



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 1 522 742 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

13.04.2005 Bulletin 2005/15

(51) Int Cl.7: **F16B 7/00, E04B 1/19**

(21) Application number: **03380250.5**

(22) Date of filing: **29.10.2003**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT RO SE SI SK TR
Designated Extension States:
AL LT LV MK

(72) Inventor: **Hevia Corte, José Antonio**
33394 Gijon (Asturias) (ES)

(74) Representative: **Davila Baz, Angel et al**
c/o Clarke, Modet & Co.,
Goya, 11
28001 Madrid (ES)

(30) Priority: **08.10.2003 ES 200302272 U**

(71) Applicant: **Ideas en Metal, S.A.**
33211 Tremenas - Gijon (Asturias) (ES)

(54) **Node for connecting bars of space frames**

(57) A node (1) for connecting bars (7) of space frames, constituted of flat plates (2,3) crossing perpendicular to one another, which are provided with holes (4)

for the passing of lockscrows (5) for fixing to the bars (7), which bars (7) are finished on their ends with tabs (6) provided with holes for the passing of lockscrows (5).

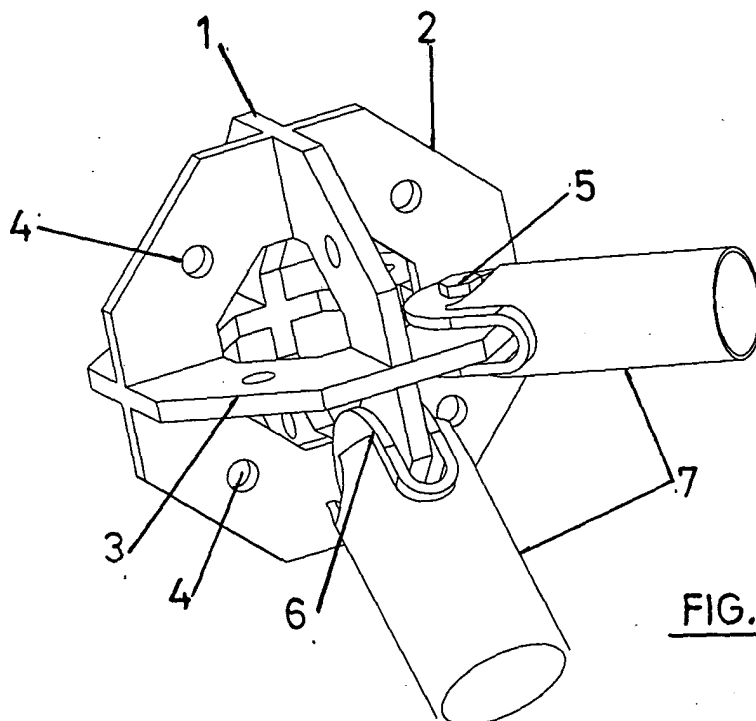


FIG. 1

EP 1 522 742 A1

Description

[0001] The present invention refers to a node for connecting bars of space or tridimensional frames, especially applicable to frames based on tubular bars of a metallic nature.

[0002] Space or tridimensional frames are constituted on the basis of bars, generally of steel and having a tubular structure, although solid sections, and other materials also, such as aluminum, wood, reinforced plastics, and the like, have been occasionally used.

[0003] In any case, the bars of these frames generally concur at points where the balance of stresses occurs.

[0004] The usual connection systems of these bars can generally be divided into three large blocks: those which use an auxiliary element called a node at which the different bars of the frame concur, those which are built from continuous longitudinal chords or units subsequently connected to one another on site, and those which are carried out by assembling on site premanufactured, standard modules.

[0005] The node that the present invention refers to, would be part of the first system mentioned.

[0006] Within the different connection systems, there are also differences in the ends of the bars, where the connection with the node occurs. In most cases, there is an additional element between the end of the bar and the node, which may vary from one to another.

[0007] The parts forming the node, due to their function, require special constitutive features, and they may become one of the components having the greatest influence on the final cost of the frame.

[0008] The object of the present invention is a node for the purpose set forth, which is constituted from flat plates, of a simple and cost-effective manufacture, such that it allows considerably reducing costs and weights of this component.

[0009] According to the present invention, the node is constituted of three flat plates which cross perpendicular to one another and determine right trihedrons. Said plates are provided with holes allowing the passing of lockscrews for fixing the bars concurring at the node.

[0010] With this constitution, the node is formed from steel plates of suitable dimensions, which simply require a cutting and drilling operation to form the through holes of the lockscrews.

[0011] The ends of the bars concurring at the node must also be machined, being able to adopt very different shapes, by means of welding, adding a fork-shaped plate, by means of crushing the end portions of said bars, or through a hub or bushing, being provided, in any case, with a hole for the passing of the lockscrew.

[0012] The plates can adopt a ring or semi-ring shape, being lightened in the central part thereof, thus reducing the weight of the node.

[0013] Each one of the plates forming the complete node can either be constituted of a single part or obtained from several parts assembled together.

[0014] So that the features and advantages of the node of the invention can be better understood, a more detailed description of the node is made below, with the aid of the attached drawings, wherein a non-limiting embodiment is shown.

Figure 1 shows a perspective view of a node constituted according to the invention, composed of ring-shaped plates perpendicular to one another, and the assembly of tubular bars finished with a fork-shaped plate through which the screwed connection is carried out.

Figure 2 shows the perspective view of a variant of the node formed by a ring-shaped plate and two semi ring-shaped plates.

Figure 3 shows a possible construction form of the node of figure 1.

Figure 4 shows a perspective view of different embodiments of the ends of the bars connected to the node of the invention.

[0015] The node shown in figure 1 is composed of three octagonal, polygonal, ring-shaped plates referenced with numbers 1, 2 and 3. All the plates are perpendicular to one another, such that the theoretical center thereof is common, such that eight trihedrons are determined.

[0016] The plates have through holes 4 which allow carrying out connections by means of screws 5 introduced through the end parts 6 of the tubular bars 7 composing the space frame.

[0017] To prevent the occurrence of secondary bending stresses, it is important to make sure that the shafts of the tubular profiles 7 concurring at each node, cross or meet at a common theoretical point, preferably at the center of gravity of the node.

[0018] One of the advantages provided by the node of the invention is that it prevents the occurrence of secondary bending moments which can be originated in the embedment of the ends of the bars 7 into the node.

[0019] Another feature of the design of the invention is that the screwed connection of the node with the tubular profiles 7 is carried out in a radius relatively distant from the theoretical center of the node or connection.

This facilitates the on site assembly and implies an important saving in the length of the tubes, which compensate the manufacturing cost of the node.

[0020] The node shown in figure 2 is similar to the node shown in figure 1, but lighter, since areas in which bars neither fall nor concur are removed. In the case of figure 2, the plate or ring 3 is completed, whereas those referenced with numbers 1 and 2 are semi-plates or semi-rings, with regard to the configuration shown in figure 1. Aside from this, the embodiment of the node shown in figure 2 has the same features and elements already disclosed with regard to that shown in figure 1 for receiving the ends of the bars.

[0021] In any case, the different parts composing the

node can be obtained by means of cutting a plate with the suitable thickness. Since assembly of the node can be a complicated operation, the plates or rings composing it can be broken down into the simplest and most similar possible elements, as shown in figure 3, to obtain the node of figure 1.

[0022] In this case, the plate or ring 1 is of a single part, the plate or ring 2 is constituted of four parts, two larger parts equal to one another, referenced with number 2, and two parts smaller and also equal to one another, referenced with number 2'; and the plate 3 is constituted of two parts 3-3'.

[0023] The different parts are provided with facing notches 8 for allowing a perfect coupling between them, the connection between the different parts being carried out later by means of welding beads.

[0024] As can be seen in figure 4, the ends of the bars can be finished in forks 9, the branches of which clamp to one of the plates of the node and are provided with respective aligned holes 10 facing one of the holes 4 of the plates for the passing of a lock screw 5.

[0025] The ends of the tubular bars 7 can also be finished with tabs 4. These tabs can be obtained either by means of crushing the end of the tubular bar 7, as referenced with number 11 in figure 4, or by a plate 12 axially fixed in a position diametral to a cylindrical hub or bushing 13 fixable to the end of the tubular bar 7. This plate can have a T-shape configuration, as indicated with reference 14, resting on and being connected by welding to the end of the tubular bar 7 through the flaps 15. In all cases, holes 16 will be provided, which will face the corresponding holes in the plates or rings, for the passing of the lock screws 5. Furthermore, the plate 12 or 14 could be fixed directly to the end of the tubular bars 7.

[0026] With the constitution disclosed, the operations to be carried out for assembling the node and adding the additional elements for connection to the ends of the tubular bars 5 can be carried out in a shop, with the advantages that this implies, such as decreasing on site assembly costs and times with regard to shop assembly, independence from climatological conditions, dimensional control, improvement of the quality of the weldings and the superficial protection through a layer of paint or galvanizing, etc.

[0027] Although the node of the invention is especially intended for being used with frames of steel tubular bars having a circular section, they could also be applied with bars of other types and profiles of other shapes.

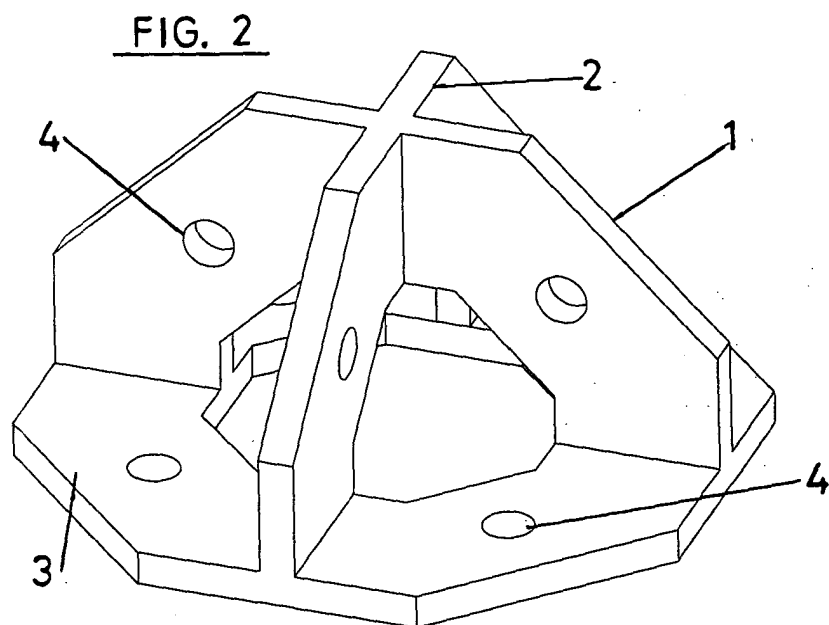
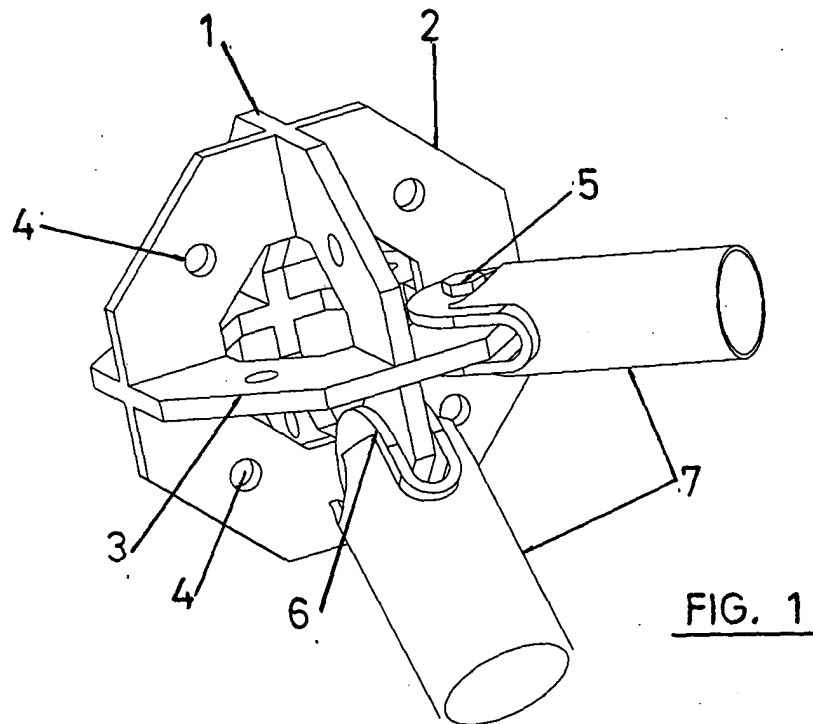
[0028] The ring-shaped configuration of the plates composing the node allows reducing the weight thereof, these rings being able to have a circular, elliptical, polygonal, etc., contour.

acterized in that it is constituted of flat plates crossing perpendicular to one another, which are provided with holes for the passing of lock screws for fixing to the bars, which bars are finished on their ends with tabs provided with holes for the passing of lock screws.

2. A node according to claim 1, **characterized in that** the tabs which the bars are finished in are constituted of a plate bent like a fork, dimensioned so as to clamp a plate, and the branches of which are provided with respective aligned holes facing one of the holes of the plates, for the passing of a lock screw.
3. A node according to claim 1, **characterized in that** the tabs which the bars are finished in are obtained by crushing the end portions of said bars.
4. A node according to claim 1, **characterized in that** the tabs which the bars are finished in are constituted of a flat plate which is axially fixed, in a diametral position, to the end of each bar, which plate is provided with a hole in the end position axially projecting from the bar.
5. A node according to claim 1, **characterized in that** the tab which the bars are finished in is constituted of a plate diametrically fixed to a hub or bushing of a section coinciding with that of the ends of the bars, for its coupling and fixing on said ends, which plate is provided with a hole in the portion projecting axially with regard to the hub or bushing.
6. A node according to claim 1, **characterized in that** the plates adopt a ring shape, having a circular or polygonal contour.
7. A node according to claim 1, **characterized in that** at least part of the plates adopt a semi-ring, circular or polygonal shape.
8. A node according to claims 6 and 7, **characterized in that** each one of the rings is constituted from two or more flat parts and is provided with coupling notches at the points of intersection with the remaining plates.

Claims

1. A node for connecting bars of space frames, **char-**



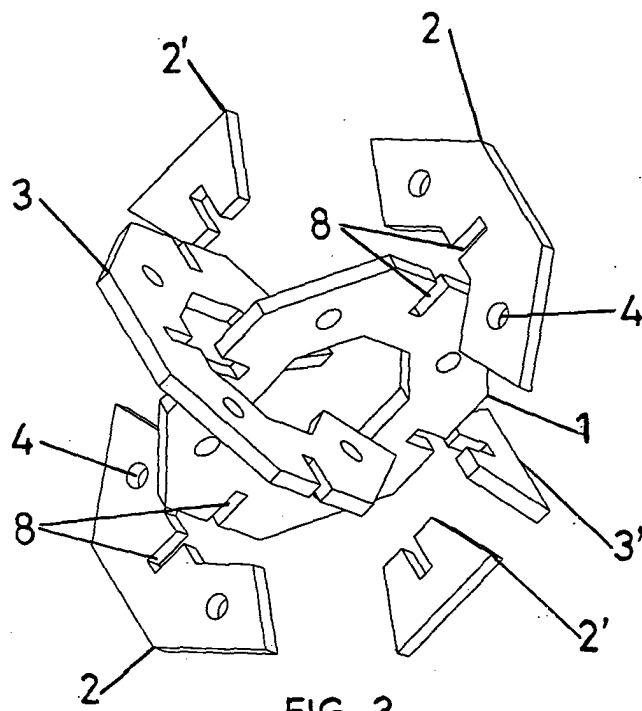


FIG. 3

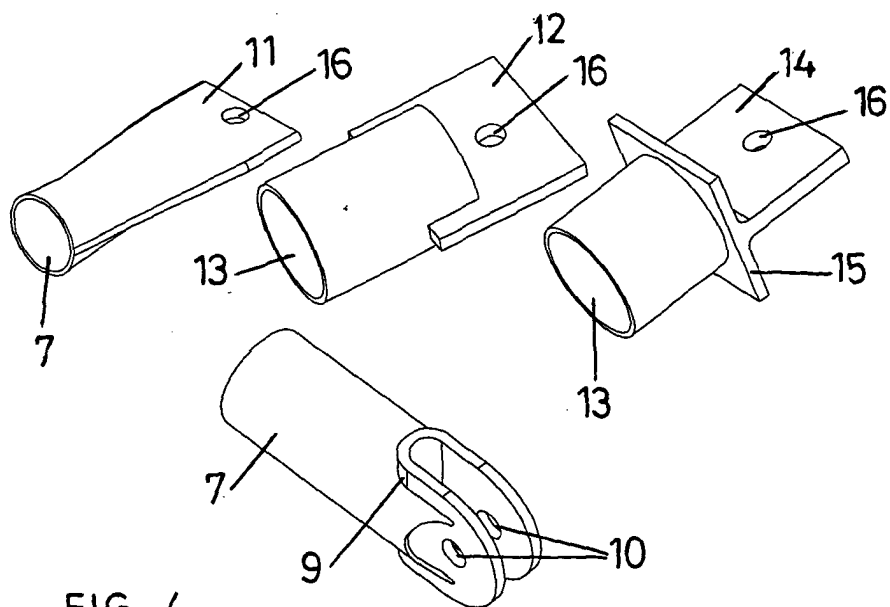


FIG. 4



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 38 0250

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.7)
X	US 4 406 562 A (NASI CESARINO) 27 September 1983 (1983-09-27) * column 5, line 54 - column 7, line 25; figure 3 *	1	F16B7/00 E04B1/19
X	DE 31 23 482 A (SERWE JOSEF) 30 December 1982 (1982-12-30) * page 18, paragraph 2 - page 23; figures 2-14 *	1,2,4-6	
Y	FR 1 579 060 A (SOCIETE D'ETUDES INDUSTRIELLES ET DE CONSTRUCTIONS CAMUSSAT GEUGUEN FR) 22 August 1969 (1969-08-22) * the whole document *	3,7,8	
Y	US 4 065 220 A (RUGA WAYNE) 27 December 1977 (1977-12-27) * column 2, line 27 - line 60; figures 1,2 *	3	
Y		7,8	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			F16B E04B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 January 2005	Examiner Comel, E
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			

 1
EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 38 0250

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-01-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4406562 A	27-09-1983	FR 2474113 A2	24-07-1981
		AT 8417 T	15-07-1984
		CA 1157222 A1	22-11-1983
		DE 3068490 D1	16-08-1984
		EP 0017574 A1	15-10-1980
		ES 8100710 A1	01-02-1981
DE 3123482 A	30-12-1982	DE 3123482 A1	30-12-1982
FR 1579060 A	22-08-1969	NONE	
US 4065220 A	27-12-1977	US 4145149 A	20-03-1979