(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
24 March 2011 (24.03.2011)

PCT

(10) International Publication Number
WO 2011/034787 A2

(51) International Patent Classification:
E04B 2/82 (2006.01)

(21) International Application Number:
PCT/US2010/048413

(22) International Filing Date:
10 September 2010 (10.09.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2009213215 15 September 2009 (15.09.2009) AU

(71) Applicant *(for all designated States except US)*: **ILLINOIS TOOL WORKS INC.** [US/US]; 3600 West Lake Avenue, Glenview, Illinois 60026 (US).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: **KENNELLY, Bernard Joseph** [AU/AU]; 25 Urunga Street, North Balgowlah, New South Wales 2093 (AU).

(74) Agent: **HAUPTMAN, Benjamin J.**; Lowe Hauptman Ham & Berner, LLP, 1700 Diagonal Road, Suite 300, Alexandria, Virginia 22314 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

WO 2011/034787 A2

(54) **Title**: FLOATING CONNECTION BETWEEN A STRUCTURAL MEMBER AND A WALL IN A BUILDING

(57) **Abstract**: There is disclosed a connector for forming a connection between a structural member and a wall in a building, the structural member being located above the wall and extending transverse to the wall, the connector having a first end attachable to a top part of the wall on one side of a vertical plane in which the structural member extends, a second end remote from the first end and attachable to the structural member, and an interconnection extending between the ends, the interconnection being configured such that, when the first and second ends are attached to the top part and structural member respectively, it extends generally transverse to the vertical plane and permits rotational displacement of the second end about the first end to allow floating of the structural member in the vertical plane whilst providing bracing between the first and second ends to restrain the structural member laterally. There is also disclosed a connection comprising the connector, and a pair of such connections, as well as associated methods of forming the connection(s).

FLOATING CONNECTION BETWEEN A STRUCTURAL MEMBER AND A WALL IN A BUILDING

The present invention relates to a connector which transfers lateral or shear loads in a structural member into a wall in a building whilst allowing the structural member to float vertically. The invention also relates to a connection between a structural member and a wall in a building, the connection incorporating the connector. In addition, the invention relates to a pair of connections according to the invention which transfer lateral or shear loads in opposite lateral directions.

The invention has particular, though not exclusive, application to the transfer of racking loads from ceiling diaphragms to non-load bearing bracing walls in buildings, in a manner which permits vertical movement, such as that resulting roof truss camber dissipation, of a structural member or pair of structural members forming part of a ceiling diaphragm.

According to a first aspect of the present invention, there is provided a connector for forming a connection between a structural member and a wall in a building, the structural member being located above the wall and extending transverse to the wall, the connector having a first end attachable to a top part of the wall on one side of a vertical plane in which the structural member extends, a second end remote from the first end and attachable to the structural member, and an interconnection extending between the ends, the interconnection being configured such that, when the first and second ends are attached to the top part and structural member respectively, it extends generally transverse to the vertical plane and permits rotational displacement of the second end about the first end to allow floating of the structural member in the vertical plane whilst providing bracing between the first and second ends to restrain the structural member laterally.

Preferably, the interconnection is configured to flex to permit said rotational displacement.

Preferably, the connector further comprises a hinge between the first end and the interconnection permitting said rotational displacement.

Preferably, the connector further comprises a hinge between the second end and the

Preferably, the or each hinge is a living hinge.

Preferably, the interconnection is configured such that, when the first and second ends are attached to the top part and structural member respectively, it braces the structural member from lateral movement towards the other side of the vertical plane. Preferably, the connector is configured in the form of a strap and is configured such that a face of the strap at the first end is receivable against the top part for attachment thereto and a face of the strap at the second end is receivable against the structural member for attachment thereto.

Preferably, the second end is attachable to a side face of the structural member. Preferably, the second end is attachable to a side face of the structural member on the opposite side of the vertical plane to the first end. Preferably, the second end is attachable to a substantially upright side face of the structural member.

Preferably, connector is configured to wrap around a longitudinal edge of the structural member to effect binding engagement between the connector and the structural member. Preferably, the connector is configured to wrap around a lower longitudinal edge of the structural member. Preferably, the connector has a preformed bend between the interconnection and the second end, the bend being configured to receive the edge so as to be bindingly engaged therewith.

Preferably, the hinge between the second end and the interconnection is a living hinge defined at the bend between the second end and the interconnection.

In accordance with a preferred embodiment of the invention, the first end is attachable to a top face of the wall.

In accordance with an alternative preferred embodiment of the invention, the first end is attachable to a side face of the wall. Preferably, the connector is configured in the form of a strap opposite ends of which are askew whereby a face of the strap at the first end is receivable against the side face for attachment thereto whilst a face of the strap at the second end is receivable against the structural member for attachment thereto. The strap

may be bent or twisted such that the faces are askew. Preferably, the connector is configured such that, when the faces of the strap at the first and second ends are received against the side face of the wall and the structural member respectively, the interconnection extends generally perpendicular to the vertical plane.

According to a second aspect of the present invention, there is provided a connection between a structural member and a wall in a building, the structural member being located above the wall and extending transverse to the wall, the connection comprising a connector having a first end attached to a top part of the wall on one side of a vertical plane in which the structural member extends, a second end remote from the first end and attached to the structural member, and an interconnection extending between the ends, the interconnection extending generally transverse to the vertical plane and being configured to permit rotational displacement of the second end about the first end to allow floating of the structural member in the vertical plane whilst providing bracing between the first and second ends to restrain the structural member laterally.

Preferably, the interconnection is configured to flex to permit said rotational displacement.

Preferably, the connection further comprises a hinge between the first end and the interconnection permitting said rotational displacement.

Preferably, the connection further comprises a hinge between the second end and the interconnection permitting said rotational displacement.

Preferably, the or each hinge is a living hinge.

Preferably, the interconnection is configured such that it braces the structural member from lateral movement towards the other side of the vertical plane. Preferably, the connector is configured in the form of a strap, a face of the strap at the first end being attached to the top part and a face of the strap at the second end being attached to the structural member.

Preferably, the second end is attached to a side face of the structural member. Preferably, the second end is attached to a side face of the structural member on the opposite side of

the vertical plane to the first end.

Preferably, the connector wraps around a longitudinal edge of the structural member to effect binding engagement between the connector and the structural member. Preferably, the connector wraps around a lower longitudinal edge of the structural member.

Preferably, the hinge between the second end and the interconnection is a living hinge defined at the bend between the second end and the interconnection.

In accordance with a preferred embodiment of the invention, the first end is attached to a top face of the wall.

In accordance with an alternative preferred embodiment of the invention, the first end is attached to a side face of the wall. Preferably, the connector is configured in the form of a strap opposite ends of which are askew whereby a face of the strap at the first end is received against the side face whilst a face of the strap at the second end is received against the structural member. The strap may be bent or twisted such that the faces are askew. Preferably, the connector is configured such that the interconnection extends generally perpendicular to the vertical plane.

Preferably, the first end is attached to a side face of the wall.

According to a third aspect of the present invention, there is provided a pair of connections as described above wherein the first ends are attached to the same wall and the second ends are attached to the same structural member such that the connectors provide lateral restraint to the structural member in opposite lateral directions.

According to a fourth aspect of the present invention, there is provided a pair of connections as described above wherein the first ends are instead attached to respective walls which are arranged in generally parallel planes and the second ends are attached to the same structural member such that the connectors provide lateral restraint to the structural member in opposite lateral directions.

In a preferred embodiment according to the third or fourth aspect of the invention, the connectors are configured such that each interconnection provides lateral bracing in tension and the first ends are attached to the wall(s) at opposite sides of the vertical plane.

According to a fifth aspect of the present invention, there is provided a pair of connections as described above wherein the first ends are attached to the same wall and the second ends are instead attached to respective structural members which are generally parallel and form part of a substantially rigid frame, whereby the connections provide restraint to the frame in opposite lateral directions.

According to a sixth aspect of the present invention, there is provided a pair of connections as described above, wherein the first ends are instead attached to respective walls which are arranged in generally parallel planes and the second ends are attached to respective structural members which are generally parallel and form part of a substantially rigid frame, whereby the connections provide restraint to the frame in opposite lateral directions.

In one preferred embodiment according to the fifth or sixth aspect of the invention, the connectors are configured such that each interconnection provides lateral bracing in tension and the first ends are attached to the wall(s) at positions between which the vertical planes are located. In another preferred embodiment according to the fifth or sixth aspect of the invention, the connectors are configured such that each interconnection provides lateral bracing in tension and the first ends are attached to the wall(s) at positions between the vertical planes.

According to a seventh aspect of the present invention, there is provided a method of forming a connection between a structural member and a wall in a building, the structural member being located above the wall and extending transverse to the wall, the method comprising attaching a first end of a connector to a top part of the wall on one side of a vertical plane in which the structural member extends, and attaching a second end of the connector, which is remote from the first end, to the structural member, whereby an interconnection of the connector, extending between the ends, extends generally transverse to the vertical plane to permit rotational displacement of the second end about the first end, thereby allowing floating of the structural member in the vertical plane whilst providing

bracing between the first and second ends to restrain the structural member laterally.

According to an eighth aspect of the present invention, there is provided a method of forming a pair of connections, wherein each connection is formed by a method according the seventh aspect, the method comprising attaching the first ends to the same wall and attaching the second ends to the same structural member such that the connectors provide lateral restraint to the structural member in opposite lateral directions.

According to a ninth aspect of the present invention, there is provided a method of forming a pair of connections, wherein each connection is formed by a method according to the seventh aspect, the method comprising attaching the first ends to respective walls which are arranged in generally parallel planes and attaching the second ends to the same structural member such that the connectors provide lateral restraint to the structural member in opposite lateral directions.

According to a tenth aspect of the present invention, there is provided a method of forming a pair of connections, wherein each connection is formed by a method according to the seventh aspect, the method comprising attaching the first ends to the same wall and attaching the second ends to respective structural members which are generally parallel and form part of a substantially rigid frame, whereby the connections provide restraint to the frame in opposite lateral directions.

According to an eleventh aspect of the present invention, there is provided a method of forming a pair of connections, wherein each connection is formed by a method according to the seventh aspect, the method comprising attaching the first ends to respective walls which are arranged in generally parallel planes and attaching the second ends to respective structural members which are generally parallel and form part of a substantially rigid frame, whereby the connections provide restraint to the frame in opposite lateral directions.

The present invention will now be described, by way of non-limiting example only, with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a pair of connectors interconnecting a structural

member and wall in accordance with a first preferred embodiment of the present invention;

Figure 2 is a perspective view of a pair of connectors interconnecting the structural member and wall in accordance with a second preferred embodiment of the invention;

Figure 3 is a perspective view of the connectors according to the first embodiment interconnecting the wall and an alternative structural member;

Figure 4 is a perspective view showing a pair of connectors according to the first embodiment interconnecting the wall with respective structural members; and

Figure 5 is a perspective view showing a pair of connectors according to the second embodiment interconnecting the wall with respective structural members.

Figure 1 illustrates a pair of connections 1 between a roof truss bottom chord 3 and the top plate 5 of a non-load bearing internal wall 6 in a building, according to a first embodiment of the invention, the chord 3 extending perpendicular to the top plate 5. In the arrangement shown, the chord 3 extends horizontally, so that its longitudinal axis is perpendicular to the plane of the wall, though the connections 1 will function adequately even if the bottom chord 3 is inclined or declined to an extent. The connections 1 will also function adequately if the longitudinal axes of the chord 3 and top plate 5 are not exactly perpendicular.

The chord 3 forms part of the building ceiling diaphragm, and the connections 1 serve to transfer raking loads from that diaphragm into the wall 6, which is a non-load bearing wall.

The connections 1 comprise identical connectors 2 each of which is configured in the form of a strap, which may be formed from 1mm thick G300-Z275 galvanised steel. Each connector 2 is formed with bends 21 and 22 at two positions along its length, defining a first end 2A, second end 2B and a straight intermediate section 2C interconnecting the ends 2A and 2B. The angles of the bends 21, 22 are such that the end 2B extends generally perpendicular to the end 2A.

The connectors 2 both connect between the top plate 5 and chord 3 and are arranged in opposed relation. Specifically, the ends 2A are fixed against a top face 8 of the top plate 5 on opposite sides of a vertical plane P in which a longitudinal axis of the chord 3 lies whilst the ends 2B are fixed to opposite upright side faces 10 respectively of the chord 3,

the second end 2B of each connector being fixed against the side face 10 of the chord 3 which lies on the opposite side of the vertical plane P to the first end 2A of that connector, the intermediate sections 2C thus crossing over underneath the chord 3. The ends 2A, 2B are provided with holes 12 therethrough which receive nails 14 fastening them to the chord 3 and top plate 5. Advantageously, because each first end 2A fixes to the top face 8 of the top plate 5, the fasteners 14 which fix them against that face 8 are easy to position and install. Moreover, the first ends 2A are clear of the sides of the top plate/wall and therefore do not interfere with the fixing of cladding and/or a cornice to the wall. Furthermore, the nature of the connections formed by the connectors is such that that any deformation of either strap at either end as the result of over-driving of nails 14 does compromise the connection effectiveness or functionality.

The bend 21 between the intermediate section 2C and second end 2B in each connector is received against a respective lower edge 11 of the chord 3, whereby each connector 2 wraps around those edges, creating a frictional interengagement between it and the chord 3 which contributes to the strength of the respective connection when the connector 2 is placed into tension (under a laterally outward load exerted against its second end by the chord 3). Each bend 21 is precisely preformed by means of a punching machine to provide a line of bearing along the interface between the respective connector 2 and the structural member 3 across the strap width, so that the connector 2, to the extent it wraps around the respective edge 11, does so in full contact therewith, providing uniform bearing and registration between the connector 2 and structural member 3, thereby contributing to the bracing strength of the connection for a given strap thickness and number of fasteners 14.

The manner in which the connections 1 function will now be described.

Owing to the flexibility of the connectors 2, the bends 21 will function as living hinges allowing pivoting of the intermediate sections 2C and thus rotational displacement of the second ends 2B thereabout, whereby the chord 3 can float and truss camber dissipation is released. The bends 22 similarly function as living hinges, which permit relative pivoting between the intermediate sections 2C and second ends 2B, maintaining the orientations of the second ends 2B substantially parallel with the vertical plane P as the chord 3 floats. However, a sideways load in the chord 3 will, depending on its direction, place the

intermediate section of one or the other connector 2 into tension, whereby it restrains the chord 3 laterally and transfers the transverse load into the wall 6 through the top plate 5, the connectors 2, 4 each having sufficient stiffness to this end. The lateral restraint or bracing provided by each connector 2 is thus in one lateral direction.

Each connector 2 is configured such that the angle θ formed between the intermediate section and the top plate upper face 8 is relatively small so that the change in the separation of, or the straight line distance between, the bends at the ends of the intermediate section of each connector will be negligible when the chord 3 is displaced downwardly from the position in which it is shown. In particular, if the chord 3 floats to a lower position, the resulting reduction in that separation will not be such that the connectors slacken sufficiently as to be incapable of laterally restraining the chord 3. If the chord 3 floats to a higher position, it will, of course, simply cause an increase in the tension in each connector. In the present embodiment, the angle θ is 15°, and the first end 2A, intermediate section 2C and second end 2B have lengths of 101mm, 128mm and 71mm respectively, so that the overall strap length is 300mm.

Figure 2 illustrates a pair of connections 1' between the roof truss bottom chord 3 and the top plate 5, according to a second embodiment of the invention. The connections 1' comprise identical connectors 2' each of which is, like a connector 2, configured in a form of a strap which may be formed from 1 mm thick G300-Z275 galvanised steel, the connectors 2' in this embodiment being bent from a flat strip of steel which, instead of being straight as in the case of the first embodiment, is angular. Each connector 2' is, like connector 2, formed with bends 21' and 22' at two positions along its length but bend 21', unlike bend 21, is longitudinal rather than transverse, whereby a first end 2A' lies in a generally vertical plane to be receivable against a respective side face 9 of the top plate 5. Bend 22', like bend 22, is transverse, thereby defining a second end 2B' which is received against a respective side face 10 of the bottom chord 3. The ends 2A' and 2B' are provided with holes 12' which receive fasteners 14' fixing them against the respective faces 9 and 10 respectively. In this embodiment, the intermediate section 2C', which is defined between bends 22' and 21', extends generally perpendicular to the vertical plane P, the bend 21' being located above the top face 8 of the top plate 5. The angle of the bend 22' is thus substantially 90°, and the intermediate section 2C' is received against or closely adjacent

the bottom face of the bottom chord 3.

The connectors 2', like the connectors 2, serve to transfer racking loads from the ceiling diaphragm into the wall 6 and are arranged in opposed relation, the ends 2A' being fixed to the top plate 5 on opposite sides of the vertical plane P whilst the ends 2B are fixed to the opposite upright side faces 10 respectively of the chord 3, the second end 2B' of each connector 2' being fixed against the side face 10 of the chord 3 which lies on the opposite side of the vertical plane P to the first end 2A' of that connector, the intermediate sections 2C' thus crossing over underneath the chords 3.

The bend 21' between the intermediate section 2C' and second end 2B' in each connector is, like bend 21, received against a respective lower edge 11 of the chord 3, whereby each connector 2' wraps around those edges, creating a frictional interengagement between it and the chord 3 which contributes to the strength of the respective connection when the connector 2' is placed into tension (under a laterally outward load exerted against its second end by the chord 3). Bends 21', like bends 21, are precisely preformed by means of a punching machine to provide a line of bearing along the interface between the respective connector 2' and the structural member 3 across the strap width, so that the connector 2', wraps around the respective edge 11 in full contact therewith, providing uniform bearing and registration between the connector 2' and structural member 3, thereby contributing to the bracing strength of the connection for a given strap thickness and number of fasteners 14'.

Owing to the flexibility of the connectors 2', the bends 22', like bends 22, function as living hinges, which permit relative pivoting between the intermediate sections 2C' and second ends 2B', maintaining the orientations of the second ends 2B' substantially parallel with the vertical plane P as the chord 3 floats when the chord 3 is located upward of a position in which its underside bottoms out against intermediate section 2C'. Bend 21', however, does not function as a living hinge, since it extends perpendicular to the axis of rotation of the end 2B', a living hinge 23', about which the intermediate section 2C' pivots, instead being defined across the width of the intermediate section 2C' adjacent the distal end of bend 21', where the end 2A' terminates and there is thus a reduction in bending stiffness. The end 2A', because it is orientated in a substantially vertical plane and fixed against the

respective side face 9 of the top plate 5, is sufficiently stiff so as not to deform when the respective connector 2' operates.

In this embodiment, because the intermediate section 2C' extends substantially perpendicular to the plane P, the change in separation (straight line distance) between the living hinge 23' and bend 22', will be negligible when the chord 3 is displaced by the upwardly or downwardly from the position in which it is shown, the change being even smaller than the change in separation of the bend 21 and 22 in the first embodiment. Bottoming out of the bottom chord 3 against the intermediate sections 2C' when the bottom chord 3 is displaced downwardly has negligible effect on the operation of the connections 1', and can even increase the frictional engagement between the bottom chord and the connectors 2' to increase the lateral restraint they provide.

Shown in Figure 3 is an alternative application of the connectors 2 according to the first embodiment, in which the structural member 3', instead of being a bottom chord 3, is a nog 3' which interconnects a pair of adjacent parallel roof truss bottom chords 3, the nog 3' and bottom chords 3 together forming part of a rigid frame defining a ceiling diaphragm in the building. Of course, connections 1' according to the second embodiment can equally be used in this application.

The connectors 2 or 2' can connect a wall to any of a number of structural members in a ceiling diaphragm frame, including ceiling joists, bottom chord ties, hanging beams, bottom chord battens and trimmers.

Shown in Figure 4 is another alternative application of the connectors 2 according to the first embodiment, in which the first ends 2A are attached to the same top plate 5 and the second ends 2B are attached to respective bottom chords 3 which are generally parallel and form part of substantially rigid frame defining the ceiling diaphragm, whereby the connections provide restraint to the frame in opposite lateral directions.

Figure 5 shows an application of connectors 2' according to the second embodiment which is analagous to the application of the connectors 2 shown in Figure 4.

It will be clear from Figures 4 and 5 that, whilst installation may be simplified by connection of the connectors to the same structural member, the invention is not limited to such. The applications shown in Figures 4 and 5 may be appropriate in the case of very short walls above which there is no centrally located truss.

Pairs of connectors 2 or 2' can also be used to interconnect two parallel walls to an overhead transversely extending structural member or to a pair of parallel overhead transversely extending structural members forming part of a ceiling diaphragm frame. In such an application, loads in the structural member(s) in one lateral direction will be transferred by one of the connectors into one of the walls and loads in the structural member(s) in the other lateral direction will be transferred by the other connector into the other wall.

Whilst the connectors resist/transfer lateral forces in the plane of the wall 6 (racking loads), they are also capable of transferring, from the top part of the wall, into the structural member, loads exerted on the wall in a direction perpendicular to the plane of the wall, thereby bracing the wall against those loads so that it cannot fall over or shift sideways.

The connections 1 and 1' have a number of advantageous characteristics. Firstly, the need for floating connections between the second ends and the structural member(s), which are relatively complicated and time-consuming to effect reliably, is eliminated, floating instead being permitted as a result of flexure within the connections 1. Moreover, the connections 1 and 1' are extremely simple in construction, each simply comprising a strap-like member bent in two positions and nailed at its ends to the top plate 5 and chord 3. In addition, because the connectors 2 are configured in the form of straps, they are not formed with any obstructions which hinder the use of a hammer to drive the fasteners through the ends 2A, 2B, 4A and 4B. Also, the frictional/binding engagement resulting from each connector wrapping around an edge 11 of the chord 3, as discussed above, contributes to the strength of the connection.

Furthermore, because the connectors in the connector pair are separate, the connector pair can accommodate structural members of varying thickness, including trusses having thicknesses of 35mm, 45mm and "double trusses" having thicknesses of 70mm and 90mm

(which are common). Structural member thickness variation can additionally result from, for example, allowed manufacturing tolerances in the truss timber, swelling of the timber due to moisture ingress taking place between prefabrication and final installation and the inclusion of nail plates (usually 1.0 to 1.6 mm in thickness) which may or may not be pressed fully home. Such variation makes it difficult to use a conventional "channel-shaped" connector bracket, which is primarily intended for a given thickness of structural member. If the structural member is too thick it may be necessary to spread the bracket apart to eliminate a very tight fit, whereas, if it is too thin, the fit between it and the bracket will be sloppy, whereby the bracket will not transfer lateral loads without the structural member first being displaced laterally.

Whilst the connectors 2, 2' in the connector pairs according to the preferred embodiments are separate, alternative embodiments in which they are interconnected are envisaged.

While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not by way of limitation. It will be apparent to a person skilled in the relevant art that various changes in form and detail can be made therein without departing from the spirit and scope of the invention. Thus, the present invention should not be limited by any of the above described exemplary embodiments.

The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as an acknowledgment or admission or any form of suggestion that that prior publication (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

CLAIMS:

1. A connector for forming a connection between a structural member and a wall in a building, the structural member being located above the wall and extending transverse to the wall, the connector having a first end attachable to a top part of the wall on one side of a vertical plane in which the structural member extends, a second end remote from the first end and attachable to the structural member, and an interconnection extending between the ends, the interconnection being configured such that, when the first and second ends are attached to the top part and structural member respectively, it extends generally transverse to the vertical plane and permits rotational displacement of the second end about the first end to allow floating of the structural member in the vertical plane whilst providing bracing between the first and second ends to restrain the structural member laterally.

2. A connector according to claim 1, wherein the interconnection is configured to flex to permit said rotational displacement.

3. A connector according to claim 1 or 2, further comprising a hinge between the first end and the interconnection permitting said rotational displacement.

4. A connector according to any one of the preceding claims, further comprising a hinge between the second end and the interconnection permitting said rotational displacement.

5. A connector according to claim 3 or 4, wherein the or each hinge is a living hinge.

6. A connector according to any one of the preceding claims, wherein the interconnection is configured such that, when the first and second ends are attached to the top part and structural member respectively, it braces the structural member from lateral movement towards the other side of the vertical plane.

7. A connector according to claim 6, the connector being configured in the form of a strap, the connector being configured such that a face of the strap at the first end is receivable against the top part for attachment thereto and a face of the strap at the second

end is receivable against the structural member for attachment thereto.

8. A connector according to any one of the preceding claims, wherein the second end is attachable to a side face of the structural member.

9. A connector according to any one of the preceding claims, wherein the second end is attachable to a side face of the structural member on the opposite side of the vertical plane to the first end.

10. A connector according to any one of the preceding claims, the connector being configured to wrap around a longitudinal edge of the structural member to effect binding engagement between the connector and the structural member.

11. A connector according to claim 10, the connector being configured to wrap around a lower longitudinal edge of the structural member.

12. A connector according to claim 11, the connector having a preformed bend between the interconnection and the second end, the bend being configured to receive the edge so as to be bindingly engaged therewith.

13. A connector according to any one of claims 10 to 12 as appended to claim 4, wherein the hinge between the second end and the interconnection is a living hinge defined at the bend.

14. A connector according to any one of the preceding claims, wherein the first end is attachable to a top face of the wall.

15. A connector according to any one of claims 1 to 13, wherein the first end is attachable to a side face of the wall.

16. A connector according to claim 15 as appended to claim 7, wherein opposite ends of the strap are askew whereby a face of the strap at the first end is receivable against the side face for attachment thereto whilst a face of the strap at the second end is receivable

against the structural member for attachment thereto.

17. A connector according to claim 16, the connector being configured such that, when the faces of the strap at the first and second ends are received against the side face of the wall and the structural member respectively, the interconnection extends generally perpendicular to the vertical plane.

18. A connection between a structural member and a wall in a building, the structural member being located above the wall and extending transverse to the wall, the connection comprising a connector having a first end attached to a top part of the wall on one side of a vertical plane in which the structural member extends, a second end remote from the first end and attached to the structural member, and an interconnection extending between the ends, the interconnection extending generally transverse to the vertical plane and being configured to permit rotational displacement of the second end about the first end to allow floating of the structural member in the vertical plane whilst providing bracing between the first and second ends to restrain the structural member laterally.

19. A connection according to claim 18, wherein the interconnection is configured to flex to permit said rotational displacement.

20. A connection according to claim 18 or 19, further comprising a hinge between the first end and the interconnection to permit said rotational displacement.

21. A connection according to any one claims 18 to 20, further comprising a hinge between the second end and the interconnection to permit said rotational displacement.

22. A connection according to any one claims 18 to 21, wherein the or each hinge is a living hinge.

23. A connection according to any one claims 18 to 22, wherein the interconnection is configured such that it braces the structural member from lateral movement towards the other side of the vertical plane.

24. A connection according to claim 23, wherein the connector is configured in the form of a strap, a face of the strap at the first end being attached to the top part and a face of the strap at the second end being attached to the structural member.

25. A connection according to any one claims 18 to 24, wherein the second end is attached to a side face of the structural member.

26. A connection according to any one claims 18 to 25, wherein the second end is attached to a side face of the structural member on the opposite side of the vertical plane to the first end.

27. A connection according to any one claims 18 to 26, wherein the connector wraps around a longitudinal edge of the structural member to effect binding engagement between the connector and the structural member.

28. A connection according to claim 27, wherein the connector wraps around a lower longitudinal edge of the structural member.

29. A connection according to claim 28 as appended to claim 21, wherein the hinge between the second end and the interconnection is a living hinge defined at the bend.

30. A connection according to any one claims 18 to 29, wherein the first end is attached to a top face of the wall.

31. A connection according to any one claims 18 to 29, wherein the first end is attached to a side face of the wall.

32. A connection according to claim 31 as appended to claim 24, wherein opposite ends of the strap are askew whereby a face of the strap at the first end is received against the side face whilst a face of the strap at the second end is received against the structural member.

33. A connection according to claim 32, wherein the interconnection extends generally

perpendicular to the vertical plane.

34. A pair of connections according to any one of claims 18 to 33, wherein the first ends are attached to the same wall and the second ends are attached to the same structural member such that the connectors provide lateral restraint to the structural member in opposite lateral directions.

35. A pair of connections according to any one of claims 18 to 33, wherein the first ends are attached to respective walls which are arranged in generally parallel planes and the second ends are attached to the same structural member such that the connectors provide lateral restraint to the structural member in opposite lateral directions.

36. A pair of connections according to any one of claims 18 to 33, wherein the first ends are attached to the same wall and the second ends are attached to respective structural members which are generally parallel and form part of a substantially rigid frame, whereby the connections provide restraint to the frame in opposite lateral directions.

37. A pair of connections according to any one of claims 18 to 33, wherein the first ends are attached to respective walls which are arranged in generally parallel planes and the second ends are attached to respective structural members which are generally parallel and form part of a substantially rigid frame, whereby the connections provide restraint to the frame in opposite lateral directions.

38. A method of forming a connection between a structural member and a wall in a building, the structural member being located above the wall and extending transverse to the wall, the method comprising attaching a first end of a connector to a top part of the wall on one side of a vertical plane in which the structural member extends, and attaching a second end of the connector, which is remote from the first end, to the structural member, whereby an interconnection of the connector, extending between the ends, extends generally transverse to the vertical plane to permit rotational displacement of the second end about the first end, thereby allowing floating of the structural member in the vertical plane whilst providing bracing between the first and second ends to restrain the structural member laterally.

39. A method of forming a pair of connections, wherein each connection is formed by a method according to claim 38, the method comprising attaching the first ends to the same wall and attaching the second ends to the same structural member such that the connectors provide lateral restraint to the structural member in opposite lateral directions.

40. A method of forming a pair of connections, wherein each connection is formed by a method according to claim 38, the method comprising attaching the first ends to respective walls which are arranged in generally parallel planes and attaching the second ends to the same structural member such that the connectors provide lateral restraint to the structural member in opposite lateral directions.

41. A method of forming a pair of connections, wherein each connection is formed by a method according to claim 38, the method comprising attaching the first ends to the same wall and attaching the second ends to respective structural members which are generally parallel and form part of a substantially rigid frame, whereby the connections provide restraint to the frame in opposite lateral directions.

42. A method of forming a pair of connections, wherein each connection is formed by a method according to claim 38, the method comprising attaching the first ends to respective walls which are arranged in generally parallel planes and attaching the second ends to respective structural members which are generally parallel and form part of a substantially rigid frame, whereby the connections provide restraint to the frame in opposite lateral directions.

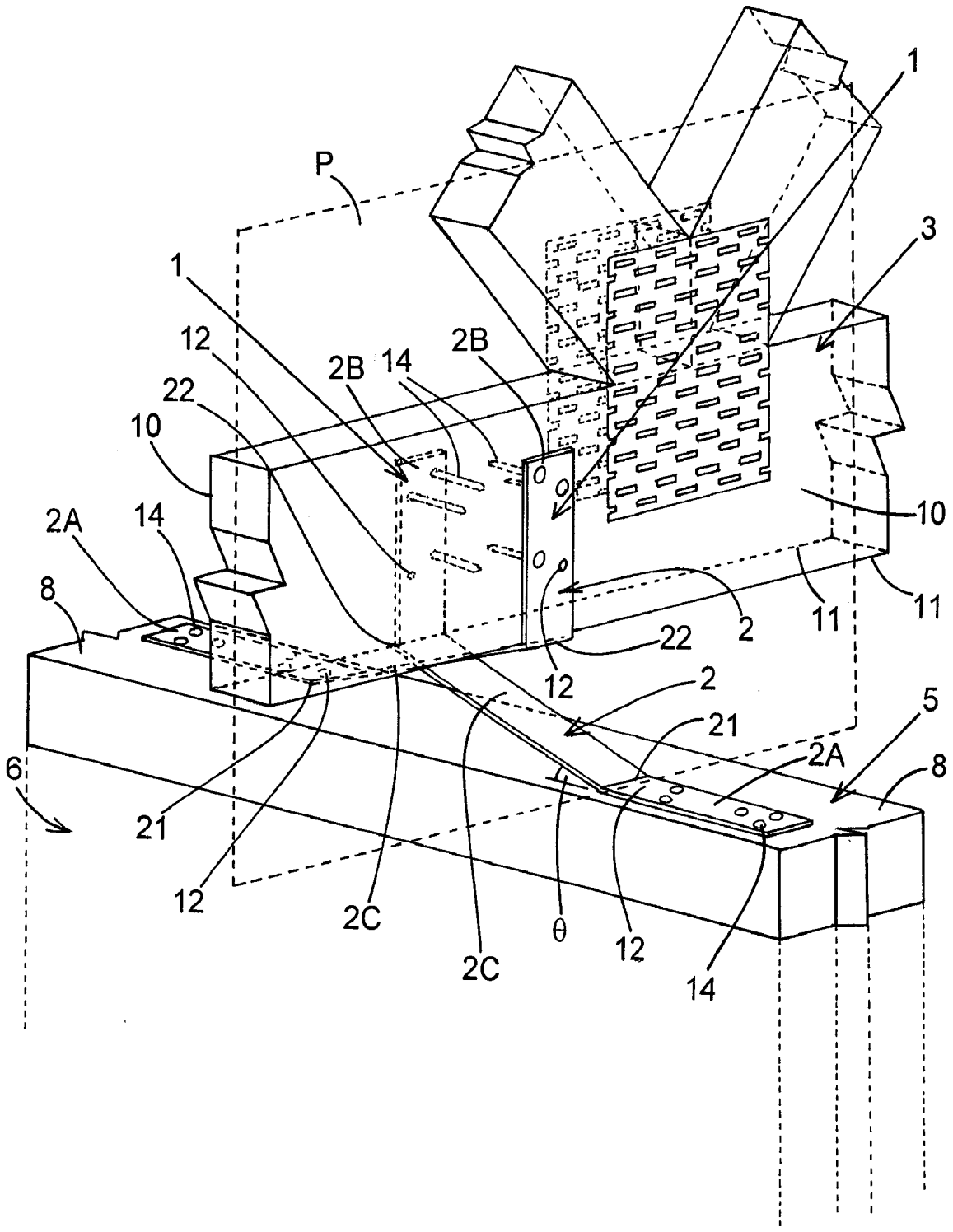
P
1
3
12
2B
14
2B
22
10
2A
14
8
10
11
11
2
22
12
2
21
5
2A
8
6
21
12
2C
2C
θ
12
14

FIGURE 1

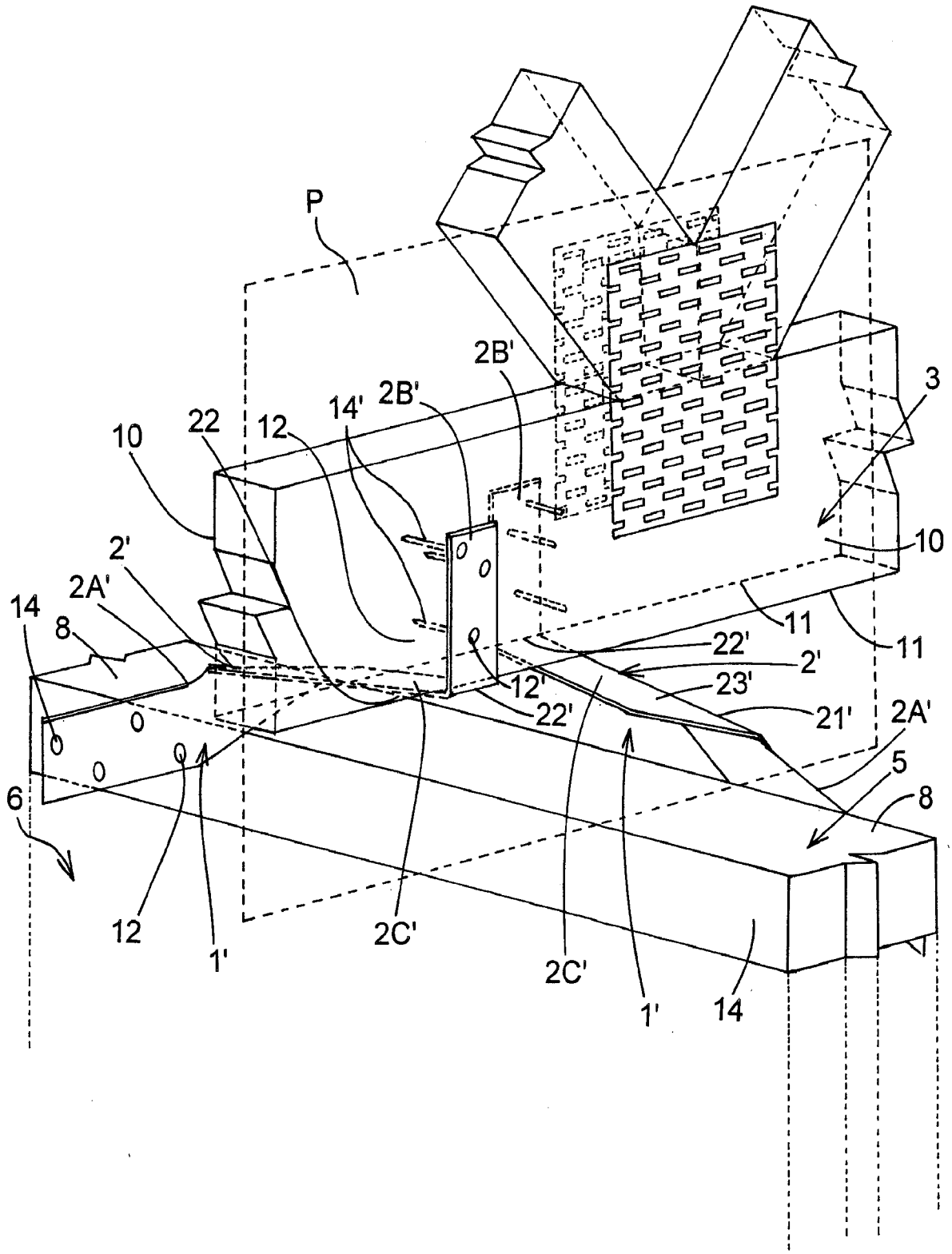
P
2B'
3
14'
2B'
22
12
10
2'
2A'
14
8
10
11
11
22'
2'
12'
23'
21'
2A'
22'
5
8
6
12
1'
2C'
2C'
1'
14

FIGURE 2

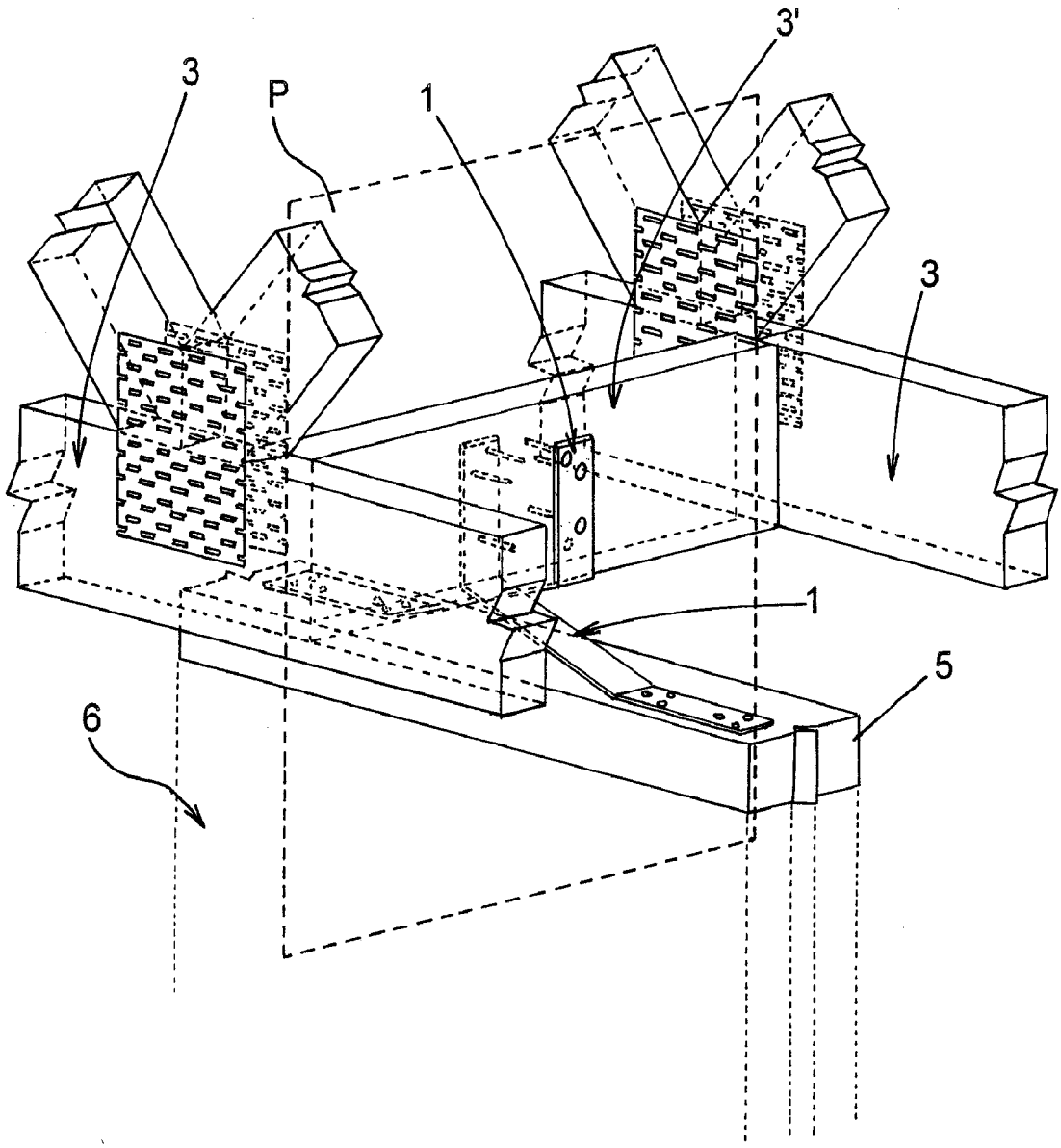

FIGURE 3

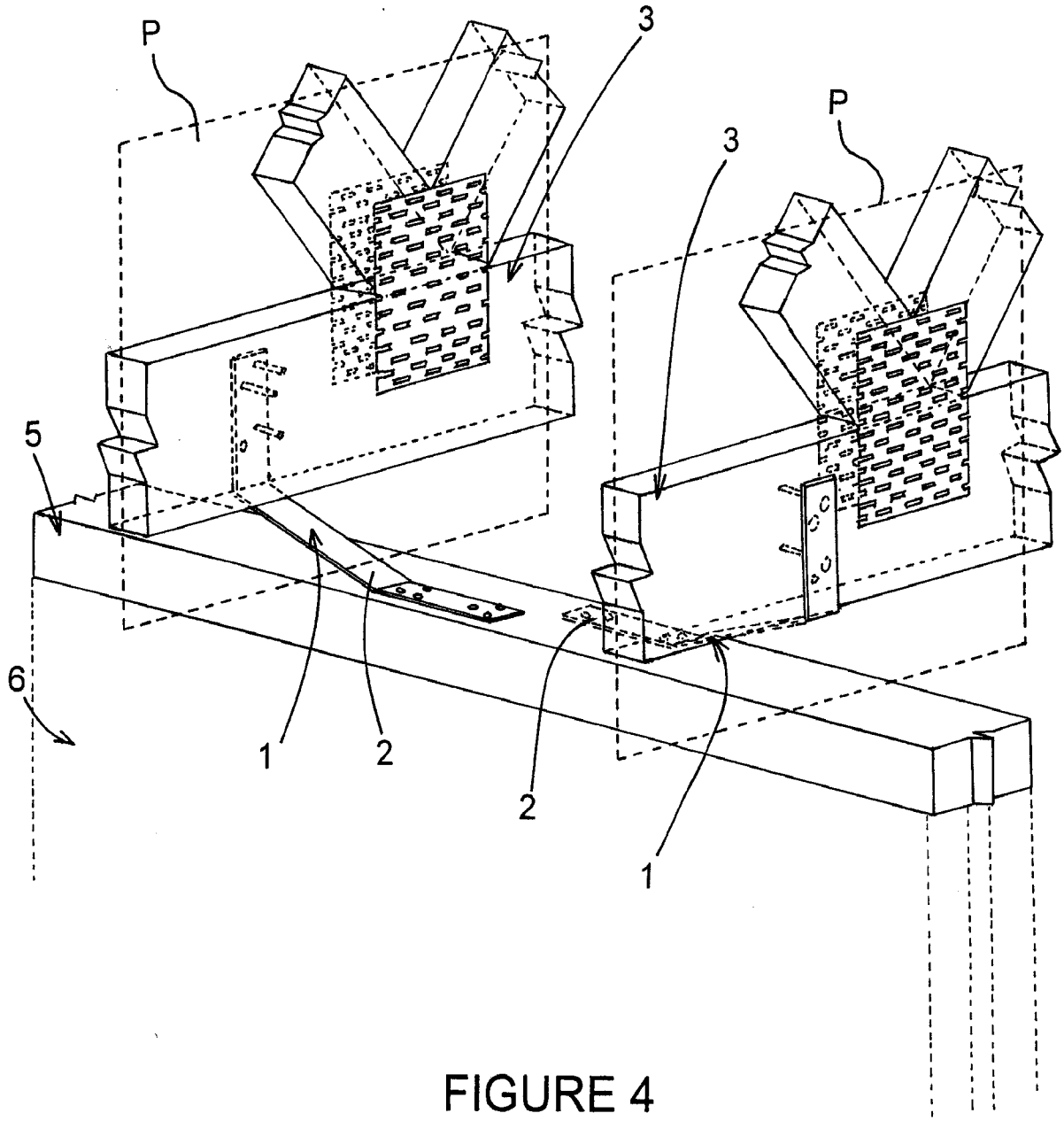

FIGURE 4

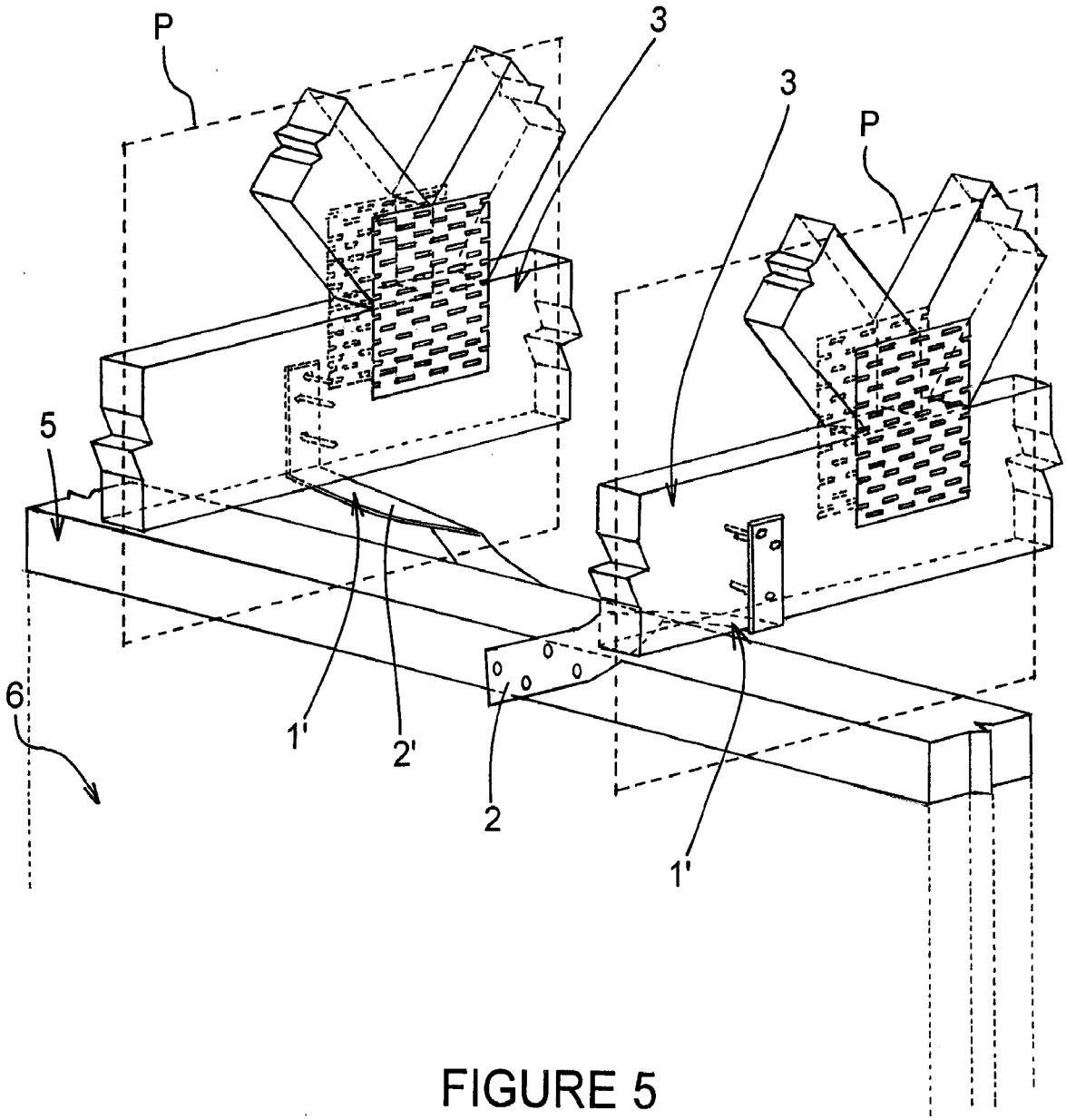

FIGURE 5