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(12) # EUROPEAN PATENT APPLICATION

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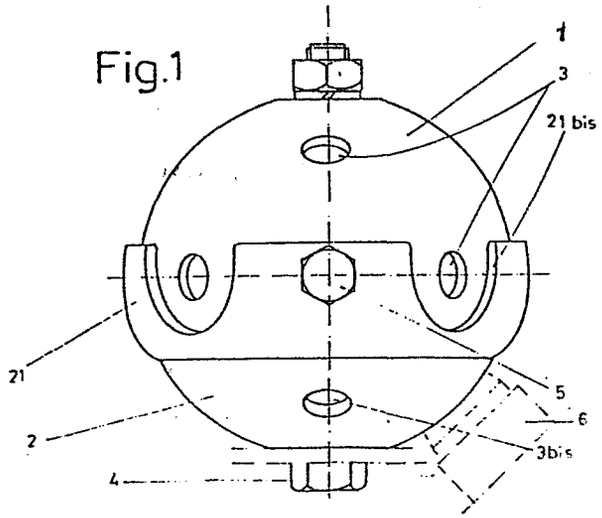
(54) **Spacial structure.**

(57) A spacial structure comprising equidistantly positioned knuckles, a set of sections, (6) and means (16) for joining either end of said sections to said knuckles, where each knuckle is made up from two hollow base pieces (1) (2) whose outside shape is approximately that of a special shell in which there is a number of equidistantly positioned holes (3) at an angular distance of α with respect to one another, and where at least one of said base pieces possesses a perimeter area which is bent inwards, (12) and comprising means of attachment (5) between the first base piece and the second base piece which, upon being joined together and forming the knuckle of the special structure, allow all the equidistantly positioned holes to lie at an angular distance of α with respect to one another.

Fig.1



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"SPACIAL STRUCTURE"

Spacial structures that comprise a number of sections whose ends are joined to a number of knuckles to make reticular spacial structures are known.

In particular, the spacial structure whose knuckles are comprised of solid balls to which tubular sections are joined is known.

The spacial structure whose knuckles are comprised of two spherical shells joined together by means of external fins is also known.

The chief drawback with the first of the aforementioned systems lies in the difficulty on site with joining the tubular sections to a solid ball, and so it can only be worked on from the outside.

The second of the systems mentioned presents the serious difficulty of the fins for joining to the spherical shells, which imposes enormous restrictions upon the reticular assembly of the relevant tubular members.

The purpose of this Patent overcomes these disadvantages by developing a knuckle that is comprised of two internally hollow parts with no outside protrusions to restrict reticulation.

The spacial structure covered by this invention, which is comprised of equidistantly positioned knuckles, an assembly of sections and means for joining these sections at each end to said knuckles, is peculiar because it is made up from:

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a) a first hollow base piece whose external shape is approximately that of a spherical shell in which there is a number of equidistantly positioned holes at an angular distance of α and with a perimeter area that is bent towards the inside,

b) a second hollow base piece whose external shape is approximately that of a spherical shell in which there is a number of equidistantly positioned holes at an angular distance of α ,

c) means of linkage between the first base piece and the second base piece which, upon being joined together, form the knuckle of the special structure, with all the holes being equidistantly positioned with respect to one another at an angular distance of α .

It is also peculiar because the second base piece possesses a bent perimeter area facing the bent area on the first base piece, making a joining area.

It is peculiar too because the bent area on the second base piece faces outwards.

It is also peculiar because the bent area on the second base piece faces inwards.

It is peculiar also because the means of linkage between the first base piece and the second base piece comprise a strength member in internal contact with the poles of both spherical shells, and means for tightening the strength member up against the poles.

It is peculiar too because the means for tightening comprise a stud which running through the middle of the strength member, goes through both spherical shells, and has a stop on one end, and a thread for tightening on

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the other.

It is peculiar moreover because the means of linkage between the first base piece and the second base piece are comprised of threaded screws at the joining area.

It is also peculiar because one of the base pieces possesses protrusions which engage inside grooves provided for the purpose in the joining area upon the other base piece.

It is peculiar too because the means for joining the sections to the knuckles are comprised of:

a) a single-piece element with inside thread and rigidly attached to the section to be joined, and with its face supported upon the outer wall of a base piece.

b) a pressure screw whose head rests against the inner wall of a base piece and whose body, after going through one of the equidistantly positioned holes, is threaded into the single-piece element.

It is peculiar furthermore because the contact areas between the single-piece element and the base piece, and the screw head and the base piece are spherical.

It is also peculiar because the single-piece element in revolution has at least one side surface which is shaped like a conical frustrum.

In order to provide a better understanding of the invention, drawings are attached to show a preferred practical construction thereof, this being subject to those minor alterations which do not affect the basic features, and wherein:

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Figure 1 is an elevational view of a knuckle as covered by the invention, where the lower base piece joining area covers the equator of the knuckle, and where the screwed attachment between the two parts is effected upon said equator.

Figure 2 is a section of the screwed attachment when same is effected below the equator.

Figure 3 is a section of a knuckle where the screwed attachment is effected on the flat part of the joint area.

Figure 4 is a section showing the joining of the two base pieces by means of protrusions.

Figure 5 is a section of the joint between a section member and a base piece.

The knuckle is comprised of two base pieces (1) and (2).

Generally, base piece (1) is larger than base piece (2), giving an asymmetrical joint, but it is perfectly feasible for both pieces to be practically alike.

The outside shape of the two base pieces is that of a spherical shell in order that its external form in the coupling is approximately a sphere.

Holes (3) provided upon each of the spherical shells are equidistantly positioned with respect to one another, and there is an angle α_1 between the adjoining edges of the different spherical shells when they lie together. (See Figure 3).

These holes (3) form part of the joint between the spacial knuckle and sections (6).

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Said angles α_1 can be altered for each knuckle and each different structure.

The first base piece (1) possesses a perimeter area (12) which is bent upon itself and is provided with open holes (13) which are preferably threaded.

Said holes (13) form part of the joint between the two base pieces (1) and (2).

The other base piece (2) possesses in turn a lip (21) into which engages the lip (12) provided on base piece (1).

In these drawings, the lip (21) is shown as engaging externally with lip (12), but the invention also includes the idea wherewith lip (21) is given a similar shape to lip (12), so that the two can engage together by means of protrusions like those depicted in Figure 4.

Base piece (2) is provided with slots (21 bis) which facilitate the engagement and joining with sections (6).

Base piece (2) is furthermore provided opposite the holes (13) on base piece (1), with open holes (13 bis), and joining screw (5) is housed in said holes (13) and (13 bis).

Base piece (2) is moreover provided with protrusions (30) which engage in slots (31) arranged in base piece (1) (See Figure 4), although it is more logical to think of the reverse construction.

The knuckle of this spacial structure is completed with a strength member (7), which may be a tubular section one of whose ends abuts against the inside of poles (11) and (22).

A stud (71) is provided inside said tube (7), whose

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head (23) abuts against pole (22), and by means of nut (4), it abuts under pressure against pole (11), thus helping to secure base pieces (1) and (2) against one another.

Figure 5 shows a single-piece element (16) in revolution (16) which is weld (15) attached to tubular section (6).

Said single-piece element (16) possesses a conical frustrum side surface in order for it to suit different diameters of tube (6).

The tightening screw (20) possesses a head (8) which, either directly or by means of a widened area (9) or an additional member such as a washer having the same shape, is offered to the inside surface of base piece (1), (2). The contact face of the widened area (9) is spherical so as to facilitate contact.

The single-piece element (16) possesses a face (10) which is offered to the outside face of the same base piece (1), (2), and said contact face is spherical as well for the reasons given.

Screw (20) and single-piece element (16) are threaded together in engagement, thus accomplishing the joint between tubular section (6) and base piece (1), (2).

The desig can also be such that the side surface (14') adjacent to the joining face (10) is shaped as a conical frustrum, thus preventing said contact face (10) from needing to be excessively large.

It is to be noted that the joining means comprised (a) of the strength member (8) with its stud (71) and fittings, and (b) of screw (5) in the engagement area, can be used either individually or together, and the presence of protrusions (30) is always optional. ../...

C L A I M S.

1. A spacial structure which is comprised of equidistantly positioned knuckles, a set of sections, and means for joining each end of said sections to said knuckles, peculiar inasmuch that it is constructed from:

a) a first hollow base piece whose outside shape is approximately that of a spherical shell, which is provided with a series of equidistantly positioned holes at an angular distance of α with respect to one another, and whose perimeter area is bent inwards,

b) a second hollow base piece whose outside shape is approximately that of a spherical shell, which is provided with a series of equidistantly positioned holes at an angular distance of α with respect to one another,

c) means of joining between the first base piece and the second base piece which, upon being joined, form the knuckle of the spacial structure, where all the holes are equidistantly positioned at an angular distance of α with respect to one another.

2. A spacial structure in full accordance with the aforegoing claim and peculiar wherewith the second base piece possesses a bent perimeter area which faces the bent area on the first base piece so as to comprise a joining area.

3. A spacial structure in accordance with the second claim above, and peculiar insofar as the bent area on the second base piece faces outwards.

4. A spacial structure in accordance with the second claim above, and peculiar insofar as the bent area on the second base piece faces inwards.

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5. A spacial structure in accordance with the second claim above, and peculiar inasmuch that the means of joining between the first base piece and the second base piece are comprised of a strength member in internal contact with the poles of both spherical shells, and of means for tightening said strength member against said poles.

6. A spacial structure in full accordance with the fifth claim above and peculiar insofar that said means of joining are comprised of a stud which, passing through the inside of the strength member, goes through both spherical shells, with a stop on one end and a thread for tightening on the other.

7. A spacial structure in full accordance with claims one to five above, and peculiar insofar that the means of joining between the first base piece and the second base piece comprise threaded screws in the joining area.

8. A spacial structure in accordance with the preceding claims, and peculiar wherewith one of the base pieces possesses protrusions which engage with slots provided in the joining area on the other base piece.

9. A spacial structure in accordance with the first claim above, and peculiar inasmuch that the means for joining the sections to the knuckles are comprised of:

a) a single-piece element which is internally threaded and rigidly attached to the section to be joined, with its face resting upon the outer face of a base piece,

b) a tightening screw whose head rests upon the inner face of a base piece and whose body goes through one of the equidistantly positioned holes and is then engaged by threading into the single-piece element.

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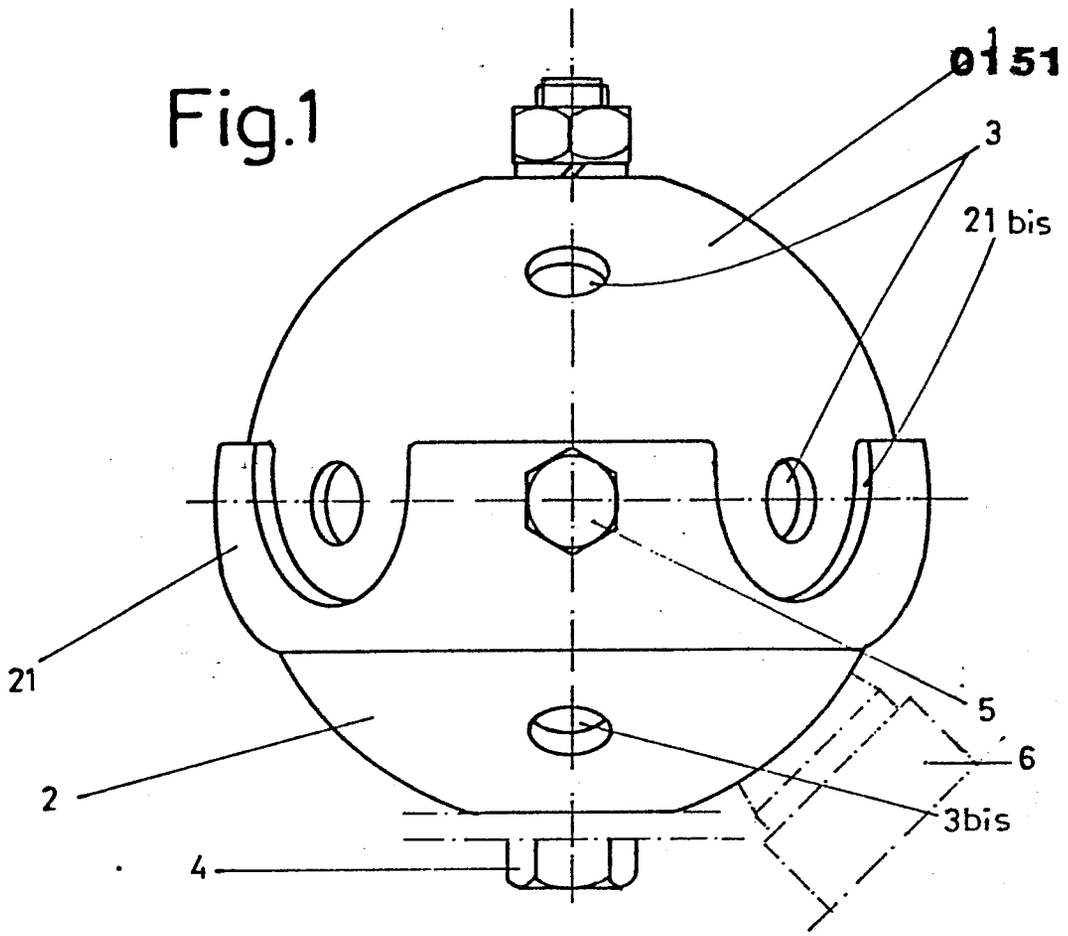
10. A spacial structure, in accordance with the aforegoing ninth claim, and peculiar insofar that the contact areas between the single-piece element and the screw head on the one hand, and the base piece on the other, are spherical.

11. A spacial structure in accordance with the ninth claim above, and peculiar insofar that the single-piece element is in revolution with at least, one side surface shaped like a conical frustrum.

Fig.1



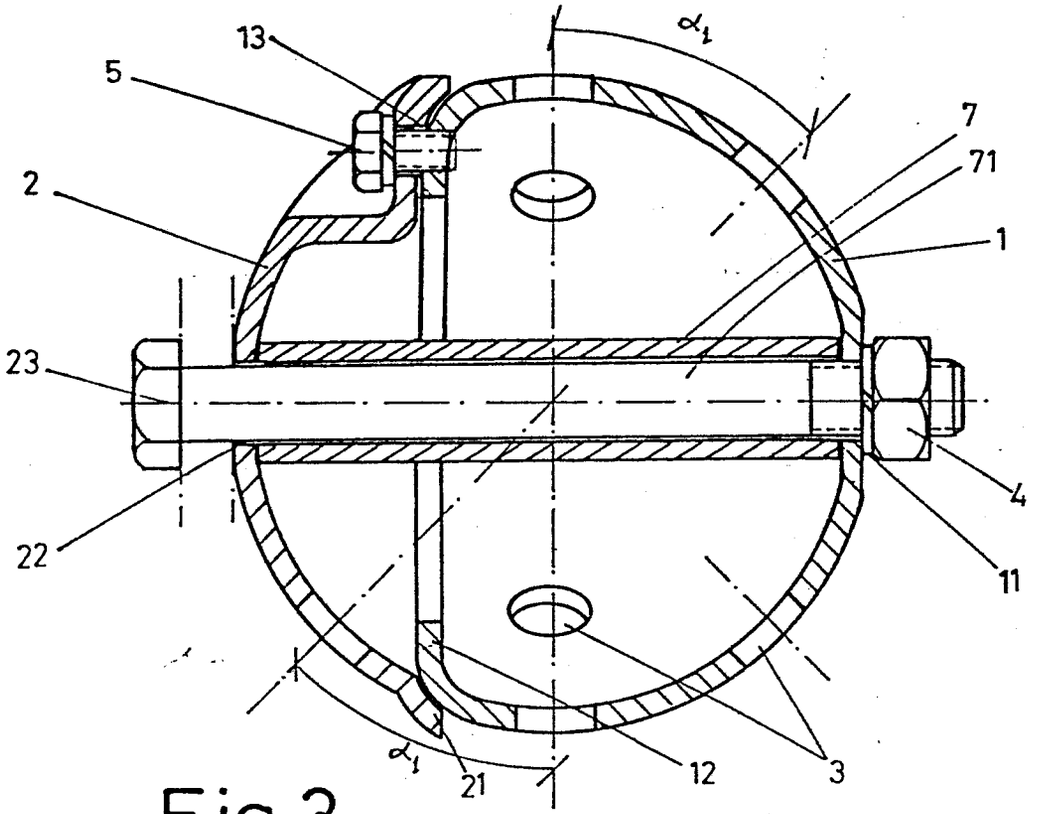


Fig.3

Fig.2

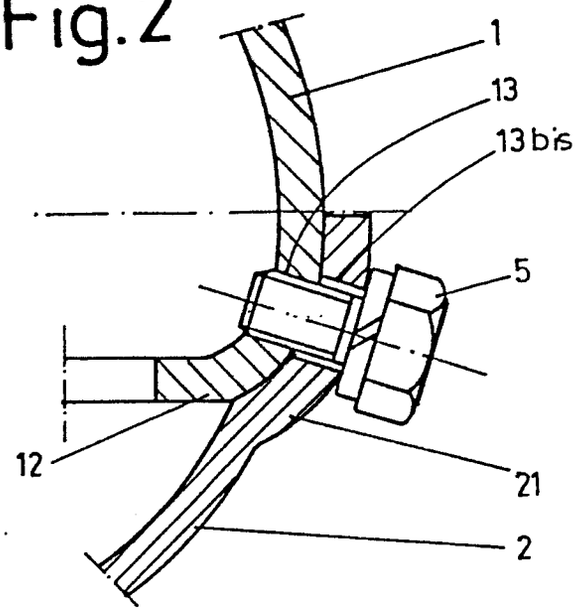
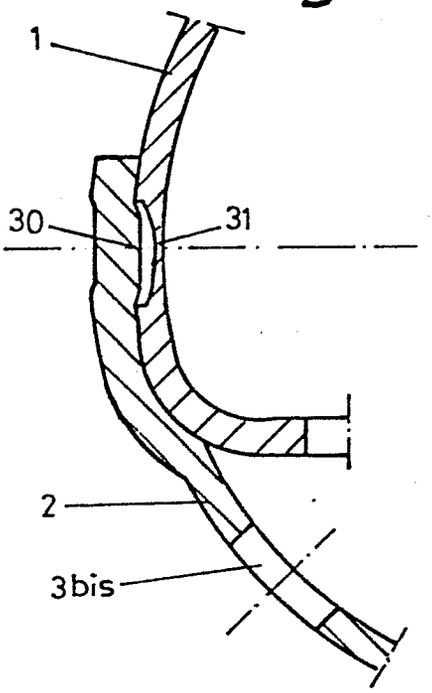


Fig.4



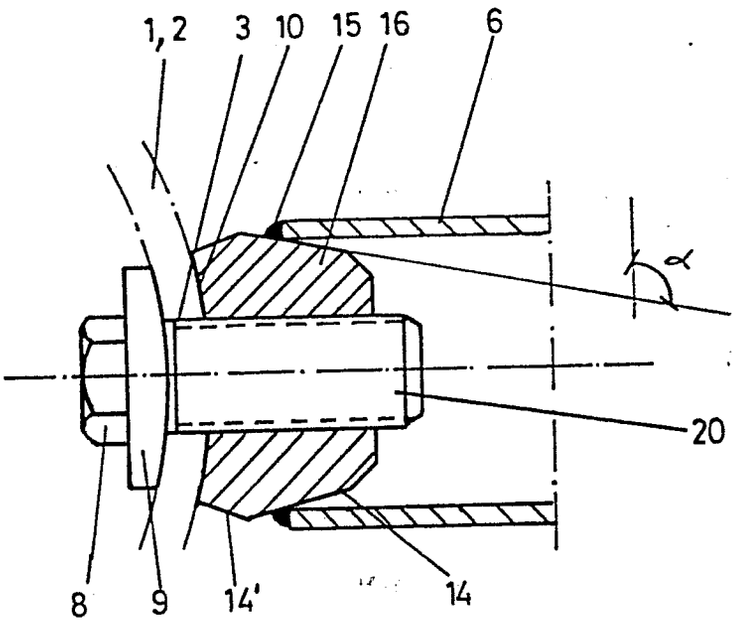


Fig.5

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EUROPEAN SEARCH REPORT

0151845
Application number

EP 84 30 0893

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)
X	EP-A-0 081 608 (PFEIFER SEIF- UND HEBETECHNIK GmbH & CO.) * Page 8, lines 3-16; figure 3 *	1,5	E 04 B 1/19
Y		2,3,9	
X	FR-A-2 452 628 (DU CHATEAU) * Page 1, lines 16-34; figures *	1	
Y	DE-A-1 775 125 (HEROLD) * Page 5, lines 1-5; figure 1 *	2,3	
Y	FR-A-1 417 285 (VALLOUREC) * Page 1, last paragraph; page 2, paragraph 1; figure 7 *	9	
A		11	TECHNICAL FIELDS SEARCHED (Int. Cl. ³) E 04 B 1/00 E 04 B 7/00 F 16 B 7/00
A	US-A-4 027 449 (CILVETI) * Column 4, lines 34-42; figure 5 *	7	
A	DE-A-3 133 946 (MÖBIUS) * Page 5, paragraph 1; figure 1 *	10	

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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
THE HAGUE	01-10-1984	LAUE F.M.

CATEGORY OF CITED DOCUMENTS

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Application number

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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	FR-A-1 476 749 (COMPAGNIE DES COMPTEURS) * Page 1, column 1, last paragraph; column 2, paragraph 1; figure 3 *	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

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