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(54) **RUNNING WIRE ROPE**

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(73) Proprietor: **SHINKO WIRE COMPANY, LTD.**
Amagasaki City
Hyogo 6600091 (JP)

(72) Inventors:
• **INOUE, Shinya**
Kaizuka-shi
Osaka 597-8501 (JP)

• **NISHII, Yuki**
Kaizuka-shi
Osaka 597-8501 (JP)

(74) Representative: **Riebling, Peter**
Patentanwalt
Postfach 31 60
88113 Lindau (DE)

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Description

TECHNICAL FIELD

[0001] The present invention relates to a running wire rope used in running rigging for an elevator or the like.

BACKGROUND ART

[0002] A wire rope used in running rigging for an elevator is formed by twisting a strand around a core member, the strand being formed by twisting a plurality of wires. In a conventional running wire rope, a fiber core or a steel core is mainly used as the core member. Such a core member is worn gradually due to repeated bending or the like through a predetermined time period of use, and thereby the core member becomes thin. When the core member becomes thin, wear fractures are generated due to contact between the strands or the wire rope is stretched, and thereby the wire rope might be damaged or the strength of the wire rope might be deteriorated. Thus, a wire rope using a resin material such as polyethylene and polypropylene as the core member has been proposed, disclosed for example in JP 2010-144305 A.

[0003] CH 689 098 A5 discloses a running wire rope formed by twisting a plurality of strands according to the preamble of claim 1.

[0004] GB 2 474 860 A discloses a reelable support member comprising a non-metallic fiber core and a coating having different colors.

TECHNICAL PROBLEMS

[0005] Replacement timing of a running wire rope is defined by respective standards, (for example, Ordinance on Industrial Safety and Health, Safety Ordinance for Cranes, Gondola Structure Standard, Inspection standard of elevator, escalator and dumbwaiter (JIS A 4302), or the like), and therefore when a diameter of the rope becomes lower than a predetermined diameter, the rope should be replaced. Thus, it is important to maintain and manage a diameter (thickness) of the running wire rope because the delay of the timing to measure a state of the diameter of the rope or the measurement error might lead a serious accident.

[0006] However, in the conventional running wire rope, it is not easy to check the diameter of the rope including the fiber core or the resin core. That is, in a case in which the diameter is measured by using a measurement jig (Vernier calipers) based on JIS G 3525, it is necessary that a machine (for example, lift) is stopped for the measurement and a plurality of portions of the wire should be measured, and such a work takes a lot of time and man-hour. At this time, when the number of the measured portions is made large, the detection accuracy of the state of the running wire rope can be improved. However, time is limited because the machine should be stopped, and thereby the measured portions are also limited. Thus,

the improvement of the detection accuracy of the state is limited.

[0007] Accordingly, an object of the present invention is, in consideration of the problem described above, to provide a running wire rope having excellent performance and being capable of facilitating measurement of a state of a diameter of a rope to derive improvement of safety.

10 SOLUTIONS TO PROBLEMS

[0008] In order to solve the problem described above, a running wire rope according to the present invention is formed by twisting a plurality of strands around a resin core served as a resin core member. The resin core is formed by a plurality of resin layers, and resin materials of the resin layers adjacent to each other are different and colors of the layers adjacent to each other are different.

[0009] According to this, the resin core is formed as a multilayer structure in which the layers are formed by different resin materials and formed in different colors, and therefore measurement of a state of a diameter of the rope can be facilitated. That is, the running wire rope is changed due to wear with the elapse of time and therefore the resin material that forms each layer is turned into powder sequentially from an outer side layer. Accordingly, the state of the diameter of the rope can be presumed based on an amount of the generated powder, and thereby the timing of the replacement of the rope can be recognized.

[0010] Here, it is preferable that a resistance against wear of the resin layer arranged at an outer side of the resin core is higher than that of the resin layer arranged at a center side of resin core.

[0011] According to this, a multilayer structure using the resin material having excellent resistance against the wear at an outer side where the wear is facilitated and using the resin material available at a relatively low cost at an inner side where the wear is not facilitated can be obtained. Consequently, the running wire rope having high performance can be obtained at a low cost.

[0012] Further, it is also preferable that a color of the resin layer arranged at an outer side of the resin core is lighter than that of the resin layer arranged at a center side of resin core.

[0013] According to this, the powder generated due to the wear is changed from a light color to a dark color, and thereby the state of the diameter of the rope can be recognized at a first sight.

ADVANTAGEOUS EFFECTS OF INVENTION

[0014] As described above, according to the running wire rope according to the present invention, since the multilayer structure in which the resin core is formed of different materials is adopted, the state of the diameter of the rope can be recognized based on the powder gen-

erated from the resin material due to the wear thereof. Consequently, the timing of the replacement of the rope can be recognized, and improvement of safety is derived.

BRIEF DESCRIPTION OF DRAWINGS

[0015]

Fig. 1 is a cross-sectional view of a running wire rope.
Fig. 2 is a view for describing a ratio of a resin core.
Fig. 3 is a cross-sectional view illustrating an embodiment of a resin core.

DESCRIPTION OF EMBODIMENTS

[0016] Hereinafter, an embodiment of the present invention is described with reference to drawings.

[0017] Fig. 1 is a cross-sectional view of a running wire rope according to an example not falling within the scope of the presently claimed invention but suitable for understanding the same.

[0018] A running wire rope 1 is formed by twisting a plurality of strands 2 around a core member. The running wire rope 1 is served as a wire rope used in running rigging for an elevator or the like. In this embodiment, a configuration in which eight strands 2 are twisted is exemplary illustrated, however a configuration in which six strands are twisted may be adopted.

[0019] The running wire rope 1 is provided with a resin core 3 as a core member. The resin core 3 has a multilayer structure formed by a first resin layer 4 and a second resin layer 5. Each of the first resin layer 4 and the second resin layer 5 that forms the resin core 3 is formed of a thermoplastic resin material such as polyethylene, polypropylene, and polyester.

[0020] A resin material that forms the first resin layer 4 is different from a resin material that forms the second resin layer. For example, in a case in which the first resin layer 4 served as a center portion is formed of a resin material available at a relatively low cost such as polyethylene and polypropylene and the second resin layer 5 arranged around the center portion is formed of a resin material having high resistance such as high density polyethylene and polyester, the resin core 3 having excellent performance can be obtained at a low cost.

[0021] In this way, since the resin core has a multilayer structure including the materials forming the respective layers different from each other, a diameter of the rope changed with the elapse of time can be recognized by powder generated from the resin material due to the wear thereof. When the powder of the resin material is generated due to the wear, some part of the corresponding layer is exposed. In particular, the rope is worn across a longitudinal direction, and thereby a certain amount of the powder of the resin material is generated. Consequently, a forecast of the replacement timing of the rope can be obtained. Further, it is preferable that a thickness of each layer is set to 1 mm or more in order to generate

a certain amount of the powder to such an extent in which a measurer can visually recognize the generation of the powder.

[0022] Fig. 2 is a view for describing a ratio of the resin core.

[0023] In the running wire rope 1 formed by twisting the eight strands 2, it is preferable that a diameter B of the resin core 3 before the strands are twisted is set in a range between 55% and 65% of a diameter A of the rope. In a case in which the diameter B is lower than 55% of the diameter A, it might be late to find a decrease of the diameter of the rope. On the other hand, in a case in which the diameter B is larger than 65% of the diameter A, the replacement of the rope is urged by the decrease of the diameter of the rope, at the timing earlier than the right timing, and therefore a lifetime of the rope might be shortened.

[0024] Further, in the running wire rope formed by twisting the six strands, it is preferable that a diameter B of the resin core is set in a range between 35% and 45% of a diameter A of the rope. The reason thereof is similar to that described above.

[0025] Fig. 3 is a cross-sectional view illustrating an embodiment of a resin core.

[0026] A resin core 3a shown in Fig. 3 is formed by layers of a first resin layer 4, a second resin layer 5, and a third resin layer 6. In addition of forming the layers by different resin materials, the layers are formed in different colors from each other. For example, in a case in which the layers are formed in respective colors closer to three primary colors of cyan (C), magenta (M), and yellow (Y) of color materials, a state of a diameter or the rope can be recognized easily based on powder generated from the resin material due to the wear thereof. The colors may be set to be different in shades in the same color system. In such a case, for example, it is preferable that the colors are set to be lighter from an inner side of the center of the core toward an outer side of the core. When the resin material is turned into the powder due to the wear of the rope, it can be recognized that the wear of the rope is advanced to which layer based on the color of the powder. Further, since the rope is worn across the longitudinal direction, in a case in which a layer having different color is exposed in some part, the wear can be recognized by a visual inspection.

[0027] Further, in addition to the differences of the resin materials of the layers and the differences of the colors of the layers, the thicknesses of the layers may be set to be different. For example, the layer may be made thicker by using a resin material having excellent resistance from an inner side of the center of the core toward an outer side of the core and further the layers may be formed in different colors from each other. Or alternatively, a resin material having excellent resistance and a resin material available at a low cost may be alternately arranged, or the thicknesses of the layers may be changed from each other, so that a resin core adapted to an apparatus for using the running wire rope is obtained. At least by using

different resin materials and by setting different colors in the layers adjacent to each other in the multilayer structure, the state of the diameter of the rope can be recognized by the powder generated from the resin material due to the wear of the rope. Consequently, many patterns of the resin cores having the multilayer structure suitable to the usage thereof or the like can be considered.

[0028] As described above, the running wire rope according to the present invention is described based on each embodiment, however the present invention is not limited to the embodiments described above. Various design modifications can be adopted within a subject matter of the present invention as long as the object of the present invention is achieved, and those modifications are also encompassed in the present invention.

INDUSTRIAL APPLICABILITY

[0029] The present invention is applied as a running wire rope used in running rigging for an elevator.

REFERENCE SIGNS LIST

[0030]

- 1: running wire rope
- 2: strand
- 3, 3a: resin core
- 4: first resin layer
- 5: second resin layer
- 6: third resin layer

Claims

1. A running wire rope (1) formed by twisting a plurality of strands (2) around a resin core (3, 3a) served as a resin core member, wherein the resin core (3, 3a) is formed by a plurality of resin layers (4, 5, 6), and resin materials of the resin layers (4, 5, 6) adjacent to each other are different, **characterized in that** the colors of the resin layers (4, 5, 6) adjacent to each other are different.
2. The running wire rope according to claim 1, wherein a resistance against wear of the resin layer (5 or 6) arranged at an outer side in the resin core (3, 3a) is higher than that of the resin layer (4 or 5) arranged at a center side in the resin core (3, 3a).
3. The running wire rope according to claim 1 or 2, wherein a color of the resin layer (5 or 6) arranged at an outer side in the resin core (3, 3a) is lighter than that of the resin layer (4 or 5) arranged at a center side in the resin core (3, 3a).

Patentansprüche

1. Laufdrahtseil, das durch Verdrillen einer Vielzahl von Drähten um einen als ein Harzkernelement fungierenden Harzkern gebildet ist, wobei der Harzkern aus einer Vielzahl von Harzschichten gebildet ist, und die Harzmaterialien der einander benachbarten Harzschichten unterschiedlich sind und die Farben der einander benachbarten Harzschichten unterschiedlich sind.
2. Laufdrahtseil nach Anspruch 1, wobei die Verschleißfestigkeit der Harzschicht, die an einer Außenseite im Harzkern angeordnet ist, höher ist als die der Harzschicht, die an einer zentralen Seite im Harzkern angeordnet ist.
3. Laufdrahtseil nach Anspruch 1 oder 2, wobei eine Farbe der Harzschicht, die an einer Außenseite im Harzkern angeordnet ist, heller ist als die der Harzschicht, die an einer zentralen Seite im Harzkern angeordnet ist.

25 **Revendications**

1. Un câble en acier formé en tordant plusieurs brins autour d'un noyau en résine faisant office de membre d'âme en résine, dans lequel l'âme en résine est formée par plusieurs couches de résine, et les matériaux des couches de résine adjacents l'un à l'autre sont différents et les couleurs des couches de résine adjacentes l'un à l'autre sont différentes.
2. Le câble en acier selon la revendication 1, dans lequel la résistance à l'usure de la couche de résine disposée à l'extérieur de l'âme en résine est plus élevée que celle de la couche de résine disposée à l'intérieur de l'âme en résine.
3. Le câble en acier selon la revendication 1 ou 2, dans lequel la couleur de la couche de résine disposée à l'extérieur de l'âme de résine est plus claire que celle de la couche de résine disposée à l'intérieur de l'âme en résine.

Fig. 1

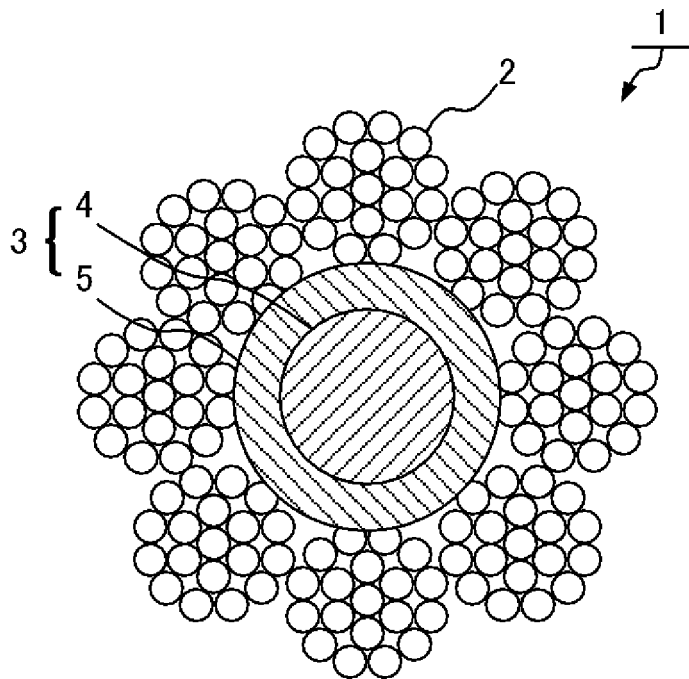


Fig. 2

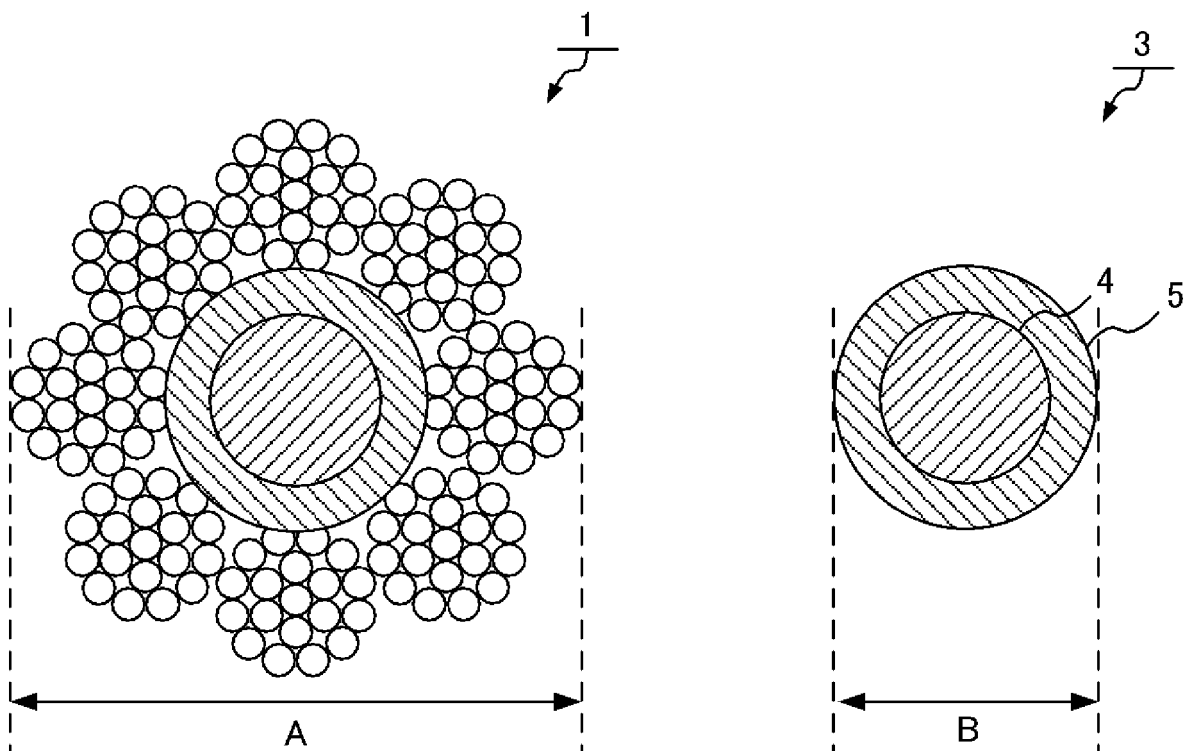
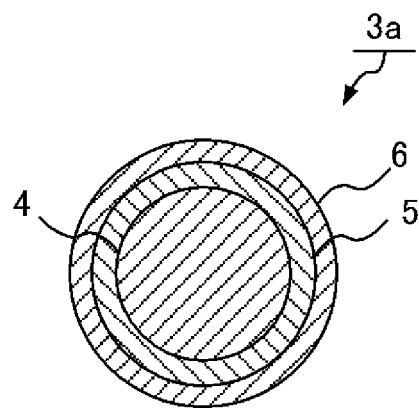


Fig. 3



REFERENCES CITED IN THE DESCRIPTION

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