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(54) Title: METHOD AND APPARATUS FOR PROVIDING CONNECTION POINTS ALONG A ROPE OR OTHER BRAIDED OR TWISTED LINE

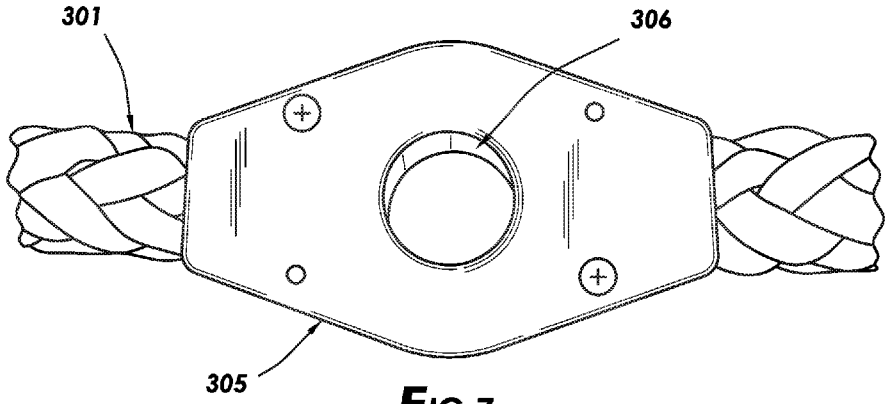

FIG.7

(57) Abstract: An apparatus and method for creating connection points at a desired location along the length of a rope. The apparatus comprises a sleeve and casing combination to separate strands of rope without degrading the integrity of the rope. The apparatus may also include a tapered separating device to separate the braided or twisted strands of the rope. The apparatus and method provide flexibility with the ability to move the connection points to various locations along the length of rope without degrading the integrity of the rope.

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METHOD AND APPARATUS FOR PROVIDING CONNECTION POINTS ALONG A ROPE OR OTHER BRAIDED OR TWISTED LINE

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to and all the benefits of U.S. Provisional Application Serial No. 62/735,470, filed on September 24, 2018 and entitled "Method and Apparatus for Providing Connection Points Along a Rope or Other Braided or Twisted Line."

BACKGROUND OF THE INVENTION

[0002] When handling and using ropes to perform various tasks, it is sometimes required to attach a device or another rope to a first rope at a location other than at either end of the rope. There are limited options for attaching a device or rope to the first rope. The current invention provides a device and method for installing a removable attachment point at any position along the length of a rope without cutting, tying or reducing the strength of the rope.

[0003] One commonly used method of attaching a device or another rope to a rope is to tie a type of knot in the rope. This method has disadvantages in that knots weaken the rope due to the tight bends required to tie the knot and the rope must have slack to tie the knot. One such example is the Dropper Loop Knot shown in Figure 1. In Figure 1 the rope (101) has been tied into the shown knot resulting in a loop (102) to which a device such as a hook or carabiner (103) may be attached.

While knots can be untied, the process of tying and untying the knot weakens the rope.

[0004] Another commonly used method is to splice thimbles, eyes or loops into the rope at the position where the attachment is desired. An example of this method of creating an attachment point is shown in Figure 2. In Figure 2, an initial length of rope is cut into 2 parts (201 and 202). Eyes (203) are then spliced into the ends of cut ends of 201 and 202 which creates the attachment point. It is important to note that the eyes must be linked together before the splices are completed. A device such as a hook or carabiner (204) can then be connected to the attachment point. This method has disadvantages in that it takes significant skill and knowledge to perform the splice, the splice requires significant time to perform, multiple splices are required to form a single attachment point and the rope cannot be returned to its original configuration after the attachment is no longer needed.

[0005] In the field of seismic acquisition, it is sometimes the case that seismic receivers are deployed on the seafloor for the purpose of recording the reflected seismic waves. In many such cases, a device known as a seafloor node is used to record the reflected seismic waves. These seafloor nodes are commonly-deployed using a method known as “nodes-on-a-rope”. In this type of deployment, the seafloor nodes are attached to a long line, cable or rope at specified intervals and then deployed off the stern of a vessel configured for that purpose.

[0006] Within the seismic industry, there are numerous methods employed to attach the seafloor nodes to the rope including “pigtails”, eyelet connectors and complex clips specifically designed for that purpose.

[0007] In the seismic industry, a commonly used separation distance between the seafloor nodes and thus, the required attachment points, is 25 meters. However, there are many instances in which the required separation is different than 25 meters. In these cases, the seismic contractor must reconfigure the deployment line to have attachment points at the different specified separation. Depending on the type of attachment points being employed, this can be an expensive and time-consuming operation and, with some types of systems, may require the construction of an entirely new deployment line. In order to optimize the efficiency of the seismic operation, a fast and easily operated seafloor seismic node attachment point which is also easily installed and removed is required. To minimize the cost of equipment, the attachment point also needs to be inexpensive to manufacture and not degrade the strength characteristics of the line when installed or removed.

SUMMARY OF THE INVENTION

[0008] The present invention provides an apparatus and method for creating a connection point in a rope without having to tie a not or splice the rope which both degrade the integrity of the rope.

[0009] The concept of the invention involves inserting a sleeve portion of the apparatus between strands of a rope at a desired location and using a case around the rope and the sleeve portion of the apparatus to hold everything in place.

[0010] In addition to maintaining the integrity of the rope, the invention also allows for the ability to move the attachment point to another location along the length of the rope.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Figure 1 shows a traditional method of attaching a device or another rope to a rope using a Dropper Loop Knot;

[0012] Figure 2 shows another traditional method of attaching a device or another rope to a rope using splice thimbles, eyes or loops spliced into the rope;

[0013] Figure 3 shows a typical braided rope;

[0014] Figure 4 shows a typical braided rope where the strands are loosened and separated along the midline of the rope forming a hole at the point where an attachment is desired;

[0015] Figure 5 shows a sleeve inserted into the hole in the separated strands;

[0016] Figure 6 shows a sleeve inserted into the hole in the separated strands of the rope and the sleeve and rope both inserted into one half of an outer case;

[0017] Figure 7 shows a sleeve inserted into the hole in the separated strands of the rope and the sleeve and rope both inserted into one two halves of an outer case;

[0018] Figure 8 shows a special tool which may be used to help separate the strands of the rope.

DETAILED DESCRIPTION OF THE INVENTION

[0019] The current invention provides a device and method for installing an attachment point in a rope at any position in the rope, whether the rope is under load, taught or slack, without degrading the original strength of the rope. In addition, the attachment point can be removed and the rope returned to its original condition and strength.

[0020] A preferred embodiment of the current invention is demonstrated in Figures 3 through 7. Figure 3 shows a typical braided rope (301). In Figure 4, the strands of the rope (301) are loosened and separated along the midline of the rope forming a hole (302) at the point where the attachment point is desired. A sleeve (303) is then inserted into the hole in the separated strands as shown in Figure 5. The sleeve can be made of a strong material such as stainless steel or it can be made of a strong plastic. In Figure 6, the rope and sleeve are then inserted into one half of an outer case (304). Finally, as shown in Figure 7, the other half of the outer case (305) is installed completing the creation of the attachment point (306). When

installed, the attachment point can be used to attach a device or another rope to the original rope through the use of commonly available hooks or clips such as a carabiner. The attachment point can be removed by reversing the installation process. The strands of the rope can then be allowed to return to their original configuration.

[0021] To assist in the installation of the attachment point, Figure 8 shows a special tool (307) which may be used to help separate the strands of the rope. Such a tool may have a rounded tip so as not to cut or tear the strands of the rope and may be tapered from a relatively fine tip to a size approximately equal to the diameter of the sleeve used to hold the strands of rope apart. The application of this tool could be manual, or the tool could be a component in an automated device for the purpose of installing the attachment points.

[0022] The present invention may either be used to connect various devices to various types of lines and more specifically may be used to connect seafloor nodes to a line for deployment of seismic devices onto the seafloor during seismic exploration.

The invention claimed is:

1. A rope separating device for creating a connection point in the rope, said rope having multiple braided or twisted strands, a first end, a second end, and a width, said rope separating device comprising:

   a. a sleeve for inserting between the strands of the rope, said sleeve having a length large enough to expand said width of said rope;

   b. an external housing for holding said rope and said sleeve stationary relative to one another.

2. The device of Claim 1 wherein said sleeve is made of metal.

3. The device of Claim 1 wherein said sleeve is made of plastic.

4. The device of Claim 1 further comprising a tapered separating device used to separate the braided or twisted strands.

5. The device of Claim 1 wherein said external housing is made of multiple parts.

6. The device of Claim 1, further comprising a seafloor seismic node attachable to said rope at said connection point.

7. A method for installing a rope separating device into a rope, said rope having multiple braided or twisted strands, the method comprising the steps of:

   a. Separating said braided or twisted strands of said rope thereby creating an opening in said rope;

   b. Inserting a sleeve into said opening of the rope;

   c. Placing an external housing around the rope and the sleeve such that the sleeve does not dislodge from the opening of the rope.

8. The method of Claim 7 wherein said sleeve is made of metal.

9. The method of Claim 7 wherein said sleeve is made of plastic.

10. The method of Claim 7 wherein said external housing is made of multiple parts.

11. The method of Claim 7 wherein said separating step includes the use of a tapered device to separate the braided or twisted strands of said rope.

12. The method of Claim 7 further comprising the step of:

    a. Attaching a device to said rope at said opening.

13. The method of Claim 7 further comprising the step of:

    a. Attaching a seafloor seismic node to said rope at said opening.

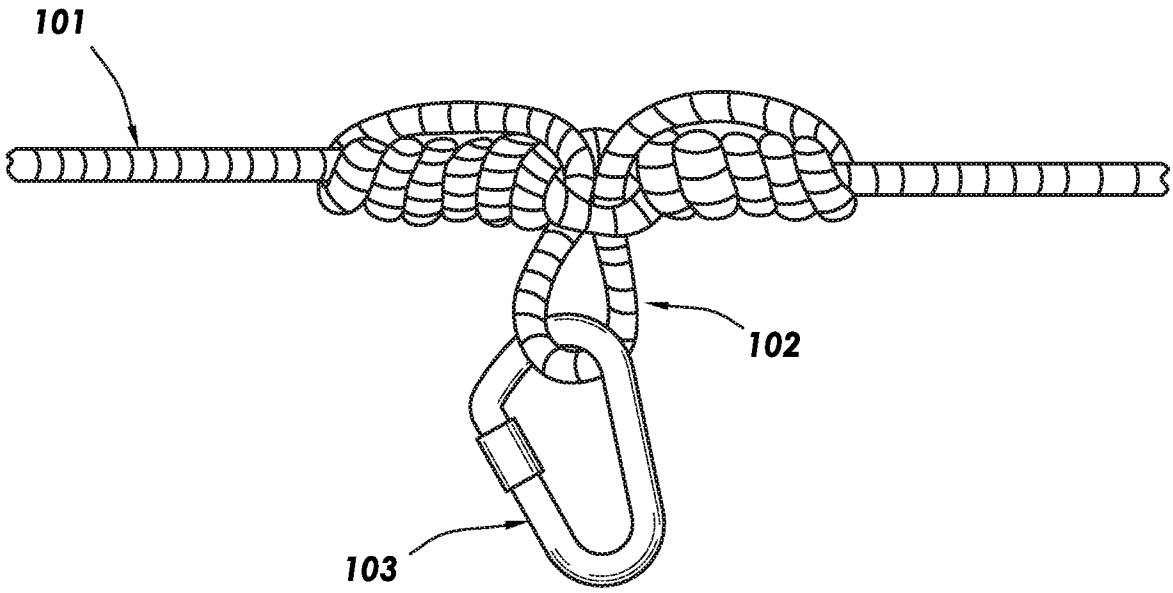

FIG.1
(Prior Art)

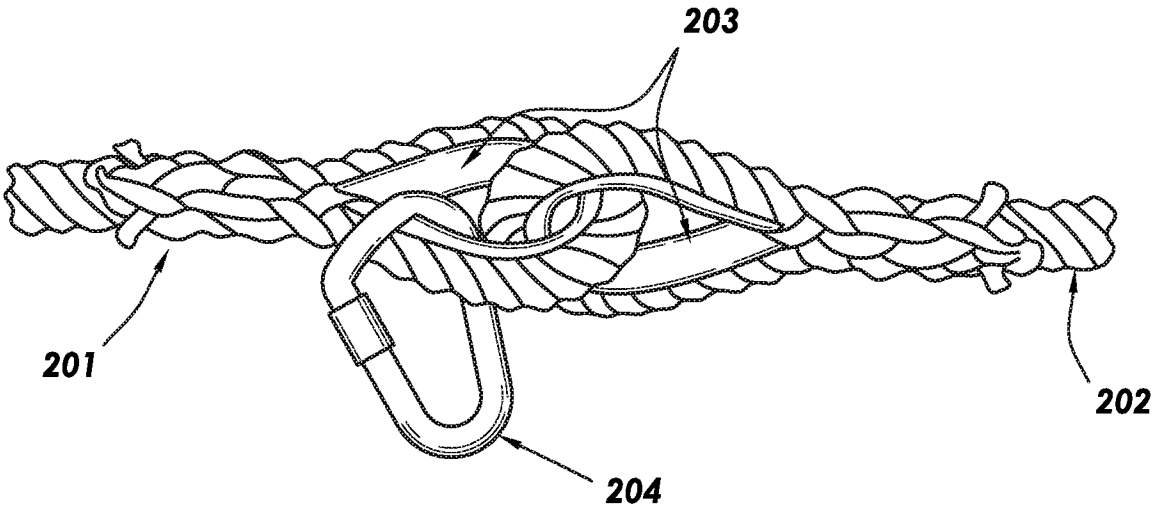

FIG.2
(Prior Art)

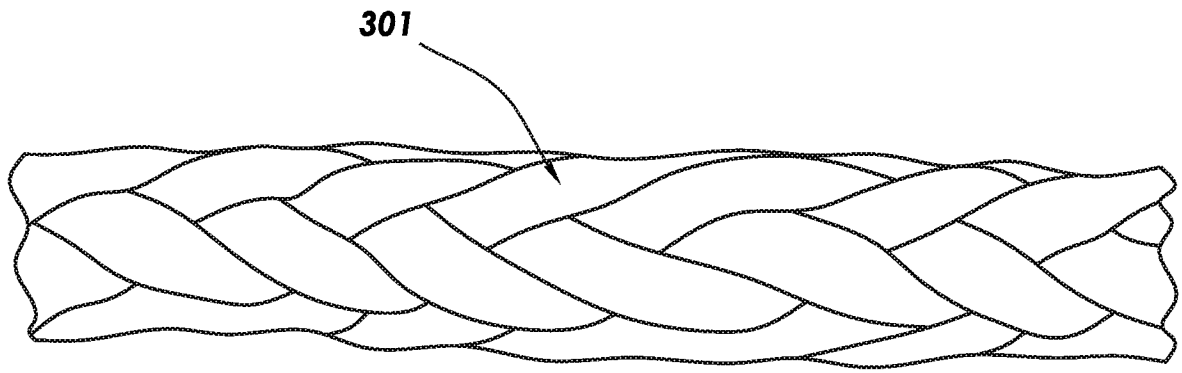

FIG.3

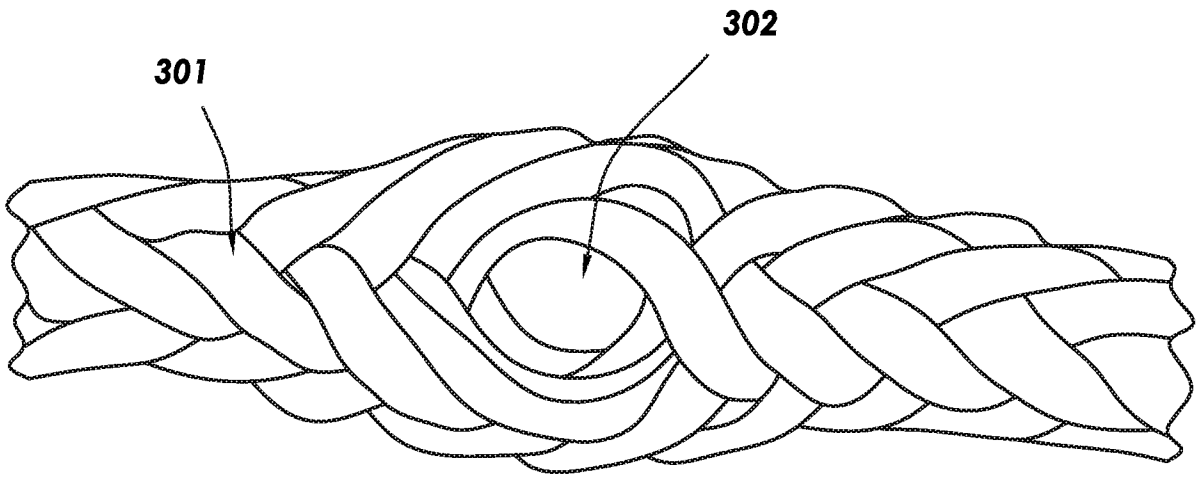

FIG.4

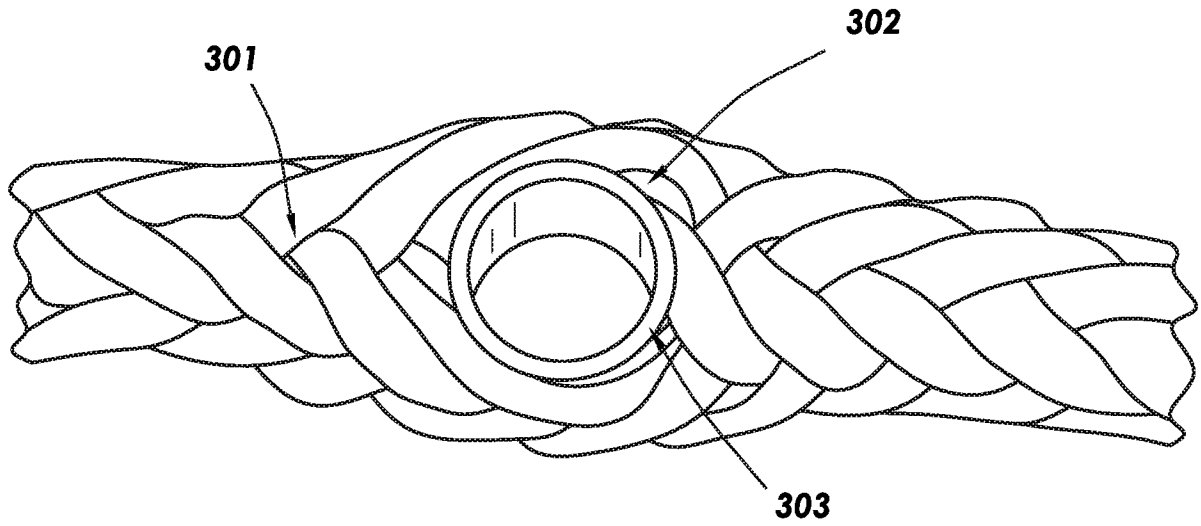

FIG.5

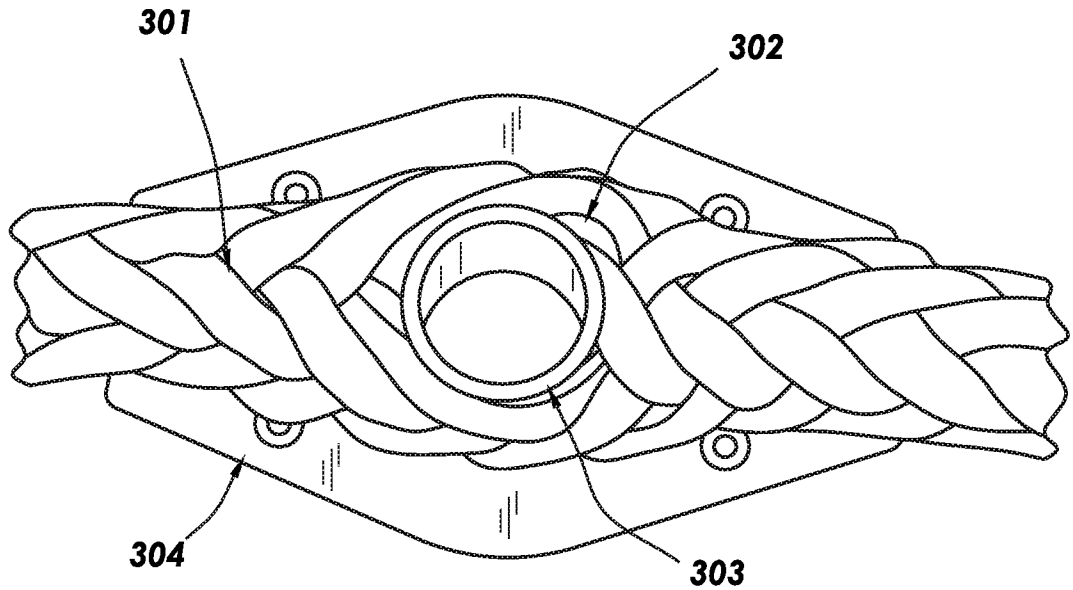

FIG.6

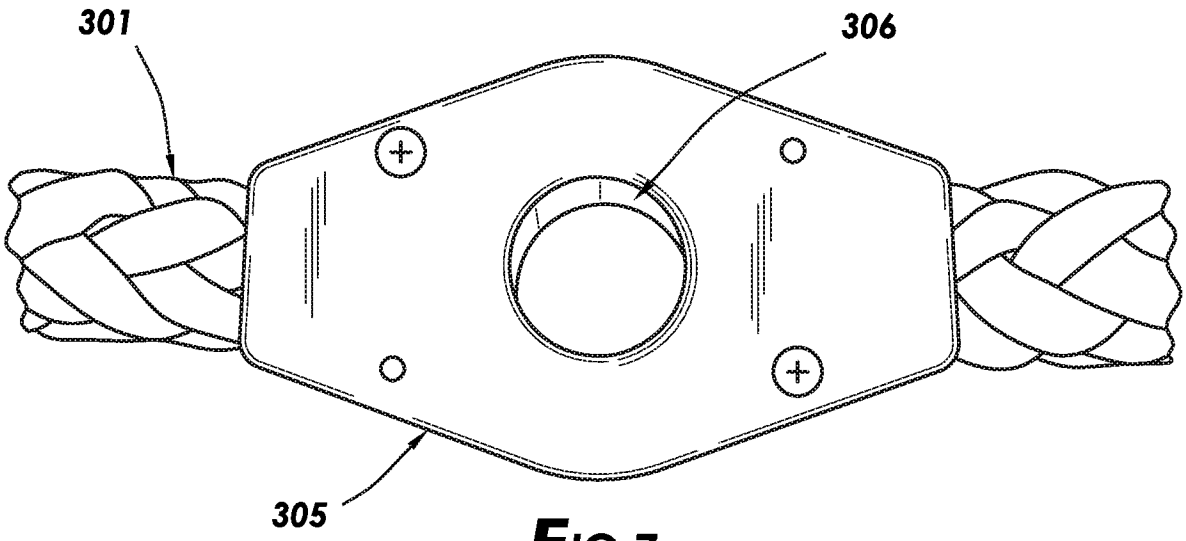

FIG.7

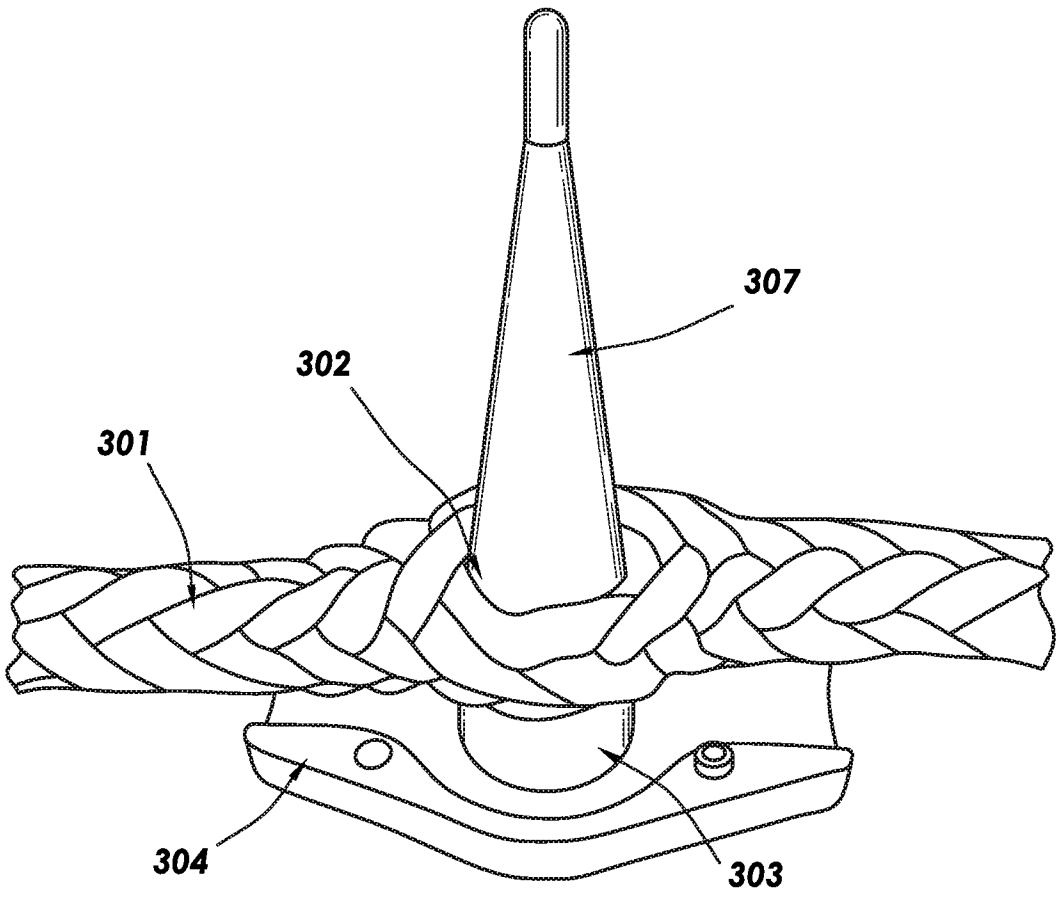

FIG.8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/052330

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - F16G 11/00; A63H 1/30; B63B 21/08; D07B 1/14; F16G 11/05; F16G 11/06; G01N 1/20 (2019.01)

CPC - F16G 11/00; A63H 1/30; B63B 21/08; D07B 1/14; D07B 2201/104; F16G 11/06; G01V 1/201; G01V 1/247; G01V 1/38; G01V 1/3843; G01V 1/3852; G01V 2210/1427 (2019.08)

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)

See Search History document

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

See Search History document

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

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3,008,537 A (ROBERTS et al) 14 November 1961 (14.11.1961) entire document	1-3, 5, 7-10, 12
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Y		1, 4, 6, 7, 11, 13
Y	Applicant Admitted Prior Art, Page 2, paragraph [0005]	1, 6, 7, 13
Y	US 4,655,376 A (DARLING) 07 April 1987 (07.04.1987) entire document	4, 11
A	US 3,128,843 A (ANAGNOSTOU) 14 April 1964 (14.04.1964) entire document	1-13
A	US 2014/0198607 A1 (FAIRFIELD INDUSTRIES INCORPORATED et al) 17 July 2014 (17.07.2014) entire document	1-13
A	US 2015/0362606 A1 (SEABED GEOSOLUTIONS B V) 17 December 2015 (17.12.2015) entire document	1-13

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

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Date of the actual completion of the international search	Date of mailing of the international search report
04 November 2019	03 JAN 2020
Name and mailing address of the ISA/US	**Authorized officer**
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774