



(11)

EP 2 559 817 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
20.02.2013 Bulletin 2013/08

(51) Int Cl.: **E04B 1/41** (2006.01) **E04B 1/04** (2006.01)

(21) Application number: **12180416.5**

(22) Date of filing: **14.08.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR
 Designated Extension States:
BA ME

(71) Applicant: **Prefabricados Dinescon, S.L.**
31395 Barasoain (Navarra) (ES)

(72) Inventor: **Luis Ezquerro, Miguel**
31395 BARASOAIN (NAVARRA) (ES)

(74) Representative: **Pons Ariño, Angel**
Glorieta Ruben Dario 4
28010 Madrid (ES)

(30) Priority: 16.08.2011 ES 201131391

(54) **Adjustable system for embedded union of prefabricated concrete elements for building structures, and method for performing the union of prefabricated concrete elements**

(57) The present invention relates to an adjustable embedded joint system of prefabricated concrete elements for building structures and to a process to carry out said joint, wherein the adjustable joint system comprises at least two prefabricated reinforced concrete blocks, an upper prefabricated block and a lower prefabricated block that join vertically by means of a bushing that joins a steel reinforcing bar of the upper prefabricated block with a steel reinforcing bar of the lower prefabricated block connecting the two adjacent reinforced concrete blocks vertically, wherein the bushing comprises an upper surface that is in contact with the upper prefabricated block, wherein said bushing confers high rigidity to the whole upper prefabricated block and lower prefabricated block before carrying out the concreting of the joint area.

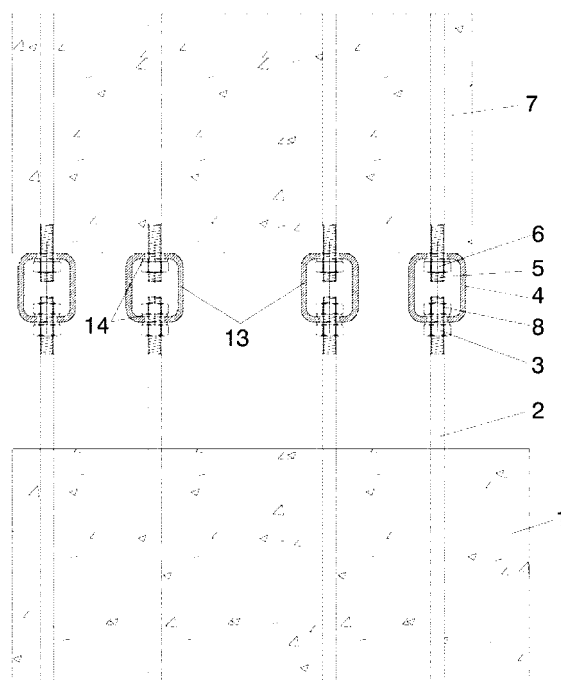


FIG. 4
A-A

Description

OBJECT OF THE INVENTION

[0001] The present invention relates to an adjustable embedded joint system of prefabricated concrete elements for building structures and to a process to carry out said joining.

[0002] The object of the invention consists of an adjustable embedded joint system of prefabricated concrete elements for building structures that comprises at least two blocks of prefabricated reinforced concrete, an upper prefabricated block and a lower prefabricated block that join vertically by means of a bushing that connects a steel reinforcing bar of the upper prefabricated block with a steel reinforcing bar of the lower prefabricated block supporting the two adjacent reinforced concrete blocks vertically.

[0003] The bushing comprises an upper surface that is in contact with the upper prefabricated block, so that it facilitates the joining between the upper prefabricated block and the lower prefabricated block, and said bushing confers high rigidity to the whole upper prefabricated block and lower prefabricated block before carrying out the concreting of the joint area.

BACKGROUND OF THE INVENTION

[0004] They are devices, well known in the state of the art, that carry out the joining of prefabricated reinforced concrete blocks by establishing a continuity between them but have certain disadvantages because a resistant portion of the reinforced concrete structural block is replaced by the joining piece as it is embedded therein, so that there is a need for a robust piece so as not to reduce the resistance of the concrete structural block, which increases the cost of the system. Moreover, it requires a second phase of concreting to protect the joint, which increases the cost and delays the work execution at the same time.

[0005] In said system different metal pieces are embedded in the lower face of the concrete structural block or expanded polystyrene or the like is placed inside the blocks so that its interior is not filled during the concreting of the prefabricated, polystyrene that should be discarded after the concreting of the piece. In the upper part of the element, the bars to be connected are protruding, leaving some bolts at the end of the bars where subsequently the prefabricated element will be supported. Once the lower structural element is placed, the framework is assembled. Said framework is concreted and the upper prefabricated block is placed on the protruding bolts of the framework. Once this operation is carried out the post is plumbed and the joint tightened. The last step is to timber a collar around the post and to fill with non-retraction mortar covering the joints and the lower face of the prefabricated element completely.

[0006] In previous systems, the joining pieces are com-

plex given that they are formed by a series of plates and bars welded together. On the other hand, there is a need to ensure that the second phase mortar completely fills the area below the post, making this operation critical.

[0007] Joint systems among elements of prefabricated concrete are also known as the one described in the Japanese patent JP3212537A that uses a solid bushing to carry out the threaded joint to the upper and lower bars of a prefabricated upper and lower block respectively in an intermediate area among said blocks.

[0008] The previous system has the disadvantages of being hard to assemble as well as the risk of breakage before the concreting of the framework between both blocks, because the bars are the ones that bear all the stress up to the framework concreting phase.

[0009] All the aforementioned disadvantages are overcome by the invention that is being described below.

DESCRIPTION OF THE INVENTION

[0010] The present invention relates to an adjustable embedded joint system of prefabricated concrete elements for building structures which comprises at least two prefabricated reinforced concrete blocks, an upper prefabricated block and a lower prefabricated block, or an upper prefabricated block and the foundation of the structure that are joined vertically through some upper and lower reinforcing bars that protrude from the lower prefabricated block or foundation, and from the upper prefabricated block respectively,

[0011] The adjustable joint system comprises at least a bushing that joins a reinforcing bar of the upper prefabricated block with a reinforcing bar of the lower prefabricated block or the foundation connecting the two adjacent reinforced concrete blocks or the upper prefabricated block and the foundation.

[0012] The bushing comprises an upper surface that is in contact with the upper prefabricated block, so that it facilitates the joining between the upper prefabricated block and the lower prefabricated block or foundation, and said bushing confers high rigidity to the whole upper prefabricated block and lower/foundation prefabricated block before carrying out the concreting of the joint area.

[0013] The bushing is of a high rigidity material, such as steel, so that the adjustable joint system is capable of bearing traction and compression stress once the joint has been concreted, since the elastic limit isn't reached at any point of the bushing, and stress due to the own weight of the upper prefabricated block and to extreme wind stress before the concreting, since no tension higher than the breakage one is reached at any point of the bushing.

[0014] The bushing is formed by a polygonal pipe section that comprises an upper side that is the upper surface that is found in contact with the upper prefabricated block and a lower side. Both the upper side and the lower side have holes for the passage of a reinforcing bar of the upper prefabricated block and lower prefabricated block

or foundation respectively.

[0015] Both the upper bars and the lower bars have a threaded end to allow the coupling of some bolts, where the joint system comprises a first bolt inwardly adjacent to the upper side of the bushing, first bolt that carries out the joining of the bushing to the upper prefabricated block, and a second bolt outwardly adjacent to the lower side of the bushing, second bolt that bears the weight of the upper prefabricated block and allows performing the adjustment of the joint, by varying the distance between the upper prefabricated block and the lower prefabricated block or foundation.

[0016] The joint system also comprises a third bolt inwardly adjacent to the lower side of the bushing, a third bolt that prevents the vertical movement of the upper prefabricated block.

[0017] The joint system thus formed, besides the aforementioned advantages, allows the bushings to remain embedded in the concrete that penetrates in the interior thereof when concreting the joint this way bracing its walls and increasing even more if possible the rigidity in the joint.

[0018] The process for carrying out the joining of elements of prefabricated concrete comprises the following steps:

- Manufacture of the prefabricated blocks in a mold where some holes are made in the end covers thereof for protruding the threaded end of the reinforcing bars,
- Placement of the reinforced bar of the prefabricated block and the lifting elements,
- Concreting of the prefabricated blocks and removing the mold,
- Placement of some polygonal section bushings in the joint, placing the lower part of the upper prefabricated block in contact with the upper side of each bushing, which has a hole for the passage of a lower reinforcing bar of the upper prefabricated block, being screwed in said lower bars and being tightened against the upper prefabricated block by means of a bolt inwardly adjacent to the upper side of the bushing,
- Threading a bolt on the upper bars of the lower prefabricated block or in the foundation,
- Placement of the upper prefabricated block over the threaded bolts to the upper bars of the lower prefabricated block or the foundation by means of the support of the bushing in said bolts, making a hole, arranged in the lower side of the bushing, go through the upper bars of the lower prefabricated block, for its passage through the upper reinforcing bar of the lower prefabricated block and tightening by means of a bolt inwardly adjacent to the lower side of the bushing,
- Concreting of a framework arranged among the prefabricated blocks or between the upper prefabricated block and the foundation, the bushings remaining

embedded in the concrete that penetrates in the interior thereof, bracing its walls,

[0019] The advantages of the adjustable joint system and the associated process are the following:

- The bushings and the joint bolts are placed during the hardening process of the prefabricated concrete blocks, after its concreting, thus simplifying the manufacturing of the prefabricated blocks.
- The bushings and bolts are embedded in the framework during the execution thereof, and this being an inevitable phase in the progress of the structure, in a way that a second phase of concrete is eliminated, achieving to accelerate the implementation time and saving material.
- The bushing presents a higher rigidity than that of the reinforcing bars of the prefabricated blocks that join them, so that until the concreting of the framework, the rigidity of the assembly is greater since the length of the bars, that are the less rigid elements, is smaller.
- The bushing is working to its maximum stress when the framework has been concreted, leaving the bushing fully embedded in the concrete and preventing the buckling of the vertical walls of said bushing.

DESCRIPTION OF THE DRAWINGS

[0020] To complement the description being made and in order to help better understand the features of the invention, according to a preferred practical embodiment thereof, a set of drawings is attached as an integral part of said description, wherein the following is shown as way of illustration but not limited to:

Figure 1.- Shows a perspective view of the lower prefabricated block of the adjustable embedded joint system of prefabricated concrete elements for building structures of the present invention where the bolts have been threaded in the upper reinforcing bars of said block.

Figure 2.- Shows a perspective view of the adjustable embedded joint system of prefabricated concrete elements for building structures of the present invention where the upper prefabricated block, to which the joint bushings have previously been attached, is leaning on the bolts of the upper reinforcing bars of the lower prefabricated block.

Figure 3.- shows a view of the system shown in Figure 2 where all the bolts of the upper reinforcing bars of the lower prefabricated block have been moved allowing the support of all the bushings thereon and other bolts are threaded to said upper bars, being inwardly adjacent to the lower side of the bushing to prevent the vertical movement of the upper prefabricated block.

Figure 4.- shows a section view AA of Figure 3 with

the difference that the prefabricated blocks have a different width from that shown in Figure 3.

PREFERRED EMBODIMENT OF THE INVENTION

[0021] In view of the figures, a preferred embodiment of the adjustable embedded joint system of prefabricated concrete elements for building structures and the process to carry out said joining is described below.

[0022] The adjustable joint system is carried out between two prefabricated reinforced concrete blocks, an upper prefabricated block (7) and a lower prefabricated block (1) that join vertically. In another example of an embodiment, not shown, instead of carrying out the joining between an upper prefabricated block and a lower prefabricated block, the joining between the foundation and an upper prefabricated block is performed.

[0023] The adjustable joint system comprises at least a steel bushing (4) that joins a steel bar (5) of the upper prefabricated block (7) with a steel bar (2) of the lower prefabricated block (1).

[0024] The bushing (4) is formed by a rectangular steel pipe section that includes an upper side (9) which is in contact with the upper prefabricated block (7), a lower side (10) and two vertical sides (13). Both the upper side (9) and the lower side (10) have holes (11) for the passage of a steel bar (5, 2) of the upper prefabricated block (7) and the lower prefabricated block (1) respectively.

[0025] Both the upper steel bars (5) and the lower steel bars (2) have their ends (12) threaded to allow coupling some bolts (3, 6, 8) arranged in the following way:

- A first bolt (6) inwardly adjacent to the upper side (9) of the bushing (4), first bolt (6) that carries out the joining of the bushing (4) to the upper prefabricated block (7).
- A second bolt (3) outwardly adjacent to the lower side (10) of the bushing (4), second bolt (3) that bears the weight of the upper prefabricated block (7) and allows to carry out the adjustment of the joint, by varying the distance between the upper prefabricated block (7) and the lower prefabricated block (1), and
- A third bolt (8) inwardly adjacent to the lower side (10) of the bushing (4), third bolt (8) that prevents the vertical movement of the upper prefabricated block (7).

[0026] All the bushings (4) are located within the outer perimeter in plan of the prefabricated block section (1, 7) so that they are not seen when the joined blocks are part of side or edge elements of the structure.

[0027] Figures 1 and 3 show that the prefabricated blocks (1, 7) have the same section, but by means of the adjustable joint system of the present invention the joining of prefabricated blocks (1, 7) of a different section can be carried out, where all the bushings (4) fall within the projection in plan of the prefabricated block (7) with

the smaller section and where the prefabricated block (7) with the smaller section is manufactured at a certain length that is greater than the theoretical one to ensure that the lower face of the prefabricated element (7) with the smaller section falls below the theoretical line of the framework so as to ensure the total continuity of the concrete by making sure that the compressions will be transmitted throughout the area of said concrete

[0028] The process for carrying out the adjustable joint system comprises the following steps:

- Manufacture of the prefabricated blocks (1, 7) in a mold where some holes are made in the end covers thereof for protruding the threaded end (12) of the longitudinal reinforcing bars (2, 5) Placement of the reinforced bar of the prefabricated block (1, 7) and the lifting elements,
- Concreting of the prefabricated block (1, 7) and removing the mold.
- Placement of some rectangular section bushings (4) in the joint, placing the lower part of the upper prefabricated block (7) in contact with the upper side (9) of each bushing (4) that has a hole (11) for the passage of a lower reinforcing bar (5) of the upper prefabricated block (7), being screwed in said lower bar (5) and being tightened against the upper prefabricated block (7) by means of a first bolt (5) inwardly adjacent to the upper side (9) of the bushing (4),
- Threading a second bolt (3) in the upper bars (2) of the lower prefabricated block (1).
- Plumbing of the support surface where the upper prefabricated block (7) will be placed by means of adjusting the external bolts of the second bolts (3), as is shown in Figure 2.
- Placement of the upper prefabricated block (7) over the second bolts (3) through the support of the bushing (4) in the external bolts of said second bolts (3), making a hole (11), arranged in the lower side (10) of the bushing (4), go through the upper bars (2) of the lower prefabricated block (1).
- Moving the second non-external bolts (3) in the upper bars (2) of the lower prefabricated block (1) toward the bushing (4).
- Tightening by means of a third bolt (8) inwardly adjacent to the lower side (10) of each bushing (4).
- Concreting of a framework arranged between the prefabricated blocks (1, 7).

[0029] Both, in the joint system described in detail and in the process, the joining of the bolts (3, 5, 8) with the side (9, 10) corresponding to the bushing (4) is carried out by inserting washers (14) between the two to ensure the tightness in the joint.

Claims

1. Adjustable embedded joint system of prefabricated

concrete elements for building structures that comprises:

- at least two prefabricated reinforced concrete blocks, an upper prefabricated block (7) and a lower prefabricated block (1), or an upper prefabricated block (7) and the foundation of the structure that are joined vertically through some upper reinforcing bars (2) and lower reinforcing bars (5) that protrude from the lower prefabricated block (1) or foundation, and the upper prefabricated block (7) respectively,
 - at least a bushing (4) that joins the lower reinforcing bar (5) of the prefabricated upper block (7) with the upper reinforcing bar (2) of the lower prefabricated block (1) or the foundation connecting the two adjacent reinforced concrete blocks or the upper prefabricated block (7) and the foundation,
- characterized in that** the bushing (4) comprises an upper surface (9) that is in contact with the upper prefabricated block (7) and which confers high rigidity to the whole upper prefabricated block (7) and lower prefabricated block (1)/foundation before carrying out the concreting of the joint area.
2. Adjustable embedded joint system of prefabricated concrete elements for building structures according to claim 1 **characterized in that** the bushing (4) is formed by a section of polygonal pipe that comprises an upper side (9) which is the upper surface that is in contact with the upper prefabricated block (7) and a lower side (10).
 3. Adjustable embedded joint system of prefabricated concrete elements for building structures according to claim 2 **characterized in that** both the upper side (9) and the lower side (10) of the bushing (4) have holes (11) for the passage of a reinforcing bar (5, 2) of the upper prefabricated block (7) and of the lower prefabricated block (1) or foundation respectively.
 4. Adjustable embedded joint system of prefabricated concrete elements for building structures according to claim 3 **characterized in that** both the upper reinforcing bars (2) and the lower reinforcing bars (5) have a threaded end (12) to allow the coupling of some bolts (3, 6, 8).
 5. Adjustable embedded joint system of prefabricated concrete elements for building structures according to claim 4 **characterized in that** it comprises a first bolt (6) inwardly adjacent to the upper side (9) of the bushing (4) that carries out the joining of the bushing (4) to the upper prefabricated block (7).
 6. Adjustable embedded joint system of prefabricated

concrete elements for building structures according to any of claims 4 or 5 **characterized in that** it comprises a second bolt (3) outwardly adjacent to the lower side (10) of the bushing (4) that bears the weight of the upper prefabricated block (7) and allows performing the adjustment of the joint, by varying the distance between the upper prefabricated block (7) and the lower prefabricated block (1) or foundation.

7. Adjustable embedded joint system of prefabricated concrete elements for building structures according to any of claims 4 or 5 or 6 **characterized in that** it comprises a third bolt (8) inwardly adjacent to the lower side (10) of the bushing (4) that prevents the vertical movement of the upper prefabricated block (7).
8. Adjustable embedded joint system of prefabricated concrete elements for building structures according to any of the previous claims **characterized in that** the prefabricated blocks (1, 7) have different sections.
9. Adjustable embedded joint system of prefabricated concrete elements for building structures according to any of the previous claims **characterized in that** the prefabricated blocks (1, 7) have different sections.
10. Adjustable embedded joint system of prefabricated concrete elements for building structures according to any of claims 1 to 8 **characterized in that** the prefabricated blocks (1, 7) have different sections.
11. Adjustable embedded joint system of prefabricated concrete elements for building structures of according to any of the previous claims **characterized in that** the bushings (4) are located within the outer perimeter in plan of the prefabricated block section (1, 7) of smaller section.
12. Process for carrying out the joining of prefabricated concrete elements making use of the system of the previous claims which comprises the steps of:
 - manufacture of prefabricated concrete blocks (1, 7) in a mold where some holes are made in the end covers thereof for protruding the threaded end of the longitudinal reinforcing bars (2, 5),
 - placement of the reinforced bar of the prefabricated block (1, 7) and the lifting elements,
 - concreting of the prefabricated blocks (1, 7) and removing the mold, **characterized in that** it comprises the additional steps of:
 - placement of some rectangular section bushings (4) in the joint, placing the lower part of the upper prefabricated block (7) in contact with the

upper side (9) of each bushing (4) that has a hole (11) for the passage of a lower reinforcing bar (5) of the upper prefabricated block (7), being screwed in said lower reinforcing bar (5) and being tightened against the upper prefabricated block (7) by means of a first bolt (5) inwardly adjacent to the upper side (9) of the bushing (4),

- placement of the upper prefabricated block (7) over the second bolts (3) through the support of the bushing (4) in the external bolts of said second bolts (3), making a hole (11), arranged in the lower side (10) of the bushing (4), go through the upper reinforcing bars (2) of the lower prefabricated block (1),
- concreting of a framework arranged between the prefabricated blocks (1, 7).

13. Process according to claim 12 characterized in that between the step of placing some bushings (4) in the joint and the step of placing the upper prefabricated block (7) over the second bolts (3) it comprises the steps of:

- threading a second bolt (3) in the upper reinforcing bars (2) of the lower prefabricated block (1),
- plumbing of the support surface where the upper prefabricated block (7) will be placed by means of adjusting the external bolts of the second bolts (3),

14. Process according to claim 13 characterized in that between the step of placing the upper prefabricated block (7) over the second bolts (3) and the step of concreting a framework arranged between the prefabricated blocks (1, 7) it comprises the steps of:

- moving the second non-external bolts (3) in the upper reinforcing bars (2) of the lower prefabricated block (1) toward the bushing (4).
- tightening by means of a third bolt (8) inwardly adjacent to the lower side (10) of each bushing (4).

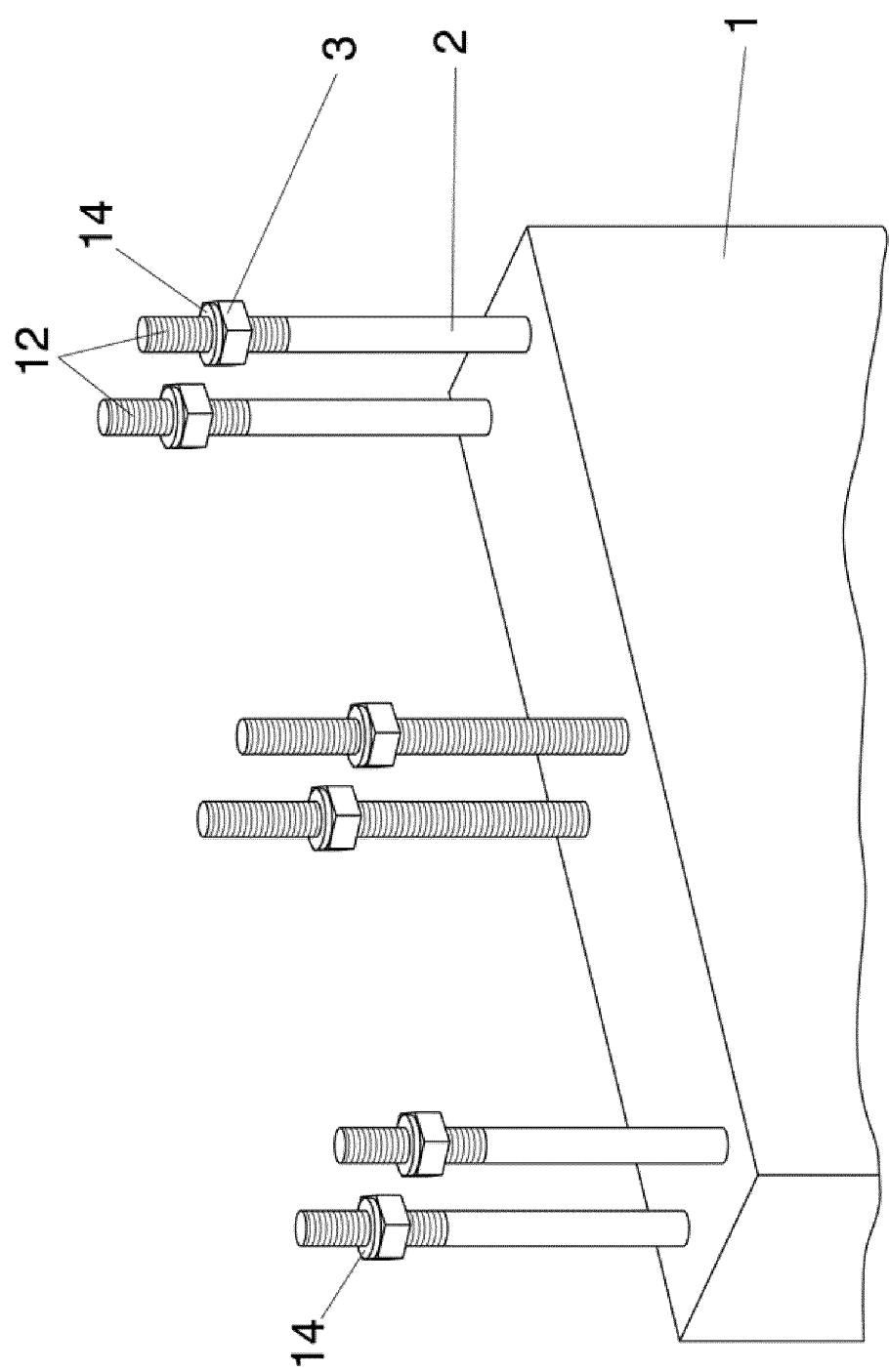


FIG. 1

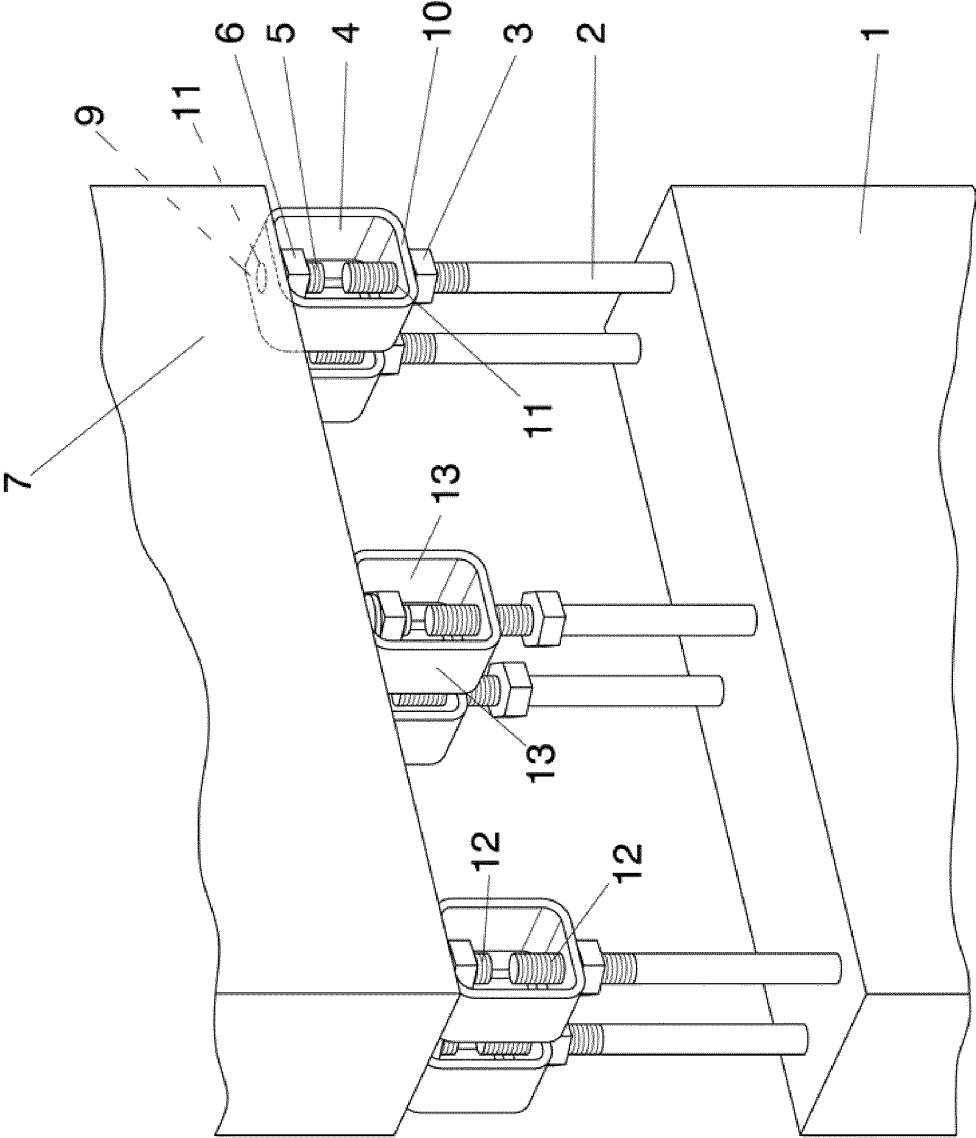
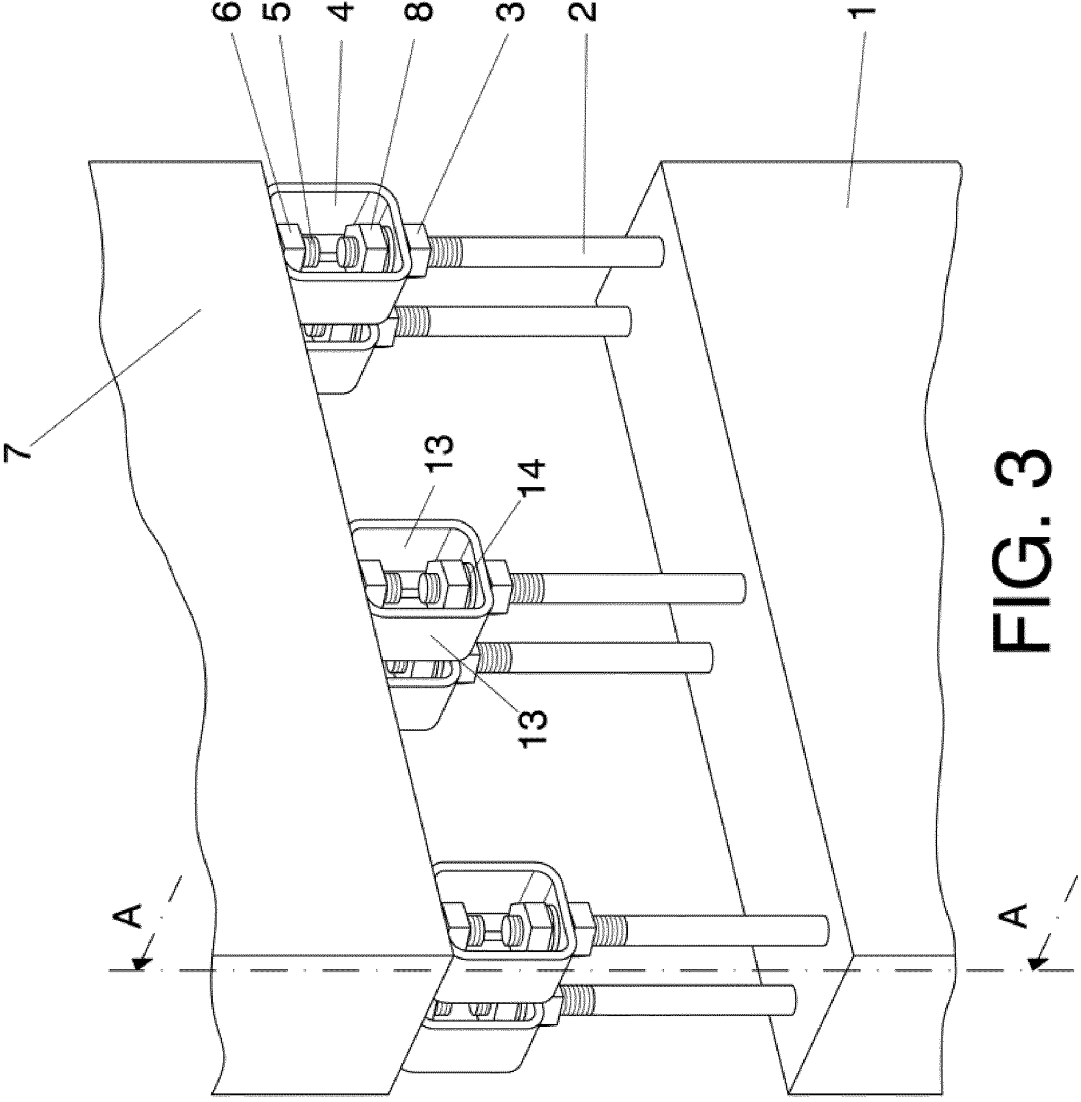


FIG. 2



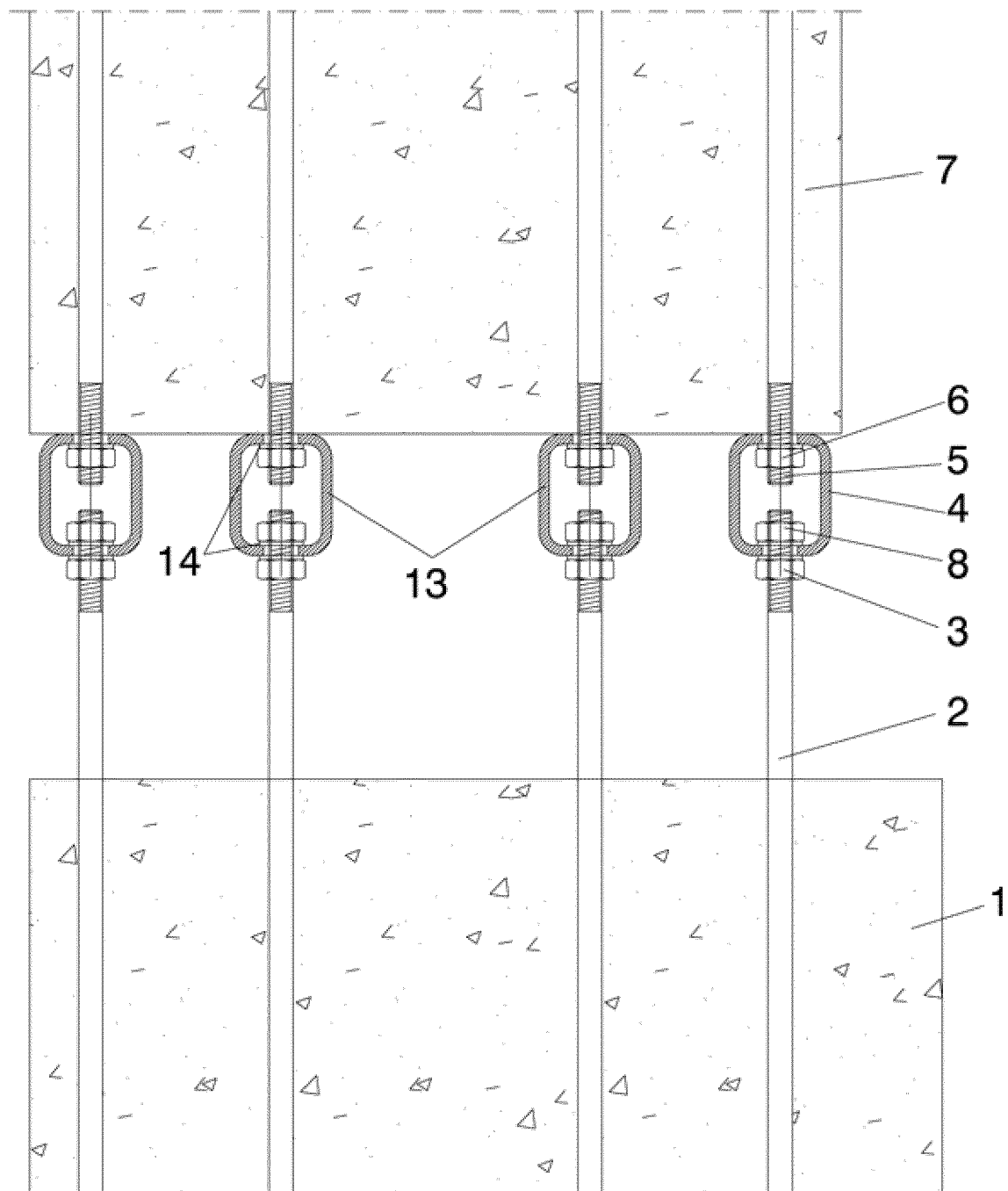


FIG. 4
A-A

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 3212537 A [0007]