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(54) **AN ASSEMBLY FOR PROTECTING A FLEXIBLE TUBE AGAINST WEAR BY FRICTION**

ANORDNUNG ZUM SCHUTZ EINES BIEGSAMEN ROHRES VOR VERSCHLEISS DURCH
REIBUNG

ENSEMBLE DE PROTECTION D'UN TUBE FLEXIBLE CONTRE L'USURE PAR FROTTEMENT

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Description

[0001] The present invention relates to an assembly for protecting a flexible tube against wear by friction, particularly for protecting risers, jumpers or umbilicals in contact with stiffeners arranged in I-tubes.

Prior Art and Drawbacks of the Prior Art

[0002] As it is widely known, flexible tubes are connected to platforms (or tankers FPSOs - FSOs) and, short before reaching the platform, they pass inside a stiffener, which is fixed to a bell mouth of a steel tube, also called I-tube, see for example US 5,526,846, disclosing all features of the preamble of claim 1.

[0003] Due to the movement of the waves and of the tides, the flexible tube moves uninterruptedly and makes friction with the internal wall of the stiffener, which causes breakage of the external cover of the flexible tube. This fact may cause premature failure of the riser and, consequently, the operation has to be stopped for replacement of the tube, which entails very high expenses, as well as loss of profits with due to the stoppage of production. US 4,130,995 discloses a Vertically Moored Platform but is not concerned with the problem of stiffeners in I-tubes.

Objectives and Advantages of the Invention

[0004] The present invention has the objective of providing a protection for the flexible tube, which considerably increases its useful life, thus avoiding stoppages for maintenance and substantially reducing the expenditures and loss of profits, as well as possible environmental accidents.

[0005] This objective is achieved by means of a protector of a flexible tube against wear by friction, according to annexed Claim 1.

[0006] An antifriction layer may be arranged on the internal wall of the stiffener or on the external wall of the trumpet, while the friction layer may be of a synthetic material.

[0007] The above-cited flexible tube may be, for example, a riser, a jumper or an umbilical.

[0008] Thus, the assembly for protection against wear by friction according to the invention, as a great advantage, enables the flexible tube to have longer useful life than the flexible tubes arranged in I-tubes according to the prior art.

[0009] The invention will now be described in greater detail, by way of example, with reference to the attached figures.

- Figure 1 is a section view of an embodiment not being part of the invention; and
- Figure 2 is a section view of a second embodiment not being part of the invention; and

- Figures 3 to 6 show two embodiments of the invention using a removable trumpet.

[0010] Figure 1 shows an I-tube 1, at the end of which a bell mouth 2 may be fixed. A stiffener 3, with a trumpet 4 fixed to its upper end, is partially arranged inside the I-tube 1. A flexible tube 5 passes inside the stiffener 3 and an annular piece 6, which may be, for example, a collar or a retractile ring, is fixed to said flexible tube 5. The stiffener 3 is mounted on the annular piece 6 and, in this way, it remains integral with the flexible tube and may follow all the movements of the latter. The stiffener 3 further presents a centralizer 7, which rests against the internal wall of the I-tube 1 and guides the displacements of the stiffener 3 inside the I-tube 1.

[0011] The fixation of the stiffener/trumpet to the flexible tube 5 may be effected by means of a split friction collar 6, installed directly in the flexible tube, with or without the use of a centralizer, or may be made by using a retractile ring installed directly in the insert of the stiffener 3 either inside or outside it.

[0012] Figure 2 shows a second embodiment, where one can see the I-tube 1, which may have a bell mouth 2 at the end. This figure further shows the stiffener 3 with the trumpet 4 inside it and the flexible tube 5 passing inside the stiffener and the trumpet 4. The stiffener 3 is fixed to the I-tube 1 and the trumpet 4 has, on the internal wall, a friction layer 8 that keeps the trumpet integral with the flexible tube 5 by friction. At least two elastic elements 9 arranged between the internal wall of the stiffener 3 and the external wall of the trumpet 4 actuate on an annular shoulder 10 of the trumpet 4 and guarantee the axial movement and the respective return of the trumpet 4. One further observes, in this figure, the antifriction layer 11, arranged between the internal wall of the stiffener 3 and the external wall of the trumpet 4.

[0013] A solution according to the invention may be reached using a removable trumpet. This trumpet 4 may be inserted inside of the stiffener 3. This removable trumpet can be steel covered (lining) with a low friction coefficient material 11, as shown in figures 3 and 4 or be totally constituted with a low friction coefficient material 12 (except the metallic topside split fixing part), as shown in figures 5 and 6. So, as the split trumpet has at its internal part a low friction material, which will be in contact with the tube outer sheath, the wear will be reduced.

[0014] Among the materials of low friction coefficient we have as example the teflon and their variations, nylon, polyurethane, etc.

[0015] Furthermore, the trumpet may be a split trumpet in two part. As the split trumpet is removable it can be removed from time to time and inspected in order to observe if the low friction material still have a thickness that wont allow the tube outer sheath wear. But if this thickness is considered reduced, this trumpet could be substituted by a new one. This operation can be done with the tubes already installed offshore without stopping the line work. So the expenses and income losses reducing

is great and the wear at the tube outer sheath could be controlled and reduced.

[0016] There are topside metallic parts made with bolts that has the function of holding the internal part of the split trumpet and also perform the closure of the split parts. The metallic parts could be painted or protected with any kind of metallic corrosion treatment. The Split Removable Trumpet for Bending Stiffeners can be installed/reinstalled onshore or offshore.

[0017] In addition to the embodiments presented before, the same inventive concept may be applied to other alternatives or possibilities of use of the invention. Thus, it will be understood that the present invention should be interpreted in a broad way, its comprehension being determined by the terms of the accompanying claims.

Claims

1. A protecting assembly being located between the external surface of a flexible tube (5) and the internal wall of an I-tube (1), comprising a stiffener (3) fixed to the I-tube and in contact with the external surface of the flexible tube (5),
characterized by further comprising:
 - a trumpet (4) in contact with the external surface of the flexible tube (5), the trumpet (4) being inserted inside the upper end of the stiffener to extend it longitudinally, the trumpet being fixed to the stiffener (3), the inner surface of the trumpet (4) having antifriction properties, whereby the flexible tube is rotary and axially movable relative to said internal wall.
2. A protecting assembly according to claim 1, further **characterized in that** the trumpet (4) comprises an antifriction layer (11).
3. A protecting assembly according to claim 1, further **characterized in that** the trumpet (4) comprises a removable internal longitudinal part (12) in contact with the flexible tube, said internal part (12) being made of low friction coefficient material.
4. A protecting assembly according to anyone of claims 1 to 3, further **characterized in that** the flexible tube (5) is a riser or a jumper.
5. A protecting assembly according to anyone of claims 1 to 3, further **characterized in that** the flexible tube (5) is a an umbilical.

Patentansprüche

1. Schutzanordnung, die zwischen der Außenfläche eines flexiblen Rohres (5) und der Innenwand eines I-

Rohres (1) angeordnet ist und ein Versteifungselement (3) umfasst, das an dem I-Rohr befestigt ist und mit der Außenfläche des flexiblen Rohres (5) in Kontakt steht,

dadurch gekennzeichnet, dass sie des Weiteren Folgendes umfasst:

ein Trichterrohr (4) in Kontakt mit der Außenfläche des flexiblen Rohres (5), wobei das Trichterrohr (4) in das obere Ende des Versteifungselements eingeführt ist, um es in der Längsrichtung zu verlängern, wobei das Trichterrohr an dem Versteifungselement (3) befestigt ist, wobei die Innenfläche des Trichterrohres (4) reibungsmindernde Eigenschaften aufweist, wodurch das flexible Rohr rotational und axial relativ zu der Wand beweglich ist.

2. Schutzanordnung nach Anspruch 1, die des Weiteren **dadurch gekennzeichnet ist, dass** das Trichterrohr (4) eine reibungsmindernde Schicht (11) umfasst.
3. Schutzanordnung nach Anspruch 1, die des Weiteren **dadurch gekennzeichnet ist, dass** das Trichterrohr (4) einen herausnehmbaren inneren longitudinalen Teil (12) umfasst, der in Kontakt mit dem flexiblen Rohr steht, wobei der innere Teil (12) aus einem Material mit niedrigem Reibungskoeffizienten besteht.
4. Schutzanordnung nach einem der Ansprüche 1 bis 3, die des Weiteren **dadurch gekennzeichnet ist, dass** das flexible Rohr (5) ein Steigrohr oder ein Überbrückungsrohr ist.
5. Schutzanordnung nach einem der Ansprüche 1 bis 3, die des Weiteren **dadurch gekennzeichnet ist, dass** das flexible Rohr (5) ein Versorgungsrohr ist.

Revendications

1. Ensemble de protection situé entre la surface externe d'un tube flexible (5) et la paroi interne d'un I-tube (1), comprenant un raidisseur (3) fixé sur le I-tube et en contact avec la surface externe du tube flexible (5),
caractérisé par le fait qu'il comprend, en outre :

un cornet (4) en contact avec la surface externe du tube flexible (5), le cornet (4) étant inséré à l'intérieur de l'extrémité supérieure du raidisseur afin de s'étendre longitudinalement, le cornet étant fixé sur le raidisseur (3), la surface interne du cornet (4) présentant des propriétés antifriction, de telle sorte que le tube flexible peut tourner et se déplacer axialement par rapport à la-

dite surface interne.

2. Ensemble de protection selon la revendication 1, **caractérisé, en outre, en ce que** le cornet (4) comprend une couche antifriction (11). 5
3. Ensemble de protection selon la revendication 1, **caractérisé, en outre, en ce que** le cornet (4) comprend une partie longitudinale interne amovible (12) en contact avec le tube flexible, ladite partie interne (12) étant réalisée en matériau à faible de coefficient de frottement. 10
4. Ensemble de protection selon l'une quelconque des revendications 1 à 3, **caractérisé, en outre, en ce que** le tube flexible (5) est une conduite ascendante ou de jonction. 15
5. Ensemble de protection selon l'une quelconque des revendications 1 à 3, **caractérisé, en outre, en ce que** le tube flexible (5) est un ombilical. 20

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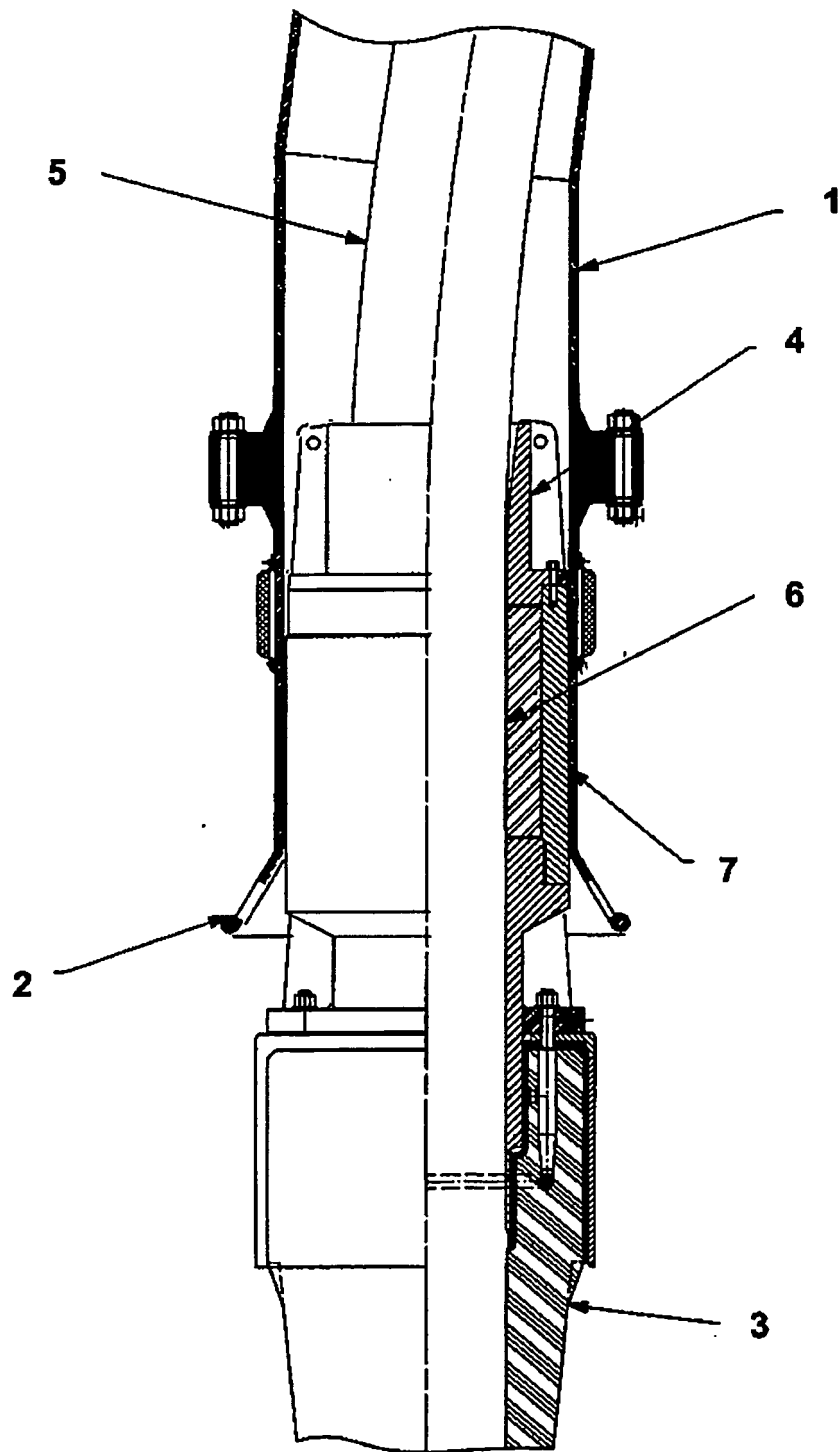
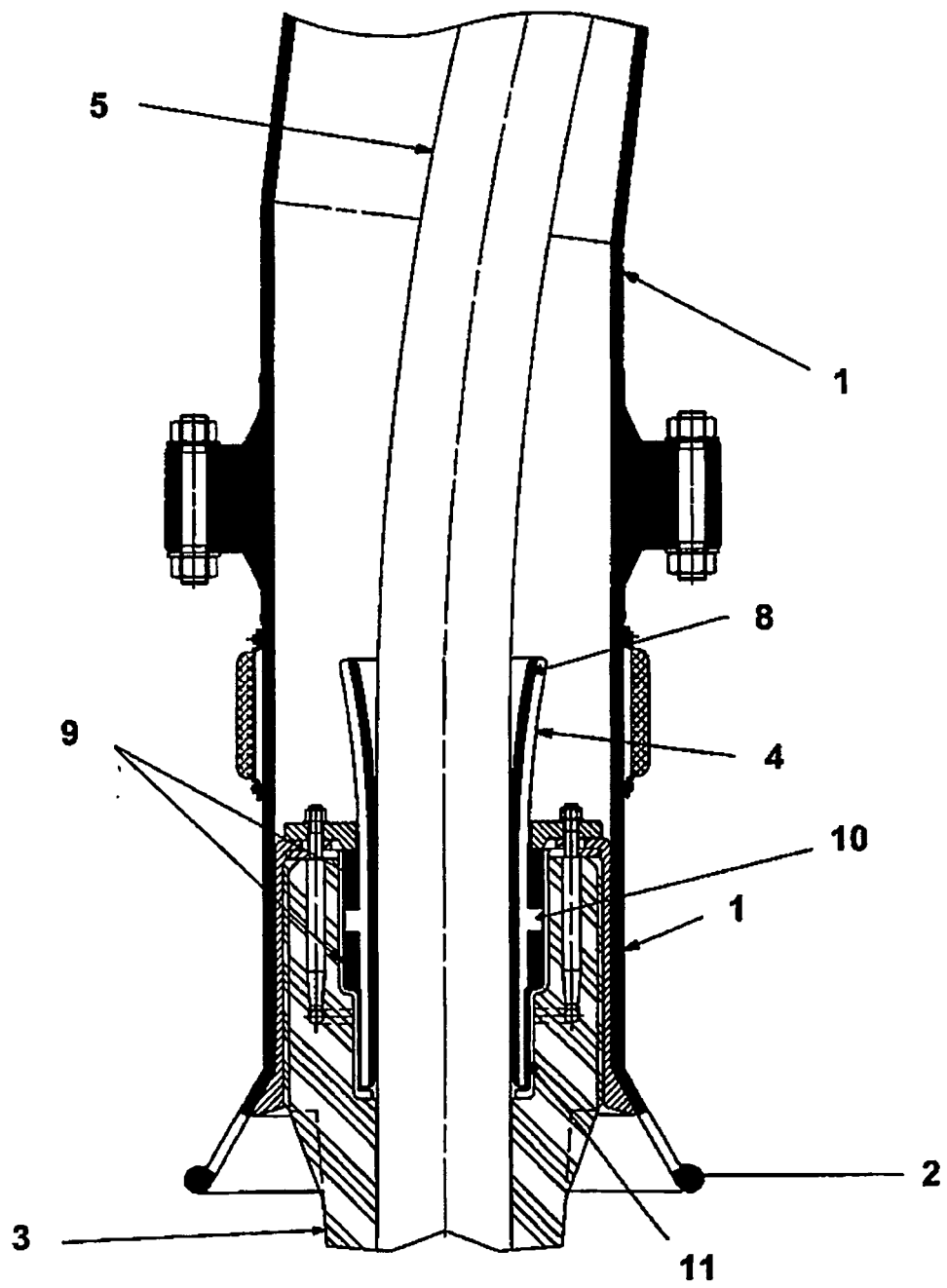


FIG.1



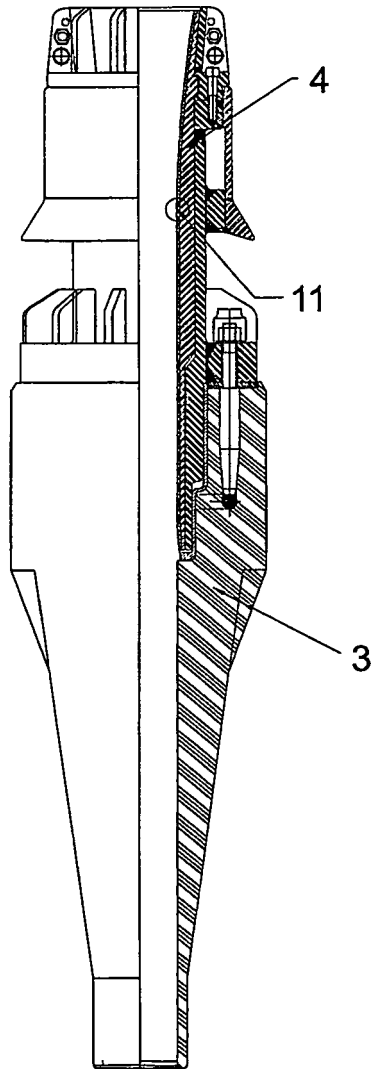


FIG.3

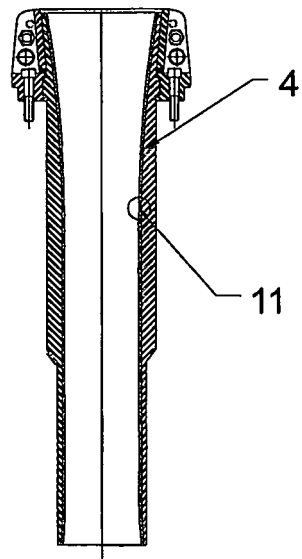


FIG.4

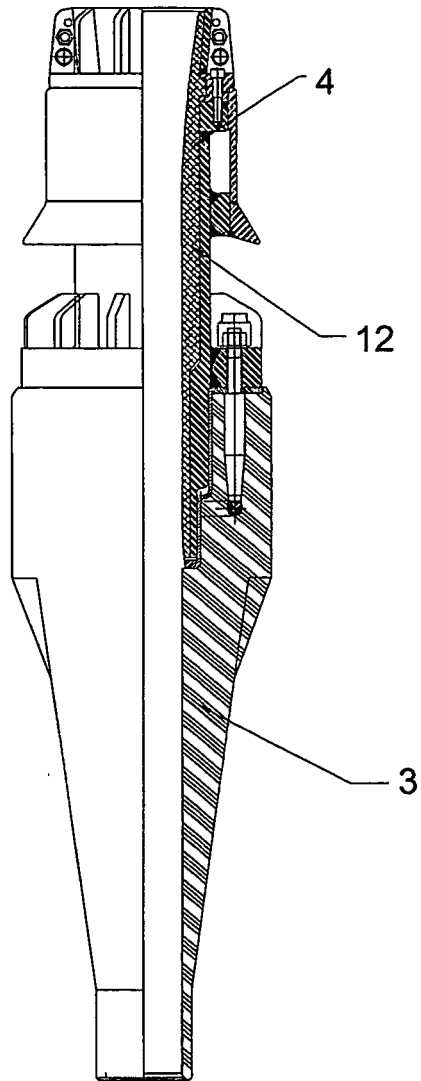


FIG.5

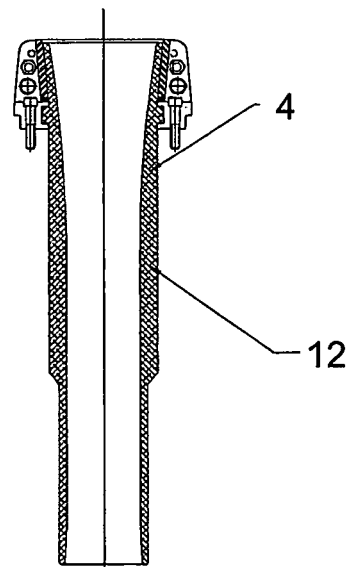


FIG.6

REFERENCES CITED IN THE DESCRIPTION

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