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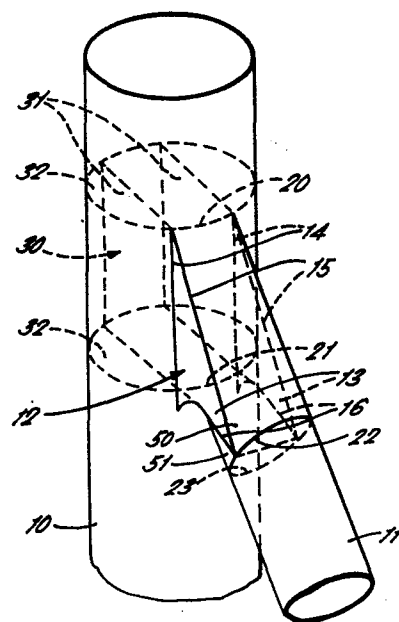
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㉗ **A joint arrangement.**

㉘ A joint arrangement comprises a hollow tubular column member (10) to which is attached a hollow tubular support member (11) by means of a bracket (12). The bracket (12) comprises a pair of parallel side plates (13) and specially curved upper and lower plate members (50) and (51). There are plates (30) provided internally of the column member (10) for bracing the bracket plates along their lines of attachment to the column member.



A JOINT ARRANGEMENT

This invention relates to a joint arrangement between two hollow cylindrical members of different outer diameters, and in particular, though not
5 exclusively, to a joint arrangement for use in the construction of a tower structure for supporting an offshore platform.

Structures for supporting offshore platforms have to be sufficiently well braced to be able to
10 withstand the forces which they will experience on location. These forces generally become greater as the depth in which the platform is to be erected is increased. In our copending British Application No. 8106753, for example, an offshore platform is
15 supported by a tripod tower structure which has a central column of 15m in outer diameter and three support legs, each of which is 8m in outer diameter, and the platform can be erected in a depth in excess of 300m. One of the difficulties with such a large
20 size and massive construction as this is the design of the joints between elements. It is the object of the present invention to at least reduce these difficulties.

This object is achieved in that there is provided a joint arrangement characterised by first and second hollow cylindrical members having intersecting axes, the first member being of a larger outer diameter than the second member, the second member being attached at one end thereof to the first member by bracket means, the bracket means including a pair of plates, which plates along first edges thereof are attached to the first member, the arrangement being such that the said first edges of the plates are parallel to the axis of the first member, and bracing means being provided internally of the first member to support the plates along their lines of attachment to the first member.

15 The plates are preferably flat, parallel to each other and of generally triangular shape..

 The bracket means preferably further comprises upper and lower end sections which extend between the first and second members and which are attached
20 therebetween.

 The upper and lower end sections are each preferably attached along an edge thereof to the first member, which edges are shaped to conform to the outer radius of curvature of the first member.

25 The upper and lower end sections are each

preferably attached along another edge thereof to the second member, which other edges are shaped to conform to the outer radius of curvature of the second member.

5 The bracket means is preferably braced by means of plates welded internally thereof.

 The bracing means for the first member preferably comprises a pair of flat generally rectangular plates, each of which plates is arranged to be
10 substantially coplanar with each of said pair of plates of the bracket means.

 The bracing means preferably further comprises a pair of circular plates attached to the inside of the first member, the circular plates being
15 arranged at either end of the pair of plates of the bracing means.

 The members and plates are preferably of metal and the means of attachment is preferably by welding.

20 The invention also provides a tower structure for use in supporting an offshore platform comprising a joint arrangement as described herein.

 The invention further provides a tower structure having a central column and at least three support
25 legs attached thereto using a joint arrangement as described herein.

By way of example, one embodiment of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 shows a joint arrangement according to the invention,

Figure 2 shows part of a tripod tower structure (with two support legs omitted for clarity) using the joint arrangement of Figure 1,

Figure 3 is a sectional view along the lines "CC" of Figure 2,

Figure 4 is a sectional view along the lines "DD" of Figure 2,

Figure 5 is a sectional view along the lines "EE" of Figure 2,

Figure 6 is a sectional view along the lines "FF" of Figure 2,

Figure 7 is a sectional view along the lines "GG" of Figure 2, and

Figure 8 is a sectional view along the lines "HH" of Figure 2.

A joint arrangement, as shown in Figure 1,

comprises a first hollow cylindrical column member 10 and a second hollow cylindrical support member 11. The support member 11 is of smaller outer diameter than the column member 10, and both are of metal.

5 One end of the support member 11 is attached to the column member 10 by means of a bracket, generally indicated by 12, and the support member lies at an oblique angle to the column member. The bracket 12 includes a pair of parallel flat metal plates 10 13 which are attached by welding along first edges 14 thereof to the column member 11. As will be seen from Figure 1, plates 13 of the bracket 12 are generally triangular. The arrangement is such that the edges 14 along which the plates 13 are attached 15 to the column member 10 are parallel to the axis of the column member.

The bracket 12 further comprises special upper and lower end sections, 50 and 51 respectively, for the support member 11. The upper end section 50 20 has trimmed edges 20 and 22 at either end thereof. Trimmed edge 20 is shaped to conform to the outer radius of curvature of the column member 10, whereas trimmed edge 22 is shaped in a semi circle to conform to the outer radius of curvature of the 25 support member 11. Similarly, the lower end section 51

has trimmed edges 21 and 23 shaped to conform to the outer radius of curvature of the column member 10 and support member 11 respectively. The longitudinal edges of the upper and lower end sections 50 and 51 match up with second and third edges, 15 and 16 respectively, of the plates 13, as can be seen from Figure 1.

The upper and lower end sections 50 and 51 are attached to the support member 11 by welding along edges 22 and 23, and are attached to the plates 13 by welding along edges 15 and 16. The bracket 12 thus formed can be braced, for example by welding a flat rectangular plate across each pair of edges 15 and 16 respectively, or by some other suitable arrangement. The line of attachment of the bracket 12 to the support member 11, namely along combined edges 22 and 23, can also be braced, for example by welding a tubular sleeve across the joint internally of the support member (as indicated in Figure 8).

The design of the bracket 12 is such that its line of attachment to the column member 10 is of a rectangular form, the bracket having a generally rectangular opening at one end and a circular opening at the other. This enables the design of a bracing structure internally of the column member to be greatly simplified.

The column member 10 has an internal bracing structure 30. This bracing structure 30 comprises a pair of parallel generally rectangular flat plates 31 and two circular flat plates 32. Plates 31 are
5 arranged to be coplanar with plates 13 of the bracket 12 and are attached to the inside of the column member 10 by welding. Circular plates 32 lie above and below plates 31 and are also attached to the inside of the column member by welding.

10 Figure 2 shows the construction of part of a tripod tower structure using a joint arrangement according to the invention. This tripod tower structure is such as is disclosed in our copending application No. 8106753. The structure has a
15 central column and three supporting legs (two of which are omitted from Figure 2 for clarity). Each supporting leg is attached to the central column by means of a bracket and the central column includes an internal bracing structure.

20 Figure 3 shows how the supporting legs are arranged around the central column as 120° spacings, and how in this particular embodiment the internal bracing structure is arranged. Figures 4 to 8 show sections through the joint arrangement at various points.

25 It will be appreciated that the joint arrangement

described above could be used for any structure involving two members of different diameters. Also, that this mode of construction of tower structures can be used whether the structure has more or
5 less than three supporting legs.

It will also be appreciated that the internal bracing structure can be arranged in a number of different ways other than that shown.

CLAIMS

1. A joint arrangement characterised by first
(10) and second (11) hollow cylindrical members having
intersecting axes, the first member (10) being of a
5 larger outer diameter than the second member (11), the
second member (11) being attached at one end thereof
to the first member (10) by bracket means (12), the
bracket means (12) including a pair of plates (13),
which plates (13) along first edges (14) thereof are
10 attached to the first member (10), the arrangement
being such that the said first edges (14) of the
plates (13) are parallel to the axis of the first
member (10), and bracing means (30) being provided
internally of the first member (10) to support the
15 plates (13) along their lines of attachment to the
first member (10).

2. A joint arrangement as claimed in Claim 1
characterised in that the plates (13) are flat,
parallel to each other and of generally triangular
20 shape.

3. A joint arrangement as claimed in Claim 1
or Claim 2 characterised in that the bracket means (12)
further comprises upper (50) and lower (51) end

sections which extend between the first (10) and second (11) members and which are attached therebetween.

4. A joint arrangement as claimed in Claim 3
5 characterised in that the upper (50) and lower (51) end sections are each attached along an edge (20, 21) thereof to the first member (10), which edges (20, 21) are shaped to conform to the outer radius of curvature of the first member (10).

10 5. A joint arrangement as claimed in Claim 4 characterised in that the upper (50) and lower (51) end sections are each attached along another edge (22, 23) thereof to the second member (11), which other edges (22, 23) are shaped to conform to the
15 outer radius of curvature of the second member (11).

6. A joint arrangement as claimed in Claim 3, Claim 4 or Claim 5 characterised in that the bracket means (12) is braced by means of plates welded internally thereof.

20 7. A joint arrangement as claimed in any preceding claim characterised in that the bracing means (30) for the first member (10) comprises a

pair of flat generally rectangular plates (31), each of which plates (31) is arranged to be substantially coplanar with each of said pair of plates (13) of the bracket means (12).

5 8. A joint arrangement as claimed in claim
7 characterised in that the bracing means (30)
further comprises a pair of circular plates (32)
attached to the inside of the first member (10),
the circular plates (32) being arranged at either
10 end of the pair of plates (31) of the bracing means
(30).

 9. A joint arrangement as claimed in any
preceding claim characterised in that said members
and plates are of metal and the means of attachment
15 is by welding.

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FIG. 1.

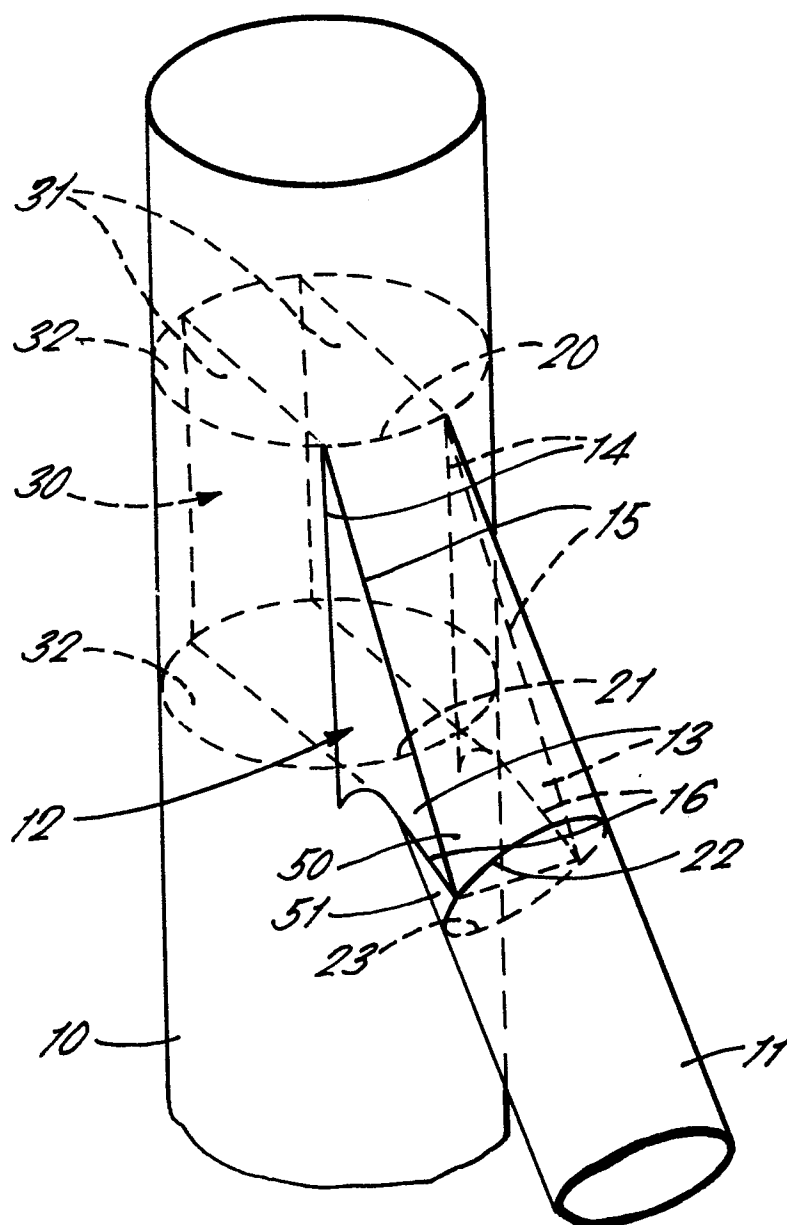
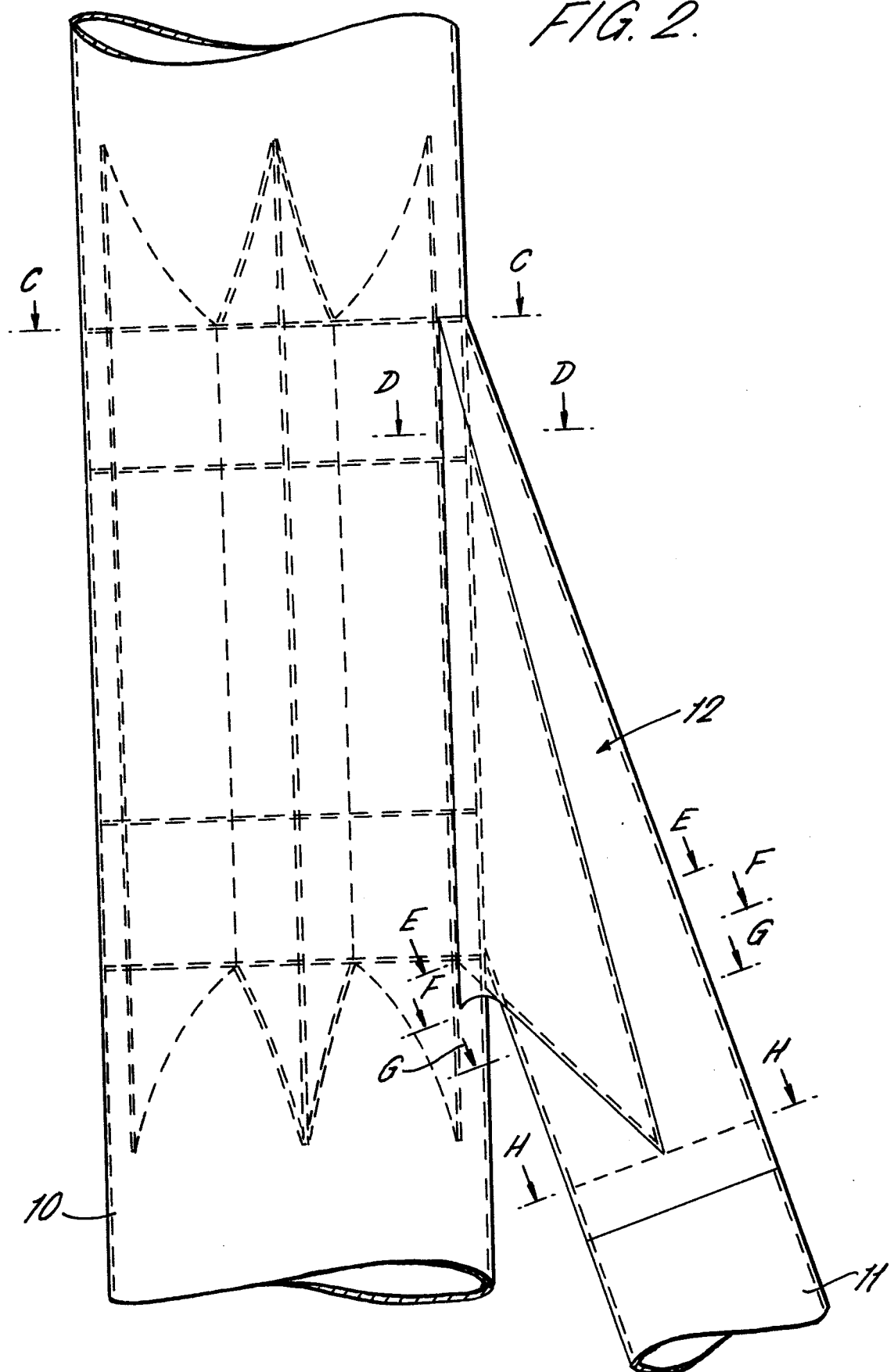


FIG. 2.



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FIG. 3.

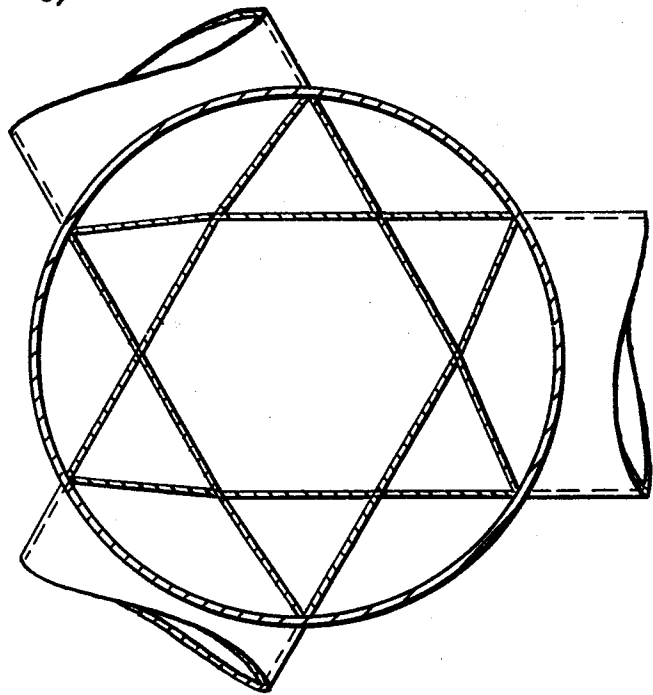


FIG. 4.

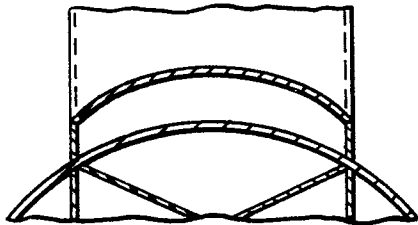


FIG. 5.

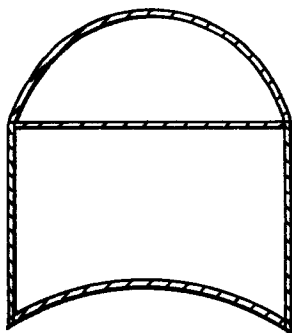


FIG. 7.

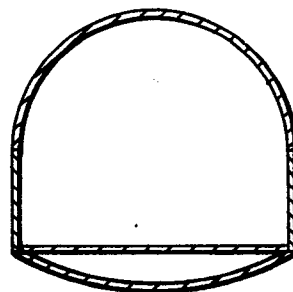


FIG. 6.

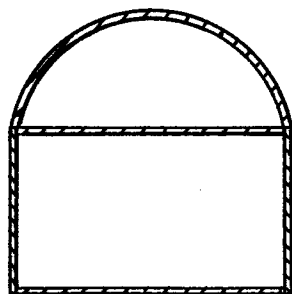
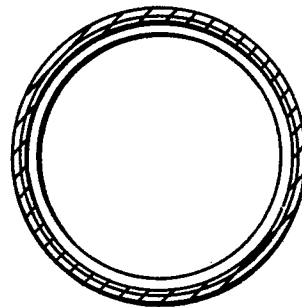


FIG. 8.





European Patent
Office

EUROPEAN SEARCH REPORT

0094156

Application number

EP 83 30 2109

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. ³)
A	US-A-3 390 531 (JOHNSTON) * Column 2, lines 27-72; column 3, lines 1-58; figure 4 *	1-5,9	E 02 B 17/00 E 04 B 1/58
A	--- US-A-3 134 235 (PARKER) * Column 3, lines 55-75; column 4, lines 1-50; figures 6-11 *	1,6,8,9	
A	--- NL-A-7 111 008 (MARCON) * Pages 4,5; figure 1 *	1	
A,D P	--- GB-A-2 096 673 (PLATFORM SERVICE SA)		
A	--- OIL & GAS JOURNAL, vol. 77, no. 18, April 1979, pages 196-211, Tulsa, USA D. BYNUM: "General guidelines given for tubular joint design" -----		TECHNICAL FIELDS SEARCHED (Int. Cl. ³) E 02 B E 04 B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 28-07-1983	Examiner HANNAART J.P.
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	