



- (51) International Patent Classification:
D07B 1/00 (2006.01)
- (21) International Application Number:
PCT/NO2012/050048
- (22) International Filing Date:
22 March 2012 (22.03.2012)
- (25) Filing Language: Norwegian
- (26) Publication Language: English
- (30) Priority Data:
20110482 29 March 2011 (29.03.2011) NO
20120261 7 March 2012 (07.03.2012) NO
- (71) Applicant (for all designated States except US):
MØRENOT AS [NO/NO]; N-6280 Søvik (NO).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **HURLEN, Stig**
[NO/NO]; Strandgata 23, N-6270 Brattvåg (NO).
- (74) Agent: **HÅMSØ PATENTBYRÅ ANS**; Postboks 171, N-4302 Sandnes (NO).

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

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: JACKET FOR A LENGTHY BODY

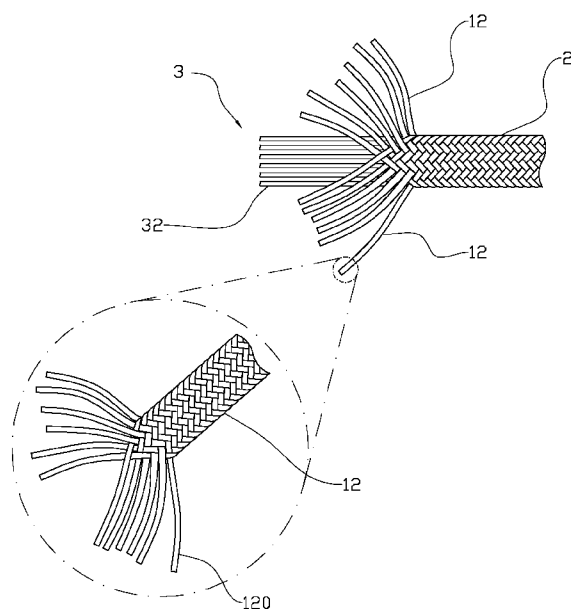


Fig. 1

(57) Abstract: A jacket (2) for a load-bearing, lengthy body (3), wherein the jacket (2) is comprised of a plurality of braid elements (12) which, when braided, enclose at least a portion of the lengthy body (3), and wherein the braid element (12) is comprised of a braided ribbon. A method of forming the jacket (2) is also described.



Published:

— *with international search report (Art. 21(3))*

JACKET FOR A LENGTHY BODY

The invention concerns a jacket enclosing a lengthy body.
More particularly, the invention concerns a braided jacket
enclosing a load-bearing, lengthy body, for example ropes and
5 mooring equipment.

Mooring equipment is subjected to large loads. Besides being
load-bearing and exposed to tensile forces, the surface of
the mooring equipment is exposed to filing, rubbing, strikes
and cuts. Particles, such as sand, may penetrate into the
10 mooring equipment if, for example, it is attached to an an-
chor lying on a seabed, and the particles may cause internal
wear and tear. Mooring equipment is also exposed to buckling.

It is known that lengthy bodies, such as ropes, mooring
equipment, electric cables, hoses and pipes, at least at an
15 end portion thereof, may be provided with a protective
jacket. This jacket may be braided, as shown in e.g. patent
publications US 4,312,260; US 4,640,178 and US 6,099,961. For
braiding of the protective jacket, it is known to use braid
elements of laid fibres. From patent publication NO 314459/
20 WO03054291, it is known that the braid elements in the pro-
tective jacket is comprised of woven ribbons.

Patent publication EP 1700948 describes a braided protective
jacket for a rope. The protective jacket comprises a plural-
ity of braid elements comprised of threads. The patent publi-

cation is silent about the construction of the threads in the braid elements. Further, the protective jacket comprises a plurality of reinforcement threads incorporated in the braiding. The patent publication provides no clear disclosure of
5 the manner in which this is done, but the reinforcement threads are not a part of the braid elements.

Patent publication WO 2005/019525 describes a braided, load-bearing rope provided with a lengthy core. The core increases the rope's resistance against squeezing, but the core has no
10 function as a load-bearing element. The load-bearing rope is not surrounded by any protective jacket.

A number of requirements exist with respect to a protective jacket. A protective jacket together with a piece of mooring equipment is used as an example. The protective jacket should
15 be pliable and such that the stiffness or bend radius of the mooring equipment does not increase. The protective jacket should be tight, whereby foreign bodies do not penetrate into the mooring equipment. The protective jacket should exhibit good resistance against filing and rubbing. During use, the
20 mooring equipment may be exposed to a cut from a sharp object. The protective jacket should be constructed in such a manner that the protective jacket provides protection against the cut from most possible angles at which the cut may be directed towards the mooring equipment, and such that the pro-
25 tective jacket does not open. A protective jacket should also be allowed to be provided with reinforcements against cuts. A protective jacket should also be allowed to be provided with a streamline coating, which is termed fairing in the art. Fairing is comprised of protruding, cut threads so as to form
30 floss. This gives the mooring equipment improved properties when pulled through the water.

It is generally known in the art that a number of monofilament fibres are laid in a first direction, for example to the left, to produce a so-called yarn. By so doing, the yarn produced is a twisted multifilament. Several yarns are laid in a second direction to produce a so-called composite bundle or strand. Three strands are laid in the first direction to produce a so-called hawser, then forming a three-strand laid hawser. Several hawsers may be laid in the second direction to produce a cable. It is also known that a four-strand laid hawser is comprised of four strands, in which one strand forms a core, a so-called calf. Further, it is known that e.g. hawsers may be comprised of more than four strands. The above does not constitute a complete disclosure of this field in the art. Examples are also known in which the lay-direction deviates from what is described herein.

A disadvantage of laid ropes is that they may twist during loading. Ropes produced via braiding of yarn, strand or hawser will not twist.

Synthetic textile fibres are produced as monofilaments being, in principle, of endless length. Hereinafter, use of synthetic textile fibres is described, but the skilled person will know how the terms may be used with respect to natural fibres. A textile element is comprised of one or more textile fibres.

Hereinafter, a thread will be used as a common term for one lengthy textile element. In its simplest form, a thread is comprised of one monofilament. Further, a thread may be comprised of two or more monofilaments lying side by side and without being twisted about each other. This will be termed a bundle. Further, a thread may be comprised of two or more monofilaments twisted about each other into, for example, a yarn. Further, a thread may be comprised of a strand, a haw-

ser or a cable, as described above. Further, a thread may be comprised of braided textile elements comprised of a monofilament, a bundle, a yarn, a strand, a hawser or a cable. A thread is further characterized in that the thread exhibits a substantially circular cross-section.

Weaving is characterized in that a group of threads, so-called warp or warp thread, is perpendicular to another group of threads, so-called woof or weft. Braiding is characterized in that the threads are functionally equivalent and are conveyed forward, whilst being cross-laid into a zigzag-pattern, below or above the other threads. A first half of the threads are conveyed spiralling forward in one direction and a second half of the threads are conveyed spiralling forward in a second direction.

The term ribbon implies a lengthy element comprised of a plurality of threads, wherein the threads may be formed in various ways, and wherein the threads may be comprised of various materials. A ribbon may be formed via weaving or via braiding and such that the ribbon in a first direction, height / thickness, is substantially shorter than in a second direction, width, wherein the first direction is perpendicular to the longitudinal direction of the ribbon, and the second direction is perpendicular both to the longitudinal direction of the ribbon and to the first direction. As such, and as an example, the ratio between the first direction, the height, and the second direction, the width, may be 1:3; 1:4; 1:5; 1:10; 1:20. The skilled person will know that this ratio varies with the number of threads in a warp, or the number of threads in a braiding.

A braided ribbon may be produced via braiding of, for example, 12 threads, wherein 6 threads lie side by side in a first direction and 6 threads lie side by side in a second

direction. The threads cross each other in particular patterns, such as e.g. over 2-under 2, or over 1-under 1. Other patterns are also available. When a thread, which lies in a first direction, is braided outwards to the edge of the ribbon, it is bent and is braided inwards along the ribbon in the second direction. The minimum number of threads in a ribbon is 3 threads. Ribbons having 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 32, 64 or 128 threads are known. It is obvious in the art to produce ribbons having a number of threads deviating from this, and it is known that the complexity of the braiding machines increases with the number of threads to be braided into a ribbon.

The object of the invention is to remedy or to reduce at least one of the disadvantages of the prior art, or at least to provide a useful alternative to the prior art.

The object is achieved by virtue of features disclosed in the following description and in the subsequent claims.

A braided ribbon according to the invention may comprise at least one lengthy, interlaced element extending in the longitudinal direction of the ribbon. The lengthy, interlaced element may be comprised of a thread of the same material used in the threads forming the braiding, or the lengthy, interlaced element may be comprised of another material. The lengthy, interlaced element may be comprised of a fibre, of a polymer or of a metal. The braiding extends around the lengthy, interlaced element. A ribbon having one or more lengthy, interlaced elements will be longer in the first direction, the height / the thickness, than a corresponding braided ribbon without lengthy, interlaced elements.

In a first aspect, the invention concerns a jacket for a lengthy, load-bearing body, wherein the jacket is comprised

of a plurality of braid elements which, when braided, enclose at least a portion of the lengthy body, and wherein the braid element is comprised of a braided ribbon.

The braided ribbon may comprise at least 3 threads. In an alternative embodiment, the braided ribbon may comprise 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 32, 64, or 128 threads. The threads are chosen from a group comprised of a monofilament, a bundle, a yarn, a strand, a hawser, and a cable. The threads may be comprised of braided textile elements.

Further, the braided ribbon may comprise at least one lengthy, interlaced element. The braided ribbon may comprise a plurality of lengthy, interlaced elements side by side. The lengthy, interlaced element may comprise a textile element. In an alternative embodiment, the lengthy, interlaced element may comprise a metal. In an alternative embodiment, the lengthy, interlaced element may comprise a polymer. The polymer may surround a metal, such as an electric conductor, or a signal conductor, such as an optical fibre. The polymer may be massive, or the polymer may be tubular. The threads of the braided ribbon may surround the lengthy, interlaced element when braided.

The lengthy, load-bearing body, which is surrounded by the jacket in at least one portion, may be chosen from a group comprising a pipe, an electric cable, a mooring element, and a rope. The invention also concerns a lengthy, load-bearing body which may be provided with a jacket, as described hereinbefore. The mooring element may be a mooring rope or a mooring hawser.

In a second aspect, the invention concerns a method of applying a braided jacket onto a lengthy, load-bearing body,

wherein the lengthy, load-bearing body is conveyed through a support sheave of a braiding machine and braid elements from spools of the braiding machine are applied, whereby the braid elements form the jacket, and wherein the braid element is
5 formed as a braided ribbon.

Hereinafter, examples of preferred embodiments are described and are depicted in the accompanying drawings, where:

Fig. 1 shows several lengthy bodies surrounded by a braided jacket, wherein the jacket is comprised of a plurality of braid elements, wherein each braid
10 element is comprised of a braided ribbon, as shown in the enlarged detail in the figure;

Fig. 2 shows, at the same scale as figure 1, one lengthy body being surrounded by a braided jacket, wherein
15 the jacket is comprised of a plurality of braid elements, wherein each braid element comprises a braided ribbon, and wherein the braided ribbon comprises interlaced, lengthy elements, as shown in the enlarged detail in the figure;

20 Fig. 3 shows the same detail as shown in figure 2, wherein the width of the braid element is depicted with a double arrow;

Fig. 4 shows, in larger scale, a section through the braid element shown in figure 3, wherein the braid ele-
25 ment is provided with interlaced, lengthy elements shown in a first embodiment; and

Fig. 5-9 show the same as in figure 4, wherein the braid element is provided with interlaced, lengthy elements in alternative embodiments.

In the figures, reference numeral 12 denotes a braided braid element. The braid element 12 is comprised of a braided ribbon. A plurality of braid elements 12 are braided around a lengthy, load-bearing body 3 and form a jacket 2. In figures 5 1 and 2 it is shown that the jacket 2 is formed by twelve braid elements 12. In figure 1, the lengthy, load-bearing body 3 is shown as a plurality of threads 32. The threads 32 may be comprised of textile threads chosen from a group comprising a monofilament, a bundle, a yarn, a strand, a hawser, 10 and a cable. Further, the thread 32 may be comprised of braided textile elements which may be comprised of a monofilament, a bundle, a yarn, a strand, a hawser or a cable. In an alternative embodiment, the thread 32 may be comprised of a metal thread. A braiding machine of a type known per se is 15 used for the braiding of the jacket 2, the machine of which is not discussed in further detail. The lengthy, load-bearing body 3 is conveyed through a support sheave (not shown) of the braiding machine and braid elements 12 from spools (not shown) of the braiding machine are applied, whereby the braid 20 elements 12 form the jacket 2.

Figure 2 shows another embodiment, wherein the lengthy body 3 is comprised of one body 34, such as, for example, a hawser, a metal thread, a hose, a stiff pipe or a pliable, electric conductor.

25 In figures 1-3, embodiments are shown wherein the braided ribbon 12 is comprised of twelve threads 120. The threads 120 may be textile threads chosen from a group comprising a monofilament, a bundle, a yarn, a strand, a hawser, and a cable. Further, the threads 120 may be comprised of braided textile 30 elements which may be comprised of a monofilament, a bundle, a yarn, a strand, a hawser, or a cable. In figures 1-3, a braiding pattern denoted as over 2-under 2 is shown. The

skilled person will know that other braiding patterns are possible. The braided ribbon 12 is produced in a braiding machine of a type known *per se*, the machine of which is not discussed in further detail.

5 In figure 2 and figure 3, the braided ribbon 12 is shown in an alternative embodiment. The braided ribbon 12 is provided with a plurality of lengthy, interlaced elements 122. In the finished ribbon 12, the interlaced elements 122 lie side by side in the longitudinal direction of the braided ribbon 12.
10 The threads 120 are braided around the interlaced elements 122, as shown schematically in figures 4-9. A double arrow marked "W" denotes the second direction of the braided ribbon 12.

Figures 4-9 show an over 2-under 2 braiding around the inter-
15 laced elements 122. A double arrow marked "H" denotes the first direction of the braided ribbon 12.

In a first embodiment, the interlaced elements 122 may constitute a reinforcement 124 of the braid element 12 in order to increase the resistance of the braid element 12 against
20 cuts, gnawing and other mechanical damage, as shown in figure 4. The interlaced elements 124 may be comprised of a thread. The interlaced elements 124 may be textile threads chosen from a group comprising a monofilament, a bundle, a yarn, a strand, a hawser, and a cable. Further, the interlaced ele-
25 ments 124 may be comprised of braided textile elements which may be comprised of a monofilament, a bundle, a yarn, a strand, a hawser, or a cable. In a further, alternative embodiment, the interlaced elements 124 may be comprised of a metal thread, and in yet a further, alternative embodiment
30 the interlaced elements 124 may be comprised of a metal wire.

In a second embodiment, the interlaced elements 122 may constitute lengthy, floating elements 125 in the braid element 12, as shown in figure 5. The interlaced elements 125 may be comprised of a material having low specific gravity. In an
5 alternative embodiment, the interlaced elements 122 may be comprised of lengthy, tubular floating elements 126, as shown in figure 6. In the embodiments shown in figures 5 and 6, the jacket 2 will constitute a buoyant body around the lengthy body 3 when placed in water.

10 In a third embodiment, the interlaced elements 122 may constitute a lengthy, weight element 127 in the braid element 12, as shown in figure 7. The interlaced weight elements 127 may be comprised of a material having high specific gravity. In this embodiment, the jacket 2 will constitute a weight
15 body around the lengthy body 3 when placed in water and will provide the lengthy body 3 with better sinking properties. The interlaced weight elements 127 may be comprised of a metal, for example of lead, or of a metal surrounded by a polymer jacket 127'.

20 In a fourth embodiment, the interlaced elements 122 may constitute a lengthy, electric conductor 128 in the braid element 12, as shown in figure 8. The interlaced electric conductors 128 may be surrounded by an electrically isolating polymer jacket 128'. At least one braid element 12 in the
25 jacket 2 is provided with at least one electric conductor 128. The electric conductor 128 may be a signal cable. The electric conductors 128 may be structured to transmit electric energy from one end portion of the lengthy body 3 and onto another end portion thereof. In an alternative embodi-
30 ment, the electric conductors 128 may be structured to form an electric field around the lengthy body 3 in order to pre-

vent, for example, sharks from biting into the lengthy body 3.

In a fifth embodiment, the interlaced element 122 may constitute a lengthy, signal conductor 129 in the braid element 12, as shown in figure 9. The interlaced signal conductor 129 may be comprised of an optical conductor 129. In figure 9, one possible combination of various interlaced elements 122 is also shown. One braid element 12 may be provided with at least one reinforcement 124, and at least one floating element 126. The skilled person will also appreciate that the various braid elements 12 forming the jacket 2 may be provided with various interlaced elements 122, or with various combinations of interlaced elements 122.

The threads 32, 120 and the interlaced elements 122 may be comprised of, for example, synthetic fibres, such as polyester, polyamide, polypropylene, polyethylene, including so-called UHMWPE (ultra-high-molecular-weight polyethylene), aramid or vectran. The threads 32, 120 and the interlaced elements 122 may be comprised of the same material, or they may be comprised of various materials.

In alternative embodiments, the lengthy body 3 may comprise a rope or a hawser, a textile thread, a metal thread, a wire, a rope, a hose, or a stiff pipe.

The skilled person will know that other braiding patterns are possible, such as e.g. over 1-under 1. Further, it is known to use another number of braid elements 12 than twelve in order to braid a jacket 2 around a lengthy, load-bearing body 3.

C l a i m s

1. A jacket (2) for a lengthy, load-bearing body (3),
wherein the jacket (2) is comprised of a plurality of
braid elements (12) which, when braided, enclose at least
5 a portion of the lengthy body (3), c h a r a c t e r -
i z e d i n that the braid element (12) is comprised of
a braided ribbon.
2. The jacket (2) according to claim 1, c h a r a c t e r -
i z e d i n that the braided ribbon (12) comprises at
10 least 3 threads (120).
3. The jacket (2) according to claim 2, c h a r a c t e r -
i z e d i n that the threads (120) are chosen from a
group comprised of a monofilament, a bundle, a yarn, a
strand, a hawser, and a cable.
- 15 4. The jacket (2) according to claim 2, c h a r a c t e r -
i z e d i n that threads (120) consist of braided tex-
tile elements.
5. The jacket (2) according to claim 1, c h a r a c t e r -
i z e d i n that the braided ribbon (12) further com-
20 prises at least one lengthy, interlaced element (122).
6. The jacket (2) according to claim 5, c h a r a c t e r -
i z e d i n that the braided ribbon (12) comprises a
plurality of lengthy, interlaced elements (122) side by
side.
- 25 7. The jacket (2) according to claim 5, c h a r a c t e r -
i z e d i n that the lengthy, interlaced element (122)
comprises a textile element.

8. The jacket (2) according to claim 5, c h a r a c t e r -
i z e d i n that the lengthy, interlaced element (122)
comprises a metal.
9. The jacket (2) according to claim 5, c h a r a c t e r -
5 i z e d i n that the lengthy, interlaced element (122)
comprises a polymer.
10. The jacket (2) according to claim 5, c h a r a c t e r -
i z e d i n that the threads (120) of the braided rib-
bon (12) surround the lengthy, interlaced element (122)
10 when braided.
11. The jacket (2) according to claim 1, c h a r a c t e r -
i z e d i n that the lengthy, load-bearing body (3) is
chosen from a group comprising a pipe, an electric cable,
a mooring element, and a rope.
- 15 12. A lengthy, load-bearing body (3) chosen from a group com-
prising a pipe, an electric cable, a mooring element, and
a rope, c h a r a c t e r i z e d i n that the lengthy
body (3) is provided with a jacket (2) according to claim
1.
- 20 13. A method of applying a braided jacket (2) onto a lengthy,
load-bearing body (3), wherein the lengthy, load-bearing
body (3) is conveyed through a support sheave of a braid-
ing machine and braid elements (12) from spools of the
braiding machine are applied, whereby the braid elements
25 (12) form the jacket (2), c h a r a c t e r i z e d i n
that the braid element (12) is formed as a braided rib-
bon.

1/6

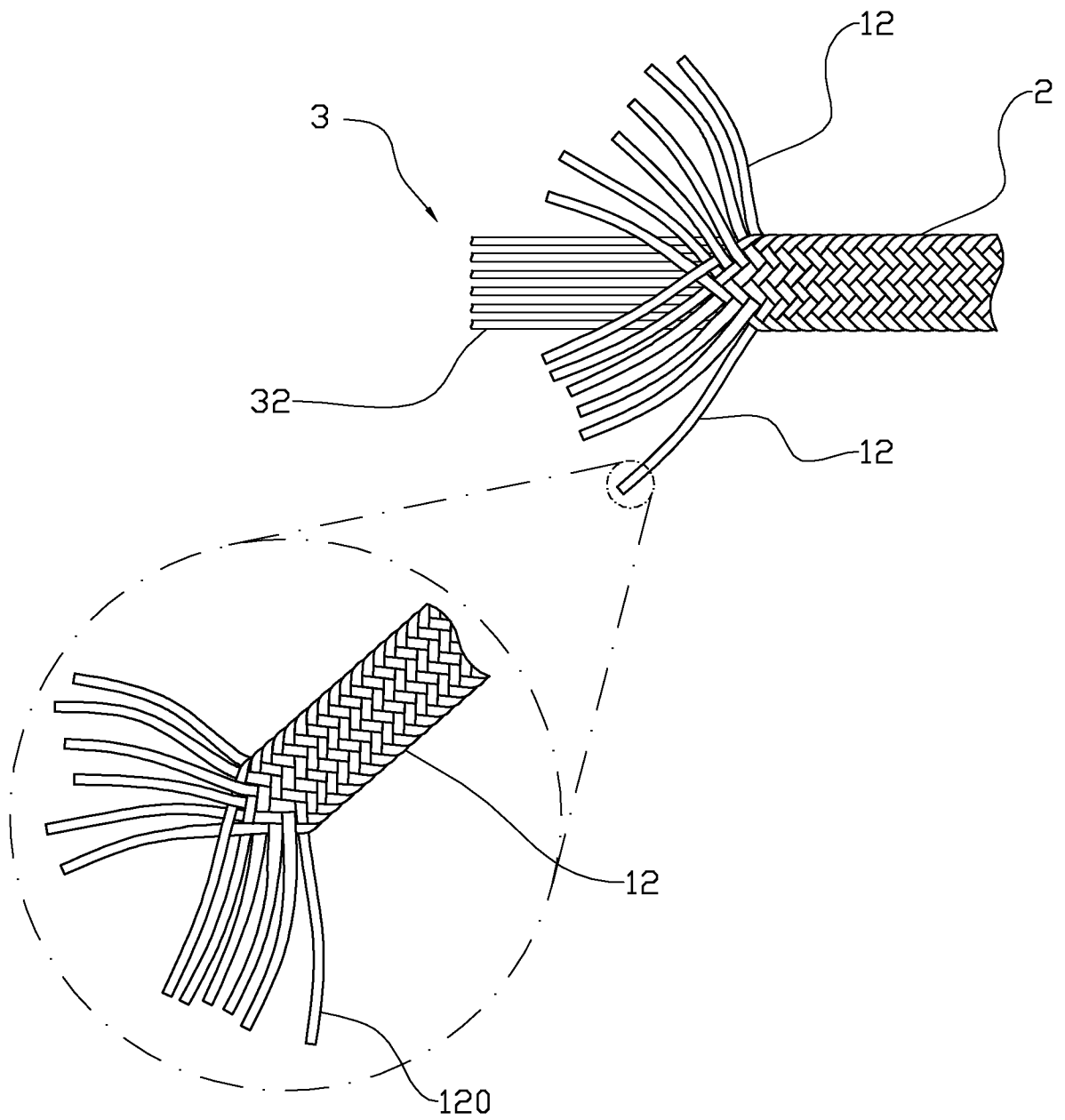


Fig. 1

2/6

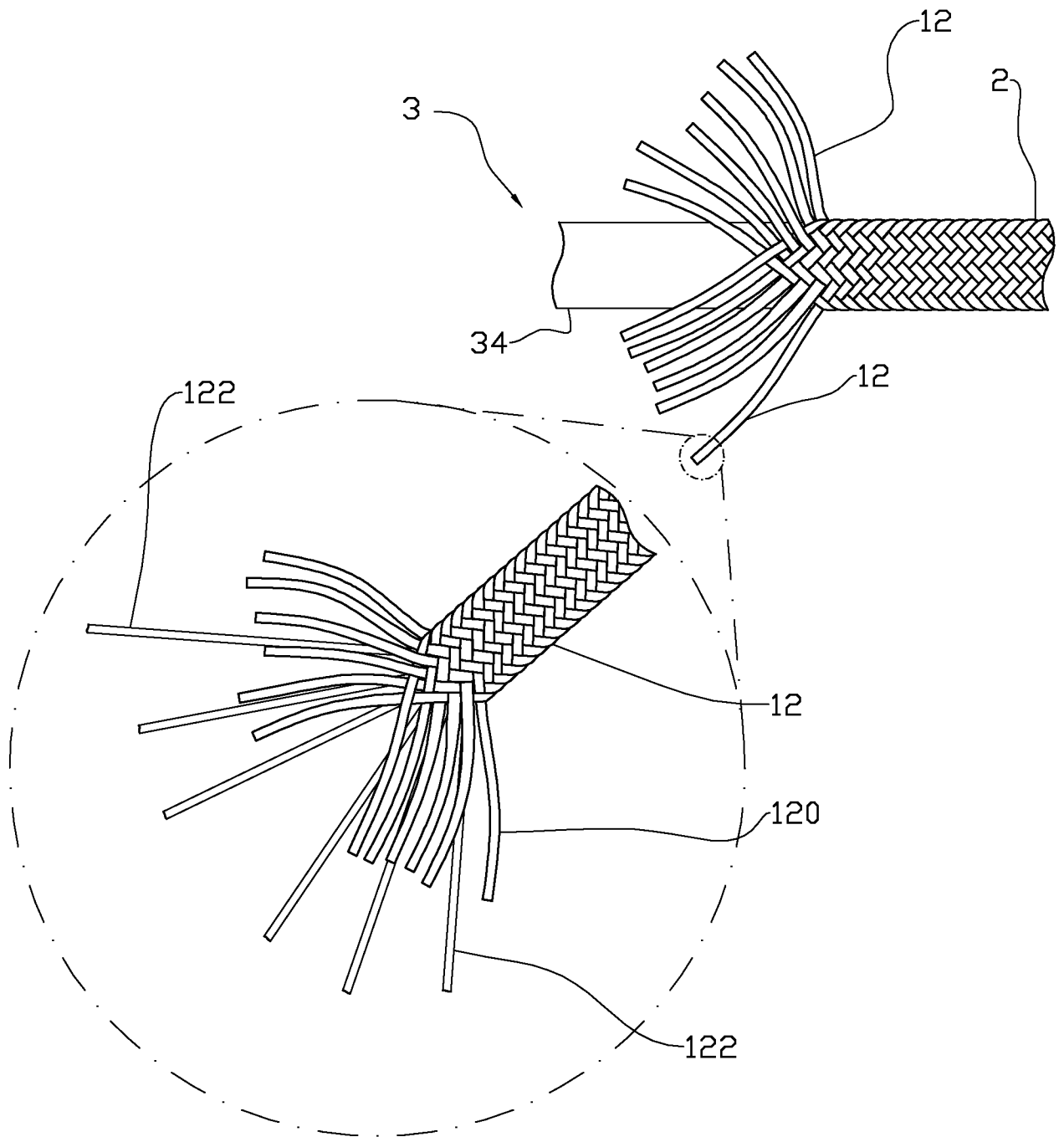


Fig. 2

3/6

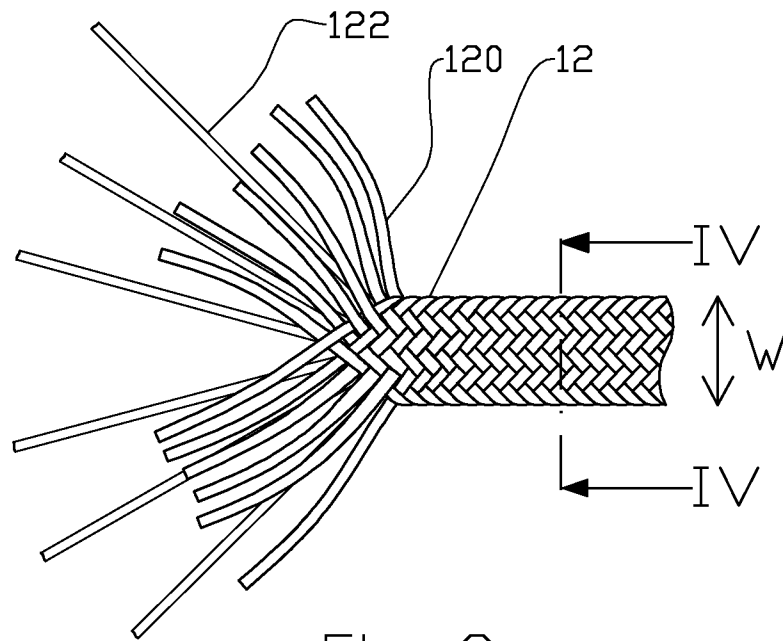


Fig. 3

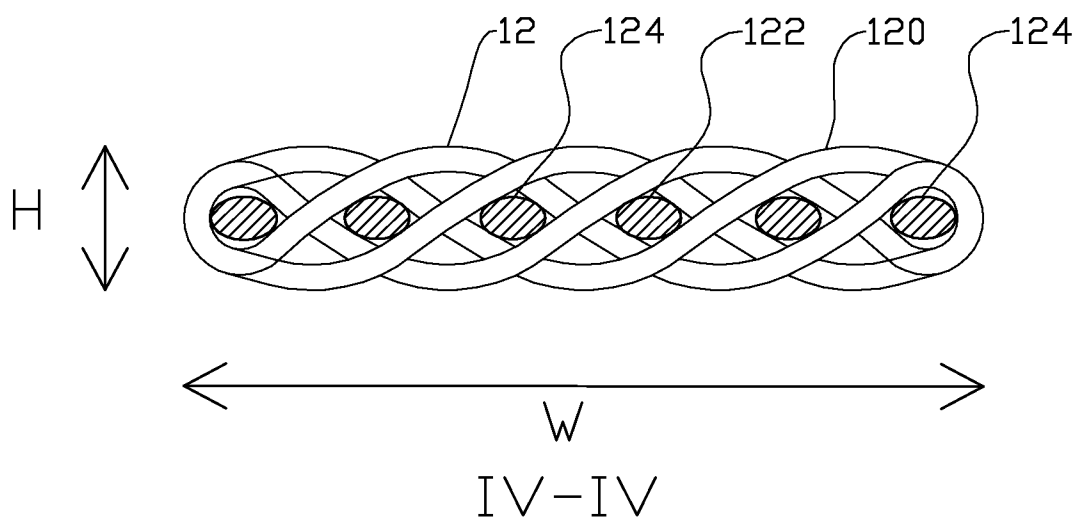


Fig. 4

4/6

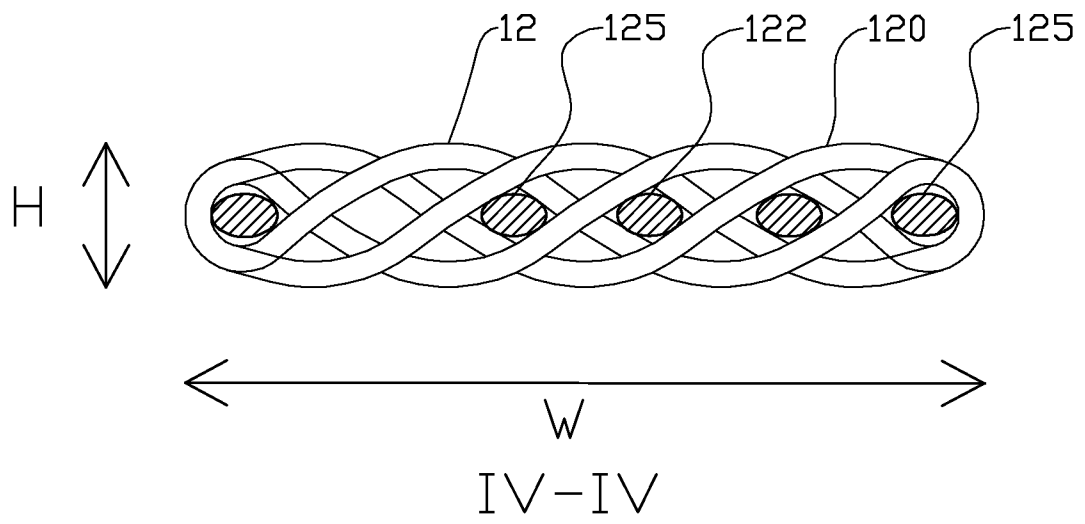


Fig. 5

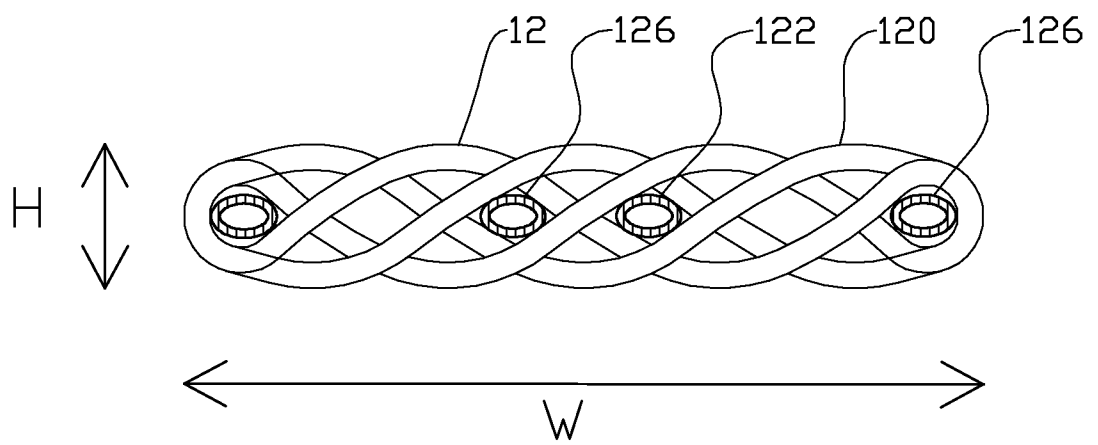


Fig. 6

5/6

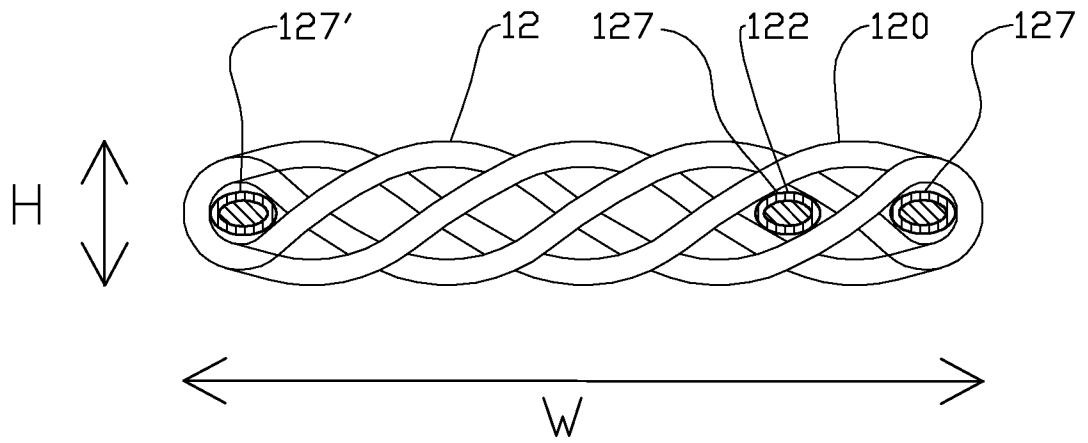


Fig. 7

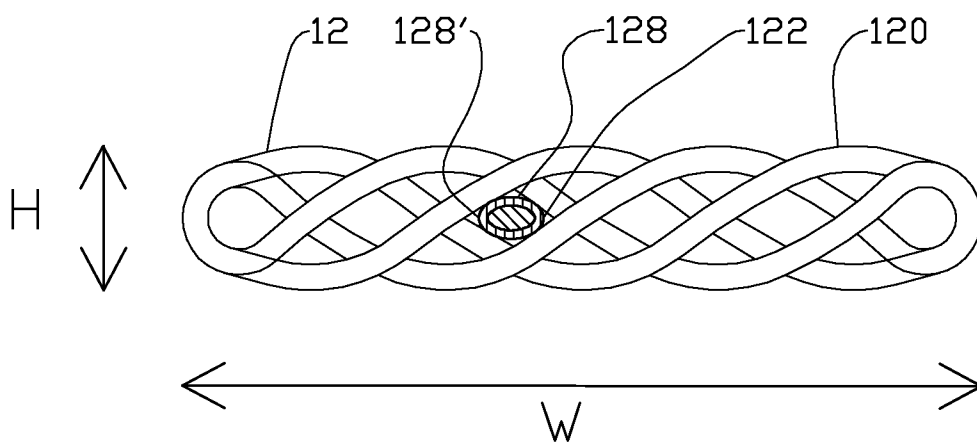


Fig. 8

6/6

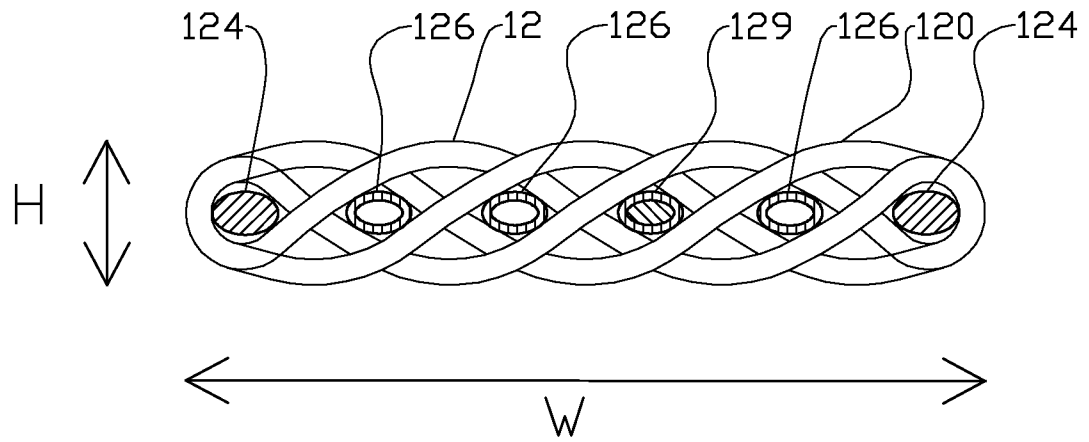


Fig. 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO2012/050048

A. CLASSIFICATION OF SUBJECT MATTER

D07B1/00

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)

IPC-8 D07B

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

DK, FI, SE, NO

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

WPI, EPODOC, PATGRANSK

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 03/054291 A1(OFFSHORE & TRAWL SUPPLY AS) 2003.07.03 figures and abstract.	1,12,13
Y		2-11
Y	WO 2005/019525 A1 (STOLT OFFSHORE LTD) 2005.03.03 figures and abstract.	1-13
Y	EP 1700948 A2 (CASTAÑO LACRUZ, jose joaquin) 2006.09.13 figures and abstract.	1-13

☐ 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
20/06/2012Date of mailing of the international search report
22/06/2012Name and mailing address of the ISA/
Nordic Patent Institute
Helgeshoj Allé 81 2630 Taastrup Denmark

Facsimile No. (45)43 50 80 08

Authorized officer
Christen Bryn

Telephone No. (47) 22 38 76 24

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/NO2012/050048

Patent document cited in the report	Publication date	Patent family member(s)	Publication date
.....			
WO03054291 A	2003-07-03		
		NO314459 B1	2003-03-24
		AU2002351522 A1	2003-07-09
		EP1456462 A1	2004-09-15
		PT1456462E	2008-08-05
WO2005019525 A1	2005-03-03		
		none	
EP1700948 A2	2006-09-13		
		ES1059722U	2005-05-16