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Publication number: **0 557 235 A1**

EUROPEAN PATENT APPLICATION

Application number: **93600006.6**

Int. Cl.⁵: **E04B 1/19, F16B 7/18**

Date of filing: **02.02.93**

Priority: **20.02.92 GR 92010071**

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Date of publication of application:
25.08.93 Bulletin 93/34

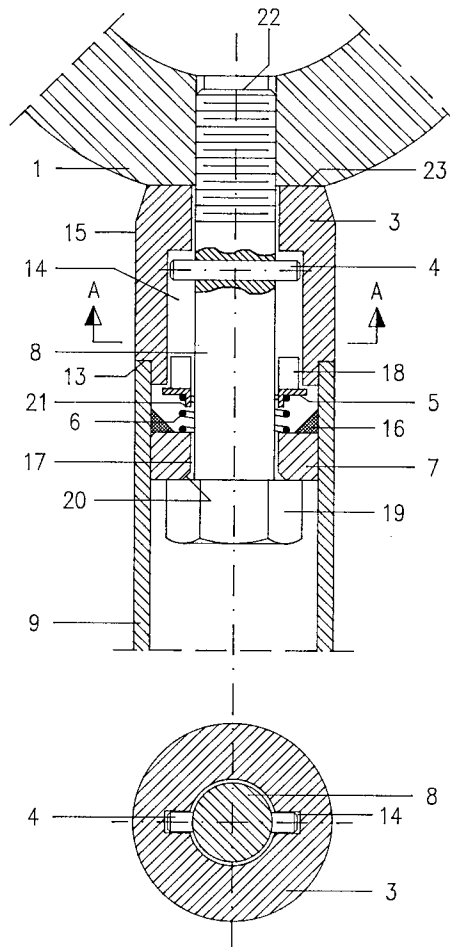
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Designated Contracting States:
AT BE CH DE DK ES FR GB IT LI SE

Mechanism for the connection of a pipe to a node of a three-dimensional structure.

A mechanism for the connection of a pipe (9) to a node (1) of a three dimensional structure consists of a bolt (8), which bears a hole for the passing through of a pin (4), an intermediate part (3), a circular disc (7), a washer (5), and a spring (6).

The mechanism is useful for the construction of buildings with extra aesthetic requirements.



SECTION A-A **FIGURE 3**

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This invention relates to a mechanism for the connection of a pipe to a connecting element (node) of a three - dimensional structure, wherein each connecting element bears at least one threaded hole. Such mechanisms are useful for the construction of buildings with extra aesthetic requirements and consist of a bolt with a hole for the passing through of a pin, an intermediate part with external diameter equal to the external diameter of the pipe, which rotates the pin, and a circular disc welded inside the pipe, which bears a hole for the passing through of the bolt.

Mechanisms of this type are well known but are either complicated and they require a lot of machining for their fabrication (German patent N° DE 4009371 A1) or the pipe bears a hole in the circumference of the mechanism for the start of bolt screwing, the intermediate part has a polygon shape, and the connection to the pipe is performed by using a conical or cylindrical part with visible welds, which bears a hole for the passing through of a bolt.

The above mechanisms either satisfy the extra aesthetic requirements having, however, high fabrication cost, or they create aesthetic problems such as visible welds, intermediate parts of a polygon shape, and holes on the pipe surface.

An object of the present invention is to eliminate these drawbacks. It gives a solution to the connection problem of the pipe in a simple and economical way.

This is achieved by:

an intermediate part with a cylindrical section outside diameter equal to the outside diameter of the pipe, which bears a bearing neck to be rotated about the pipe axis, and two opposite grooves wherein the pin moves; a washer with a neck, which has two opposite tooth-shaped projections that enter into the grooves of the intermediate part; and

a spring having the same axis with the bolt, which is seated on the circular disc inside the pipe and is in touch with the washer.

When the bolt is at backward position, the pin touches the two opposite tooth-shaped projections of the washer.

At the moment the pin comes in contact with the two opposite projections of the washer, the bolt end projects several millimetres off the face of the intermediate part. By pressing the bolt, since the pin is in contact with the two opposite tooth-shaped projections of the washer, the washer being in touch with the spring, the spring is compressed and when the bolt end lies on the same plane with the bolt face a force acts on the bolt. This force is sufficient to start the bolt screwing. By rotating the intermediate part the bolt is screwed and, at same time, the pin moves in the two grooves of the

intermediate part.

Just before the pin comes to the end of its path, the pipe is in contact with the bearing neck of the intermediate part and, at same time, the face of the intermediate part is in contact with the node of the space structure. By applying a torque on the intermediate part, the pipe and the node are tightened on the intermediate part.

The advantages of this invention are that the extra aesthetic requirements are satisfied at low cost, the required twisting force for the tightening is small due to the large diameter of the intermediate part, and that the penetration depth of the bolt into the node is long, which allows connection of pipes to nodes made of material with low strength (e.g. aluminum, plastic).

The invention will be further described, by way of example only, with reference to the accompanying figures, in which:

Figure 1 shows a part of a structure with connection elements and pipes where the mechanism is used according to the invention.

Figure 2 shows a longitudinal and a cross section of the mechanism according to the invention before the bolt screwing.

Figure 3 shows a longitudinal and a cross section of the mechanism according to the invention after the bolt has been screwed.

The structure according to figure 1 is called three dimensional structure or space structure and comprises the connecting elements, which are called nodes, and the bars 9.

The structure according to figure 1 is useful for the construction of buildings with extra aesthetic requirements, such as exhibition pavillions, shopping centers, shops, covered sports facilities, airport halls, hotel facilities, tourism facilities, universities, theaters, museums, libraries, etc.

The nodes are hollow spheres 1 with partial flat surfaces 11, distributed on their outer surface, bearing threaded radial holes 10.

Bars comprise one pipe 9 and two connection mechanisms 12, which connect the bar ends to the nodes.

Each connection mechanism 12 comprises a bolt 8, a pin 4, an intermediate part 3, a circular disc 7, a washer 5, and a spring 6.

The bolt 8 bears a hole for the passing through of the pin 4.

The intermediate part 3, with a cylindrical section outside diameter 15 equal to the external diameter of the pipe 9, has a bearing neck 13 in order to be rotated about the pipe axis and two opposite grooves 14 wherein the pin 4 moves.

The circular disc 7 is welded inside the pipe with a circumferential weld 16 and bears a hole 17 for the passing through of the bolt 8.

The washer with the neck 5 has two opposite tooth-shaped projections 18, which enter into the grooves 14 of the intermediate part.

During the assembling and after the welding of the circular disc 7 to one end of the pipe, the two bolts 8 (one for each connection mechanism) are passed inside the pipe through the other end so that their heads 19 are in contact. Then another circular disc is placed at the other end of the pipe and is welded. Holding the pipe at vertical position and shaking it, and with the aid of the chamfer 20 of the circular disc 7, the bolt end passes through the hole 17 of the circular disc 7. The spring 6, the washer, the pin 4, and the intermediate part 3, are then placed consequently. The intermediate part 3 is held in position by wrapping up its contact with the pipe 9 with an adhesive plastic tape.

After the placement of the bar in contact with the node 1, the tape is unwrapped and the intermediate part 3 is rotated. The spring 6, via washer 5 and pin 4, applies a force on the bolt 8, which is sufficient to start the bolt screwing.

By applying a torque (using a suitable tool) on the intermediate part 3, the pipe and the node are tightened on the intermediate part.

Claims

1. A mechanism for the connection of a pipe (9) to a connecting element (1) of a three dimensional structure, wherein each connecting element bears at least one threaded hole (10), being useful for the construction of buildings with extra aesthetic requirements, comprises a bolt (8) with a hole for the passing through of a pin (4), an intermediate part (3), with external diameter equal to the external diameter of the pipe (9), which rotates the pin (4), a circular disc (7) welded (16) insided the pipe (9), which bears a hole (17) for the passing through of the bolt (8), and **is characterized** by a spring (6), a washer (5), and by fact that the intermediate part (3) bears a bearing neck (13) and two opposite grooves (14).
2. A mechanism according to claim 1, in which the spring (6) has the same axis with the bolt (8), bears on the circular disc (7), and is in touch with the washer (5).
3. A mechanism according to claim 1 or 2, in which washer (5) bears two opposite tooth-shaped projections (18) which enter into the corresponding grooves (14) of the intermediate part (3).
4. A mechanism according to any one of claims 1 to 3, in which washer (5) preferably bears a
5. A mechanism according to any one of claims 1 to 4, in which at the moment the pipe (9) is in contact with the bearing neck (13) of the intermediate part (3) and the end (22) of the bolt (8) lyes on the same plane with the face (23) of the intermediate part (3), the spring, via washer (5) and pin (4), applies a force on the bolt (8).
6. A mechanism according to any one of the claims 1 to 5, in which circular disc (7) preferably bears a chamfer (20).

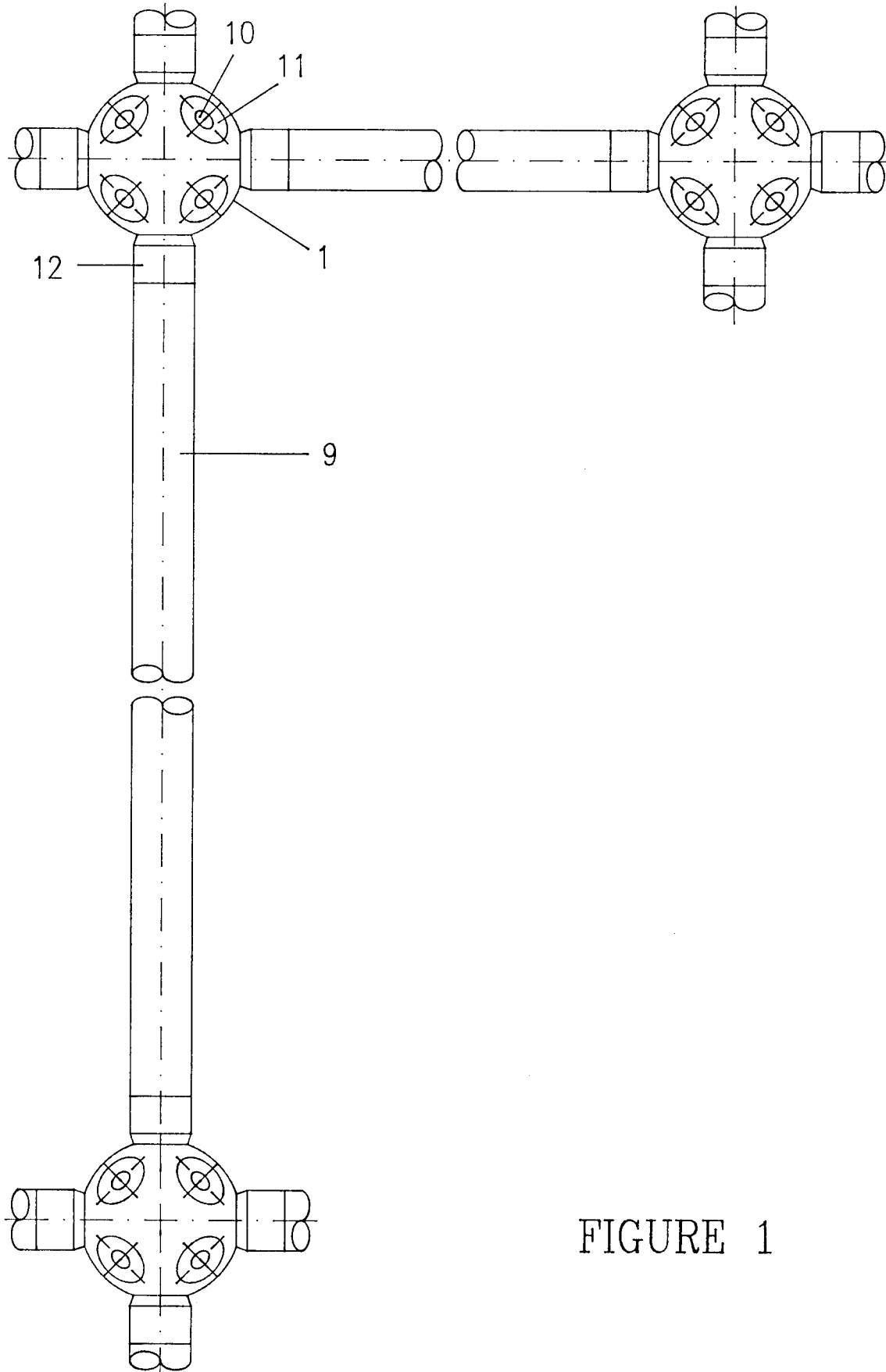
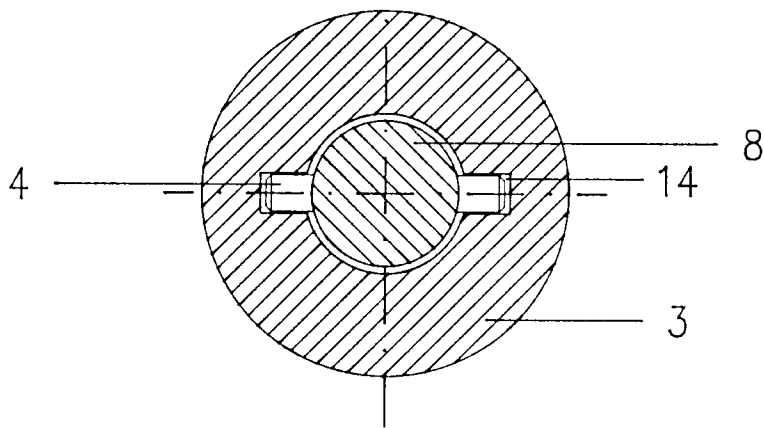
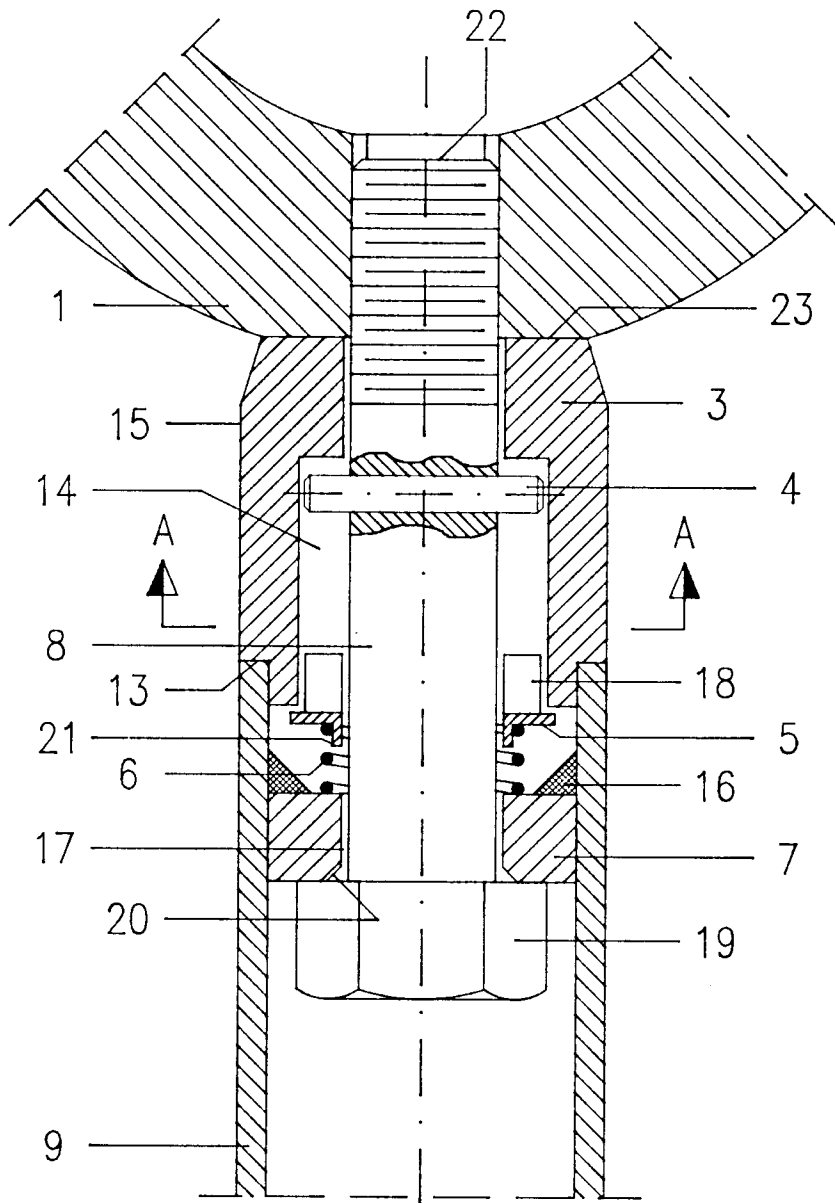


FIGURE 1



SECTION A-A

FIGURE 3



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	WO-A-9 112 383 (SYMA INTERCONTINENTAL AG) * page 2, paragraph 3 - page 4, paragraph 1 * * page 8, paragraph 2; figures 1,5 * ---	1,2	E04B1/19 F16B7/18
A	WO-A-9 006 449 (HASSID) * figure 2 * ---	1,2,5	
A	FR-A-2 628 461 (OVERBEEKE) * page 5, line 23 - page 7, line 9; figures 1,2 * ---	1,6	
A	US-A-4 475 840 (SCHMITT) * column 5, line 24 - line 68; figure 5 * ---	1	
A	WO-A-8 002 728 (EDWD. WATERS & SONS) * the whole document * ---	1	
A	FR-A-2 103 104 (PHILLIPS SCREW COMPANY) * page 5, line 5 - line 12; figures * -----	3	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			E04B F16B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 08 JUNE 1993	Examiner FORDHAM A.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	