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(54) **Pillar for building constructions and structural node consisting of said pillar and one or more horizontal structural elements**

(57) Connection pillar (11) for building constructions comprising at least a metal reinforcement possibly incorporated in a concrete mix and provided with connection members (16) able to define a structural node (10) by connection to one or more horizontal structural elements (12). The connection members (16) comprise at least a horizontal metal plate (17, 20) solid with the metal rein-

forcement and from which two metal uprights (19, 21) branch off vertically, protruding with respect to the metal reinforcement. The two metal uprights (19, 21) are substantially parallel to each other and offset with respect to a median transverse plane passing through the center-line of the metal plate (17, 20), so as to define two supporting zones in each of which one of the horizontal structural elements (12) is able to rest.

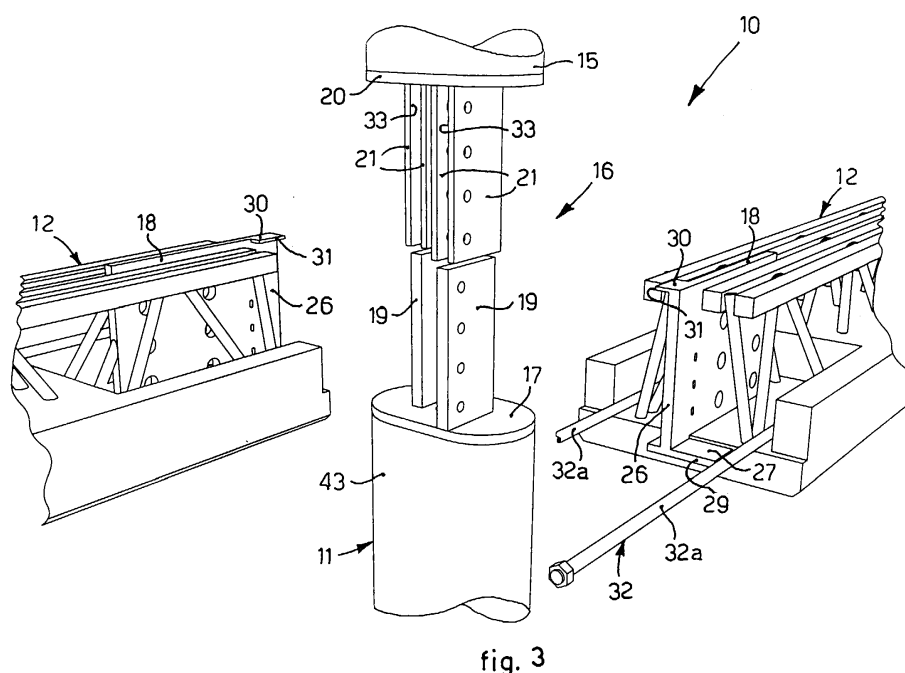


fig. 3

Description

FIELD OF THE INVENTION

[0001] The present invention concerns a pillar for building constructions, such as for example a building, a bridge, a viaduct, a multi-storey car park or other. The present invention also concerns a structural node consisting of said pillar and one or more horizontal structural elements structurally associated therewith. In particular, the pillar is provided with at least a connection member which allows to connect to the pillar a horizontal structural element, and thus defines a structural node. The structural node is constituted by positioning specific support means of the beam in correspondence with the connection means of the pillar, so as to determine a structural continuity of the pillar and the beam.

BACKGROUND OF THE INVENTION

[0002] It is known in building constructions to make pillars, including pre-fabricated pillars, of the self-bearing type consisting of a plurality of parts or modules, which can even be several tens of meters long, and which are connected to each other by means of connection members so as to guarantee structural continuity thereof.

[0003] In this known solution, to every connection member a supporting plate is attached, protruding from the bulk of the relative part or module, and able to support one or more horizontal structural elements, such as floor beams and/or roof beams of the construction.

[0004] In this way, a structural node is defined between the two bearing elements, that is, the formed pillar and the beams, so as to achieve a structural continuity between them.

[0005] Although this known solution promotes easy and safe installation of the bearing elements, it has the disadvantage that it provides a structural node between the pillar and the beam in which, due to the protrusion of the supporting plate from the bulk of the relative part or module, there is no real and proper interconnection of the pillar and beam, since the latter remains outside the pillar although it is physically connected to it.

[0006] One purpose of the present invention is therefore to achieve a pillar for building constructions which not only guarantees a stable and safe interconnection of the parts or modules of which it is made, but also allows to rest the relative beams, or other horizontal structural elements, inside its bulk.

[0007] Another purpose of the present invention is to achieve a structural node between the pillar and beam which is simple and economical to make, and which allows to physically interconnect the pillar and beam, increasing the structural solidity of the building construction thus made.

[0008] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other pur-

poses and advantages.

SUMMARY OF THE INVENTION

[0009] The present invention is set forth and characterized in the independent claims, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0010] In accordance with the above purposes, a connection pillar according to the present invention is applied in the making of building constructions and comprises at least a metal reinforcement, possibly incorporated in a concrete mix, and provided with connection means able to define a structural node by means of connection to one or more horizontal structural elements.

[0011] According to a first characteristic feature of the present invention, the connection means comprises at least a horizontal metal plate solid with said metal reinforcement and from which two metal uprights, protruding with respect to said metal reinforcement, branch off vertically, and which define at least an abutment surface for the positioning of the horizontal structural element, and allow to coaxially connect the pillar with an analogous pillar, guaranteeing structural continuity between the two.

[0012] According to another characteristic feature of the present invention, the two metal uprights are substantially parallel to each other and offset with respect to a median transverse plane passing through the center line of the metal plate, so as to define two supporting zones, substantially inside the transverse bulk of the pillar, in each of which one of said horizontal structural elements is able to rest.

[0013] In this way, the horizontal structural elements can cooperate directly with the connection means inside the bulk of the pillar, thus defining a proper interconnection between the pillar and beam.

[0014] With the present invention we therefore have a considerable improvement to the structural resistance of the building construction achieved, but in any case maintaining an easy and safe installation of the parts.

[0015] In a preferential form of embodiment, the metal uprights define respective reference surfaces able to determine the correct positioning of the horizontal structural elements in the supporting zones.

[0016] According to another preferential form of embodiment, the pillar comprises two metal plates, respectively first and second, disposed solid on opposite sides with respect to the metal reinforcement and each provided with respective first and second metal uprights.

[0017] In particular, the first metal uprights comprise two first metal blocks disposed parallel, distanced and offset to each other with respect to the transverse plane passing through the center line of the first plate; while the second metal uprights comprise two pairs of second metal blocks, in which the two pairs of second blocks are disposed parallel, distanced and offset to each other with respect to the transverse plane passing through the center line of the second plate, and in which every pair of

second metal blocks defines a housing seating able to house, in the assembled condition, the first metal blocks of the first metal uprights.

[0018] In this way, two analogous pillars according to the present invention can be coupled coaxially together stably and safely, ensuring reciprocal structural continuity.

[0019] Furthermore, each horizontal structural element comprises an end having at least a protruding portion and provided with a first abutment surface able to cooperate with a corresponding first reference surface defined by the metal uprights, so as to determine a first positioning of the horizontal structural element in the supporting zone defined by the metal uprights in a first direction, and a second abutment surface able to cooperate with a corresponding second reference surface defined by the connection means, so as to determine a second positioning of the horizontal structural element in the supporting zone in a second direction, substantially inclined with respect to the first direction.

[0020] Advantageously, the first reference surface and the second reference surface are substantially perpendicular to each other.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] These and other characteristics of the present invention will become apparent from the following description of some preferential forms of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a lateral view of a connection node according to the present invention;
- fig. 2 is a view from above, partly in section, of the connection node in fig. 1;
- fig. 3 is a perspective and exploded view of the connection node in fig. 1;
- figs. 4a and 4b show two first variant embodiments of the connection node in fig. 1;
- figs. 5a to 5d show further variant embodiments of the connection node in fig. 1;
- fig. 6 is a perspective and exploded view of a variant of the connection node in fig. 1.

DETAILED DESCRIPTION OF SOME PREFERENTIAL FORMS OF EMBODIMENT

[0022] A connection node 10 and a pillar 11, only partly illustrated, according to the present invention, can be seen in the attached drawings.

[0023] In particular, the connection node 10 is applied to reciprocally connect, with structural continuity, the pillar 11 and at least a beam 12, in this case two aligned with each other, in a building construction, such as for example a building, a bridge, a viaduct or other.

[0024] However, it cannot be excluded that instead of the beam 12 any other known horizontal structural ele-

ment can be provided.

[0025] In particular, the pillar 11 substantially consists of a plurality of modules, in this case a lower module 43 and an upper module 15, connected by means of a connection member 16, while the two beams 12 are for example of the type known in the market under the trade name REP®.

[0026] To simplify the description, hereafter we shall refer specifically to a pillar 11 made with only two modules 43 and 15, but it cannot be excluded that every pillar 11 can consist of a desired number of modules until the specific planned heights of the building construction are reached.

[0027] In the form of embodiment shown in figs. 1 to 3, each module 43 or 15 has a transverse shape substantially rounded on the opposite sides and, for example, can be of the type formed by a metal tubular element inside which, in a known manner, concrete or other filler material is disposed, reinforced by means of specific rods or reinforcement cages 14.

[0028] Alternatively, each module 43 or 15 can preferably be made of centrifuged reinforced concrete, or vibrated reinforced concrete.

[0029] According to the variant embodiments shown in figs. 4a and 4b, the modules 43 and 15 that form the pillars 11 have a cross section of a different geometric shape from that of fig. 1, for example quadrangular (fig. 4a), or circular (fig. 4b), or other shapes depending on the various aesthetic or operational requirements.

[0030] The connection node 10 according to the present invention comprises on one side the connection member 16 between the two modules 43, 15 of the pillar 11 and, on the other side, a respective end plate 18, associated with each of the two beams 12.

[0031] In this case, the connection member 16 comprises a lower plate 17 welded directly to the reinforcements 14 of the lower module 43, and from which two coupling blocks 19 extend vertically, and an upper plate 20 welded directly to the reinforcements 14 of the upper module 15 and from which two coupling blocks 21 extend vertically.

[0032] Alternatively, the lower plate 17 and the upper plate 19, instead of being welded, are made solid with the respective reinforcements 14 of the modules 43 and 15 by means of bolts, bushings or other.

[0033] In particular, the coupling blocks 19 constitute the male element of the connection member 16 and are substantially parallel to each other and offset with respect to a median transverse plane passing through the centerline of the lower plate 17. The two pairs of coupling blocks 21 constitute instead the female element of the connection member 16 and each of them consists, precisely, of two metal blocks 21, disposed parallel and separate so as to define a housing seating 33 able to house a relative one of the coupling blocks 19 of the lower plate 17. The assembly of the coupling blocks 19 and the pairs of coupling blocks 21 is consolidated in this case by means of bolts.

[0034] The two coupling blocks 19 and the two relative pairs of blocks 21 form two relative assembled elements, respectively a first 24 and a second 28, separated and parallel so as to define between them a housing interstice 22, two relative front reference surfaces 23 and two relative lateral reference surfaces 25. In particular, each assembled element 24 or 28 defines a front reference surface 23 and a lateral reference surface 25, each lying on relative planes substantially orthogonal to each other.

[0035] According to another form of embodiment, shown in fig. 6, in the case of prefabricated multi-plane modules the connection member 16 is made with only the two blocks 19 offset, solidly attached, for example by welding, on both sides to the lower plate 17 and the upper plate 20.

[0036] Each end plate 18 is attached axially to the relative beam 12, and has a protruding portion 26 which protrudes frontally from the bulk of the beam 12, and is able to be positioned in the housing interstice 22 defined between the two assembled elements 24 and 28 of the connection member 16.

[0037] In particular, the protruding portion 26 comprises a first fin 27 extending laterally and having at the front an abutment surface 29 able to be positioned in contact with a relative first frontal reference surface 23, so as to define the positioning of the beam 12 with respect to the pillar 11 in a first direction substantially radial to the pillar 11, and to prevent the accidental lateral tilting of the beam 12.

[0038] The protruding portion 26 also comprises a second fin 30 extending laterally and having on the side a supporting surface 31 able to be positioned resting against a relative lateral reference surface, so as to define the positioning of the beam 12 with respect to the pillar 11 in a second direction substantially orthogonal to said first radial direction.

[0039] Once the connection node 10 has been constituted in this way, we have a real and proper physical interconnection of the pillar 11 and the relative beams 12, so as to guarantee maximum structural continuity and mechanical resistance to stress of the construction thus achieved.

[0040] As shown in the attached drawings, in this case, the connection node 10 also comprises two lateral reinforcement elements 32 which have their respective ends disposed in association with the two beams 12, laterally to the respective end plates 18, and pass through the connection member 16 passing laterally to the two assembled elements 24 and 28. The lateral reinforcement elements 32 thus define a structural continuity and reinforcement between the two beams 12 and also between the beams 12 and the pillar 11.

[0041] In particular, in the form of embodiment shown in figs. 1, 2, 3, 4a and 4b, each of the lateral reinforcement elements 32 consists of a straight metal bar 32a.

[0042] In the variant shown in fig. 5a, the metal bar 32a which makes up the lateral reinforcement elements 32 has its ends bent upwards by about 90°.

[0043] In the variants shown in figs. 5b and 5c, each of the lateral reinforcement elements 32 consists of two metal bars 32a, each attached to an anchoring blade 32b incorporated and welded inside the relative beam 12.

[0044] In the variant shown in fig. 5d, each of the lateral reinforcement elements 32 consists of two metal bars 32a.

[0045] It is clear, however, that modifications and/or additions of parts may be made to the connection node 10 and the pillar 11 as described heretofore, without departing from the field and scope of the present invention.

[0046] It is also clear that, although the present invention has been described with reference to specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of pillar for building constructions and structural node consisting of said pillar and of one or more horizontal structural elements, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

Claims

1. Connection pillar for building constructions comprising at least a metal reinforcement (14) possibly incorporated in a concrete mix and provided with connection means (16) able to define a structural node by connection to one or more horizontal structural elements (12), **characterized in that** said connection means (16) comprises at least a horizontal metal plate (17, 20) solid with said metal reinforcement (14) and from which two metal uprights (19, 21) branch off vertically, protruding with respect to said metal reinforcement (14), and **in that** said two metal uprights (19, 21) are substantially parallel to each other and offset with respect to a median transverse plane passing through the center-line of said metal plate (17, 20), so as to define two supporting zones in each of which one of said horizontal structural elements (12) is able to rest.
2. Connection pillar as in claim 1, **characterized in that** said metal uprights (19, 21) define respective reference surfaces (23, 25) able to determine the correct positioning of said horizontal structural elements (12) in said supporting zones.
3. Connection pillar as in claim 1 or 2, **characterized in that** said connection means (16) comprises a first metal plate (17) and a second metal plate (20), disposed solid on opposite sides with respect to said metal reinforcement (14), wherein said first metal plate (17) is provided with first metal uprights (19) and said second metal plate (20) is provided with second metal uprights (21).
4. Connection pillar as in claim 1 or 2, **characterized in that** said connection means (16) comprises a first

metal plate (17) and a second metal plate (20), disposed solid on opposite sides with respect to said metal reinforcement (14), wherein first metal uprights (19) are solidly attached on both sides both to said first metal plate (17) and also to said second metal plate (20).

5. Connection pillar as in claim 3, **characterized in that** said first metal uprights comprise two first metal blocks (19) disposed parallel, distanced and offset to each other with respect to the transverse plane passing through the center-line of said first metal plate (17), and **in that** said second metal uprights comprise two pairs of second metal blocks (21) disposed parallel, distanced and offset to each other with respect to the transverse plane passing through the center-line of said second metal plate (20), and wherein each pair of second metal blocks (21) defines a housing seating (33) able to house, in the assembled condition, said first metal blocks (19) of the first metal uprights.

6. Structural node able to interconnect a pillar (11) and at least a horizontal structural element (12) in a building construction, in which said pillar (11) comprises connection means (16), and in which said horizontal structural element (12) comprises a relative end element (18) able to be coupled with said connection means (16), **characterized in that** said connection means (16) comprises at least a horizontal metal plate (17, 20) solid with said metal reinforcement (14) and from which two metal uprights (19, 21) branch off vertically, protruding with respect to said metal reinforcement (14), and **in that** said two metal uprights (19, 21) are substantially parallel to each other and offset with respect to a median transverse plane passing through the center-line of said metal plate (17, 20), so as to define two supporting zones, and **in that** said end element (18) comprises at least a protruding portion (26) able to rest on a relative one of said supporting zones.

7. Structural node as in claim 6, **characterized in that** said metal uprights (19, 21) define respective reference surfaces (23, 25) able to determine the correct positioning of said protruding portion (26) of said end element (18) in said supporting zones.

8. Structural node as in claim 7, **characterized in that** said end element (18) comprises a first abutment surface (29) able to cooperate with a corresponding first of said reference surfaces (23), in order to define a first position of said horizontal structural element (12) in a first direction, and a second abutment surface (31) able to cooperate with a corresponding second of said reference surfaces (25), in order to define a second position of said beam (12) in a second direction substantially inclined with respect to said first

direction.

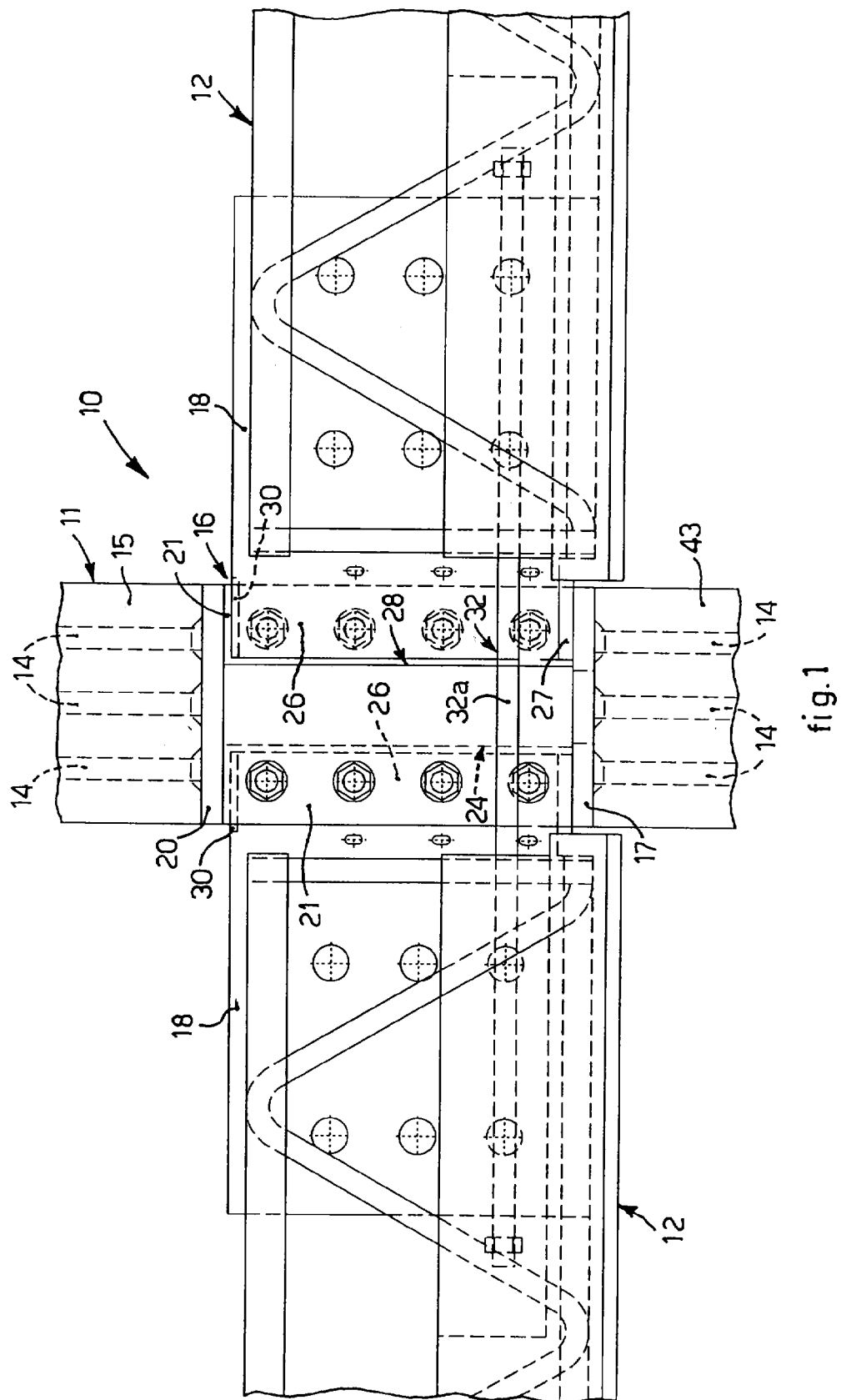
9. Structural node as in claim 8, **characterized in that** said protruding portion (26) comprises a first fin (27) extending laterally and defining frontally said first abutment surface (29) and a second fin (30) extending laterally and defining on the side said second abutment surface (31).

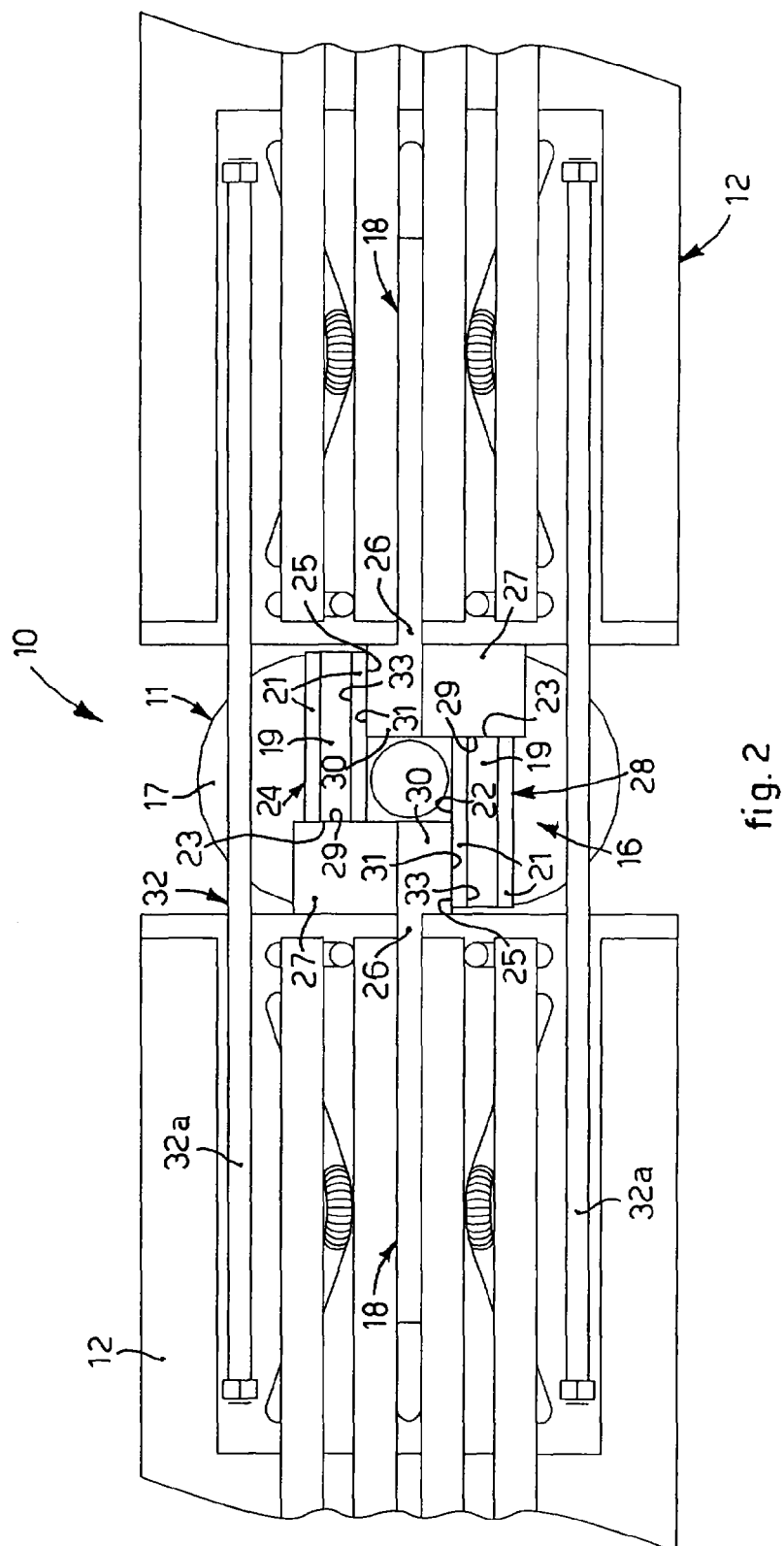
10. Structural node as in claim 7, 8 or 9, **characterized in that** said first reference surface (23) and said second reference surface (25) are substantially perpendicular to each other.

11. Structural node as in any claim from 9 to 10, **characterized in that** said connection means (16) comprises two assembled elements (24, 28), disposed substantially parallel, offset with respect to a transverse plane passing through the center-line and separated so as to define between them a housing interstice (22), in which said protruding portion (26) of said end element (18) is at least partly housed.

12. Structural node as in claims 7 and 11, **characterized in that** said first reference surface (23) is defined by a first (24) of said assembled elements, while said second reference surface (25) is defined by a second (28) of said assembled elements.

13. Structural node as in any claim from 6 to 12, **characterized in that** it also comprises one or more lateral reinforcement elements (32) which have their respective ends disposed in association with the respective horizontal structural element (12), and pass laterally through said connection means (16).





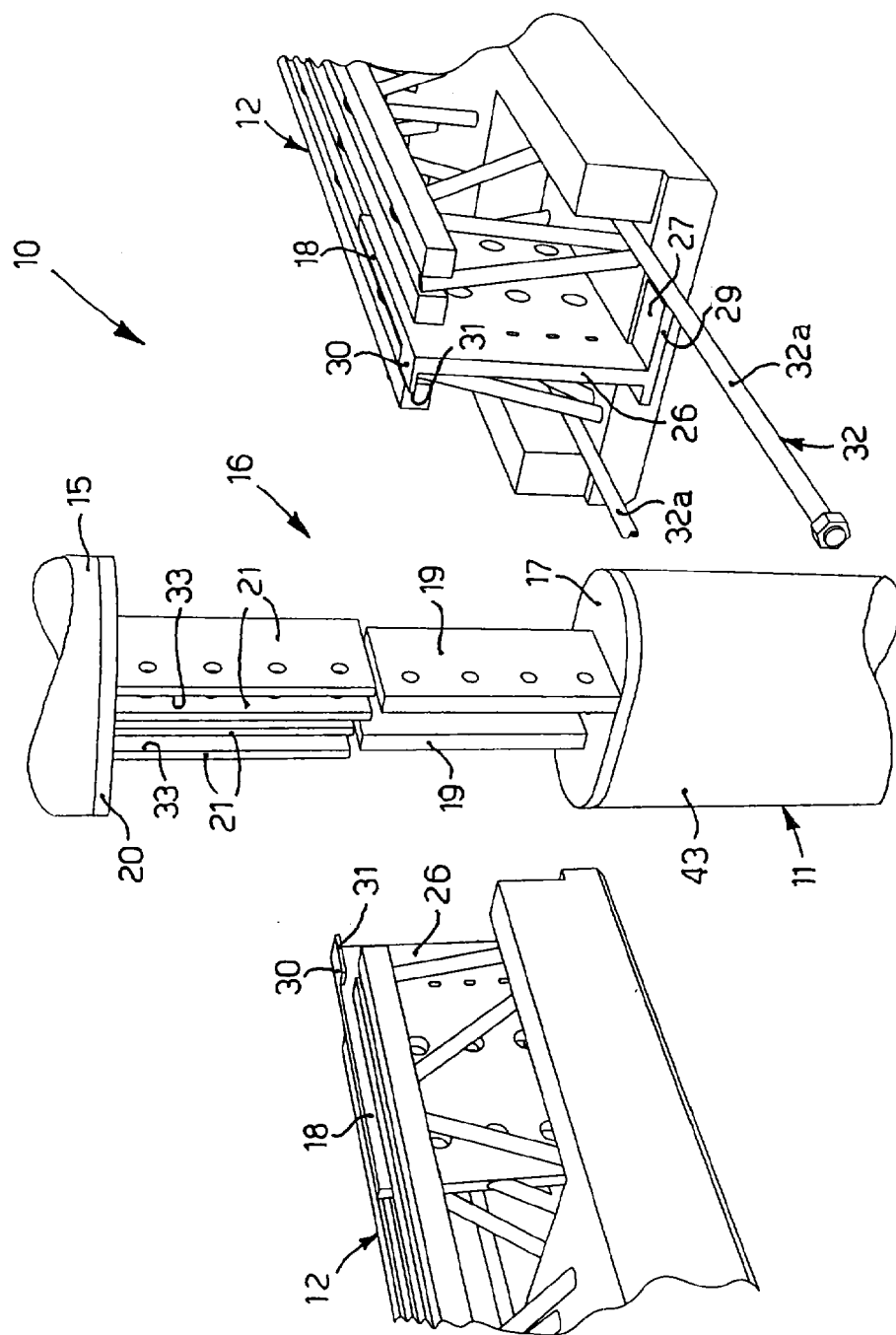


fig. 3

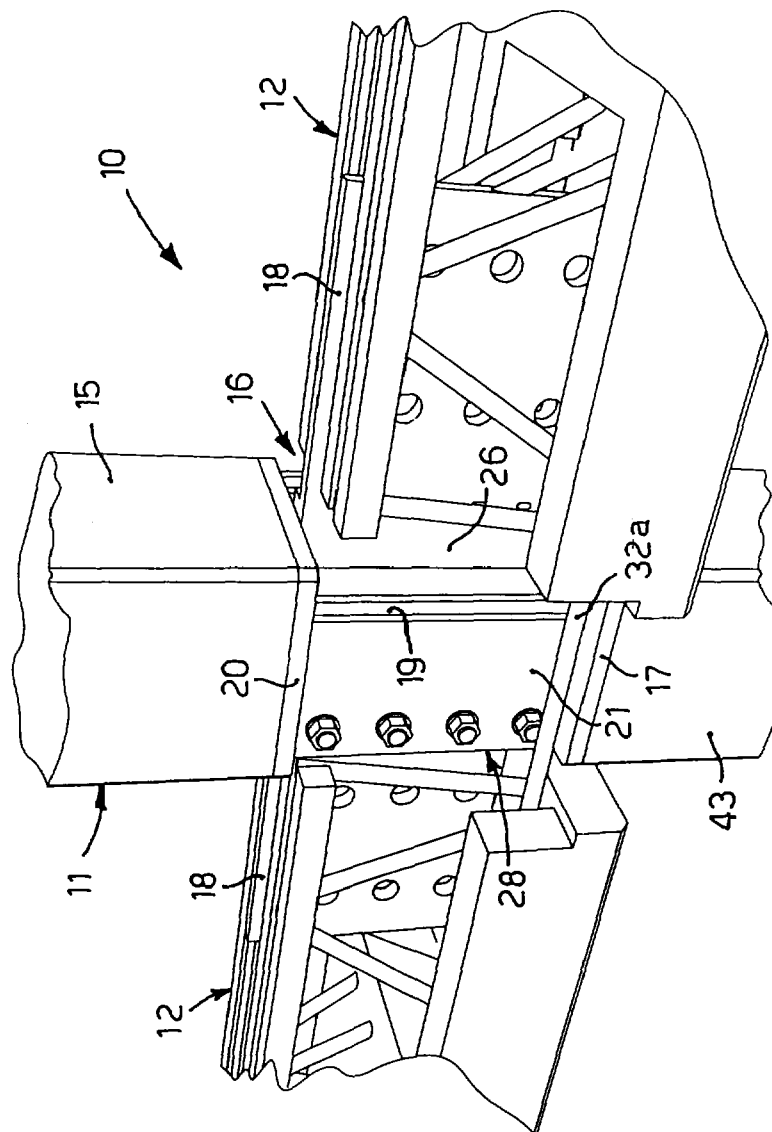


fig. 4a

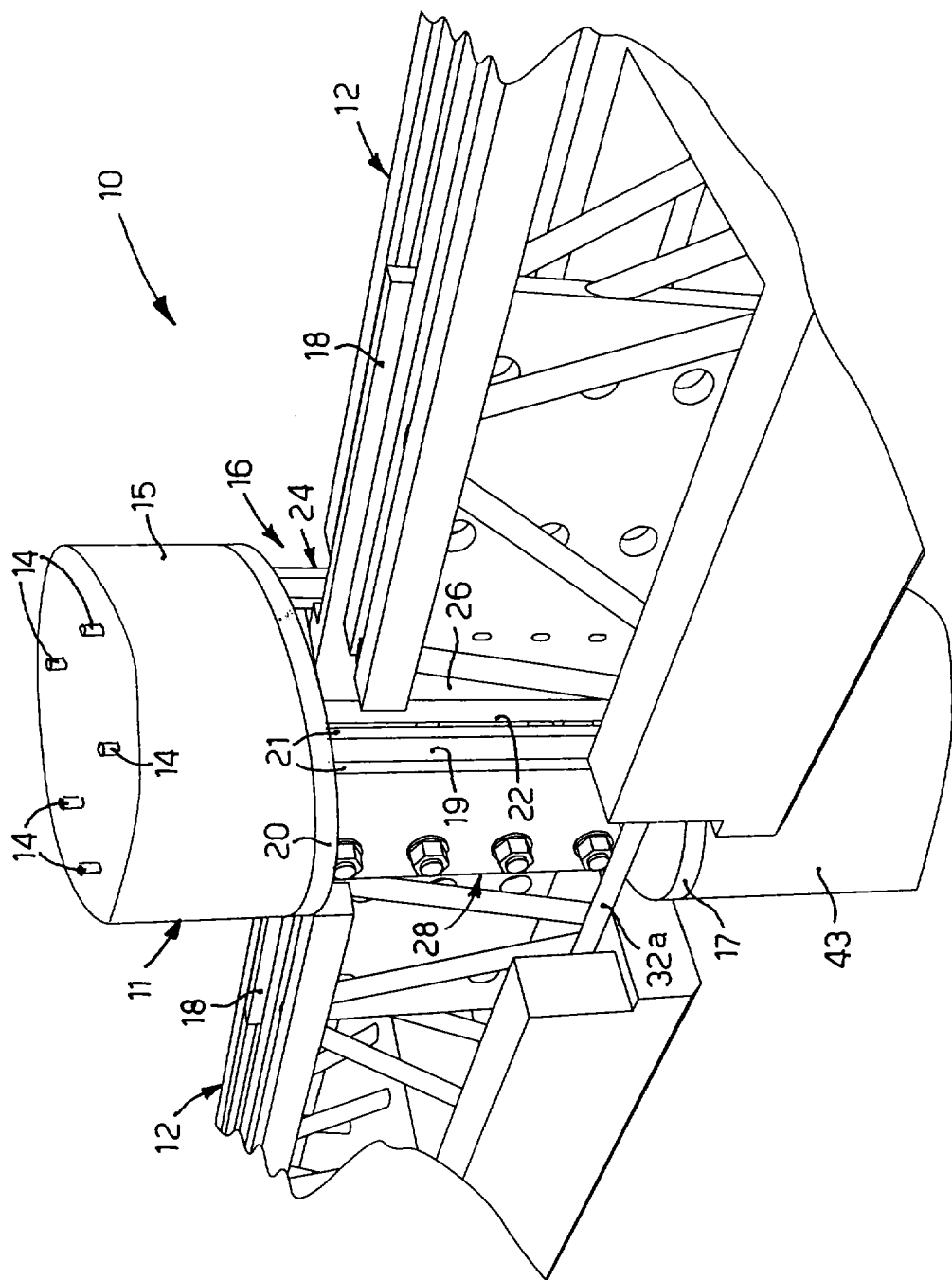


fig. 4b

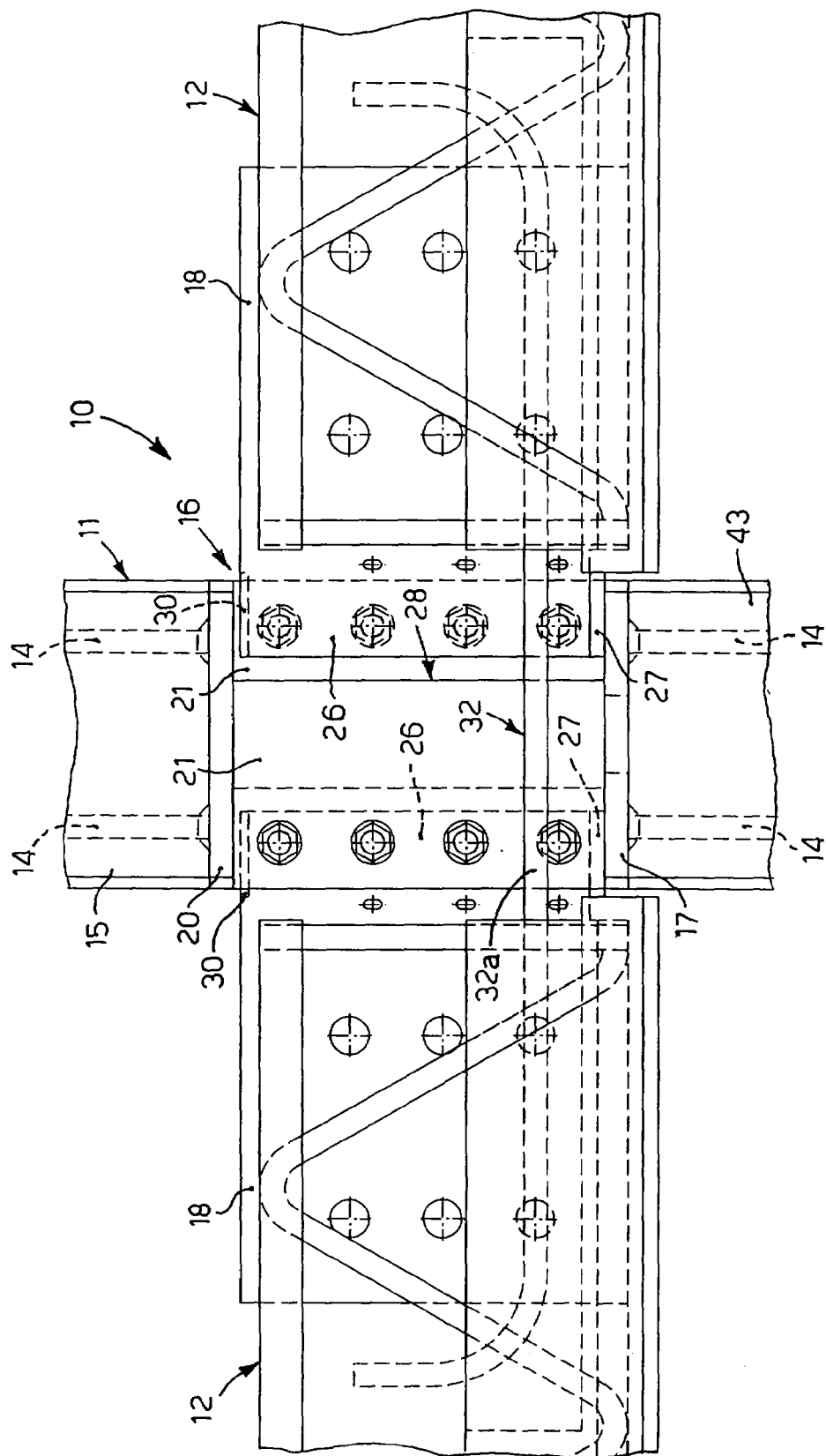


fig. 5a

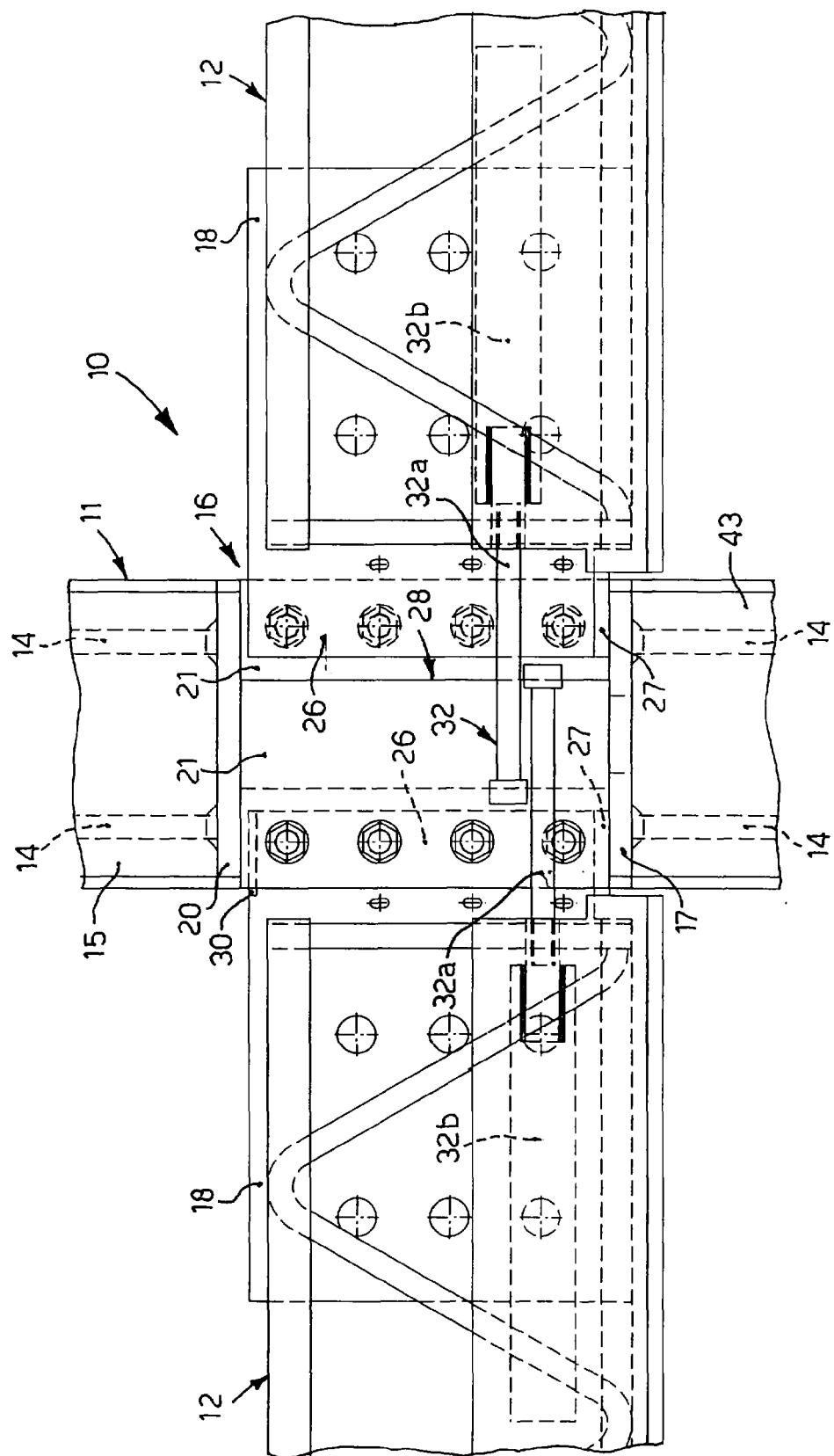


fig. 5b

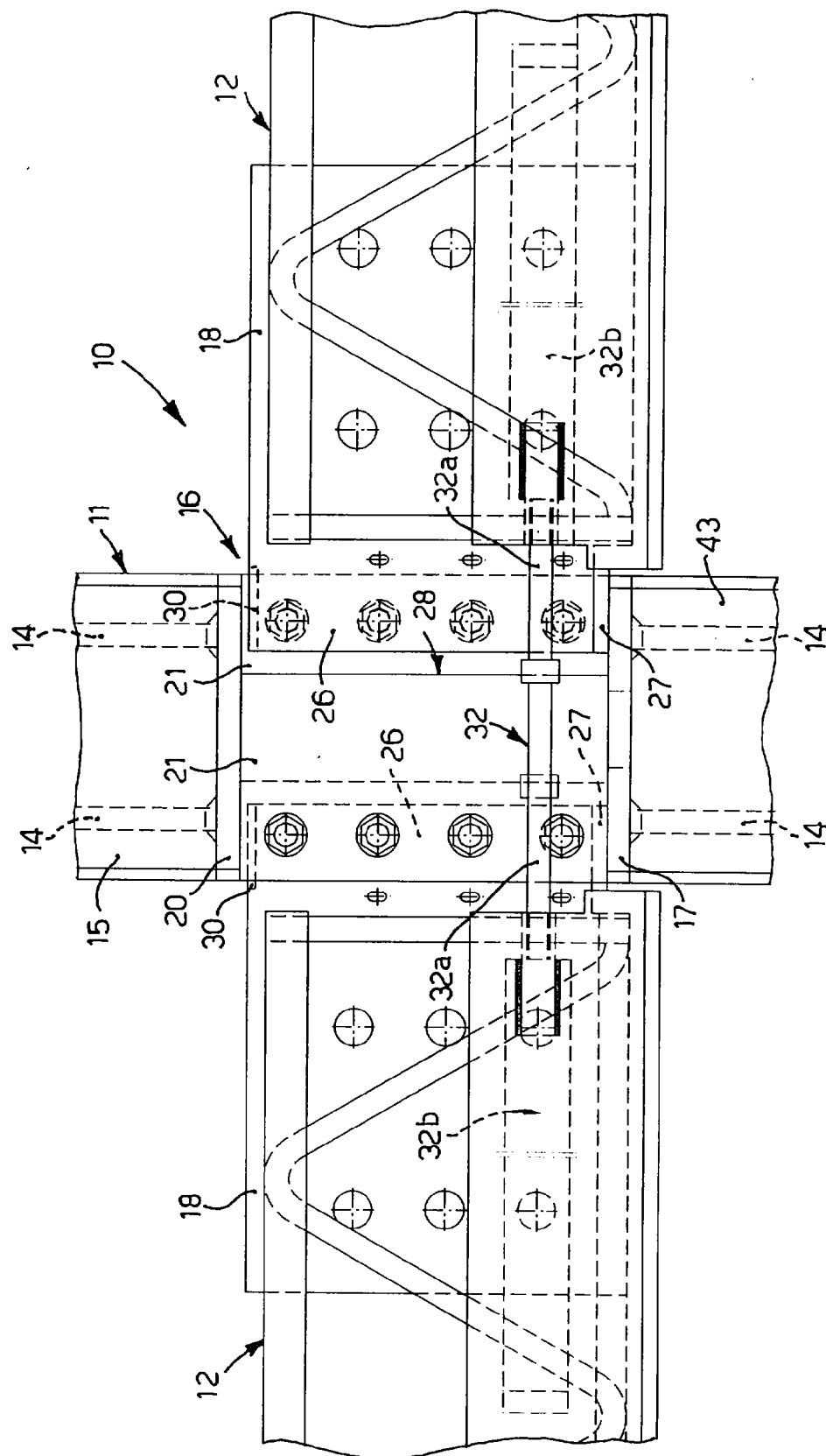
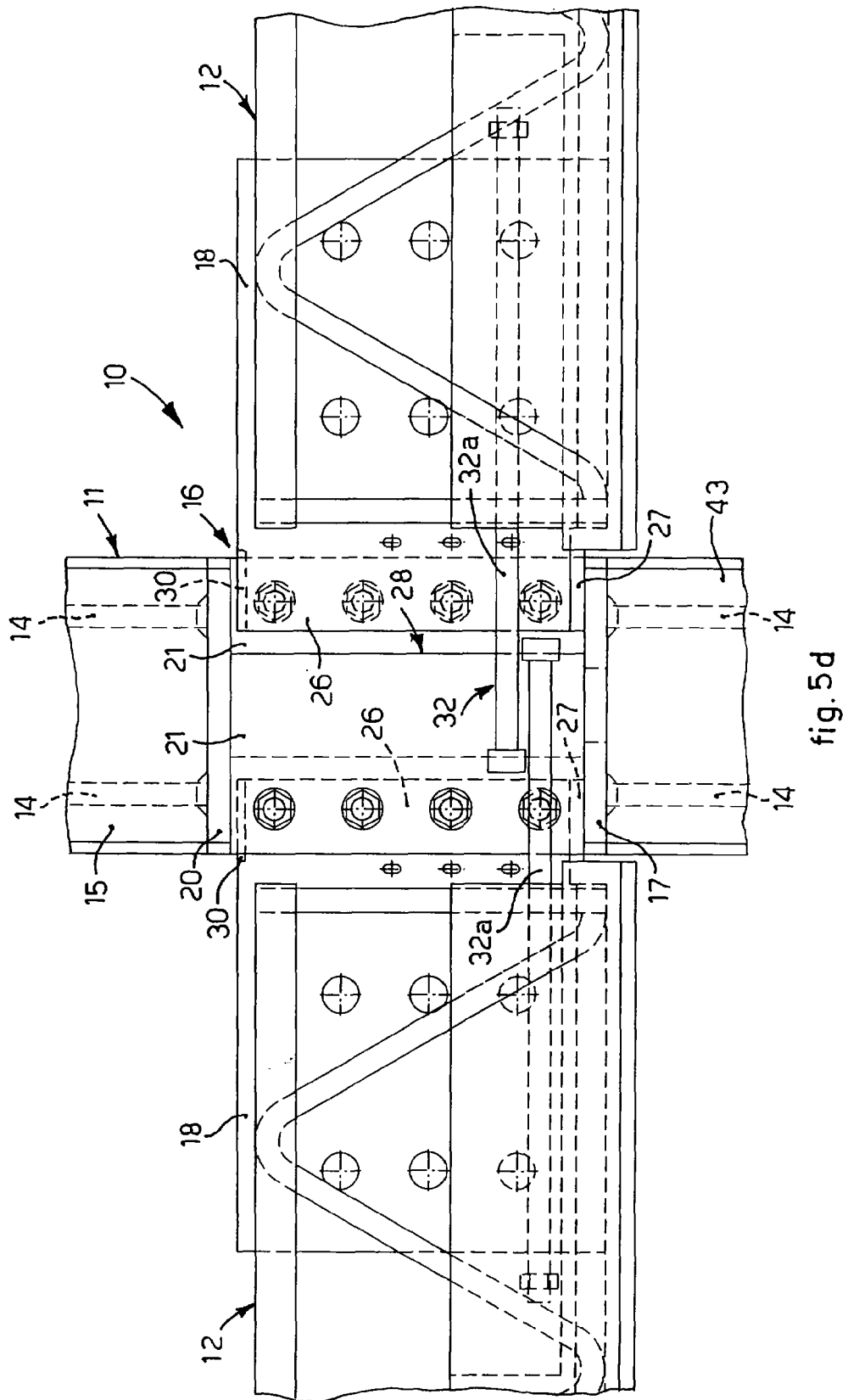


fig. 5c



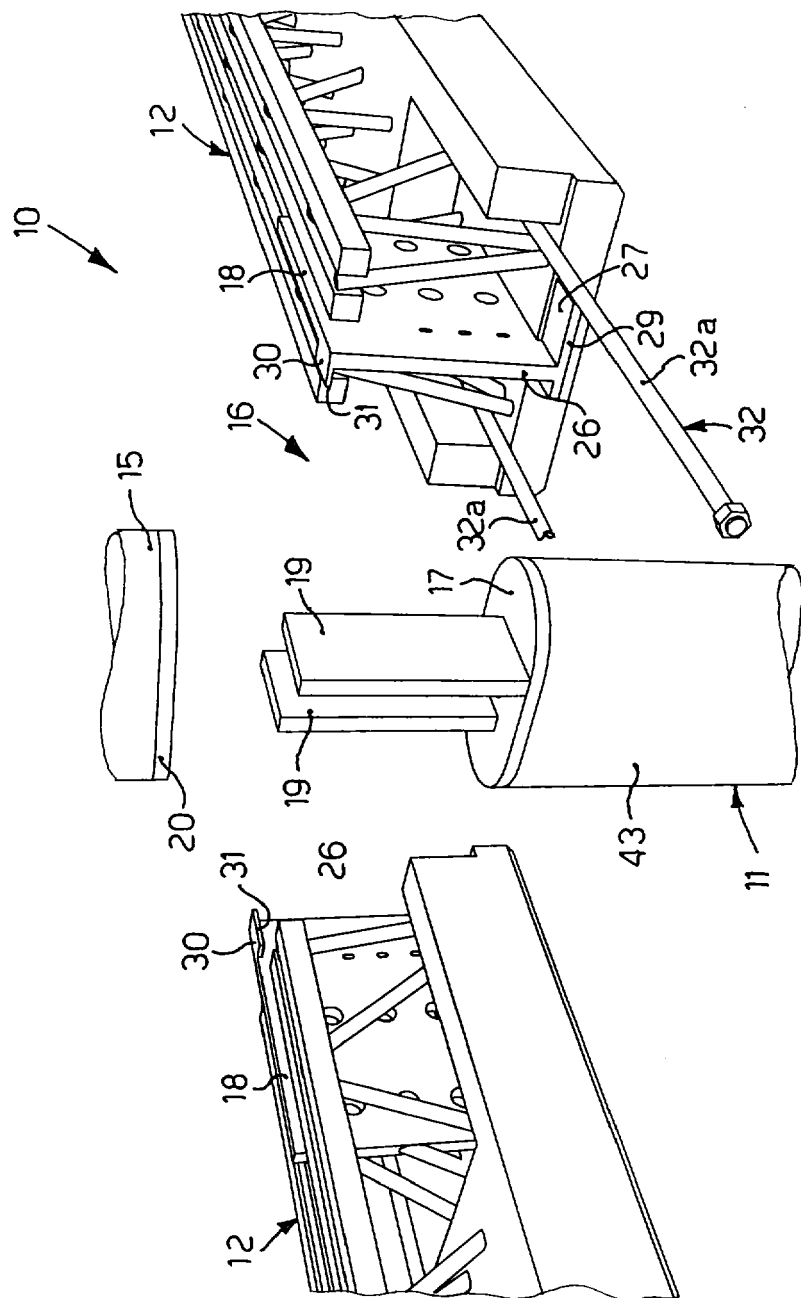


fig. 6



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 12 1818

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 1 031 048 A (CONZELMAN, J.E) 2 July 1912 (1912-07-02) * the whole document *	1,4,6,13	INV. E04B1/21 E04C3/294
X	GB 118 058 A (RINGS, F.C.C) 15 August 1918 (1918-08-15) * page 2, lines 4,5; figure 7 *	1,2,6,7	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04B E04C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 29 February 2008	Examiner Rosborough, John
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 07 12 1818

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29-02-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 1031048	A	NONE	

GB 118058	A	NONE	
