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(54) **APPARATUS AND METHOD FOR CONNECTING A BUOY TO A MOORING LINE**

VORRICHTUNG UND VERFAHREN ZUM VERBINDEN EINER BOJE MIT EINER FANGLEINE

APPAREIL ET PROCÉDÉ POUR RACCORDER UNE BOUÉE À UNE LIGNE D'AMARRAGE

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(73) Proprietor: **Egersund Herøy AS**
6092 Fosnavåg (NO)

(72) Inventor: **HANSEN, Ove Henning**
6091 Fosnavåg (NO)

(74) Representative: **Håmsø Patentbyrå AS**
P.O. Box 9
4068 Stavanger (NO)

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Description

Field of invention

[0001] The present invention relates to the field of mooring, and in particular to an apparatus and a method for connecting a buoy to a mooring line.

Background

[0002] There are several different ways of mooring a vessel offshore. One such way of mooring a vessel utilises one or more buoys connected to a mooring line. Typically, to connect such a buoy to a mooring line according to prior art, a connection means, such as a rope, is choked or cranked onto the mooring line and connected to the buoy. The prior art method of choking or cranking the connection means onto the mooring line is known to be problematic, as it may cause damage to the mooring line. There is therefore a need for an improved method.

[0003] WO2017102265A1, in accordance with its abstract, states "Assembly of an anchoring wire and a clamping joint that engages the anchoring wire to attach a ramification line thereto, wherein the clamping joint comprises two complementary steel wire clamps that together define an inner passage for the anchoring wire, multiple clamping bolts that connect the wire clamps to each other, and an exchangeable first insert that is releasably confined in an inner confinement chamber of the wire clamps, wherein the first insert comprises a plastic contact layer having an imprint that corresponds to the outer shape of the anchoring wire, wherein the contact layer is pressed against the anchoring wire by tightening the clamping bolts. This document discloses an apparatus for connecting a buoy to a fibre mooring line according to the preamble of claim 1.

[0004] US5570652A, in accordance with its abstract, states "A pest guard comprises a flat disk mounted on a cylindrical sleeve which is fixed against linear movement on a support member by a pair of clamps. The sleeve is provided with a longitudinal slot permitting it to be placed over the support member. The clamps are each formed by two halves and adapted to be fitted over a respective ends of the sleeve so that the clamps permit rotational movement of the sleeve but inhibit longitudinal movement of the sleeve about the cable. The disk is provided with a central opening such that it is permitted to rotate about the sleeve. The disk is also provided with a radial, curved slit which resists opening and which maintains the disk flat through extended use."

The invention

[0005] According to a first aspect of the invention, there is provided an apparatus according to claim 1 for connecting a buoy to a fibre mooring line.

[0006] As the clamp is made to be locked directly around the mooring line at a predetermined position, rather than choked or cranked onto the mooring line and to the predetermined position, it will not cause the damage due to friction/gnawing that is known from prior art. The apparatus may comprise a means for locking the clamp in a closed position, so as to lock the clamp to the mooring line. The means for locking the clamp may comprise e.g. a nut-and-bolt arrangement, one or more strips, or any other locking mechanism suitable for the purpose.

[0007] The clamp may have a longitudinal opening for receiving the mooring line, the opening being closable for locking the clamp around the mooring line by use of the means for locking the clamp.

[0008] The clamp may comprise at least two parts which can be combined to fix the clamp around the mooring line and locked together by use of the means for locking the clamp. The at least two parts of the clamp may be separate but combinable or they may be e.g. pivotably connected. Having the at least two parts be pivotably connected may be particularly advantageous as it may increase ease of use.

[0009] The apparatus may comprise at least one hinge. The hinge may be attached to two parts of the clamp and used to pivotably connect the two parts.

[0010] The means for locking the clamp may comprise one or more nuts. The one or more nuts may be comprised by the clamp. The one or more nuts may be moulded into one or more portions of the clamp. Moulding one or more nuts into the clamp may be advantageous to ease the locking of the clamp.

[0011] The clamp may be designed such as to be attached to a mooring line by one person. The connection means may be a rope, a wire, a chain, a combination of two or more of a rope, a wire and a chain, or any other such connection means suitable for the purpose. The swivel may comprise two or more parts which can be combined to rotatably attach the swivel around a portion of the clamp and locked together by use of a means for locking the swivel. The two parts of the swivel may be separate but combinable or they may be e.g. pivotably connected. Having the two parts being pivotably connected may be particularly advantageous as it may increase ease of use.

[0012] The swivel may be designed such as to be attached to a mooring line by one person. The apparatus may comprise the means for locking the swivel. The means for locking the swivel may e.g. comprise a nut-and-bolt arrangement, one or more strips or any other locking mechanism suitable for the purpose. The apparatus may comprise one or more grooves for one or more strips.

[0013] The clamp comprises one or more protrusions on its inner surface. The one or more protrusions may advantageously increase the grip of the clamp on the mooring line. Furthermore, the clamp may comprise a material on its inner surface that may interact with the outer surface of the mooring line to provide improved grip.

[0014] The clamp comprises one or more protrusions on its outer surface. The one or more protrusions have corresponding indentation, in the form of one or more grooves, in the inner surface of the swivel. The one or more protrusions on the outer surface of the clamp and the one or more indentations in the inner surface of the swivel may advantageously improve the connection between the clamp and the swivel and/or reduce the friction caused from rotation of the swivel around the clamp.

[0015] One or two end portions of the clamp may have a greater diameter than the remaining clamp. The greater diameter around the one or two end portions may advantageously facilitate holding the swivel in the correct position around the clamp.

[0016] The mooring line is a mooring line comprising a fibre material. The mooring line may be an artificial fibre rope. The apparatus may be an apparatus for connecting a buoy to an artificial fibre rope mooring line.

[0017] The apparatus may comprise a material that is suited for connecting to a fibre mooring line. The apparatus may be made from the material. The material may be a flexible material. An inner surface of the clamp may comprise the material, and the material may be a material having high friction against e.g. artificial fibre rope, to improve a connectivity between the apparatus and the artificial fibre rope.

[0018] If one or more parts of the apparatus is made from a flexible material, the apparatus may advantageously be e.g. more robust against certain forces, such as impact forces, and/or it may be easier to operate, e.g. to fasten it to a fibre rope during mobilisation, compared to prior art apparatuses in the same technical field that are made from a harder, stiffer material, such as a hard metal material. If the apparatus is flexible, spooling the apparatus onto a winch may have reduced risk of damaging the apparatus, the mooring line or other equipment compared to if the apparatus is not/less flexible.

[0019] The material is a relatively lightweight material, with a lower density than e.g. a metal such as steel. The density of the material may be as low as e.g. 1/6 of the density of steel, 1/8 of the density of steel or 1/10 of the density of steel. Using a lightweight material may e.g. make it easier to operate the apparatus. Using a lightweight material may facilitate for a single person to operate the apparatus, e.g. to apply the apparatus to a mooring line.

[0020] The material of the clamp is a plastic material or a rubber material. The material may e.g. be a polyurethane elastomer material or a polytetrahydrofuran/PTMEG material.

[0021] The apparatus may comprise one or more inserts. One or more Inserts may be used to fit an apparatus to mooring lines of different diameter.

[0022] According to a second aspect of the invention, there is provided a method of connecting a buoy to a mooring line, the method comprising the steps of: providing the apparatus according to the first aspect of the invention, fixing the apparatus to the mooring line, the swivel being rotatably attached to the clamp; and connecting a buoy to the swivel by connecting a connection means to the buoy and to the swivel.

[0023] The mooring line may be a fibre mooring line.

[0024] One or more of the steps of the method may be performed by a single person.

[0025] The step of fixing an apparatus comprising a clamp and a swivel to the mooring line may comprise of the steps of: fixing a clamp to the mooring line; and fixing a swivel to the clamp.

[0026] The step of fixing a clamp to the mooring line may include fitting a portion of a mooring line into the clamp through the longitudinal opening of the clamp, closing the longitudinal opening of the clamp, and locking the longitudinal opening in a closed state by use of the nut-and-bolt arrangement. The locking may comprise connecting one of a number of bolts to each one of an equal number of nuts. The nuts may be nuts that are moulded into a part of the clamp.

[0027] The step of fixing the swivel to the clamp may comprise the step of fixing the swivel to the clamp by use of a nut-and-bolt arrangement or by use of strips, such as e.g. plastic strips. In the following is described examples of preferred embodiments illustrated in the accompanying drawings, wherein:

Fig. 1 shows the clamp of the apparatus fixed around a mooring line;
Fig. 2 shows a cross-sectional view of the clamp;
Fig. 3 shows the swivel fixed around the clamp;
Fig. 4 shows a cross-sectional view of the swivel;
Fig. 5 shows a mooring line with the apparatus and with a connection means connected to the swivel; and
Fig. 6 shows an alternative embodiment of the apparatus locked to a mooring line.

[0028] Note that the figures show an example of the apparatus according to the first aspect of the invention. Other configurations may also be possible within the confines of the invention. The figures are not necessarily drawn to scale.

[0029] Figure 1 shows a clamp 2 according to the first aspect of the invention fixed around a mooring line 9. The clamp 2 has two end portions 21, 22 and a middle portion 23, where the two end portions 21, 22 have a greater outer diameter than the middle portion 23. The middle portion 23 is arranged to receive a swivel (not shown), whereas the end portions 21, 22 are configured to facilitate keeping the swivel in the correct position around the clamp 2.

[0030] Figure 1 further shows the clamp 2 having circular protrusions 24 around the outer circumference of the clamp 2. The circular protrusions 24 may act as tracks for the swivel for facilitating rotation of the swivel around the clamp 2.

[0031] The clamp 2 has a longitudinal discontinuity 25 along its body. This discontinuity 25 is closed when the

clamp 25 is in a closed state but may be opened to receive the mooring line 9 to install the apparatus 1 of the first aspect of the invention onto the mooring line 9. The clamp 2 is closed and locked in a closed position by use of a plurality of fibre-reinforced plastic strips 41 each placed in one of several grooves 28 in the two end portions 21, 22 of the clamp 2.

[0032] In Figure 2, the clamp 2 is shown in a cross-sectional view, so as to show inner protrusions 26 on the inner surface 27 of the clamp 2. The inner protrusions 26 improves the clamp's ability to lock to a mooring line (not shown).

[0033] Figure 3 shows the clamp 2 on the mooring line 9 and a swivel 3 arranged around the clamp 2. The swivel 3 has two end portions 31, 32 and a middle portion 33, where the two end portions 31, 32 have a greater outer diameter than the middle portion 33. The middle portion 33 is configured to receive a connection means (not shown), whereas the end portions 31, 32 are configured to facilitate keeping the connection means in the correct position. The swivel 3 is closed around the clamp 2 by use of fibre-reinforced plastic strips 42 placed in grooves 35, whereof there is one on each of the two end portions 31, 32.

[0034] Using plastic strips to close the swivel 3 and/or the clamp 2 is merely one possible solution. Alternatively, the swivel 3 and/or the clamp 2 may e.g. be closed/locked by use of e.g. a nut-and-bolt arrangement.

[0035] Figure 4 shows a cross-sectional view of the swivel 3, showing how it has grooves 36 in its inner surface 37, that correspond to the circular protrusions 24 of the clamp 2 (shown in Figure 1). The grooves 36 and the circular protrusions 24 work together to facilitate circular movement of the swivel 3 around the clamp 2 and may be configured for sea water to lubricate the swivel 3 to further facilitate movement.

[0036] In Figure 5, the apparatus 1 is shown having a connection means 4 in the form of a grommet/rope 4 attached to and wrapped tightly around the swivel 3. The rope 4 may be connected to a buoy (not shown), for attaching the buoy to the apparatus 1 and to the mooring line 9.

[0037] Figure 6 shows an alternative embodiment of the apparatus 1. The apparatus 1 is locked onto a mooring line 9. The apparatus 1 has a rope 4 attached to a swivel 3 locked around a clamp 2. The clamp, in this embodiment, is locked around the mooring line 9 by use of four nut-and-bolt connection 42, two on each end-portions 21, 22 of the clamp 2.

[0038] It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments within the scope of the appended claims. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. Use of the verb "comprise" and its conjugations does not exclude the presence of elements or steps other than those stated in a claim. The article "a" or "an" preceding an element does not exclude the presence of a plurality of such elements.

[0039] The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

Claims

1. An apparatus (1) for connecting a buoy to a fibre mooring line (9),

   the apparatus (1) comprising a clamp (2) for locking the apparatus (1) to the mooring line (9); and
   a swivel (3) being rotatably attachable around a portion of the clamp (2),
   the swivel (3) being configured to receive a connection means (4) for connecting the buoy to the mooring line (9),
   characterised in that the clamp (2) is made from a plastic or rubber material with a density at most ¼ of the density of steel, wherein the swivel (3) is configured with one or more grooves (36) in its inner surface for allowing
   water to lubricate the swivel (3) by entering the one or more grooves (36), and
   the clamp (2) comprises one or more circular protrusions (24) on its outer surface which correspond to the one or more grooves (36).

2. The apparatus (1) according to claim (1), wherein the apparatus (1) comprises a means for locking the clamp (2) in a closed position, so as to lock the clamp (2) to the mooring line (9).

3. The apparatus (1) according to claim (2), wherein the clamp (2) has a longitudinal discontinuity (25) for receiving the mooring line (9), the discontinuity (25) being closable so as to lock the clamp (2) around the mooring line (9) by use of the means for locking the clamp (2).

4. The apparatus (1) according to claim (2), wherein the clamp (2) comprises means for locking the clamp (2) and at least two parts which can be combined to fix the clamp (2) around the mooring line (9) and locked together by use of the means for locking the clamp (2).

5. The apparatus (1) according to any one of the previous claims, wherein the connection means (4) comprises a rope and/or a wire and/or a chain.

6. The apparatus (1) according to any one of the previous claims, wherein the swivel (3) comprises two or more parts which can be combined to rotatably at-

tach the swivel (3) around a portion of the clamp (2) and which can be locked together by use of a means for locking the swivel (3).

7. The apparatus 1 according to claim (6), wherein the means for locking the swivel (3) comprises one or more nut-and-bolt connections (42) and/or one or more strips (41).

8. The apparatus (1) according to any one of the previous claims, wherein the clamp (2) comprises one or more substantially circumferential protrusions (26) on an inner surface (27) thereof.

9. The apparatus (1) according to any one of the previous claims, wherein the swivel (3) has one or more end portions (31, 32) protruding outwardly to keep the connection means (4) in place around the swivel (3).

10. The apparatus (1) according to any one of the preceding claims, wherein the clamp (2) is made from a polyurethane elastomer material or a polytetrahydrofuran/PTMEG material.

11. Method of connecting a buoy to a mooring line (9), the method comprising the steps of:

providing the apparatus (1) according to any one of the preceding claims;
fixing the apparatus , the swivel (3) being rotatably attached to the clamp (2); and
connecting a buoy to the swivel (3) by connecting a connection means (4) to the buoy and to the swivel (3).

Patentansprüche

1. Einrichtung (1) zum Verbinden einer Boje mit einer Fangleine aus Fasermaterial (9),

wobei die Einrichtung (1) eine Klemme (2) zum Verriegeln der Einrichtung (1) an der Fangleine (9) umfasst; und
einen Wirbel (3), der drehbar um einen Abschnitt der Klemme (2) herum anbringbar ist,
wobei der Wirbel (3) dazu ausgebildet ist, ein Verbindungsmittel (4) zum Verbinden der Boje mit der Fangleine (9) aufzunehmen,
dadurch gekennzeichnet, dass die Klemme (2) aus einem Kunststoff- oder Gummimaterial mit einer Dichte von höchstens ¼ der Dichte von Stahl hergestellt ist,
wobei der Wirbel (3) mit einer oder mehreren Nuten (36) in seiner Innenfläche dazu ausgebildet ist, Wasser zu ermöglichen, den Wirbel (3) durch Eindringen in die eine oder die mehreren Nuten (36) zu schmieren, und die Klemme (2) einen oder mehrere kreisförmige Vorsprünge (24) auf ihrer Außenfläche umfasst, die der einen oder den mehreren Nuten (36) entsprechen.

2. Einrichtung (1) nach Anspruch (1), wobei die Einrichtung (1) ein Mittel zum Verriegeln der Klemme (2) in einer geschlossenen Stellung umfasst, sodass die Klemme (2) an der Fangleine (9) verriegelt wird.

3. Einrichtung (1) nach Anspruch (2), wobei die Klemme (2) eine Längsunterbrechung (25) zum Aufnehmen der Fangleine (9) aufweist, wobei die Unterbrechung (25) verschließbar ist, sodass die Klemme (2) unter Verwendung des Mittels zum Verriegeln der Klemme (2) um die Fangleine (9) herum verriegelt wird.

4. Einrichtung (1) nach Anspruch (2), wobei die Klemme (2) Mittel zum Verriegeln der Klemme (2) und mindestens zwei Teile umfasst, die kombiniert werden können, um die Klemme (2) um die Fangleine (9) herum zu befestigen, und die unter Verwendung des Mittels zum Verriegeln der Klemme (2) miteinander verriegelt werden können.

5. Einrichtung (1) nach einem der vorstehenden Ansprüche, wobei das Verbindungsmittel (4) ein Seil und/oder einen Draht und/oder eine Kette umfasst.

6. Einrichtung (1) nach einem der vorstehenden Ansprüche, wobei der Wirbel (3) zwei oder mehr Teile umfasst, die kombiniert werden können, um den Wirbel (3) drehbar um einen Abschnitt der Klemme (2) herum anzubringen und die unter Verwendung eines Mittels zum Verriegeln des Wirbels (3) miteinander verriegelt werden können.

7. Einrichtung 1 nach Anspruch (6), wobei das Mittel zum Verriegeln des Wirbels (3) eine oder mehrere Schrauben-Mutter-Verbindungen (42) und/oder ein oder mehrere Bänder (41) umfasst.

8. Einrichtung (1) nach einem der vorstehenden Ansprüche, wobei die Klemme (2) einen oder mehrere im Wesentlichen umlaufende Vorsprünge (26) auf einer Innenfläche (27) davon umfasst.

9. Einrichtung (1) nach einem der vorstehenden Ansprüche, wobei der Wirbel (3) einen oder mehrere Endabschnitte (31, 32) aufweist, die nach außen vorstehen, um das Verbindungsmittel (4) um den Wirbel (3) herum an Ort und Stelle zu halten.

10. Einrichtung (1) nach einem der vorstehenden Ansprüche, wobei die Klemme (2) aus einem Polyurethan-Elastomermaterial oder einem Polytetrahydro-

furan/PTMEG-Material hergestellt ist.

11. Verfahren zum Verbinden einer Boje mit einer Fangleine (9), wobei das Verfahren folgende Schritte umfasst:

Bereitstellen der Einrichtung (1) nach einem der vorhergehenden Ansprüche;
Befestigen der Einrichtung, wobei der Wirbel (3) drehbar an der Klemme (2) angebracht ist; und Verbinden einer Boje mit dem Wirbel (3) durch Verbinden eines Verbindungsmittels (4) mit der Boje und mit dem Wirbel (3).

Revendications

1. Appareil (1) pour raccorder une bouée à une ligne d'amarrage (9) en fibres, l'appareil (1) comprenant un organe de serrage (2) destiné à verrouiller l'appareil (1) sur la ligne d'amarrage (9) ; et

un raccord rotatif (3) pouvant être fixé de manière rotative autour d'une portion de l'organe de serrage (2),
le raccord rotatif (3) étant configuré pour recevoir un moyen de liaison (4) pour raccorder la bouée à la ligne d'amarrage (9),
caractérisé en ce que l'organe de serrage (2) est constitué d'un matériau en plastique ou en caoutchouc ayant une densité d'au plus ¼ de la densité de l'acier,
dans lequel le raccord rotatif (3) est configuré avec une ou plusieurs rainures (36) dans sa surface interne afin de permettre à l'eau de lubrifier le raccord rotatif (3) en pénétrant dans la ou les rainures (36), et l'organe de serrage (2) comprend une ou plusieurs saillies circulaires (24) sur sa surface externe qui correspondent à la ou aux rainures (36).

2. Appareil (1) selon la revendication (1), dans lequel l'appareil (1) comprend un moyen de verrouillage de l'organe de serrage (2) dans une position fermée, de façon à verrouiller l'organe de serrage (2) sur la ligne d'amarrage (9).

3. Appareil (1) selon la revendication (2), dans lequel l'organe de serrage (2) présente une discontinuité longitudinale (25) pour recevoir la ligne d'amarrage (9), la discontinuité (25) pouvant être fermée de façon à verrouiller l'organe de serrage (2) autour de la ligne d'amarrage (9) par utilisation du moyen de verrouillage de l'organe de serrage (2).

4. Appareil (1) selon la revendication (2), dans lequel l'organe de serrage (2) comprend un moyen de verrouillage de l'organe de serrage (2) et au moins deux parties qui peuvent être combinées pour fixer l'organe de serrage (2) autour de la ligne d'amarrage (9) et être verrouillées ensemble par utilisation du moyen de verrouillage de l'organe de serrage (2).

5. Appareil (1) selon l'une quelconque des revendications précédentes, dans lequel le moyen de liaison (4) comprend une corde et/ou un câble et/ou une chaîne.

6. Appareil (1) selon l'une quelconque des revendications précédentes, dans lequel le raccord rotatif (3) comprend deux parties ou plus qui peuvent être combinées pour fixer de manière rotative le raccord rotatif (3) autour d'une portion de l'organe de serrage (2) et qui peuvent être verrouillées ensemble par utilisation d'un moyen de verrouillage du raccord rotatif (3).

7. Appareil 1 selon la revendication (6), dans lequel le moyen de verrouillage du raccord rotatif (3) comprend un ou plusieurs assemblages écrou-boulon (42) et/ou une ou plusieurs bandes (41).

8. Appareil (1) selon l'une quelconque des revendications précédentes, dans lequel l'organe de serrage (2) comprend une ou plusieurs saillies sensiblement circonférentielles (26) sur sa surface interne (27).

9. Appareil (1) selon l'une quelconque des revendications précédentes, dans lequel le raccord rotatif (3) présente une ou plusieurs portions d'extrémité (31, 32) faisant saillie vers l'extérieur pour maintenir le moyen de liaison (4) en place autour du raccord rotatif (3).

10. Appareil (1) selon l'une quelconque des revendications précédentes, dans lequel l'organe de serrage (2) est constitué d'un matériau élastomère de polyuréthane ou d'un matériau en polytétrahydrofurane/PTMEG.

11. Procédé pour raccorder une bouée à une ligne d'amarrage (9), le procédé comprenant les étapes suivantes : la fourniture de l'appareil (1) selon l'une quelconque des revendications précédentes ; la fixation de l'appareil, le raccord rotatif (3) étant fixé de manière rotative à l'organe de serrage (2) ; et le raccord d'une bouée au raccord rotatif (3) par raccordement d'un moyen de liaison (4) à la bouée et au raccord rotatif (3).

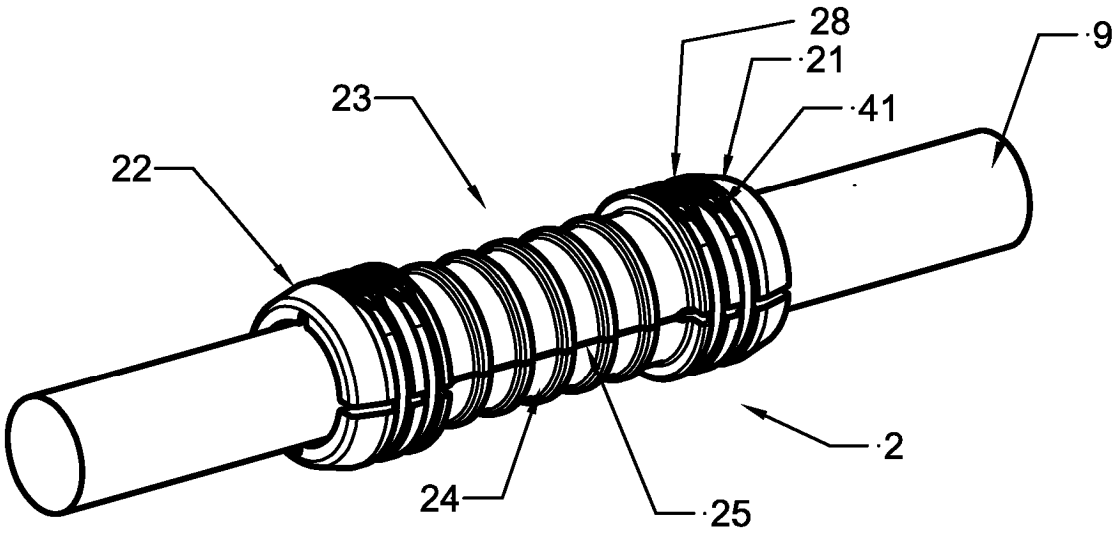


Fig. 1

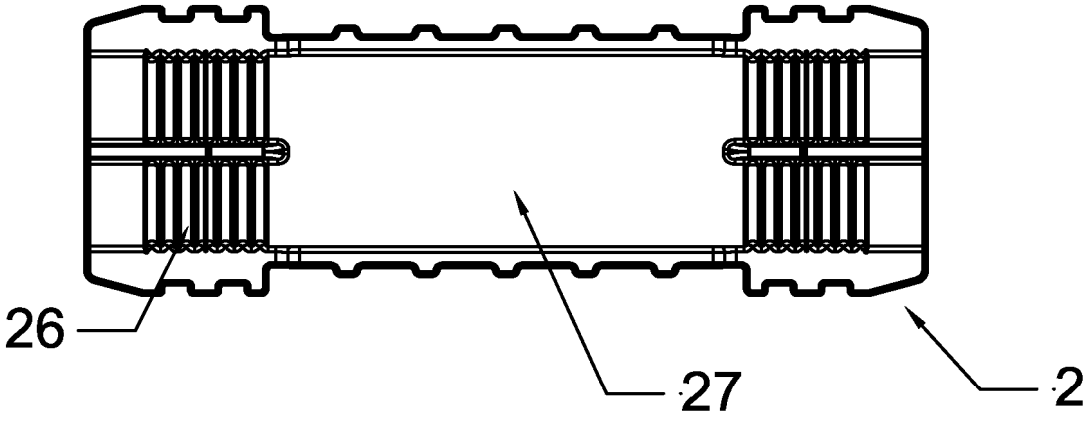


Fig. 2

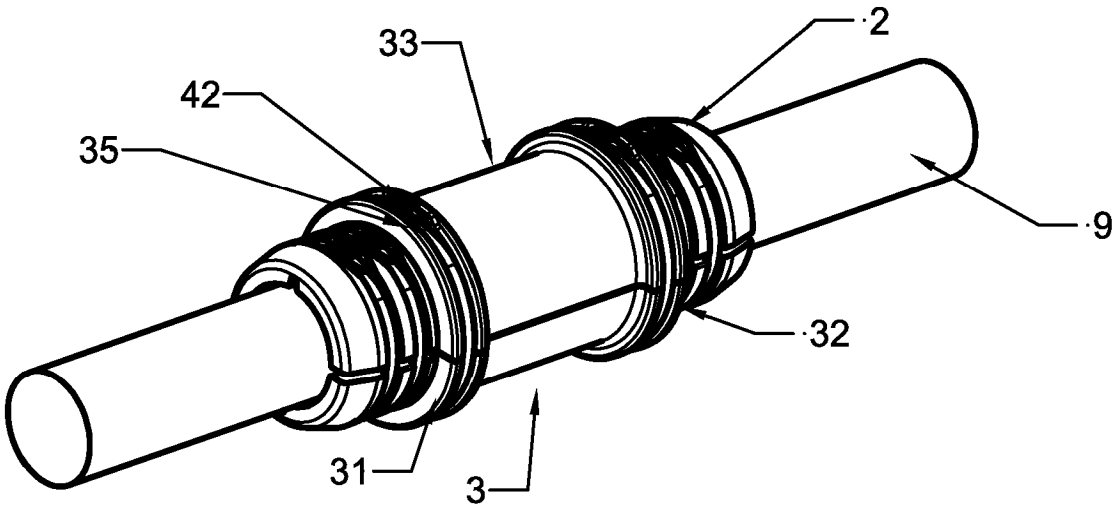


Fig. 3

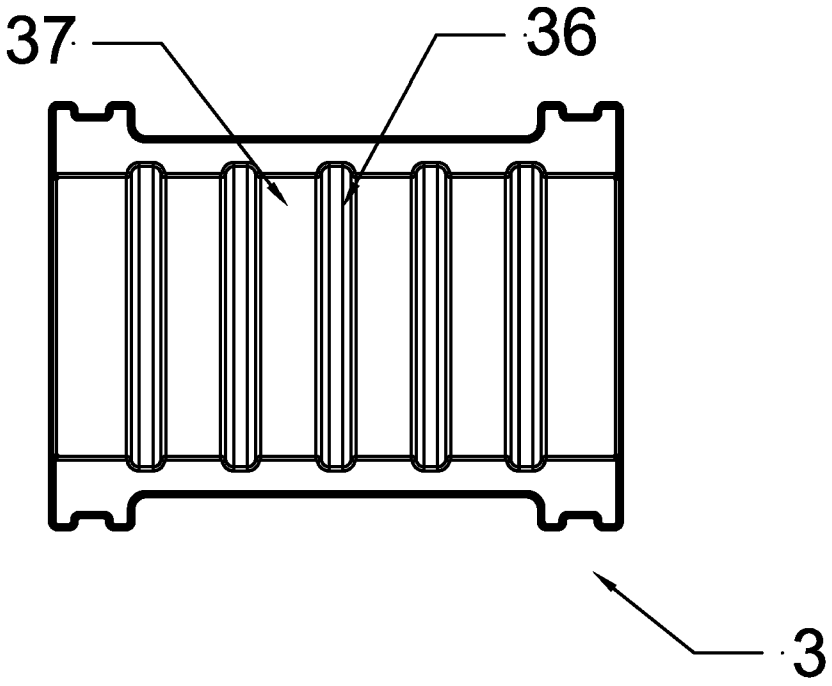


Fig. 4

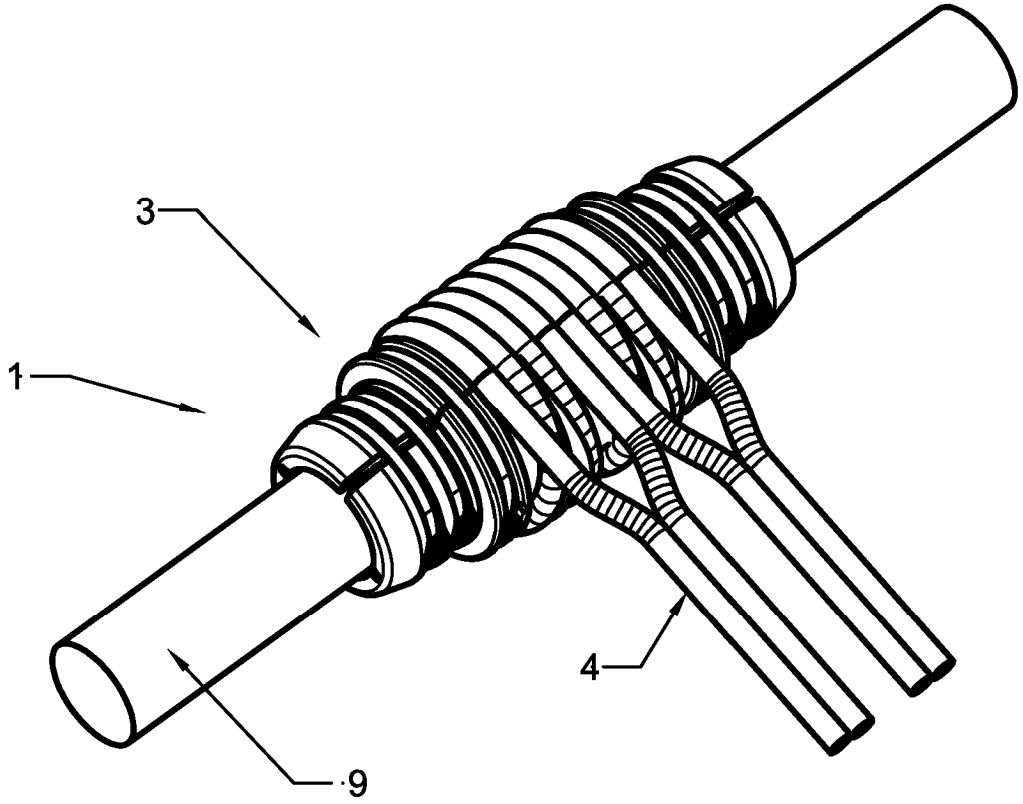


Fig. 5

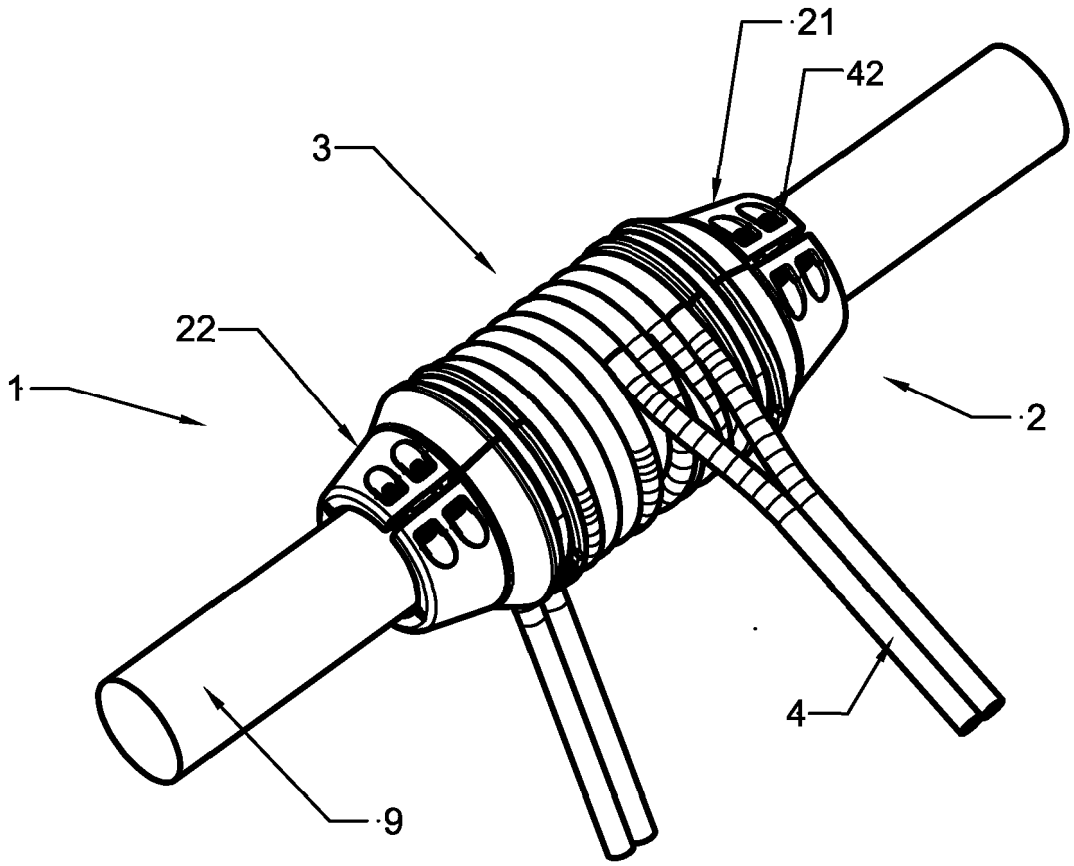


Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2017102265 A1 **[0003]**
- US 5570652 A **[0004]**