(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
22 November 2001 (22.11.2001)

PCT

(10) International Publication Number
WO 01/88398 A1

(51) International Patent Classification[7]: F16D 3/56, 3/64, 3/74

(21) International Application Number: PCT/NO01/00194

(22) International Filing Date: 11 May 2001 (11.05.2001)

(25) Filing Language: Norwegian

(26) Publication Language: English

(30) Priority Data:
20002503 15 May 2000 (15.05.2000) NO

(71) Applicant *(for all designated States except US)*: **ENGINEERING & DRILLING MACHINERY AS** [NO/NO]; Herikstadveien 25, N-4349 Bryne (NO).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **EILERTSEN, Björn** [NO/NO]; Hundvåg Ring 11, N-4085 Hundvåg (NO).

(74) Agent: **REISTAD, Gunnar, O.**; Bryns Zacco AS, P.O. Box 765, Sentrum, N-0106 Oslo (NO).

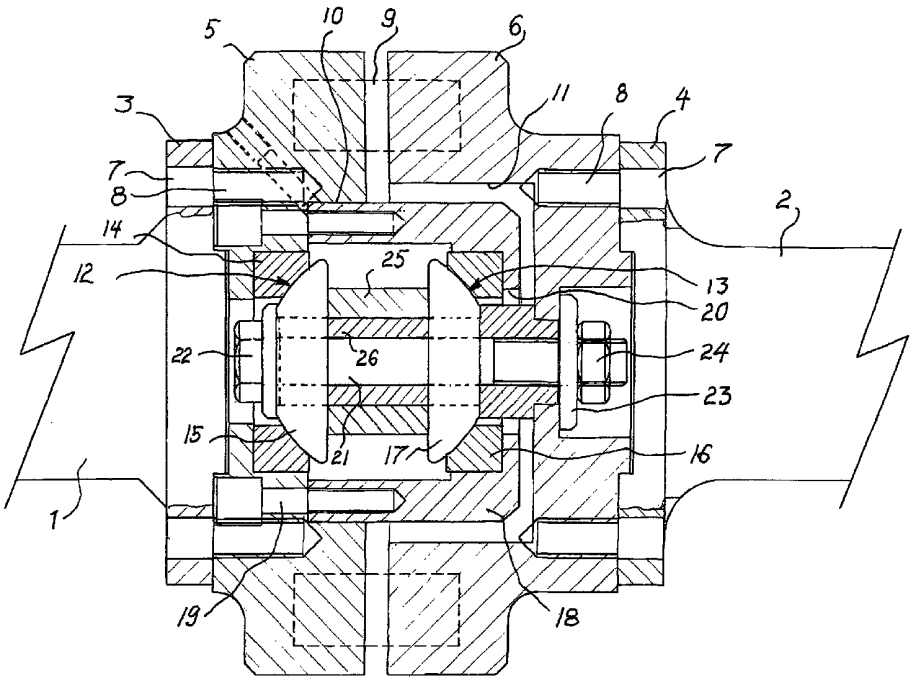
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: FLEXIBLE SHAFT COUPLING



(57) Abstract: A flexible shaft coupling is provided with a ball joint (12, 13) in the form of two spherical bearings which are so arranged that their bearing faces each form a part of a spherical surface whose centre is centrally positioned between the two coupling halves (5, 6) of the shaft coupling.

WO 01/88398 A1

FLEXIBLE SHAFT COUPLING

The present invention relates to a flexible shaft coupling, comprising a first coupling member attached to a first shaft, a second coupling member attached to a second shaft, which two coupling members are arranged directly opposite each other and spaced apart in the direction of the shaft, one or more flexible members in engagement with the two coupling members for transmission of a torque between the coupling members, and a ball joint disposed between the two coupling halves.

Flexible shaft couplings of this type are used when it is desirable to have a certain flexibility between the two interconnected shafts, while the coupling should, at least to a certain extent, be capable of taking axial forces.

It is an object of the invention to provide a flexible shaft coupling, especially for rather large, so-called heavy drive mechanisms, for example, for driving pinions in rack-drilling rigs, which shaft coupling can serve to assure flexibility and straightness and transmission of compressive and tensile forces with minimal movement in the torque part of the coupling, and especially when using standard components to provide the ball joint.

According to the invention, there is therefore proposed a flexible shaft coupling as mentioned above in the introduction, characterised in that the ball joint comprises two spherical bearings so arranged that their bearing faces each form a part of a spherical surface the centre of which is centrally positioned between the two coupling halves.

It is of particular advantage if one of the spherical bearings can be arranged in the bottom of a cup-shaped body the rim of which is attached to the first coupling half, the two spherical bearings being held apart from one another within the cup part by means of a sleeve aligned in the direction of the shaft between the convex bearing portions of the two spherical bearings, which bearing portions are held together by a bolt running through the sleeve and attached to the second coupling half.

In a flexible shaft coupling of this kind it is advantageous to use standard spherical bearings which, with some simple adjustments, can be utilised to provide the ball joint centrally in the coupling.

The invention will now be explained in more detail with reference to the drawing which shows a section through a preferred embodiment of the new flexible shaft coupling.

The two shafts that are to be connected by means of the flexible shaft coupling are indicated by the reference numerals 1 and 2 respectively. The first shaft 1 has an end flange 3 and the second shaft 2 has an end flange 4. The coupling itself consists of a first coupling half 5 and a second coupling half 6, the first coupling half 5 being connected to the first end flange 3 and the second coupling half 6 being connected to the second end flange 4. In order to provide the connection between the end flanges and the coupling halves, bolt holes 7 that are aligned with threaded bores 8 in the respective coupling half are made in a known way per se in the end flanges 3, 4. The threaded bolts that are used for the connections between the end flanges and the coupling halves have not been included in the drawing.

Rubber members 9, shown in broken lines on the drawing, are disposed between the two coupling halves 5, 6 in a known way. These rubber members 9 serve to transmit torque. Of course, many torque-transmitting members that are known per se could be used here.

As shown, the two coupling halves 5, 6 are hollowed out 10, 11, so that a space is formed between them to provide room for the ball joint, which in this case is formed of two spherical bearings 12 and 13. The spherical bearing 12 is made of a bearing ring 14 having a concave bearing face and of a spherical segment 15 which constitutes the convex bearing portion. Similarly, the spherical bearing 13 is made of a bearing ring 16 and a spherical segment 17. The two bearing rings 14, 16 are alike and thus are interchangeable, and the same is true of the spherical segments 15, 17.

The bearing ring 14 lies in the first coupling half 5, whilst the bearing ring 16 lies in the bottom of a cup-shaped part 18. On its opening side, the cup-shaped part 18 is connected to the first coupling half 5 by means of screw bolts 19 (the screw holes 8 and the bolts 19 are shown in the same plane in the drawing, but are of course offset in the practical embodiment so that they do not overlap). Cut out in the bottom of the cup-shaped part 18 is an opening 20, for the insertion of a bolt 21 the head 22 of which rests against the spherical segment 15, and the shank of which is passed through the bottom opening 20 of the cup body and through a washer 23, and is tensioned by means of a nut 24. Disposed between the two spherical segments 15, 17 is a spacer sleeve 25 that is machined with exactitude so that the two spherical segments 15, 17 screwed together as

shown form parts of an ideal sphere. Placed around the bolt 21 is an inner sleeve 26 which centres the spacer sleeve 25.

From the drawing and accompanying description, it will be understood that the theoretical sphere is composed of two spherical, preferably standard bearings that are spaced apart by a spacer sleeve in such manner that the bearing faces of the two spherical bearings each form a part of a spherical surface. The coupling can transmit thrust load in both directions, and at the same time it is self-aligning. The couplings are made so that the centre of the "sphere" is also the centre of the torque transmission. This means that there is minimal movement in the torque part of the coupling, which in turn serves to reduce wear in the coupling.

Patent claims

1.

A flexible shaft coupling, comprising a first coupling half (5) attached to a first shaft (1);

a second coupling half (6) attached to a second shaft (2);

which two coupling halves (5, 6) are arranged directly opposite one another and spaced apart in the direction of the shaft;

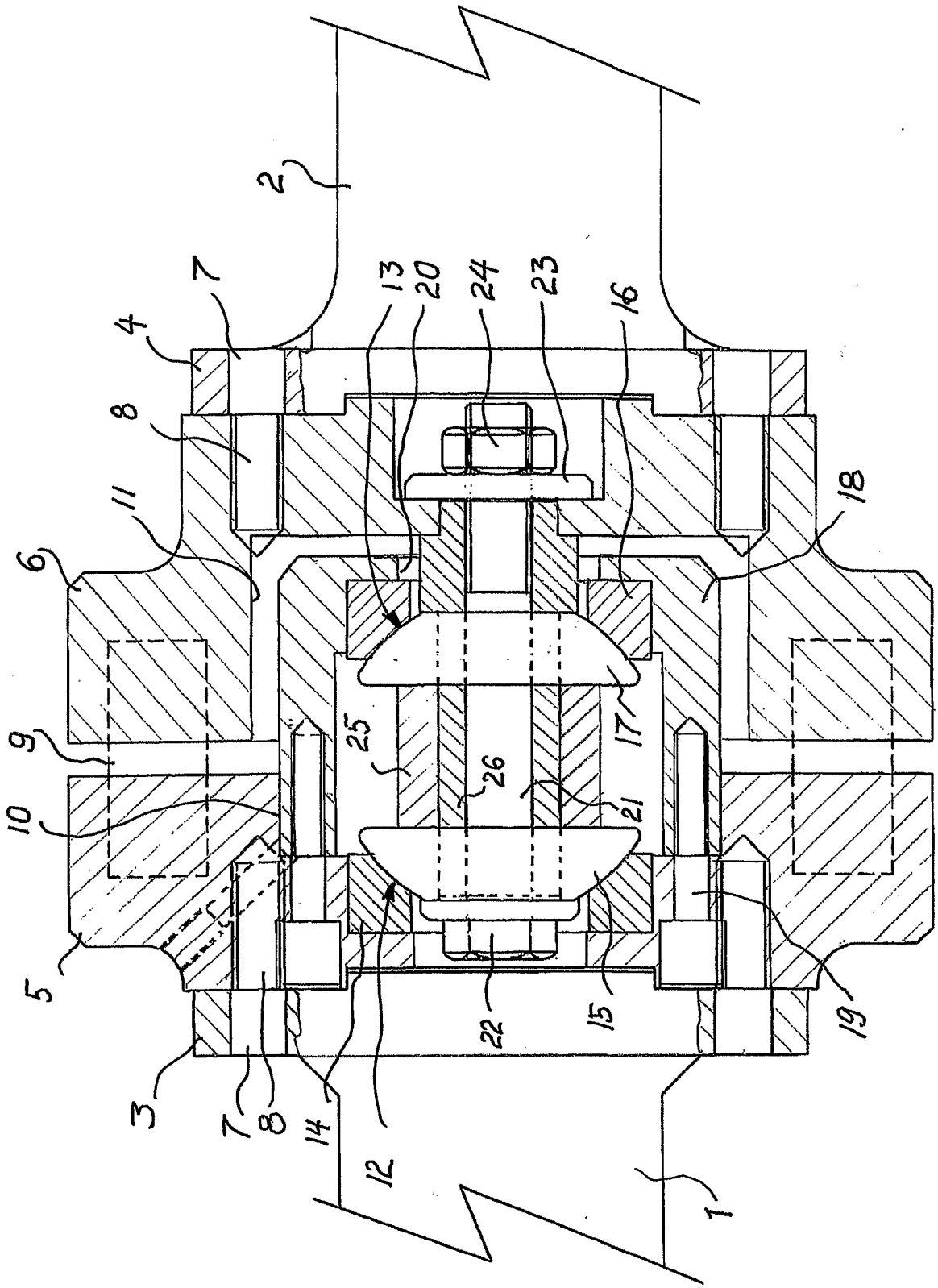
one or more flexible members (9) in engagement with the two coupling halves (5, 6) for transmission of a torque between the coupling halves (5, 6) and a ball joint (12, 13) disposed between the two coupling halves (5, 6), characterised in that

the ball joint comprises two spherical bearings (12, 13) so arranged that their bearing faces each form a part of a spherical surface whose centre is centrally positioned between the two coupling halves (5, 6).

2.

A flexible shaft coupling according to claim 1, characterised in that

one of the spherical bearings (13) is arranged in the bottom of a cup-shaped body (18) the rim of which is attached to the first coupling half (5), and that the spherical bearings (12, 13) are held apart by a sleeve (25) aligned in the axial direction of the shaft between the convex bearing parts (15, 17), which are held together by a bolt (31) running through the spacer sleeve (25) and attached to the second coupling half (6).


2
7
13
20
24
23
16
4
8
11
18
6
9
25
26
17
21
10
5
22
15
19
3
7
8
14
12
1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 01/00194

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: F16D 3/56, F16D 3/64, F16D 3/74
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: F16D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2171999 A (A. WEILAND), 5 Sept 1939 (05.09.39), figure 1	1,2
	--	
X	US 3531949 A (H.A. DOWNEY), 6 October 1970 (06.10.70), figures 1,2	1
	--	
X	US 3678707 A (ULICS), 25 July 1972 (25.07.72), figure 1	1
	--	

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 August 2001	06 -09- 2001
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Jan-Axel Ylivainio / JA A Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

Inf(nembers 02/08/01

International application No.
PCT/NO 01/00194

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2171999 A	05/09/39	NONE	
US 3531949 A	06/10/70	CA 927620 A	05/06/73
US 3678707 A	25/07/72	CA 954320 A	10/09/74
		DE 2143270 A,B,C	23/03/72
		GB 1315786 A	02/05/73
		JP 51024049 B	21/07/76