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

(19) World Intellectual Property Organization
International Bureau

PCT

(43) International Publication Date
9 November 2006 (09.11.2006)

(10) International Publication Number
WO 2006/118465 A1

(51) International Patent Classification:
D07B 1/02 (2006.01) *D07B 1/14* (2006.01)

(21) International Application Number:
PCT/NO2006/000150

(22) International Filing Date: 25 April 2006 (25.04.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
20052107 29 April 2005 (29.04.2005) NO

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

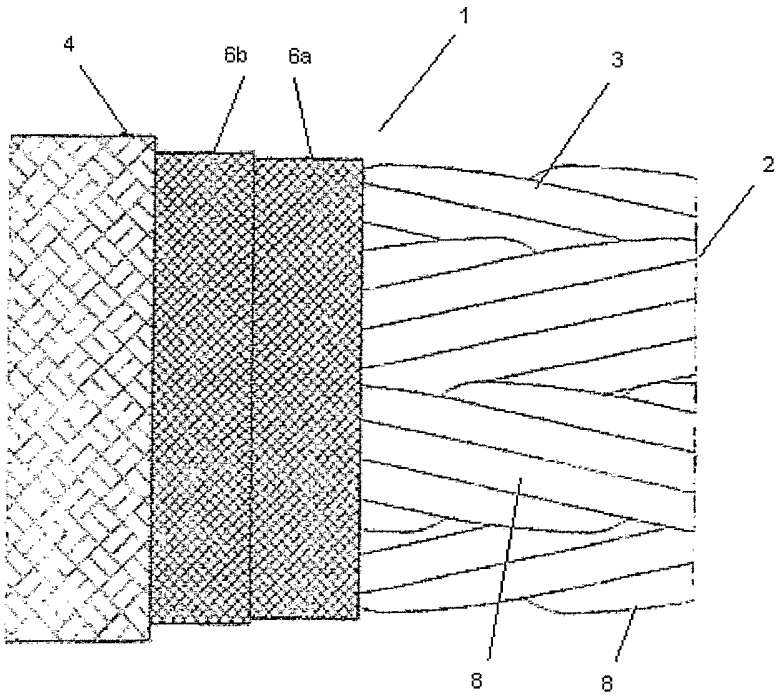
(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:
— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
— *of inventorship (Rule 4.17(iv))*

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: ROPE



(57) Abstract: The invention relates to a rope, and preferably a mooring rope. The rope comprises a core (2) of man-made fibres, a braided jacket (4) covering the core (2) and a particle barrier (5) between the core (2) and the braided jacket (4) . The particle barrier (5) comprises two layers (6) of filter material arranged onto the core (2) in such a way that the second layer (6b) is covering the firs layer (6a) .

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ROPE

The present invention relates to a rope and a method for manufacturing such rope.

Ropes or cables are commonly used for anchoring of boats, offshore installations and other floating installations. As the ropes must resist large tensions and heavy loading, they have most commonly been made of steel. However, as offshore installations are more and more situated in deep sea and will therefore need long ropes, such steel cables can have an undesired deadweight.

To meet these problems, fibre ropes are increasingly used to anchor offshore installations such as oil platforms and drilling rigs. Due to the large dimensions of the ropes and the limited time for anchoring the platform once it is placed in situ, it would in many cases be advantageous to pre-install the anchoring ropes by laying them down on the seabed to await the arrival of the platform. The ropes can then be directly connected to the platform from the seabed, limiting the vulnerability of the anchoring process due to weather changes, wave activity and the like. However this is generally not done because of the possibility of abrasive particles of mud or sand penetrating into the rope during this process. Such particles would over time wear down the rope, thereby undermining the load-bearing properties of the rope.

US patent 6,099,961 describes a synthetic rope, whereby the problem of penetrating particles can be reduced. A core is protected by an outer braided protective layer. Between the rope and the layer, a strip of polymer material is wound helically around the core. The polymer strip will prevent some articles from penetrating the rope, but will not act as a full barrier against any particles affecting the rope as the polymer strip will not be completely covering the

core as the rope is moved during the anchoring operations and also due to sea currents affecting rope on the seabed.

In order to be effective however, any protective measure must prevent rather than reduce particle penetration of the rope. Particularly in the case of drilling rig moorings, one must offer protection over an extended time period and for multiple deployments. The anchoring system must also continue to provide protection if damaged.

The object of the present invention is to present a mooring rope which is not penetrated by particles. It is also an object of the invention to present a rope which is safe to use in large-scale anchoring operations where the rope is laid down on the seabed prior to anchoring an offshore installation.

These and more objects are obtained by arranging two layers of filter material and an underlying additional layer around the core of a rope before covering the rope by an outer protective jacket.

The rope according to the invention, preferably being a mooring rope, comprises a core of man-made fibres, a braided jacket covering the core and a particle barrier between the core and the braided jacket. The particle barrier comprises two layers of filter material arranged onto the core in such a way that the first layer is covering the second layer.

The rope is advantageously provided with an underlying layer arranged on the core beneath the two layers of the particle barrier, where the underlying layer preferably is made of an absorbent material.

Furthermore, are the layers made of man-made fibres which are cut into a long strip which is being wound onto the core.

Further advantages, details, objects and effects of the invention will become apparant from the discussion below with reference to the figures where:

Fig. 1 shows a cross sectional view of a rope according to the invention,

Fig. 2 shows a side view of a mooring rope according to the invention.

The present invention consists of a mooring rope 1 composed of a load bearing core 2 of one or more man-made fibre sub-ropes 3 enclosed within a protective braided jacket 4 also of man-made fibre, as can be seen on figure 1 and 2.

The load bearing core 2 is made of one or more sub-ropes 3. A sub-rope 3 is normally made by assembling one or more strands 8. The strands are normally made of polyester fibres. The strands 8 can be assembled into sub ropes by braiding (interlacing) or by laying in a helical manner. One or more of these sub ropes are then axially aligned. In the core according to fig. 1, seven sub-ropes 3 are arranged in such a way that one central sub-rope is encircled by six outer sub-ropes. The laid construction outer sub-ropes are arranged is such a way that the direction of rotation is altering around the circumference of the core 2.

It should be noted that the core 2 can be made of any other materials such as polyamide, polypropylene, aramid, polyethylene, liquid crystal polymer, carbon fibre or any other high strength fibre.

In another embodiment, the core can be made of one central sub-rope. The rope can be of a braided or laid construction

A particle barrier 5 is arranged on the core 2 prior to covering the rope 2 by the protective jacket 4. The barrier

5 consists of two layers 6 of filter material, each layer of which is an effective particle barrier. The filter material can be a woven or non-woven construction of fibrous material.

The layers 6 are made using strips of filter material.

A first layer 6a is wounded onto the rope, mainly covering the core 2. The strip is wounded in such a way that it will form a helical spring around the core. The strip is preferably wounded onto the core 2 in such a way that the border of the strip is partly covering the already wounded layer, thereby forming a tight layer on the complete surface of the core 2.

A second layer 6b is wounded onto the first layer in the same way as the first layer 6a, thereby mainly covering the core 2 and the first layer 6a. An underlying layer 7 is intended to act as a safeguard should there be any problem with the outer layer, i.e the braided jacket 4 and the particle barrier 2.

However, the two layers could also be formed by a single winding with at least 50% overlap. It could also be made by having a double layer of material laid in line with the sub-ropes, but completely covering them.

Beneath the particle barrier 5 can be placed an underlying layer 7 of absorbent material, completely covering the core 2. In the event that the two layers 6 of filter material forming the particle barrier 5 are punctured, any particles of abrasive material passing through the layers 6 will be absorbed into the filter material of the underlying layer 7 before reaching the core.

Additionally the outer barrier layers 6 may have a coating of adhesive in order to secure it to the braided jacket 4,

thus inhibiting any migration which might occur with repeated bending or flexing of the rope.

Figure 2 shows a side view of a rope according to the invention. The core 2 is made of several sub-ropes 3. The sub-ropes 3 again are made of one or more strands 8 which, with respect to the direction of the wounding of the strands, will lie in altering directions.

When the rope is hanging between the seabed and the offshore installation or platform, it will be affected by sea currents, movement of the platform etc. The rope according to the invention can also be used in connection with steel cables. In these situations, it is important that the rope is rotationally compatible with the steel cable.

Both the barrier layers and the absorbent layer are water permeable thus the whole rope assembly is free flooding for cooling purposes.

Most of the presently known ropes rely on the barrier effect from a filter material. The material is introduced in order to prevent the damaging particles from reaching the load bearing core elements of the rope. This filter barrier is only effective so long as it remains intact. Damage to the filter can allow particles to penetrate into the core through the damaged area. Similarly, in a rope which is repeatedly handled and used, the spirally wound filter barrier can become displaced opening up gaps between adjacent windings.

The system according to the invention provides additional security in these cases since the underlying layer of material is not a barrier but an absorber. It will trap any particles that penetrate through a damaged or displaced barrier layer.

Patent Claims

1. A rope, and preferably a mooring rope, comprising a core (2) of man-made fibres, a braided jacket (4) covering the core (2) and a particle barrier (5) between the core (2) and the braided jacket (4),
c h a r a c t e r i s e d i n that
the particle barrier (5) comprises two layers (6) of filter material arranged onto the core (2) in such a way that the first layer (6a) is covering the second layer (6b).

2. A rope according to claim 1,
c h a r a c t e r i s e d i n that
an underlying layer (7) is arranged on the core (2) beneath the two layers (6) of the particle barrier, where the underlying layer (7) preferably is made of an absorbent material.

3. A rope according to claim 1 or 2,
c h a r a c t e r i s e d i n that the layers (6) are made of man-made fibres cut into a long strip being wound onto the core (2).

Fig. 2

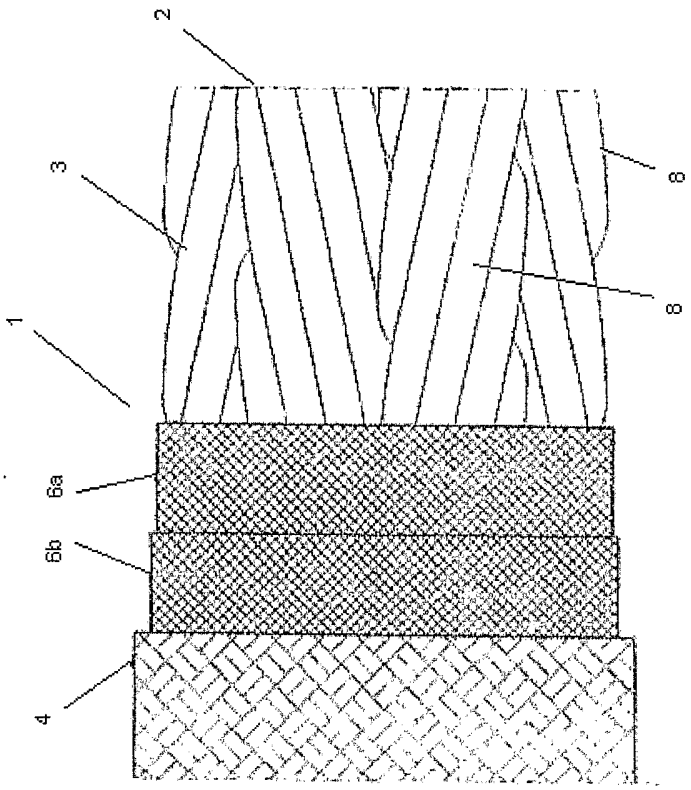
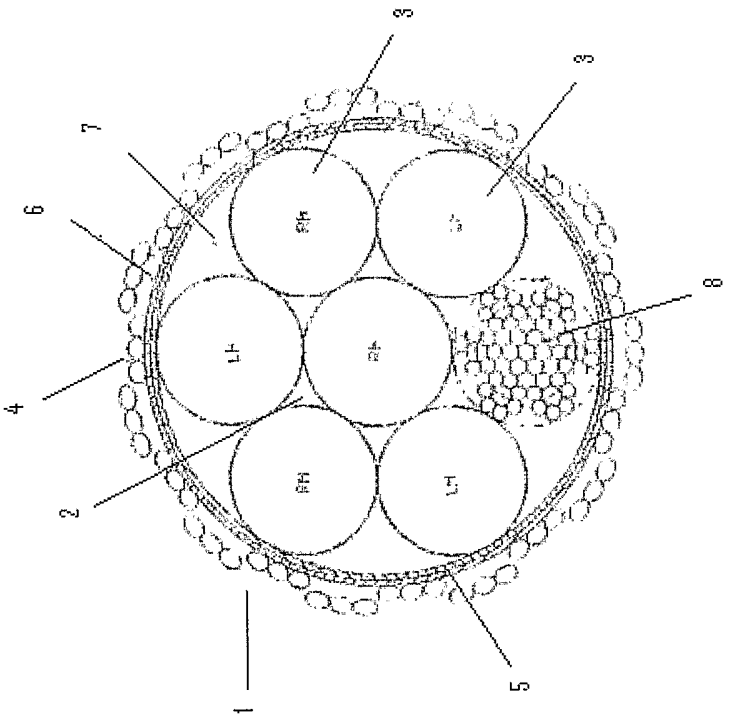


Fig. 1



INTERNATIONAL SEARCH REPORT

International application No
PCT/NO2006/000150

A. CLASSIFICATION OF SUBJECT MATTER
INV. D07B1/02 D07B1/14

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)
D07B

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	BE 1 013 590 A (BEXCO N.V.) 2 April 2002 (2002-04-02) page 1, line 5 - page 2, line 27 page 3, line 28 - page 5, line 19 page 7, line 10 - line 27	1-3
A	WO 99/01605 A (MARLOW ROPES LTD.) 14 January 1999 (1999-01-14) page 8, line 30 - page 9, line 22 page 6, line 9 - line 14	1-3
A	US 6 099 961 A (C.J.M. DEL VECCHIO; A.T. KOMURA) 8 August 2000 (2000-08-08) cited in the application column 4, line 12 - line 45	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

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Date of the actual completion of the international search	Date of mailing of the international search report
13 July 2006	20/07/2006

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/NO2006/000150

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