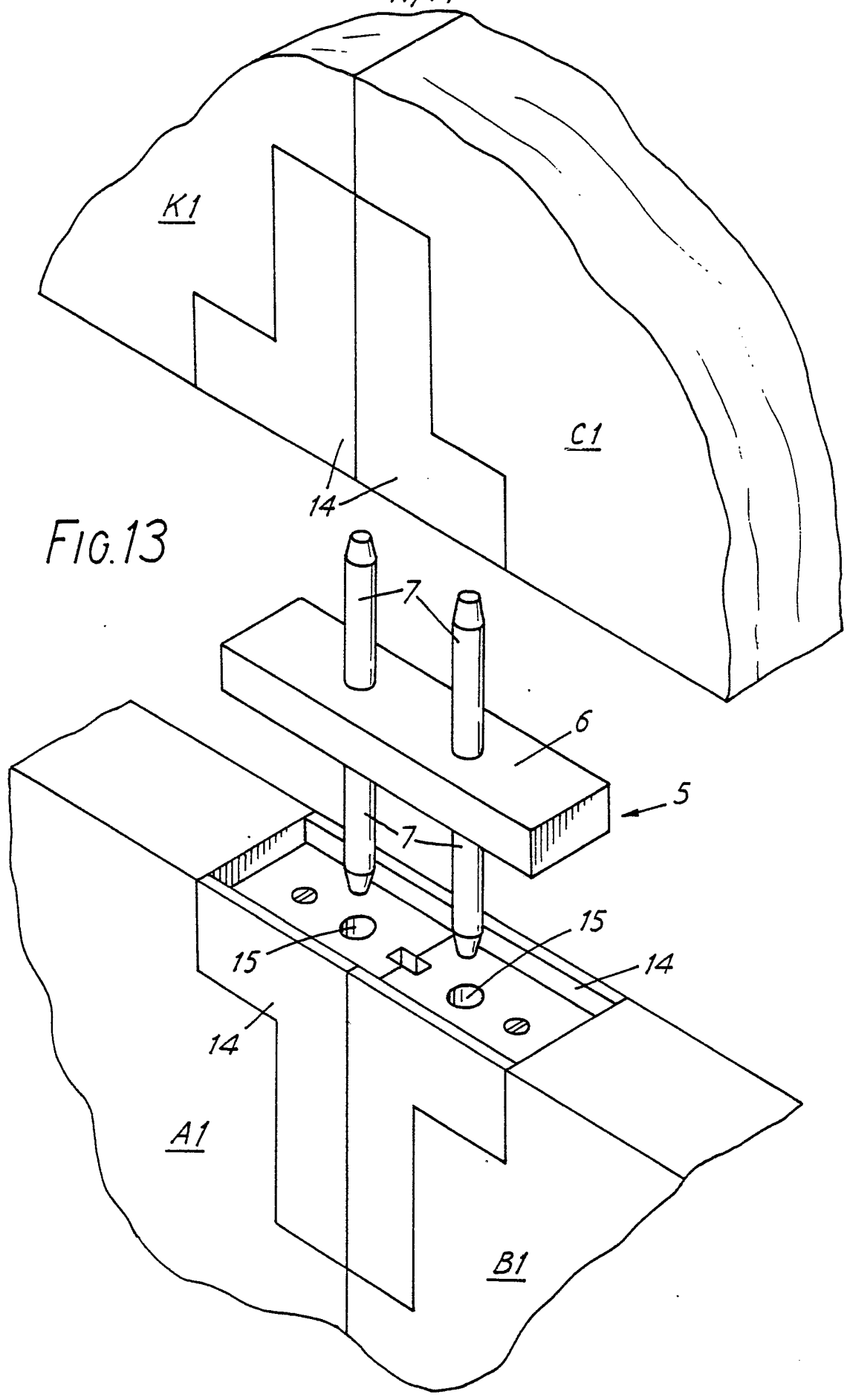


FIG.13

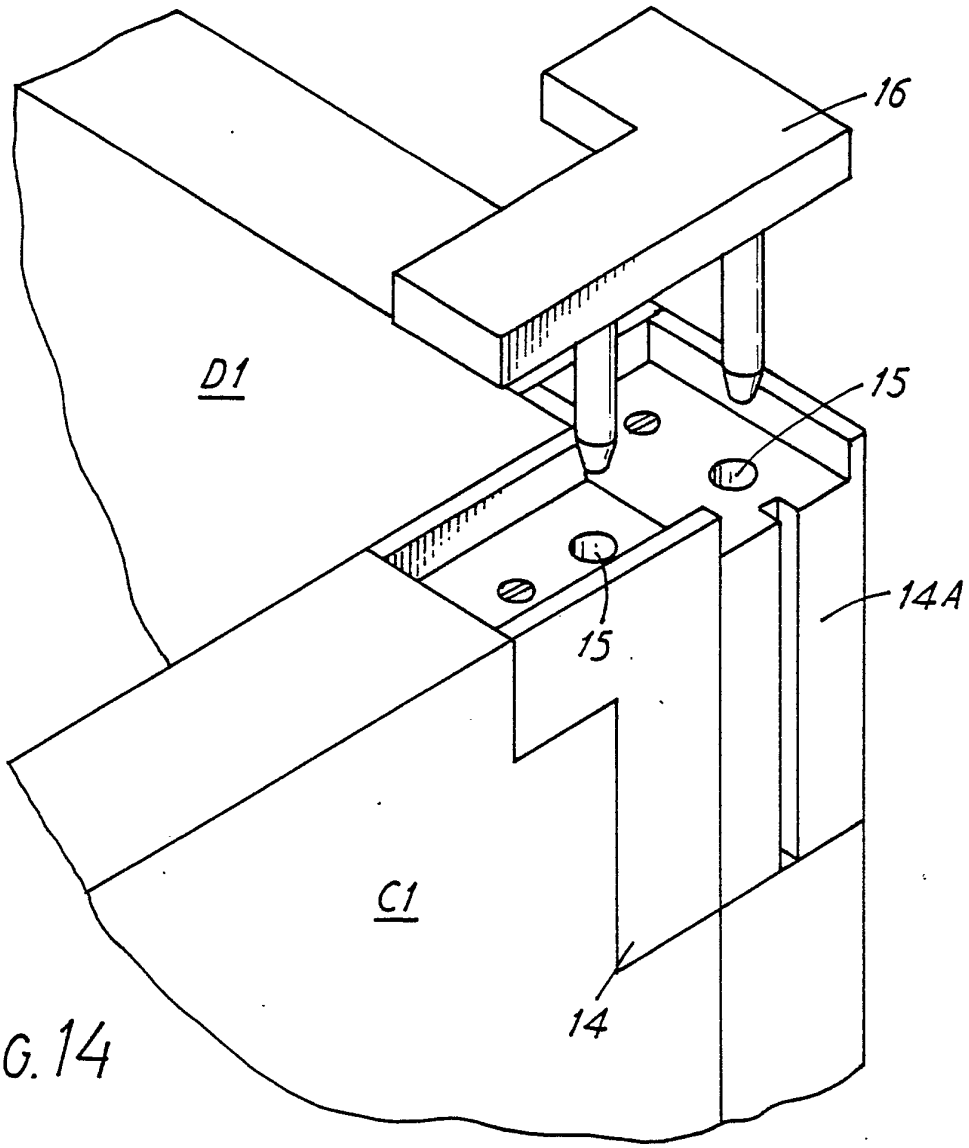


FIG. 14

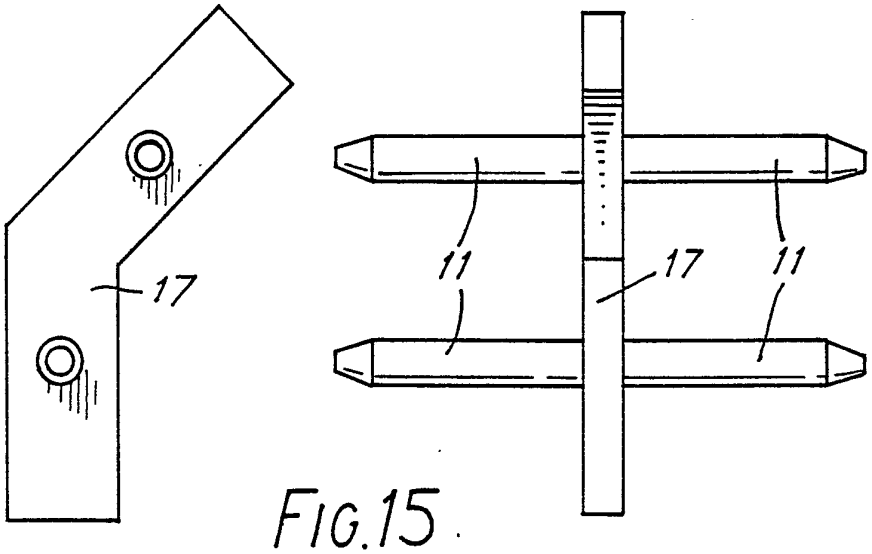


FIG. 15

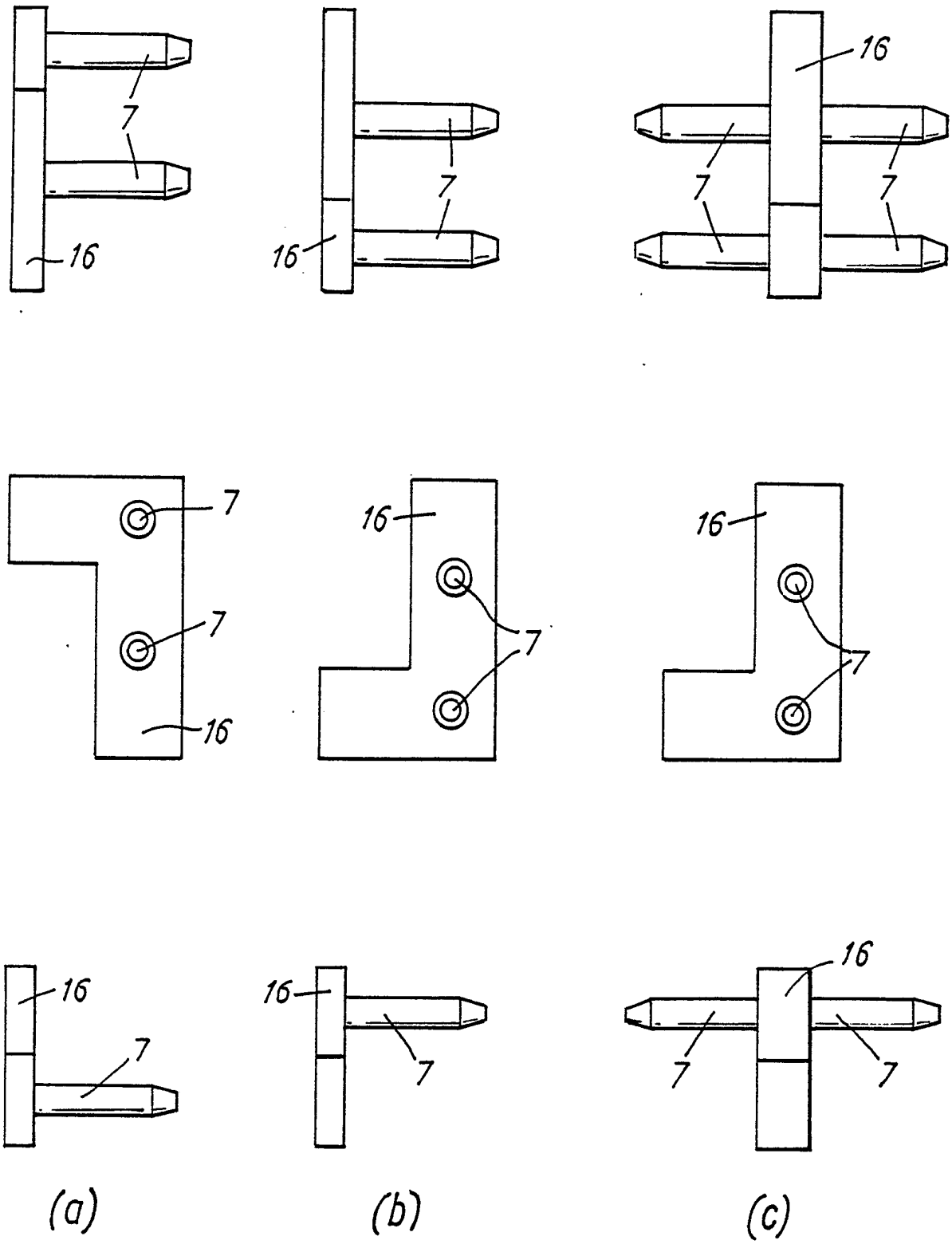


FIG.16

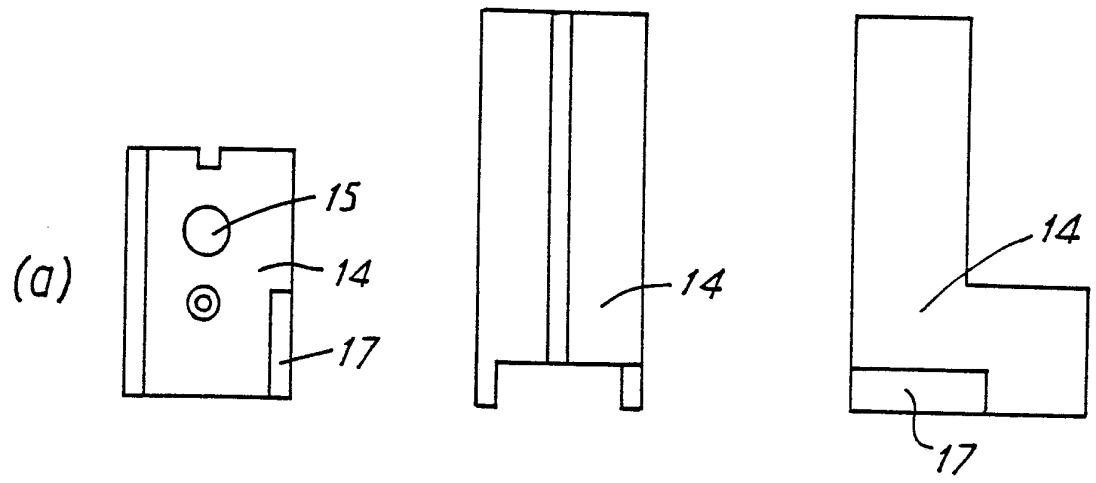


FIG.17

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 86/00734

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

IPC[4]: E 04 B 2/74

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[4]	E 04 B; E 04 H

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]
X	DE, A, 2010667 (PETERMANN) 16 September 1971 see page 4, last paragraph - page 6, last paragraph; figures 1-10	1
Y		2-8
	--	
Y	DE, A, 2857450 (GASSLER) 21 August 1980 see page 12, paragraph 2; figures 36,37	3-8
	--	
Y	GB, A, 1378300 (BEECH) 27 December 1974 see page 1, line 70 - page 3, line 18; figures 1-8	2
A		3-8
	--	
A	GB, A, 2053407 (BEIER) 4 February 1981 see page 1, line 113 - page 2, line 56; figures 1-3	1,3-7
	--	
A	GB, A, 2142058 (HEPWORTH) 9 January 1985 cited in the application	

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* Special categories of cited documents: [10]

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
20th February 1987	27 MAR 1987
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	M. VAN MOL

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/GB 86/00734 (SA 15381)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 04/03/87

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A- 2010667	16/09/71	None	
DE-A- 2857450	21/08/80	None	
GB-A- 1378300	18/12/74	None	
GB-A- 2053407	04/02/81	FR-A- 2461068	30/01/81
GB-A- 2142058	09/01/85	None	