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(54) Improvements in and relating to structural beam connectors.

(57) A connector (2) for use with a soldier to allow the attachment of a rod member (22) thereto is described. The connector (2) comprises a body member and mounting means for connecting the body member (4) to a soldier at or adjacent a main hole therein. The body member (4) comprises a pair of wings (6) between which the rod member (22) is passed. A nut (24) is secured to the rod member and screwed down onto the wings' edges to hold the rod member in place at an angle defined by the nuts' location along the wings' edges.

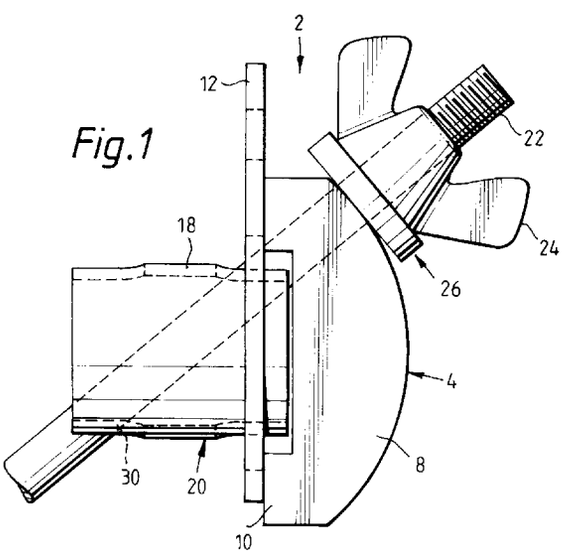

Fig.1

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This invention relates to structural members of the type which are formed with apertures therein and, in particular, it relates to a device for permitting connection of structural components to such structural members.

Many forms of structural members are known which have apertures therein. One particular well known form is the structural member which is commonly referred to as a "soldier". Soldiers comprise two back to back members, interconnected by crossplates along their lengths, the two members being formed with a number of pairs of aligned holes. Generally, the soldier members have a U cross-section or a C cross-section. However, as used herein, the term "soldier" covers any type of member and is not limited to those having a U or C cross-section.

Soldiers are used in many different applications. In particular, they are employed to provide backing for formwork and are used in heavy-duty shoring applications, for side bracing, gantry support and cantilever parapet formwork. In recent years, soldiers have also been increasingly employed as scaffolding, a scaffold framework being constructed from interconnected horizontal and vertical soldiers. In many of these applications, other structural components need to be connected to the soldiers. For example, it is often desirable to provide bracing for the soldiers, particularly when they are used for scaffolding.

In one known arrangement for connecting bracing to soldiers, a flat plate is welded across a pair of aligned holes in the soldier. The flat plate has a hole therein through which one end of a bracing rod can be passed, the bracing rod then being secured in position by attaching a nut to its end. With this arrangement, the bracing rod extends from the soldier between the webs thereof and its movement is constrained by these webs. The arrangement, therefore, only permits bracing of either two horizontal soldiers lying in different vertical planes, or of two vertical soldiers, the hole axes of which lie in different vertical planes. It does not permit bracing of two horizontal soldiers in the same horizontal plane, nor does it permit bracing of two vertical soldiers, the hole axes of which lie in the same vertical plane. The arrangement therefore does not permit full bracing of a structure composed of interconnected soldiers.

Arrangements are known which allow bracing of two vertical soldiers whose hole axes lie in the same vertical plane, known, and hereinafter referred to, as "facade bracing", or of two horizontal soldiers lying in the same plane, known, and hereinafter referred to, as "plan bracing". In one such known arrangement, a length of tube of the appropriate size is prepared for use as a brace by cutting its ends diagonally across so that it will fit between two soldiers to be braced. The ends are then welded to plates, which in turn, are bolted to the sides of the soldiers. Soldiers are often provided with a pair of small holes either side of their main holes, the diameter of which is many times smaller than that of the main holes, and the plates, with the tubular brace welded thereto, are bolted to the sides of the soldiers via these small holes. This arrangement is expensive and difficult. Given the many variations in bay size possible in a structure composed of interconnected horizontal and vertical soldiers, a large number of different length braces need to be provided. The braces have a fixed length and, therefore, they do not accommodate any errors in the construction of the soldiers or of the structure into which the soldiers are connected. Furthermore, the angle at which a brace can be set to a soldier is also fixed so that there is no freedom of choice as to where the brace is provided.

In accordance with the invention, a connector for use with a soldier comprises a body member, means for releasably mounting the body member to a side of a soldier at or adjacent one of the main holes therein, the body member being so dimensioned and arranged that a rod member may be releasably secured thereto at an angle to the axis of the hole, with part of the rod member located in, or passing through, a cavity in the body member.

With two such connectors and a rod member of a type suitable to act as a brace, both facade bracing and plan bracing of a structure formed from interconnected soldiers are possible. Any length of brace may be employed and there is no need to specially shape the ends thereof. In particular, a suitable rod member of approximately the correct length can be secured between two soldiers with the length between the attachment points being exactly as required for the particular bay to be braced, the ends of the rods being accommodated in the cavities in the connectors.

In a preferred embodiment, the body member provides a bearing surface for a nut securable to the rod member, the nut, when in a position bearing against the bearing surface connecting the rod member to the body member, the position of the nut on the bearing surface setting the angle at which the rod member is orientated relative to the axis of the soldier hole. By providing a suitably shaped bearing surface therefore, a rod member can be connected to a soldier at any desired angle to the axis of the hole of the soldier at or adjacent which the connector is mounted. This allows bracing to be positioned in any desired diagonal orientation across a bay of a structure of which the soldier forms a part and further serves to ensure that bracing will not introduce secondary stresses into the structure. Furthermore, if the rod member is not to be used as a brace but instead forms part of some structural component to be connected to the soldier, it allows the structural component to be held in position at a particular desired angle relative to the soldier.

The bearing surface on the body member can be arranged so that the rod member can be set in any one

of a number of particular different angular orientations relative to the soldier. In particular, the bearing surface may be such that the rod member can be positioned at between 0° and 45° either side of the axis of the soldier hole, at or adjacent which the connector is secured, within the plane containing the axis of the hole and the axis of the soldier or, alternatively, within the plane to which the soldier axis is normal.

The body member may comprise a pair of wings spaced apart to define the cavity, a portion of the wings' edges defining the bearing surface. By providing a pair of wings between which part of the rod member, in use, locates, a rod member may be used as a brace whose length is greater than the required bracing length. Furthermore, the wings serve to restrain the rod member whilst it is being secured in position by tightening down of a nut onto the bearing surface defined by the wings. The body member is preferably mounted on the soldier in such a way that the wings lie on either side of a diameter of the main hole in the soldier at which the connector is mounted and are evenly spaced therefrom. Suitably the diameter is that which is parallel to the axis of the soldier.

The mounting means may comprise a plate to which the body member is attached and which, in turn, is connected to the soldier by the small holes either side of a main hole. thereof, suitably by bolting. Alternatively, or additionally, the mounting means may comprise a tubular member, to which the body member is attached, which locates in and bears against the walls of the main hole of the soldier at which the connector is mounted. The provision of a surface on the mounting means which bears against the main hole at which the connector is mounted gives good load transferal via the connector.

Whichever form the mounting means takes, it suitably includes cutouts or slots so positioned as to allow passage of the rod member therethrough. This increases the size of the angle at which the rod member may be mounted relative the soldier hole axis.

The invention will now be further described by way of example with reference to the accompanying drawings in which:-

Figure 1 is a view from one side of a connector in accordance with the invention;

Figure 2 is a view from the right of the connector of Figure 1;

Figure 3 is a view from above of the connector of Figure 1;

Figure 4 illustrates one use of the connector of Figure 1; and

Figure 5 illustrates a second use of the connector of Figure 1.

The connector 2 comprises a body member 4 in the form of two wings 6. Each wing 6 consists of a generally arc-shaped segment 8 and two leg sections 10. The wings 6 are attached to a plate 12 by welding their legs 10 to the plate 12. The plate 12 has a hole 14 therein and the wings 6 are mounted on the plate 12 across the hole 14 on either side of a diameter thereof so that they are spaced apart and define a gap therebetween.

The plate 12 has a second smaller hole therein 16 by which it can be mounted on a soldier, the plate 12 being secured to the soldier by passing a bolt through the hole 16 and one of the small holes provided by the soldier. The dimensions and positions of the holes 14 and 16 in the plate 12 are so arranged that when the plate 12 is mounted on a soldier, the hole 14 aligns with and lies above a main hole of the soldier. The wings 6 are so positioned that the diameter of the hole 14 on either side of which they are located is parallel to the axis of the soldier.

The connector 2 further comprises a tubular member 18 welded into the hole 14. When the plate 12 is mounted to the soldier the tubular member 18 passes through the main hole of the soldier and is so dimensioned that its outer surface 20 bears against the walls of the main hole of the soldier.

Figure 1 illustrates how a rod member 22 can be connected to a soldier by use of the connector 2. One end of the rod member 22 is passed between the two wings 6 and through the hole 14 in the plate 12, the main hole of the soldier at which the connector 2 is mounted, and, the tubular member 18. The rod 22 is moved until it is at the required angle relative to the axis of the soldier main hole through which it passes, the wings 6 serving to constrain it to move within a plane defined by the axis of the soldier and the axis of the main hole thereof. When the rod 22 is in the desired position, it is secured in place by tightening a nut 24 up against the curved surface of the arcuate sections 8 of the wings 6. If desired, and as is shown, a washer 26 may be positioned between the nut 24 and the wings 6. The rod 22 is held by the nut 24 by virtue of interlocking threads provided on the two parts.

It will be appreciated that the curved bearing surface defined by the arcuate portions 8 of the wings 6 allows the rod 22 to be secured to the connector 2, and hence the soldier on which this is mounted, at a number of different angles relative to the axis of the tubular member 18 and hence that of the soldier hole. To allow the rod to be secured at any point along the curved surfaces of the wings 6, cutouts 28 and 30 are provided on the plate 12, intersecting with the holes 14, and in the tubular member 18, at either end thereof. With the rod 22 positioned at the extremities of the curved surfaces of the wings 6 a portion thereof passes through these cutouts 28 and 30 as is illustrated in Figure 1. The combination of the curved surfaces of the wings 8 and the cutouts 28 and 30 in the plate 12 and tubular member 18 respectively allows the rod 22 to be positioned about 45° above or below the axis of the tubular member 18. With the arrangement shown in the Figures, this means the rod 22 can be connected at any angle between 0° and 45° either

side of the axis of the main hole of the soldier at which the connector 2 is mounted in the plane defined by the axis of the soldier and the axis of the hole.

By changing the position of the wings 6, and if provided, the cutouts 28 and 30, the rod 22 can be attached at other orientations relative to the soldier. In particular, it can be connected at any angle between 0° and 45° on either side of the axis of the main hole of the soldier at which the connector 2 is attached within a plane at right angles to that defined by the axis of the soldier and the axis of the hole by turning the wings through 90° from the position shown in the Figures, i.e., within a plane to which the soldier axis is normal.

The rod 22 may be part of a structural component to be connected to a soldier. However, most suitably the rod is of suitable strength and size for it to be used to brace a scaffolding or other structure formed from interconnected vertical and horizontal soldiers. The connector 2 permits both plan bracing and facade bracing of such structures, as is illustrated in Figures 4 and 5 respectively.

Figure 4 shows four horizontally positioned soldiers 32 interconnected by some suitable joint 34 which also serves to connect them to four vertical soldiers 36. A rod 22 is connected between, and braces, two connectors 2. As a result of the fact that the rod 22 can be releasably connected to the connectors 2 and that the connectors 2 allow the rod 22 to pass therethrough, any length of rod 22 can be used and its ends do not have to be specially shaped.

The arrangement further accommodates any discrepancies in the construction of the soldiers 32 or of the structure formed by these and soldiers 36, since the portion of the rod 22 which extends between the two connectors 2 can be set at exactly the required length. Thus the rod 22 will not either pull the two soldiers 32a and 32b, between which it is connected, together or push them apart and so will not cause secondary stresses to be introduced into the structure.

Figure 5 shows a similar arrangement to Figure 4, but this time the connectors 2 are employed for facade bracing. Two horizontal soldiers 32c and 32d, which are vertically spaced, are braced by a rod 22 connected between them by way of two connectors 2. Figure 5 additionally illustrates by dotted line 38 one of the alternative positions in which the rod 22 could have been placed due to the freedom of angular orientation relative to the soldiers 32c and 32d provided by the use of the connectors 2.

Claims

1. A connector for use with a soldier comprising a body member, means for releasably mounting the body member to a side of a soldier at or adjacent one of the main holes therein, the body member being so dimensioned and arranged that a rod member may be releasably secured thereto at an angle to the axis of the hole, with part of the rod member located in or passing through a cavity in the body member.

2. A connector as claimed in Claim 1 wherein the body member provides a bearing surface for a nut securable to the rod member.

3. A connector as claimed in Claim 2 wherein the arrangement is such that when the nut bears against the bearing surface it connects the rod member to the body member, the location of the nut along the bearing surface setting the angle at which the rod member is oriented relative the axis of the soldier hole at or adjacent which the body member is mounted.

4. A connector as claimed in Claim 3 wherein the bearing surface is arranged such that the rod member can be positioned at between 0° and 45° either side of the axis of the soldier hole at which the body member is mounted either within the plane containing that axis and the soldier axis or within the plane normal to the soldier axis.

5. A connector as claimed in any one of Claims 2 to 4 wherein the body member comprises a pair of wings spaced apart to define the cavity therebetween, a portion of the wings' edges defining the bearing surface.

6. A connector as claimed in Claim 5 wherein the mounting means is such as to mount the body member on the soldier with the wings on either side of a diameter of the soldier hole at which the body member is mounted.

7. A connector as claimed in any preceding Claim wherein the mounting means comprises a plate to which the body member is attached, the plate having apertures therein by which it may be bolted to a soldier.

8. A connector as claimed in any preceding Claim wherein the mounting means comprises a tubular member attached to the body member and dimensioned such that it can be located in the walls of a main hole of the soldier and, when so located, bears against those walls.

9. A connector as claimed in any preceding Claim wherein the mounting means includes cutouts through which a portion of the rod member can pass.

Fig.1

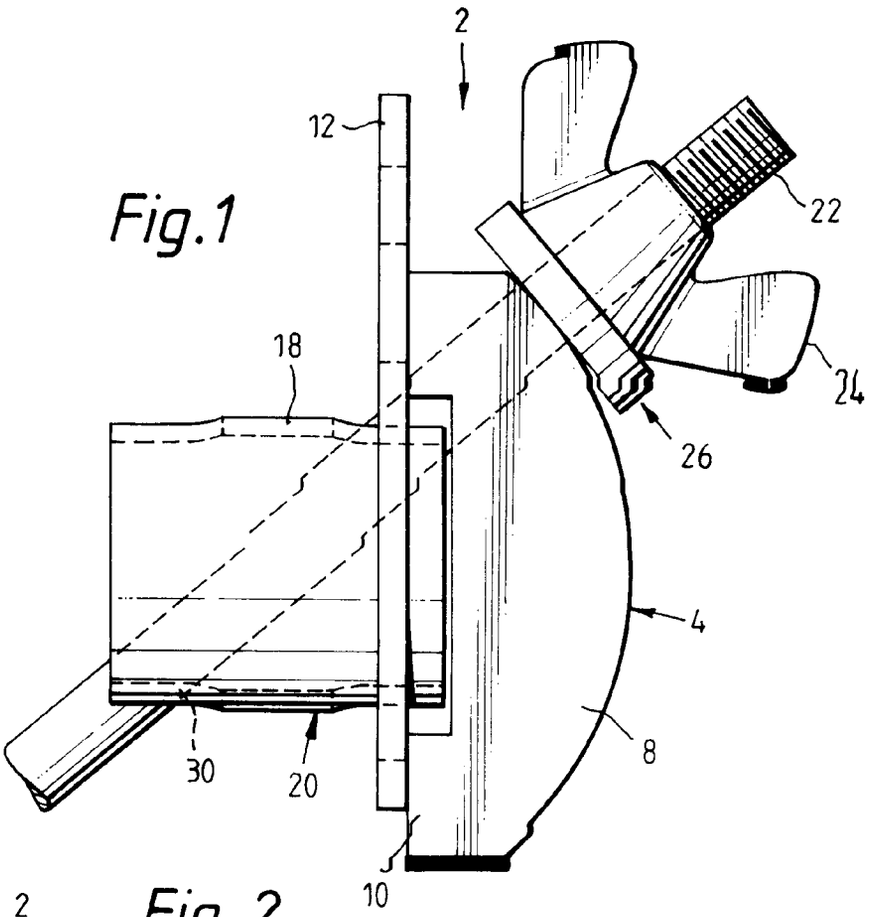


Fig.2

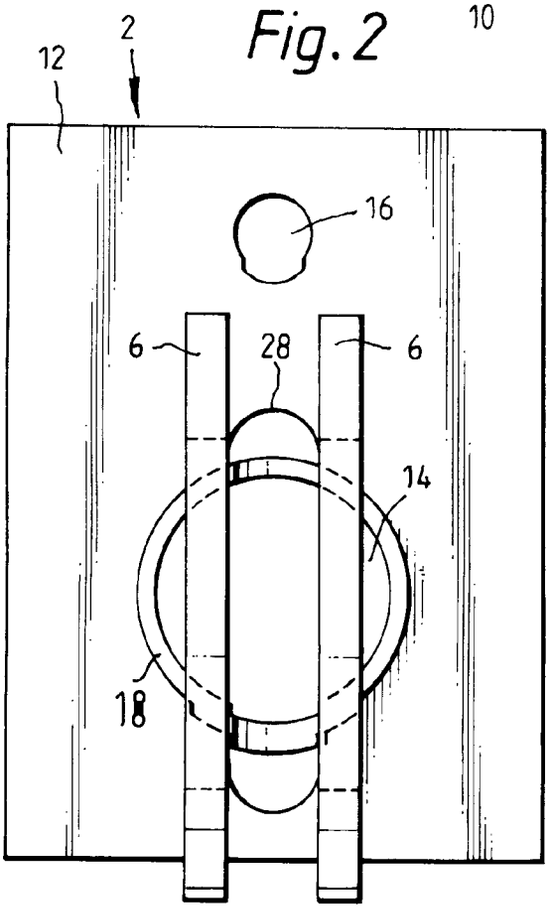


Fig.3

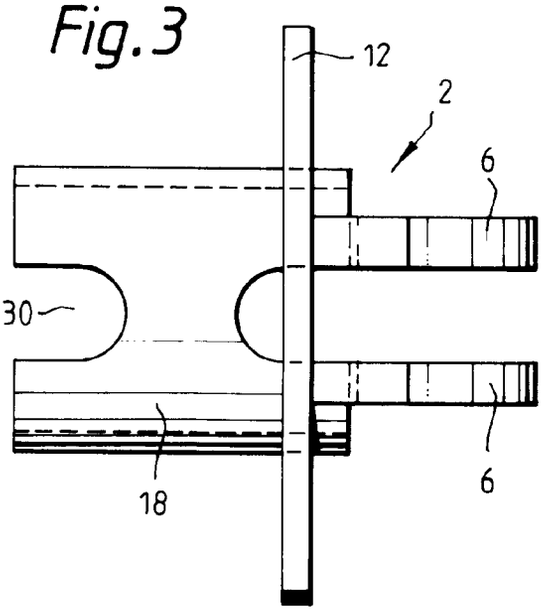


Fig.4

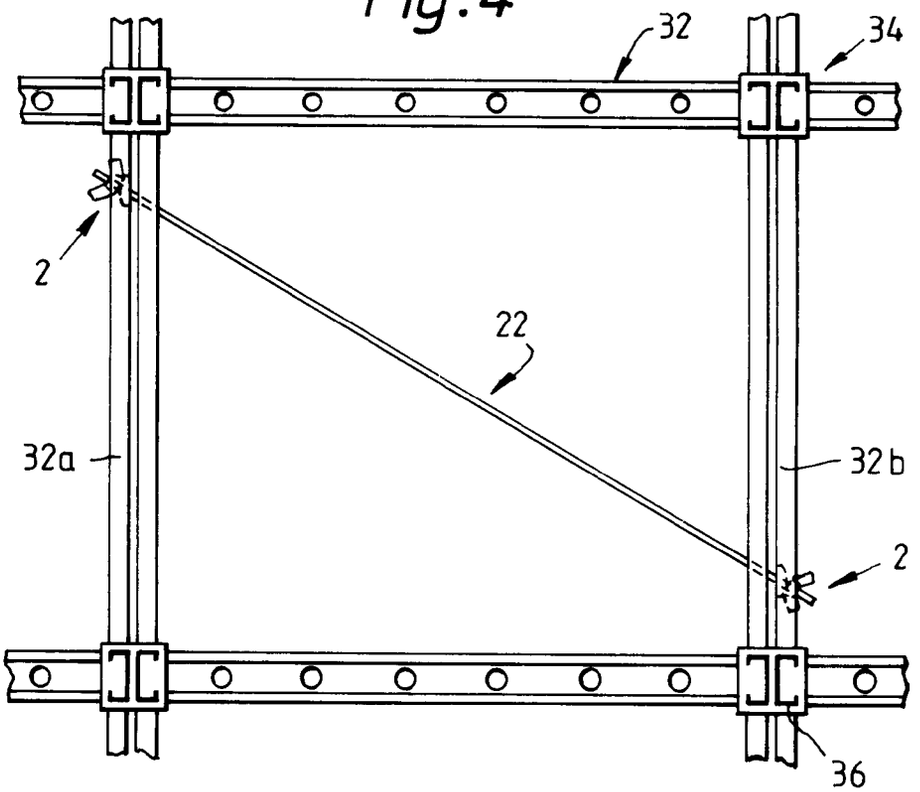
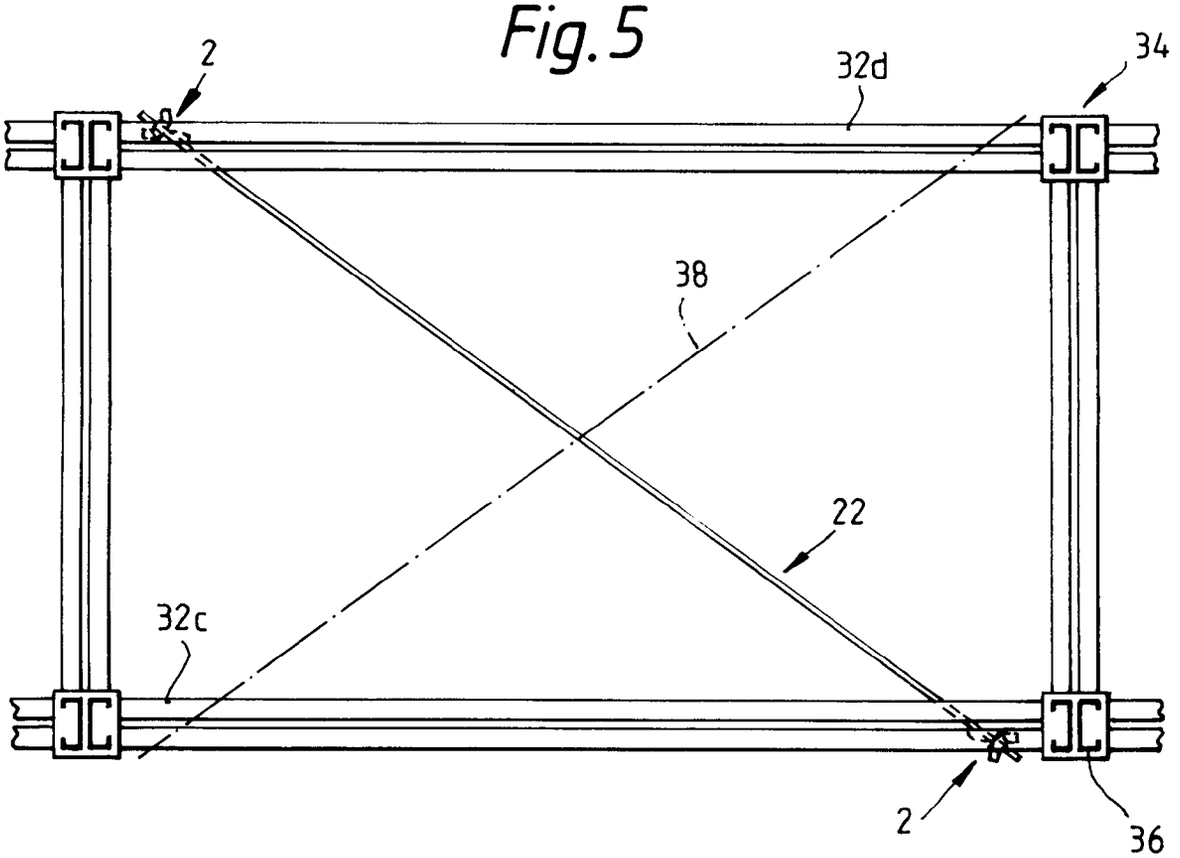


Fig.5



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EUROPEAN SEARCH REPORT

Application Number

EP 91 30 9934

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)
A	FR-A-745 718 (LUCHTERHAND) * page 3, line 80 - page 4, line 17; figures *	1,2,3,5	E04G1/16 E04G1/12 E04G1/06
A	US-A-1 448 503 (PALMER - JONES)		
A	DE-A-1 901 880 (SPEEDRACK INC.)		
A	DE-A-2 352 228 (HAUSER)		
A	EP-A-0 279 046 (HÜNNEBECK)		
A	DE-A-3 641 349 (ISCHEBECK)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

E04G
E02D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	04 FEBRUARY 1992	VIJVERMAN W.C.

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