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(54) **Twisted strand or cable with a smooth outer surface**

Verdrillte Drahtlitze oder verdrilltes Kabel mit glatter Außenfläche

Toron ou câble torsadé avec une surface extérieure lisse

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a metal cable.

Description of the Prior Art

[0002] Metal cable is frequently used in brake assembly of bicycle or motorbike. Metal cable is used for activating brake clamp when user grabs and presses handle of the brake assembly. Conventionally, metal cable is manufactured by twisting several metal wires. To obtain batter operation performance, metal cable which has lowered friction, minimized elongation, and greater flexibility is desired.

[0003] To reduce friction caused in operation, metal cable, as disclosed in US 986,817, is entwisted with several flat wires at outer surface thereof. However, differentiated outer layer which has specified appearance would peel off easily.

[0004] Additionally, some metal cables, as disclosed in US 3,778,993 and US 4,311,001, are prepared with smoothened outer surface by pressing and deforming outer wires thereof. However, such serious deformation causes not only troubles in manufacturing, but damage in mechanical properties such as elongation coefficient. Moreover, the metal cables provided are still covered be lines and veins. Friction and abrasion would still occur in operation.

[0005] Another metal cable, as described in US 4,809,492, is provided with several elliptical wires. The elliptical wires are twisted on the central cable. Thus, outer surface is smoothened and veins on the outer surface are lessened. However, interval vacant space takes a considerable space in the cable. Effective cross section area of the wire is descended. As a result, mechanical properties of the metal cable are also damaged.

[0006] DE 29 49 754 B1 discloses a strand having a plurality of wires with different cross-sectional shapes.

[0007] US 6 260 343 B1 discloses strands and wire ropes composed of materials such as high carbon steels and stainless steels that are provided in a compacted, mechanically stress relieved and thermally stress relieved condition.

[0008] The present invention is, therefore, arisen to obviate or at least mitigate the above mentioned disadvantages.

SUMMARY OF THE INVENTION

[0009] The main object of the present invention is to provide a metal cable which is prepared for batter operation performance in brake assembly.

[0010] To achieve the above and other objects, a twisted cable according to claim 1 is provided including a central wire and several surround wires.

[0011] The surround wires are arrenged around the central wire. The surround wires are arranged in layers which are concentrically defined outwardly from the central wire as an inner layer, a middle layer, and an outer layer.

[0012] The surround wires are classified according to sizes of areas of transversal cross sections thereof, and classified into first wires, second wires, third wires, and fourth wires, which are ranged from the smallest to the largest. Each transversal cross section of each surround wire is perpendicular to an axial direction of the surround wire.

[0013] The inner layer comprises six second wires. Size of area of transversal cross section of each second wire is smaller than the size of area of transversal cross section of the central wire.

[0014] The middle layer comprises plural first wires and plural third wires. The third wires are interspersed between any two adjacent first wires of the first wires. Quantity of the first wires of the middle layer, quantity of the third wires of the middle layer, and quantity of the second wires of the inner layer are the same.

[0015] The outer layer comprises plural fourth wires. Quantity of the fourth wires of the outer layer is equal to the total quantity of the first wires and the third wires of the middle layer.

[0016] Each of the fourth wires has an inner surface facing the central wire and an outer surface away from the central wire. Curvature of the outer surface is smaller than curvature of the inner surface from a cross sectional viewpoint. The surround wires are twisted on the central wire together.

[0017] The present invention will become more obvious from the following description when taken in connection with the accompanying drawings, which show, for purpose of illustrations only, the preferred embodiment(s) in accordance with the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

Fig. 1 is a side view showing a first embodiment of the present invention;
Fig. 2 is a profile showing a first embodiment of the present invention;
Fig. 3 is a schematic drawing showing a first embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] Please refer to Fig. 1 to Fig. 3 for a first embodiment of the present invention. The twisted cable 1 of the present embodiment includes several wires. The wires are bundled and entwisted. As shown in Fig. 2 and Fig. 3, interval vacant spaces still remain between the wires.

In the present embodiment, all of the wires of the twisted cable are single metal wire.

[0020] The wires of the twisted cable 1 include a central wire 11 and several surround wires. The surround wires are arranged around the central wire 11. The surround wires are arranged in layers which are concentrically defined outwardly from the central wire 11 as an inner layer, a middle layer, and an outer layer. In other words, the inner layer is located between the central wire and the middle layer, the middle layer is located between the inner layer and the outer layer, and these three layers are defined circularly and annularly in transversal cross section. The surround wires are classified according to sizes of areas of transversal cross sections thereof, in particular, are classified into first wires 12, second wires 13, third wires 14, and fourth wires 15 by ranging the surround wires from the smallest to the largest, wherein each transversal cross section of each surround wire is perpendicular to an axial direction of the surround wire. In other words, the first wires 12 have the smallest cross section in the surround wires. Cross sections of the first wires 12, the second wires 13, and the third wires 14 are preferably formed circularly before entwisting or pressing.

[0021] The inner layer includes several second wires 13 which are annularly arranged. Cross section of the second wire 13 is smaller than cross section of the central wire 11. Therefore, there are six second wires 13 in the inner layer. Given that the cross section of the second wires 13 is smaller than the cross section of the central wire 11, gaps are defined and remain between the second wires 13.

Preferably, ratio of radius of contour of cross section of each second wire 13 to radius of contour of cross section of the central wire 11 is equal to or greater than 0.8. Thus, the inner layer includes just six second wires 13.

[0022] The middle layer includes several first wires 12 and several third wires 14. The first wires 12 and the third wires 14 are annularly arranged. The third wires 14 are interspersed between any two adjacent first wires 12. Therefore, the third wires 14 and the first wires 12 are alternatively arranged. Quantities of the first wires 12 and the third wires 13 are equal to quantity of the second wires 12 of the inner layer respectively. In the present embodiment, first, second, and third wires are all six wires, and are eighteen wires in total. The sizes of areas of transversal cross sections of the third wires 14 are equal to size of area of transversal cross section of the central wire 11 respectively. Each third wire 14 is adjacent to two second wires 13, and each first wire 12 is adjacent to one second wires 13. Thus, the third wires 14, which are larger than the first wires 12, are held in the recesses between any two adjacent second wires 13.

[0023] The outer layer includes several fourth wires 15 which are annularly arranged. Quantity of the fourth wires 15 is equal to total quantity of the first wires 12 and the third wires 14. In the present embodiment, the middle layer includes six first wires 12 and six third wires 14. Thus, there are twelve fourth wires 15 in the outer layer. Preferably, each fourth wire 15 is located adjacent to one first wire 12 and one third wire 14. Thus, the fourth wires 15 are held in or adjoined to the recess between one of the first wires 12 and the adjacent third wire 14. Each fourth wire 15 has an inner surface 151 and an outer surface 152. From a cross sectional viewpoint, curvature of the outer surface 152 is smaller than curvature of the inner surface 151. That is to say, in comparison with the inner surface 151, the outer surface 152 is smoothened. From the cross sectional viewpoint, contour of the outer surface 152 is an arc, as shown in Fig. 2.

[0024] In addition, as shown in Fig. 2, the outer surfaces 152 of the fourth wires 15 are circularly connected as a circle. The cross sectional viewpoint here is a transverse observation on the whole twisted cable. However, transverse observation on each fourth wire 15 would show a similar contour mentioned above.

[0025] To take structure strength, weight, and thickness in consideration, the wires may be manufactured in the sizes below:

First wires 12: 0.17mm in diameter;
Second wires 13: 0.21mm in diameter;
Third wires 14 and central wire 11: 0.24mm in diameter;
Fourth wires 15: 0.32mm in maximum width.

[0026] However, the sizes mentioned above are not made unchangeable. Sizes of the wires can be magnified or shrunk by a predetermined scale.

[0027] Accordingly, the twisted cable 1 has smoothened outer surface. Friction and abrasion caused in pulling are minimized. When the twisted cable 1 is assembled in brake assembly, resistance caused in pulling the twisted cable is minimized, too. Thus, handle of brake assembly can pull the twisted cable dexterously and precisely.

[0028] In addition, the wires of inner layer and middle layer are arranged around the central wire 11. Interval vacant space is reduced. Thus, elongation of the twisted cable is also reduced.

[0029] Moreover, internal space is remained between the middle layer and the outer layer. Thus, the twisted cable can be bent or curved easily. Fitting for bicycle or motorbike is facilitated.

Claims

1. A twisted cable (1), comprising:

a central wire (11) and plural surround wires, the surround wires arranging around the central wire (11), the surround wires being arranged in layers which are concentrically defined outwardly from the central wire (11) as an inner layer, a middle layer, and an outer layer;

wherein the surround wires are classified according to sizes of areas of transversal cross sections thereof, and classified into first wires (12), second wires (13), third wires (14), and fourth wires (15), which are ranged from the smallest to the largest;
wherein each transversal cross section of each surround wire is perpendicular to an axial direction of the surround wire;
wherein the inner layer comprises at least six second wires (13), size of area of transversal cross section of each second wire (13) is smaller than size of area of transversal cross section of the central wire (11);
wherein the middle layer comprises plural first wires (12) and plural third wires (14), the third wires (14) are interspersed between any two adjacent first wires (12) of the first wires (12), quantity of the first wires (12) of the middle layer, quantity of the third wires (14) of the middle layer, and quantity of the second wires (13) of the inner layer are the same;
wherein the outer layer comprises plural fourth wires (15), quantity of the fourth wires (15) of the outer layer is equal to total quantity of the first wires (12) and the third wires (14) of the middle layer;
wherein each of the fourth wires (15) has an inner surface (151) facing the central wire (11) and an outer surface (152) away from the central wire (11),
curvature of the outer surface (152) is smaller than curvature of the inner surface (151) from a cross sectional viewpoint;
wherein the surround wires are twisted on the central wire (11) together **characterized in that**:

the size of area of the transversal cross section

of each third wire (14) is equal to the size of area of
transversal cross section of the central wire (11);
the outmost surfacial contours (152) of the fourth wires (15) are entirely circularly connected as a circle from a cross sectional viewpoint;
the quantity of wires of the middle layer consists of 12, namely six of the first wires (12) and six of the third wires (14), and every two opposing first wires (12) or third wires (14) are symmetrical corresponding to the central wire (11);
each wire of the inner and middle layers is circumferentially spaced apart form one another;
any two wires of the central wire (11), inner layer or middle layer form a gap which is free of any material.

2. The twisted cable of claim 1, wherein each third wire (14) is adjacent to two of the second wires (13), and each first wire (12) is adjacent to one of the second wires (13).

3. The twisted cable of claim 1, wherein the wires are of the sizes below:

first wires (12): 0.17mm in diameter;
second wires (13): 0.21mm in diameter;
third wires (14) and central wire (11): 0.24mm in diameter; fourth wires 15: 0.32mm in maximum width.

4. The twisted cable of claim 1, wherein each fourth wire (15) is adjacent to one of the first wires (12) and one of the third wires (14).

5. The twisted cable of claim 1, wherein the central wire (11), the first wires (12), the second wires (13), and the third wires (14) has circular cross sections respectively before the surround wires are twisted, ratio of radius of contour of cross section of each second wire (13) to radius of contour of cross section of the central wire (11) is equal or greater than 0.8.

Patentansprüche

1. Verdrilltes Kabel (1), umfassend:

einen zentralen Draht (11) und mehrere umliegende Drähte, wobei die umliegenden Drähte um den zentralen Draht (11) angeordnet sind, wobei die umliegenden Drähte in Schichten angeordnet sind, die von dem zentralen Draht (11) konzentrisch nach außen hin als eine Innenschicht, eine Zwischenschicht und eine Außenschicht definiert sind,
wobei die umliegenden Drähte entsprechend der Größen ihrer transversalen Querschnittsflächen klassifiziert sind und in der Reihenfolge von dem kleinsten zu dem größten in erste Drähte (12), zweite Drähte (13), dritte Drähte (14) und vierte Drähte (15) unterteilt sind,
wobei jeder transversale Querschnitt von jedem umliegenden Draht senkrecht zu einer axialen Richtung des umliegenden Drahts ist,
wobei die Innenschicht wenigstens sechs zweite Drähte (13) umfasst, wobei die Größe der transversalen Querschnittsfläche von jedem zweiten Draht (13) kleiner ist als die Größe der transversalen Querschnittsfläche des zentralen Drahts (11),
wobei die Zwischenschicht mehrere erste Drähte (12) und mehrere dritte Drähte (14) umfasst, wobei die dritten Drähte (14) zwischen zwei beliebigen benachbarten ersten Drähten (12) der ersten Drähte (12) eingefügt sind, wobei die An-

zahl der ersten Drähte (12) der Zwischenschicht, die Anzahl der dritten Drähte (14) der Zwischenschicht und die Anzahl der zweiten Drähte (13) der Innenschicht gleich sind,
wobei die Außenschicht mehrere vierte Drähte (15) umfasst, wobei die Anzahl der vierten Drähte (15) der Außenschicht gleich der Gesamtzahl der ersten Drähte (12) und der dritten Drähte (14) der Zwischenschicht ist,
wobei jeder der vierten Drähte (15) eine Innenfläche (151), die dem zentralen Draht (11) zugewandt ist, und eine Außenfläche (152) hat, die von dem zentralen Draht (11) weg zeigt, wobei die Krümmung der Außenfläche (152) in einer Querschnittsansicht kleiner ist als die Krümmung der Innenfläche (151),
wobei die umliegenden Drähte um den zentralen Draht (11) miteinander verdrillt sind, **dadurch gekennzeichnet, dass**:

die Größe der transversalen Querschnittsfläche von jedem dritten Draht (14) gleich der Größe der transversalen Querschnittsfläche des zentralen Drahts (11) ist,
die Konturen der Außenflächen (152) der vierten Drähte (15) in einer Querschnittsansicht vollständig kreisförmig zu einem Kreis verbunden sind,
die Anzahl der Drähte der Zwischenschicht 12 beträgt, und zwar sechs erste Drähte (12) und sechs dritte Drähte (14), wobei die zwei gegenüberliegenden ersten Drähte (12) oder dritten Drähte (14) jeweils symmetrisch in Bezug auf den zentralen Draht (11) sind,
jeder Draht der Innen- und der Zwischenschichten in Umfangsrichtung voneinander getrennt sind,
zwei beliebige Drähte des zentralen Drahts (11), der Innenschicht oder der Zwischenschicht einen Spalt bilden, der frei von jeglichem Material ist.

2. Verdrilltes Kabel nach Anspruch 1, bei welchem jeder dritte Draht (14) zu zwei der zweiten Drähte (13) benachbart ist, und jeder erste Draht (12) zu einem der zweiten Drähte (13) benachbart ist.

3. Verdrilltes Kabel nach Anspruch 1, bei welchem die Drähte die nachstehenden Größen aufweisen:

erster Draht (12): Durchmesser von 0,17 mm,
zweiter Draht (13): Durchmesser von 0,21 mm,
dritter Draht (14) und zentraler Draht (11): Durchmesser von 0,24 mm,
vierter Draht (15): maximale Breite von 0,32 mm.

4. Verdrilltes Kabel nach Anspruch 1, bei welchem jeder vierte Draht (15) zu einem der ersten Drähte (12) und einem der dritten Drähte (14) benachbart ist.

5. Verdrilltes Kabel nach Anspruch 1, bei welchem der zentrale Draht (11), die ersten Drähte (12), die zweiten Drähte (13) und die dritten Drähte (14) jeweils kreisförmige Querschnitte haben bevor die umliegenden Drähte verdrillt werden, wobei das Verhältnis des Radius der Querschnittsumrisslinie von jedem zweiten Draht (13) zum Radius der Querschnittsumrisslinie des zentralen Drahts (11) gleich oder größer als 0,8 ist.

Revendications

1. Câble torsadé (1) comprenant :

un fil central (11) et plusieurs fils qui entourent, les fils qui entourent étant arrangés autour du fil central (11), les fils qui entourent étant arrangés en couches qui sont définies concentriquement vers l'extérieur du fil central (11) comme une couche intérieure, une couche centrale et une couche extérieure,
les fils qui entourent étant classés selon des tailles de régions de section transversale de ceux-ci et étant classés en premiers fils (12), seconds fils (13),
troisièmes fils (14) et quatrièmes fils (15) qui sont classés du plus petit au plus grand,
chaque section transversale de chaque fil qui entoure étant perpendiculaire à une direction axiale du fil qui entoure,
la couche intérieure comprenant au moins six seconds fils (13), la taille de la région de la section transversale de chaque second fil (13) étant plus petite que la taille de la région de la section transversale du fil central (11),
la couche centrale comprenant plusieurs premiers fils (12) et plusieurs troisièmes fils (14), les troisièmes fils (14) étant intercalés entre deux premiers fils adjacents quelconques (12) des premiers fils (12), la quantité des premiers fils (12) de la couche centrale, la quantité des troisièmes fils (14) de la couche centrale et la quantité des seconds fils (13) de la couche intérieure étant la même,
la couche extérieure comprenant plusieurs quatrièmes fils (15), la quantité des quatrièmes fils (15) de la couche extérieure étant égale à la quantité totale des premiers fils (12) et des troisièmes fils (14) de la couche centrale,
chacun des quatrièmes fils (15) ayant une surface intérieure (151) faisant face au fil central (11) et une surface extérieure (152) détournée du fil central (11), la courbure de la surface extérieure (152) étant plus petite que la courbure

de la surface intérieure (151) d'un point de vue de section transversale,
les fils qui entourent étant torsadés ensemble sur le fil central (11),
caractérisé en ce que la taille de la région de la section transversale de chaque troisième fil (14) est égale à la taille de la région de la section transversale du fil central (11), les contours de surface les plus à l'extérieur (152) des quatrièmes fils (15) sont reliés entièrement de manière circulaire en tant que cercle d'un point de vue de section transversale, la quantité de fils de la couche centrale est de 12, à savoir six premiers fils (12) et six troisièmes fils (14) et tous les deux premiers fils opposés (12) ou troisièmes fils (14) correspondent symétriquement au fil central (11), chaque fil de la couche intérieure et de la couche centrale est espacé dans le sens de la circonférence l'un de l'autre, n'importe quels deux fils de la couche intérieure ou de la couche centrale ou du fil central (11) forment un vide qui est exempt de quelque matière que ce soit.

2. Câble torsadé selon la revendication 1, chaque troisième fil (14) étant adjacent à deux des seconds fils (13) et chaque premier fil (12) étant adjacent à l'un des seconds fils (13).

3. Câble torsadé selon la revendication 1, les fils étant des tailles ci-dessous :

premiers fils (12) de 0,17 mm de diamètre,
seconds fils (13) de 0,21 mm de diamètre,
troisièmes fils (14) et fil central (11) de 0,24 mm de diamètre,
quatrièmes fils (15) d'une largeur maximum de 0,32 mm.

4. Câble torsadé selon la revendication 1, chaque quatrième fil (15) étant adjacent à un des premiers fils (12) et à un des troisièmes fils (14).

5. Câble torsadé selon la revendication 1, le fil central (11), les premiers fils (12), les seconds fils (13) et les troisièmes fils (14) ayant des sections circulaires respectivement avant que les fils qui entourent soient torsadés, le rapport du rayon du contour de section de chaque second fil (13) au rayon du contour de section du fil central (11) étant égal ou supérieur à 0,8.

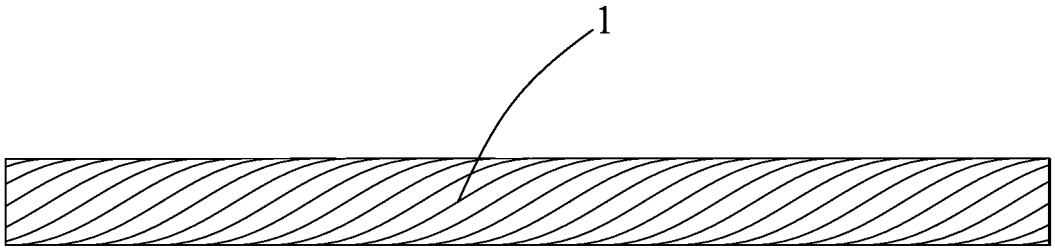


FIG. 1

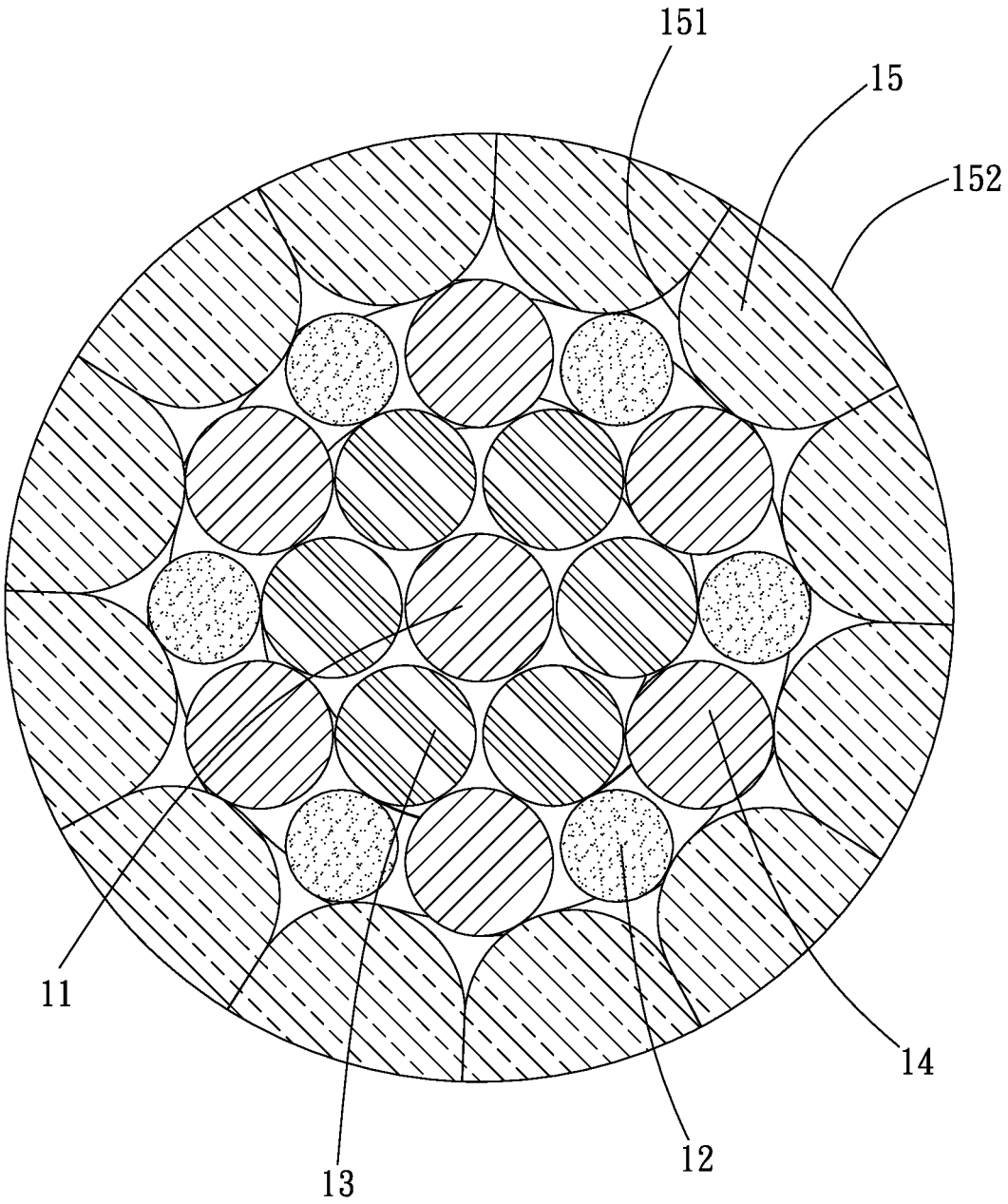


FIG. 2

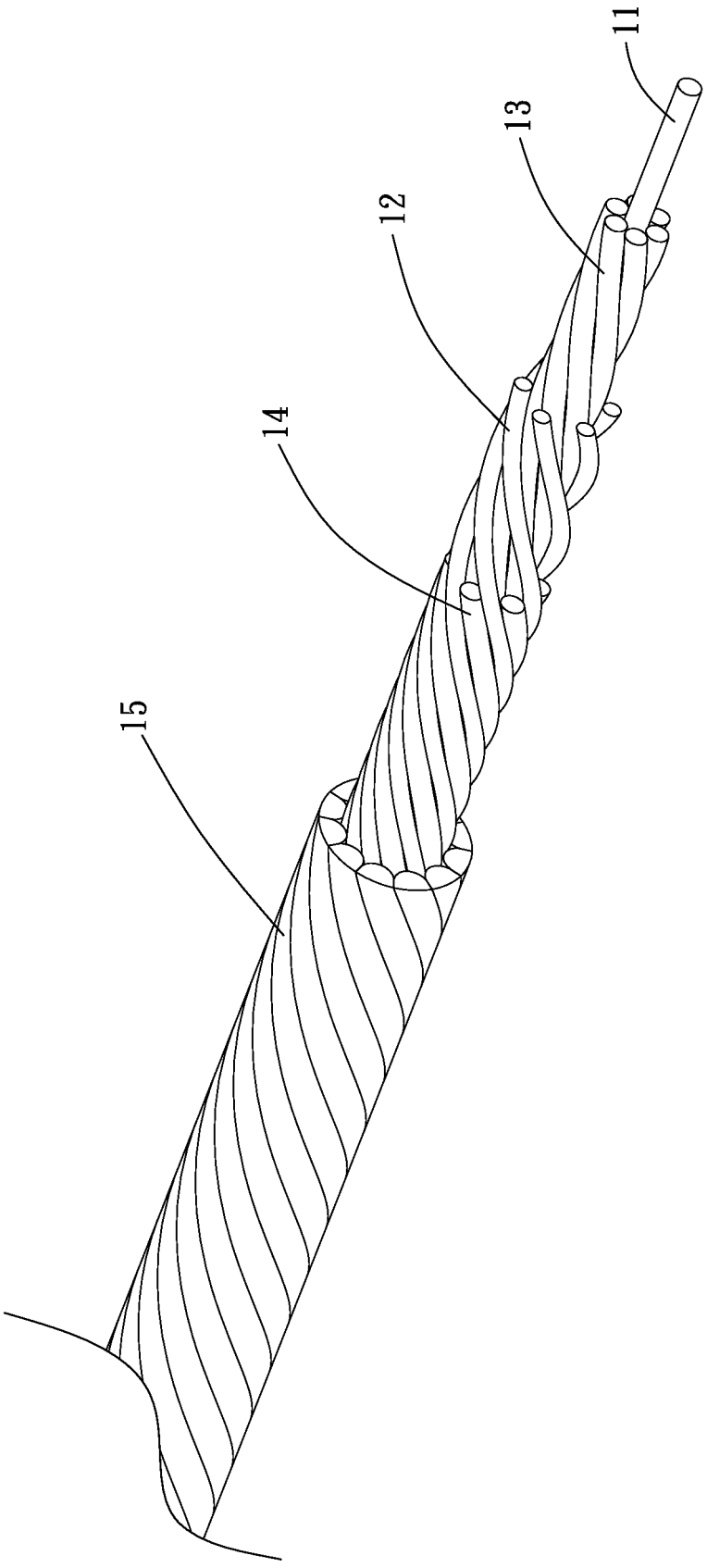


FIG. 3

REFERENCES CITED IN THE DESCRIPTION

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