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(54) **Method for prefabricating the metal reinforcement of beams and columns for standard-length mixed steel/concrete structures and a telescopic beam**

(57) Method for using standard-length metal beams (pre-assembled reinforcement) over variable spans for mixed steel/concrete structures, in which the individual main beams (2) are associated with relatively short beam sections (2') or with bracket-type supports (9) and are able to slide telescopically with respect to these sections (2') or, by means of these supports (9), to be positioned at variable distances with respect to a supporting pillar beam (1); these beam sections (2') and/or these supports (9) are provided at the end with means (6, 8, 11, 13) for rapidly securing them to the pillar beam (1) and/or to the opposite beam section (2').

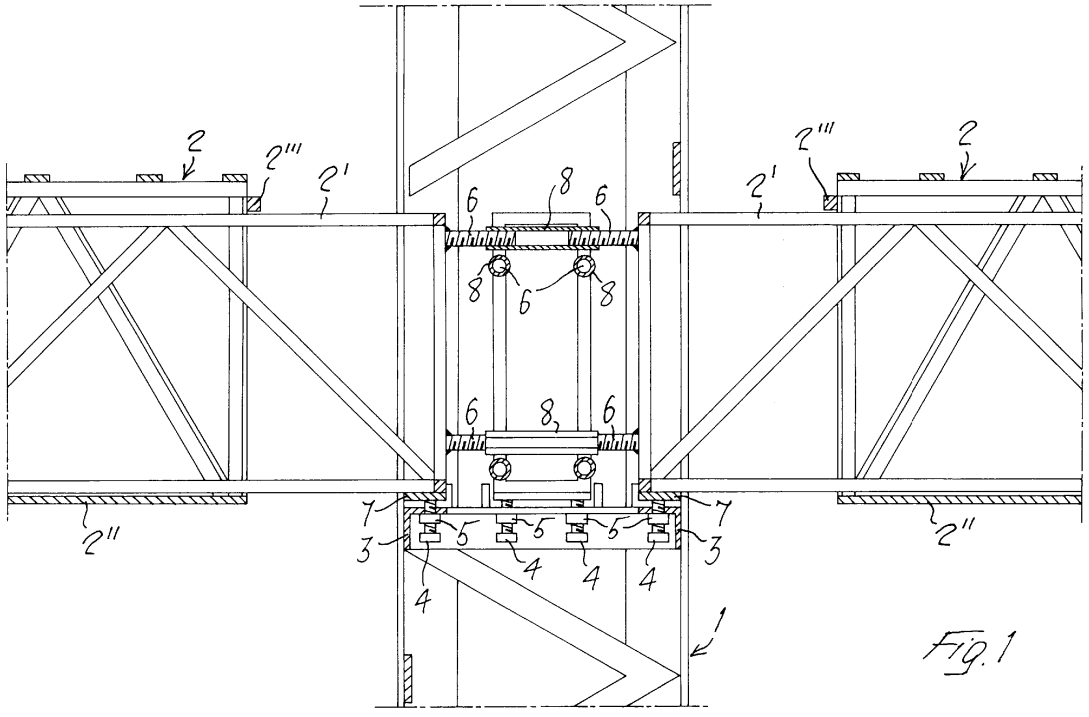

Fig. 1

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Description

[0001] The present invention relates to metal load-bearing beams and columns for mixed steel/concrete structures and envisages suitable confinement of the critical sections of the reinforced-concrete structures by means of the provision of a closed section such as that shown in the accompanying drawings.

[0002] In order to speed up the operations and reduce the costs, these metal beams are normally prefabricated.

[0003] However, one of the drawbacks of these prefabricated beams consists in the fact that rarely do they have the exact length required at the working location. Therefore, their length must be modified on-site, which is not always easy and in any case results in a considerable amount of additional labour which also greatly increases the costs.

[0004] The object of the present invention is therefore to devise a method for adapting beams on-site in an easy and rapid manner as well as provide a metal telescopic beam for implementing this method.

[0005] This object is achieved by the present invention by means of a method for modifying on-site the length of metal beams for mixed steel/concrete structures, characterized in that the individual main beams are associated with relatively short beam sections or with bracket-type supports and are able to slide telescopically with respect to said sections or, by means of said supports rigidly connected to and hinged with the vertical structure forming the core of the columns, are able to be positioned at variable distances with respect to the support pillar; said beam sections and/or said supports are provided at the end with means for rapidly securing them to the pillar and/or to the opposite beam section.

[0006] The pillars are designed to form a robust and stable framework able to ensure rapid and secure assembly and support their own weight and the weight of the cast concrete for completing the structure, so as to obtain a mixed steel/concrete structure which also has a suitable fire-resistance.

[0007] Further characteristic features and advantages of the present invention will emerge more clearly from the following description of a preferred embodiment thereof, provided with reference to the accompanying drawings, in which:

Figure 1 is a longitudinally sectioned view of a pillar able to support four beams according to a first embodiment of the invention;

Figure 2 is a schematic perspective view of the same pillar with the four beams according to the invention;

Figure 3 is a longitudinally sectioned view of a variant of the present beam where adaptation of the centre-to-centre distance of the standard beams and columns is performed by means of standard-length support brackets with suitable dimensions.

[0008] With reference to the drawings and with particular reference to Figure 1 thereof, 1 denotes a metal load-bearing pillar and 2 denotes four beams which are cross-fastened to said pillar. Metal angle-pieces are welded in the zone of the pillar 1 where the beams 2 are placed and supported, along the internal perimeter of the pillar 1. The flanges of these angle-pieces 3 projecting in the manner of a bracket towards the inside of the pillar 1 are provided with threaded through-holes inside which bolts 4 provided with a counter-nut 5, intended for the purposes described below, are screwed.

[0009] Beam sections 2' are mounted in a telescopically slidable manner inside the beams 2.

[0010] The beam sections 2' have welded (or otherwise fastened) at their end four bolts 6 and have welded on their underside a strip member 7 with a thickness such as to raise the support base of these beams to the same level as the bottom part 2" of the beams 2.

[0011] The strip members 7 are arranged on the ends of pairs of bolts 4 which, by means of screwing or unscrewing, allow perfect levelling adjustment of the beams 2',2.

[0012] 8 denotes tubular sleeves which are threaded at both ends and which are screwed onto the ends of the nuts 6 so as to connect rigidly by means of screwing the opposite pairs of beams 2,2'.

[0013] The beams 2 have on their upper side strip members 2"' which have the purpose of guiding the beam sections 2' so as to limit any heightwise play of the telescopic beam sections 2'.

[0014] The operating principle of the beam described according to this first embodiment of the invention will be evident.

[0015] By means of telescopic extraction of the sections 2', the span of the beam 2 is completed and the latter is fastened to the pylon 1. By means of rotation of the threaded sleeves 8, the two opposite sections 2', 2' are rigidly connected together. By means of adjustment of the bolts 4, the support points of the beams 2 on the pylon 1 are adjusted.

[0016] At this point, the beams and pylon may be provided with suitable disposable formwork for containing the casting, forming valid elements for reducing the energy consumption.

[0017] As an alternative to the sections 2' described above (see Figure 3 of the accompanying drawings) an angular support 9 formed by a bracket 109 and a pair of tie-rods 209 is provided. This bracket 109 is hinged on the pylon 1 by means of a pin 10 which allows rotation thereof towards said pylon 1 through about 90°. This support 9 is shown, on the left of the pylon when viewing the figure, in the lowered position and, on the right and frontally with respect to the pylon, in a position rotated upwards with the bracket 9 horizontal. At the free end each tie-rod 209 has a pin 11 for positioning against the wall of the pylon 1 (see the bracket 9 shown on the right of this pylon 1). These tie-rods 209 of each support 9 are fixed to the pylon 1 by means of the pins 13. The beam

2 instead is placed on the bracket 109 once the support 9 is in the operative position, i.e. rotated through 90° upwards and with this bracket in the horizontal position. This beam 109 may be placed on this bracket 109 in a position at a varying distance from the pylon 1 and is fixed thereto by means of adjustable pins 12 which - see for example the pin 12' - have a stem 112 with a certain length and are provided between the beam 2 and the pylon 1 with a pair of nuts 212 which allow a certain adjustment of the length thereof, i.e. the distance between beam 2 and pylon 1. The telescopic feature of the present beam is therefore, in this constructional variant, achieved by means of variable distance positioning of said beam 2 on said bracket.

[0018] Obviously the present invention is not limited to the embodiment shown and described, but comprises all those variants and modifications which fall within the scope of the inventive idea, substantially as claimed below.

Claims

1. Method for using standard-length metal beams (pre-assembled reinforcement) over variable spans for mixed steel/concrete structures, in which the individual main beams (2) are associated with relatively short beam sections (2') or with bracket-type supports (9) and are able to slide telescopically with respect to said sections (2') or, by means of said supports (9), to be positioned at variable distances with respect to a supporting pillar beam (1), said beam sections (2') and/or said supports (9) being provided at the end with means (6, 8, 11, 13) for rapidly securing them to the pillar beam (1) and/or to the opposite beam section (2').

2. Method according to Claim 1, **characterized in that** metal angle-pieces (3) are secured in the zone of the pillar (1) for supporting the beams (2, 2'), along the internal perimeter of the pillar (1), the flanges of said angle-pieces, which projecting in the manner of a bracket towards the inside of the pillar (1), being provided with threaded through-holes inside which bolts (4) forming adjustable support elements for the ends of the beams (2,2') are screwed.

3. Method according to the preceding Claims 1 and 2, **characterized in that** the beam sections (2') have, welded at the end, bolts (6) and have welded on their bottom side a spacing strip member (7).

4. Method according to Claim 3, **characterized in that** the said strip members (7) rest on the ends of the pairs of bolts (4) which, by means of screwing or unscrewing, allow perfect levelling adjustment of the beams (2',2).

5. Method according to any one of the preceding claims, **characterized in that** tubular sleeves (8) which are threaded at both ends are envisaged, being screwed onto the ends of the nuts (6), so as to connect rigidly by means of screwing thereof the opposite pairs of beams (2,2').

6. Metal beam for mixed steel/concrete structures, **characterized in that** it comprises two beam elements (2, 2') which are mounted slidably relative to each other in a telescopic manner and are provided with means (6, 8) for rigidly connecting them to a pillar (1) and/or to an opposite beam structure.

7. Metal beam according to Claim 1, **characterized in that** said support (9) comprises a bracket (109) which is hinged via means (10) which allow a certain rotation thereof with respect to the pillar (1) and a tie-rod (209) fixed by suitable means (11, 13) to said pillar (1), the beam (2) being able to rest on said bracket (109) and be fixed to the pillar (1) at a variable distance.

8. Metal beam according to Claim 7, **characterized in that** the beam (2) is rested on the bracket (109) and fixed to the pillar (1) by means of the adjustable-length pins (12, 12') able to be fixed to the wall of the pillar (1) so as to arrange said beam at a varying distance from the pillar (1).

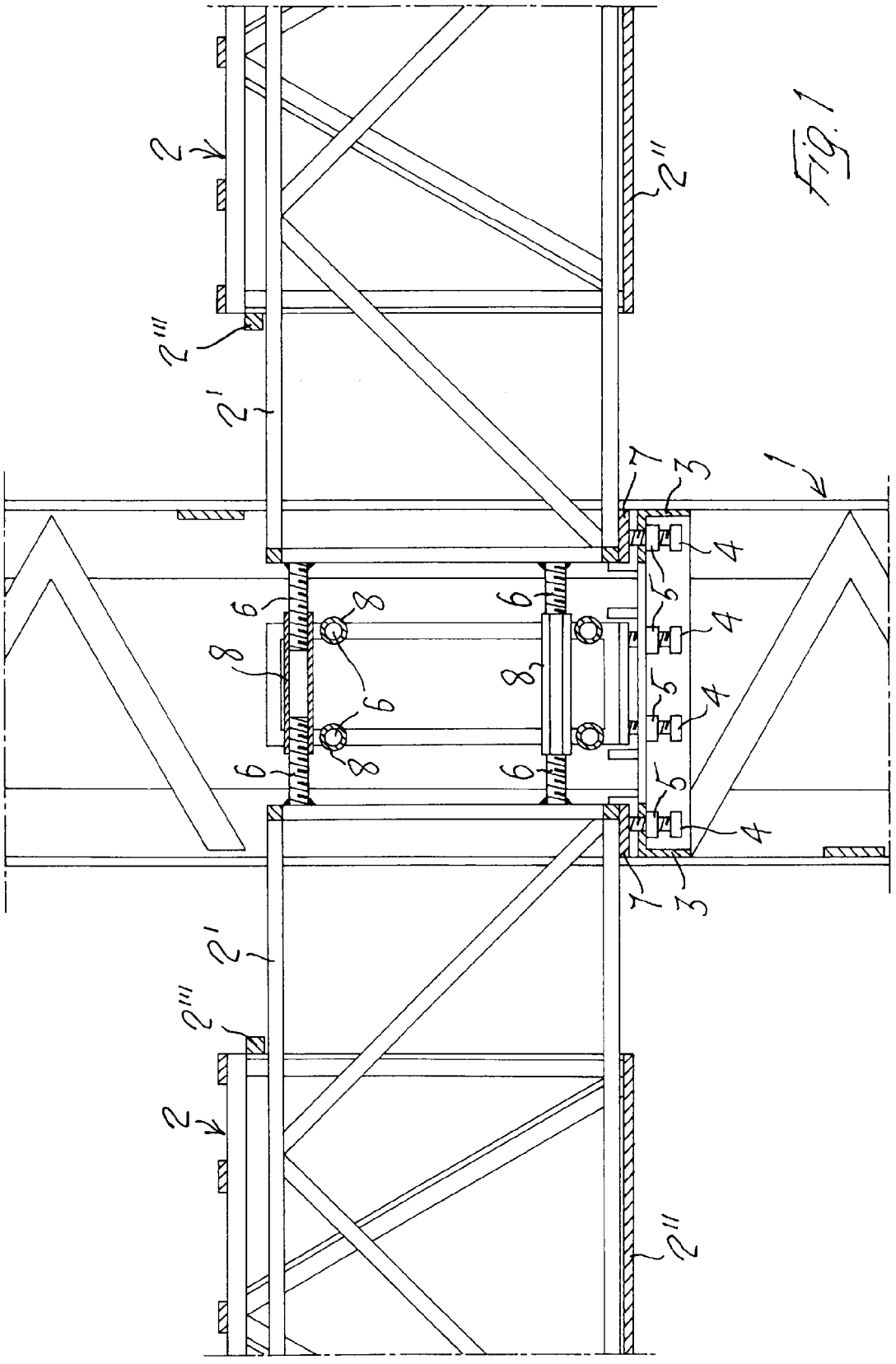

Fig. 1

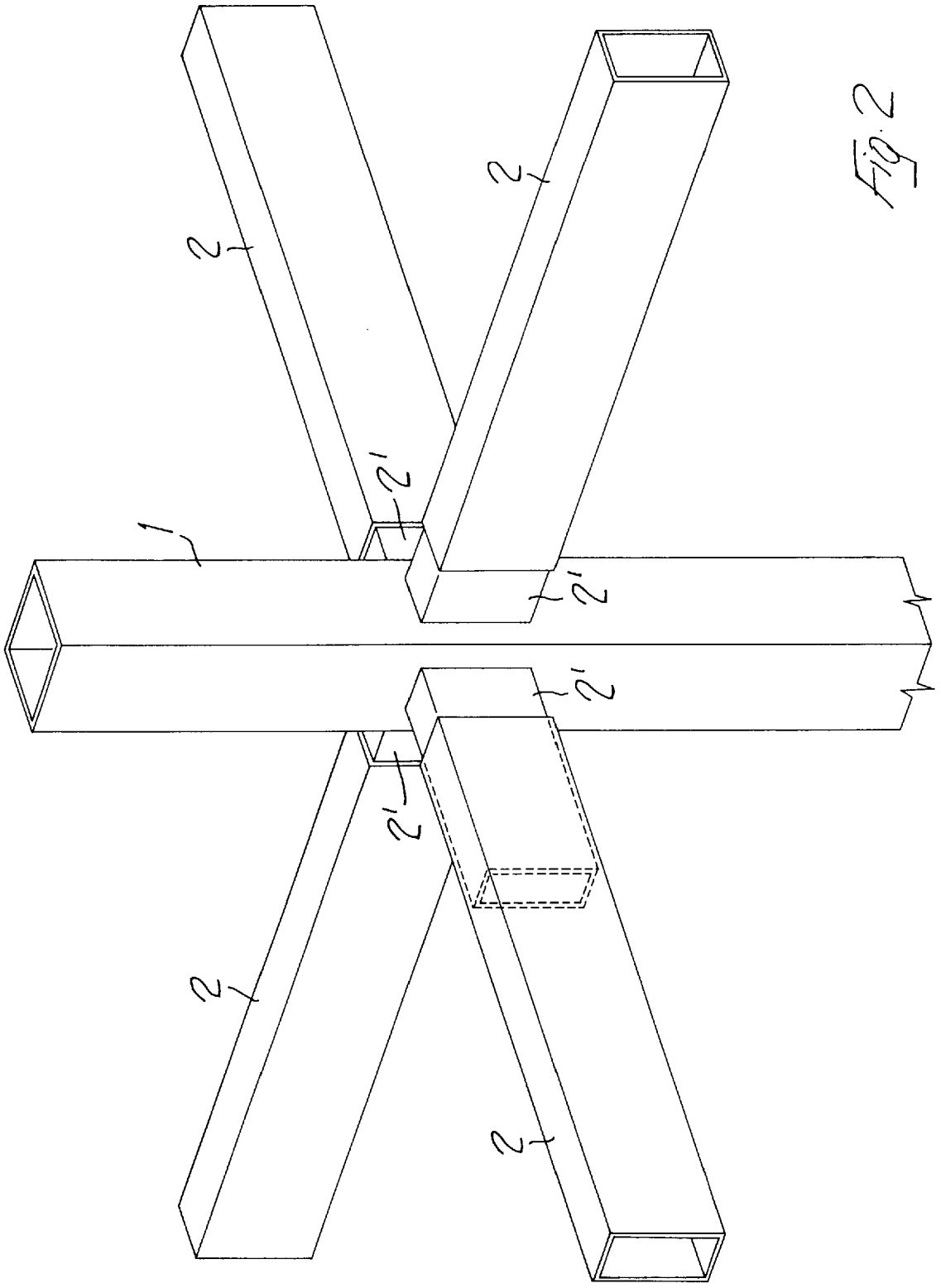

Fig. 2

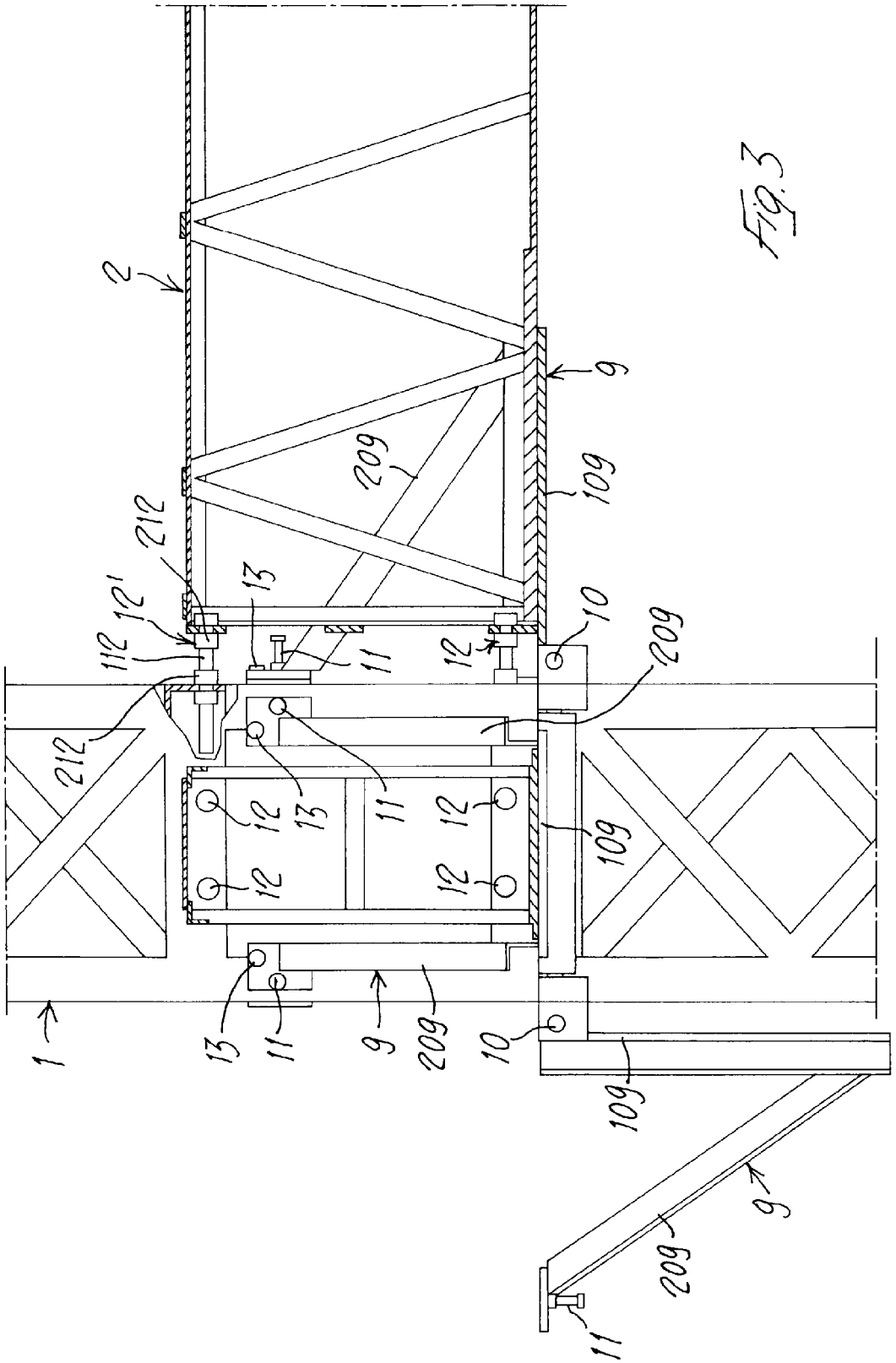
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Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 07 11 9729

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	28 February 2008	Rosborough, John

CATEGORY OF CITED DOCUMENTS

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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