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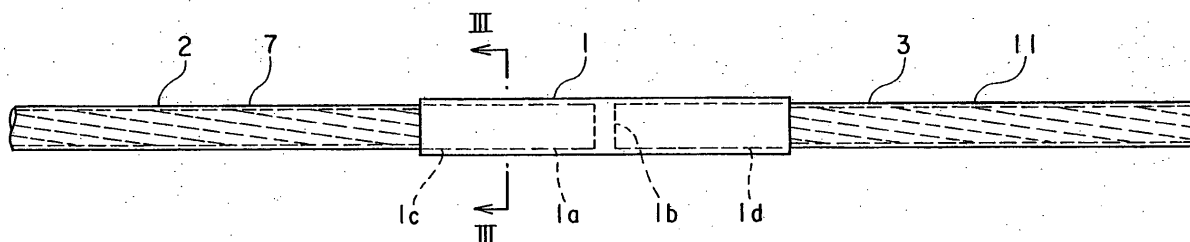
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(54) **METHOD OF CONNECTING ELEVATOR ROPES**

(57) In an elevator rope connecting method, first an end portion of a first elevator rope is inserted into a rope insertion aperture from a first end portion of a connecting pipe that is made of a resin that includes the rope insertion

aperture, and an end portion of a second elevator rope is inserted into the rope insertion aperture from a second end portion of the connecting pipe. Next, the end portions of the first and second elevator ropes are welded to the connecting pipe by heating the connecting pipe.

FIG. 1



Description

TECHNICAL FIELD

[0001] The present invention relates to an elevator rope connecting method that connects together elevator ropes on an outer circumferential portion of which is disposed an outer circumferential coated layer that is made of a resin.

BACKGROUND ART

[0002] Generally, when replacing elevator ropes, a new rope is connected to an old rope that is already installed, and then the old rope and the new rope are moved along a rope installation pathway. The new rope is thereby installed while recovering the old rope.

[0003] One method for connecting the new and old ropes is to cut strands of end portions of the new and old ropes by a predetermined length so as to leave a portion of the strands, and then to overlap end portions of the remaining strands with each another, cover them with a metal sleeve, and crimp them (see Patent Literature 1, for example).

[0004]

[Patent Literature 1]

Japanese Patent Laid-Open No. 2001-80827 (Gazette)

DISCLOSURE OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0005] However, in recent years, resin-coated ropes on an outer circumferential portion of which is disposed an outer circumferential coated layer that is made of a resin are sometimes used, and it has been extremely time-consuming and impractical to attempt to connect together resin-coated ropes of this kind by conventional methods such as that described above since it is first necessary to remove the outer circumferential coated layer from the end portion of each of the resin-coated ropes.

[0006] The present invention aims to solve the above problems and an object of the present invention is to provide an elevator rope connecting method that can easily connect together elevator ropes on an outer circumferential portion of which is disposed an outer circumferential coated layer that is made of a resin.

MEANS FOR SOLVING THE PROBLEM

[0007] In order to achieve the above object, according to one aspect of the present invention, there is provided an elevator rope connecting method that includes steps of: inserting an end portion of a first elevator rope into a rope insertion aperture from a first end portion of a con-

necting pipe that is made of a resin that includes the rope insertion aperture, and also inserting an end portion of a second elevator rope into the rope insertion aperture from a second end portion of the connecting pipe; and welding the end portions of the first and second elevator ropes to the connecting pipe by heating the connecting pipe.

According to another aspect of the present invention, there is provided an elevator rope connecting method that includes steps of: inserting an end portion of a first elevator rope into a rope insertion aperture from a first end portion of a connecting pipe that is made of a resin that includes the rope insertion aperture, and also inserting an end portion of a second elevator rope into the rope insertion aperture from a second end portion of the connecting pipe; and fixing the end portions of the first and second elevator ropes to the connecting pipe by means of an adhesive.

According to yet another aspect of the present invention, there is provided an elevator rope connecting method that includes steps of: accommodating an end portion of a first elevator rope and an end portion of a second elevator rope inside a mold; injecting a melted connecting resin into the mold; and forming a connecting pipe that is made of a resin that covers the end portions of the first and second elevator ropes by hardening the connecting resin inside the mold.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Figure 1 is a side elevation that shows a connected portion between first and second elevator ropes that have been connected using a method according to Embodiment 1 of the present invention;

Figure 2 is a cross section of the first and second elevator ropes from Figure 1;

Figure 3 is a cross section that is taken along Line III - III in Figure 1;

Figure 4 is a side elevation that shows a connecting pipe from Figure 1;

Figure 5 is a side elevation that shows a connected portion between first and second elevator ropes that have been connected using a method according to Embodiment 2 of the present invention; and

Figure 6 is a cross section of a connected portion between first and second elevator ropes that have been connected using a method according to Embodiment 3 of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0009] Preferred embodiments of the present invention will now be explained with reference to the drawings.

Embodiment 1

[0010] Figure 1 is a side elevation that shows a con-

nected portion between first and second elevator ropes that have been connected using a method according to Embodiment 1 of the present invention, Figure 2 is a cross section of the first and second elevator ropes from Figure 1, Figure 3 is a cross section that is taken along Line III - III in Figure 1, and Figure 4 is a side elevation that shows a connecting pipe from Figure 1.

[0011] In the figures, a rope insertion aperture 1a is disposed in a connecting pipe 1 that is made of a resin. The rope insertion apertures 1a is divided into first and second rope insertion apertures 1c and 1d that have identical lengths by a partitioning wall 1b that is disposed in an intermediate portion thereof.

[0012] An end portion of a first elevator rope 2 is inserted inside the first rope insertion aperture 1c from a first end portion of the connecting pipe 1. An end portion of a second elevator rope 3 is inserted inside the second rope insertion aperture 1d from a second end portion of the connecting pipe 1. End surfaces of the first and second elevator ropes 2 and 3 are placed in contact with the partitioning wall 1b so as to face each other on opposite sides of the partitioning wall 1b.

[0013] The first and second elevator ropes 2 and 3 have similar cross-sectional constructions. The first elevator rope 2 has: a first core rope 4; a first core rope coating layer 5 that is made of a resin that is disposed on an outer circumference of the first core rope 4; a first outer circumferential strand layer 6 that is disposed on an outer circumference of the first core rope coating layer 5; and a first outer circumferential coating layer 7 that is made of a resin that is disposed on an outer circumference of the first outer circumferential strand layer 6. In other words, the first outer circumferential coating layer 7 is disposed on an outer circumferential portion of the first elevator rope 2. An end portion of the first outer circumferential coating layer 7 is welded to the connecting pipe 1.

[0014] The second elevator rope 3 has: a second core rope 8; a second core rope coating layer 9 that is made of a resin that is disposed on an outer circumference of the second core rope 8; a second outer circumferential strand layer 10 that is disposed on an outer circumference of the second core rope coating layer 9; and a second outer circumferential coating layer 11 that is made of a resin that is disposed on an outer circumference of the second outer circumferential strand layer 10. In other words, the second outer circumferential coating layer 11 is disposed on an outer circumferential portion of the second elevator rope 3. An end portion of the second outer circumferential coating layer 11 is welded to the connecting pipe 1.

[0015] The core ropes 4 and 8 have a plurality of core strands. Each of the core strands is configured by twisting together a plurality of steel wires. The outer circumferential strand layers 6 and 10 have a plurality of outer circumferential strands (in this case, eight) that are twisted together on an outer circumference of the core rope coating layer 5 and 9. Each of the outer circumferential

strands is configured by twisting together a plurality of steel wires. The outer circumferential strands and the outer circumferential coating layer 7 and 11 may be fixed using an adhesive if required.

[0016] Next, a method for connecting the elevator ropes 2 and 3 will be explained. First, the end portion of the first elevator rope 2 is inserted inside the first rope insertion aperture 1c from the first end portion of the connecting pipe 1, and the end portion of the second elevator rope 3 is also inserted inside the second rope insertion aperture 1d from the second end portion of the connecting pipe 1. Next, the end portions of the first and second elevator ropes 2 and 3 are welded to the connecting pipe 1 by heating the connecting pipe 1 from outside.

[0017] In other words, at least a portion of the connecting pipe 1 and at least a portion of the first and second outer circumferential coating layers 7 and 11 are melted by heating the connecting pipe 1, and the end portions of the first and second outer circumferential coating layers 7 and 11 are subsequently welded to the connecting pipe 1 by rehardening the melted portion, connecting the first and second elevator ropes 2 and 3 by means of the connecting pipe 1.

[0018] If replacing a first elevator rope 2 that constitutes an old rope with a second elevator rope 3 that constitutes a new rope, the first and second elevator ropes 2 and 3 are connected and then the first and second elevator ropes 2 and 3 are moved along the installation pathway of the first elevator rope 2. The second elevator rope 3 can thereby be installed while recovering the first elevator rope 2.

[0019] In a method of this kind for connecting the elevator ropes 2 and 3, because it is not necessary to remove the outer circumferential coating layers 7 and 11, or to cut off portions of outer layer strands, etc., the elevator ropes 2 and 3, on outer circumferential portions of which are disposed outer circumferential coated layers 7 and 11 that are made of a resin, can be connected easily.

[0020] Because the rope insertion aperture 1a is divided into first and second rope insertion apertures 1c and 1d by the partitioning wall 1b, the amount of insertion of the first and second elevator ropes 2 and 3 into the connecting pipe 1 can easily be made uniform. The strength of the connecting pipe 1 can also be increased by the partitioning wall 1b. In addition, the first and second elevator ropes 2 and 3 can be connected more firmly by welding the end surfaces of the first and second elevator ropes 2 and 3 to the partitioning wall 1b.

[0021] In addition, the shape of the connected portion can be formed into a stable shape by placing the connecting pipe 1 in a metal mold and heating it when the first and second elevator ropes 2 and 3 are being welded to the connecting pipe 1.

[0022] Now, rope latches are normally disposed on the sheaves around which the elevator ropes 2 and 3 are wound. Clearance between top portions of the elevator ropes 2 and 3 and the rope latches when the elevator ropes 2 and 3 are wound onto the sheaves is set to less

than or equal to 3 mm. Because of this, it is preferable for a difference between an outside diameter of the connecting pipe 1 and an outside diameter of the first and second elevator ropes 2 and 3 to be set to less than or equal to 3 mm, thereby enabling interference between the connecting pipe 1 and the rope latches to be prevented, and also enabling the connecting pipe 1 to be passed through the sheaves with the rope latches still mounted.

Embodiment 2

[0023] Next, Figure 5 is a side elevation that shows a connected portion between first and second elevator ropes that have been connected using a method according to Embodiment 2 of the present invention. In the figure, a first tapered portion 1e in which an outside diameter reduces gradually toward an end surface is disposed on one end portion of a connecting pipe 1. A second tapered portion 1f in which an outside diameter reduces gradually toward an end surface is disposed on another end portion of the connecting pipe 1. Tapered portions 1e and 1f of this kind may be formed on the connecting pipe 1 in advance, or may also be formed using a metal mold when welding first and second elevator ropes 2 and 3. The rest of the configuration and the connecting method are similar to those of Embodiment 1.

[0024] In a method of this kind for connecting the elevator ropes 2 and 3, because the tapered portions 1e and 1f are disposed on the connecting pipe 1, end portions of the connecting pipe 1 are prevented from being caught on the rope latches as the connected portion between the first and second elevator ropes 2 and 3 is being moved along the installation pathway.

[0025] Moreover, in the above example, the tapered portions 1e and 1f are disposed on two end portions of the connecting pipe 1, but may be disposed on only one end portion of the connecting pipe 1, i.e., on an end that is in front when the first and second elevator ropes 2 and 3 are moved.

Embodiment 3

[0026] Next, Figure 6 is a cross section of a connected portion between first and second elevator ropes that have been connected using a method according to Embodiment 3 of the present invention, and corresponds to a cross section that is taken along Line III - III in Figure 1. In Embodiment 1, the end portions of the first and second elevator ropes 2 and 3 were welded to the connecting pipe 1, but in Embodiment 3, end portions of first and second elevator ropes 2 and 3 are fixed to a connecting pipe 1 by means of an adhesive 12. The rest of the configuration and the connecting method are similar to those of Embodiment 1.

[0027] Using a method of this kind for connecting the elevator ropes 2 and 3, because it is not necessary to remove the outer circumferential coating layers 7 and 11, or to cut off portions of outer layer strands, etc., the ele-

vator ropes 2 and 3, on outer circumferential portions of which are disposed outer circumferential coated layers 7 and 11 that are made of a resin, can also be connected easily.

5 The first and second elevator ropes 2 and 3 can also be connected more firmly by adhesively fixing the end surfaces of the first and second elevator ropes 2 and 3 to the partitioning wall 1 b.

10 Embodiment 4

[0028] Next, Embodiment 4 of the present invention will be explained. Construction of a connected portion between first and second elevator ropes 2 and 3 that have been connected by a method according to Embodiment 4 is similar to that in Figures 1 or 5. However, in Embodiments 1 and 2, a preformed connecting pipe 1 was used, but in Embodiment 4, a connecting pipe 1 that covers end portions of first and second elevator ropes 2 and 3 and is welded together with those end portions is formed by accommodating the end portions of the first and second elevator ropes 2 and 3 inside a metal mold, injecting a melted connecting resin into the mold, and then hardening the connecting resin inside the mold.

25 **[0029]** Using an elevator rope connecting method of this kind, because it is not necessary to remove the outer circumferential coating layers 7 and 11, or to cut off portions of outer layer strands, etc., the elevator ropes 2 and 3, on outer circumferential portions of which are disposed outer circumferential coated layers 7 and 11 that are made of a resin, can also be connected easily.

30 **[0030]** Moreover, in the above examples, cases in which the cross-sectional constructions of the first and second elevator ropes 2 and 3 are similar have been shown, but the cross-sectional constructions of the first and second elevator ropes 2 and 3 may differ provided that first and second outer circumferential coating layers 7 and 11 are disposed on outer circumferential portions. The above connecting methods are applied to a replacement operation for a main rope that suspends a car and a counterweight, but can also be applied to cases in which other elevator ropes such as a compensating rope that is suspended between a lower portion of a car and a lower portion of a counterweight, or a speed governor rope, etc., are being connected, for example.

In addition, in the above examples, a partitioning wall 1b has been disposed inside the rope insertion aperture 1a, but the partitioning wall 1b may also be omitted.

50 Claims

1. An elevator rope connecting method that connects a first elevator rope on an outer circumferential portion of which is disposed a first outer circumferential coating layer that is made of a resin, and a second elevator rope on an outer circumferential portion of which is disposed a second outer circumferential

coating layer that is made of a resin,
wherein the elevator rope connecting method includes steps of:

inserting an end portion of the first elevator rope into a rope insertion aperture from a first end portion of a connecting pipe that is made of a resin that comprises the rope insertion aperture, and also inserting an end portion of the second elevator rope into the rope insertion aperture from a second end portion of the connecting pipe; and
welding the end portions of the first and second elevator ropes to the connecting pipe by heating the connecting pipe.

2. An elevator rope connecting method that connects a first elevator rope on an outer circumferential portion of which is disposed a first outer circumferential coating layer that is made of a resin, and a second elevator rope on an outer circumferential portion of which is disposed a second outer circumferential coating layer that is made of a resin, wherein the elevator rope connecting method includes steps of:

inserting an end portion of the first elevator rope into a rope insertion aperture from a first end portion of a connecting pipe that is made of a resin that comprises the rope insertion aperture, and also inserting an end portion of the second elevator rope into the rope insertion aperture from a second end portion of the connecting pipe; and
fixing the end portions of the first and second elevator ropes to the connecting pipe by means of an adhesive.

3. An elevator rope connecting method that connects a first elevator rope on an outer circumferential portion of which is disposed a first outer circumferential coating layer that is made of a resin, and a second elevator rope on an outer circumferential portion of which is disposed a second outer circumferential coating layer that is made of a resin, wherein the elevator rope connecting method includes steps of:

accommodating an end portion of the first elevator rope and an end portion of the second elevator rope inside a mold;
injecting a melted connecting resin into the mold; and
forming a connecting pipe that is made of a resin that covers the end portions of the first and second elevator ropes by hardening the connecting resin inside the mold.

4. An elevator rope connecting method according to either of Claims 1 or 2, wherein the rope insertion aperture is divided into first and second rope insertion apertures by a partitioning wall that is disposed in an intermediate portion of the rope insertion aperture.

5. An elevator rope connecting method according to any one of Claims 1 through 3, wherein a tapered portion in which an outside diameter reduces gradually toward an end surface is disposed on one end portion of the connecting pipe.

6. An elevator rope connecting method according to any one of Claims 1 through 3, wherein a difference between an outside diameter of the connecting pipe and an outside diameter of the first and second elevator ropes is less than or equal to 3 mm.

FIG. 1

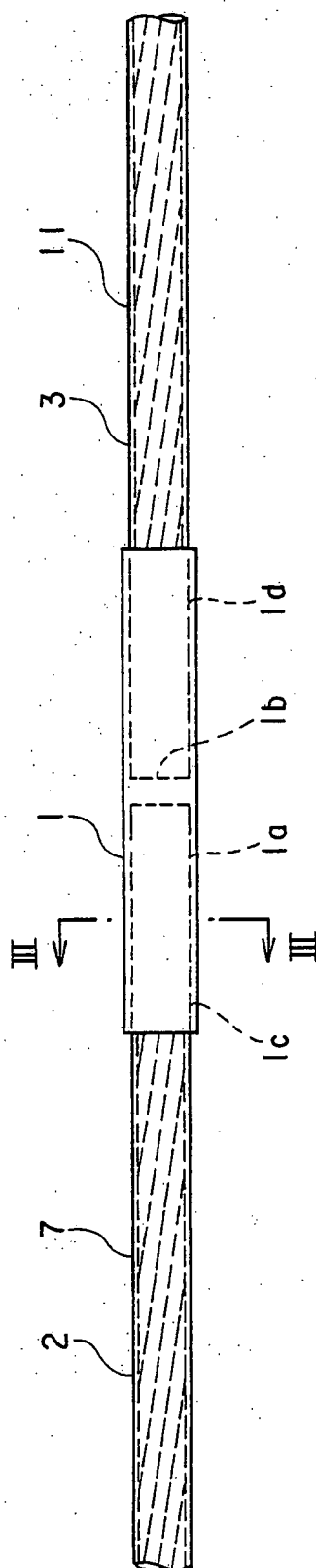


FIG. 2

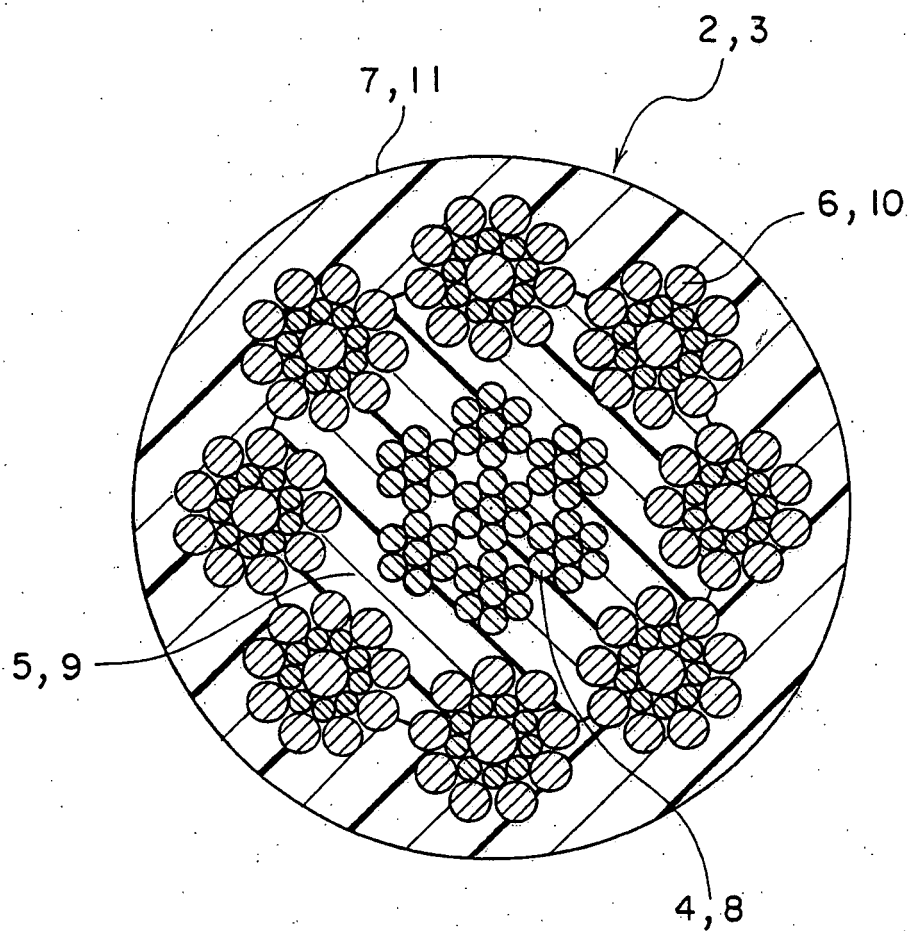


FIG. 3

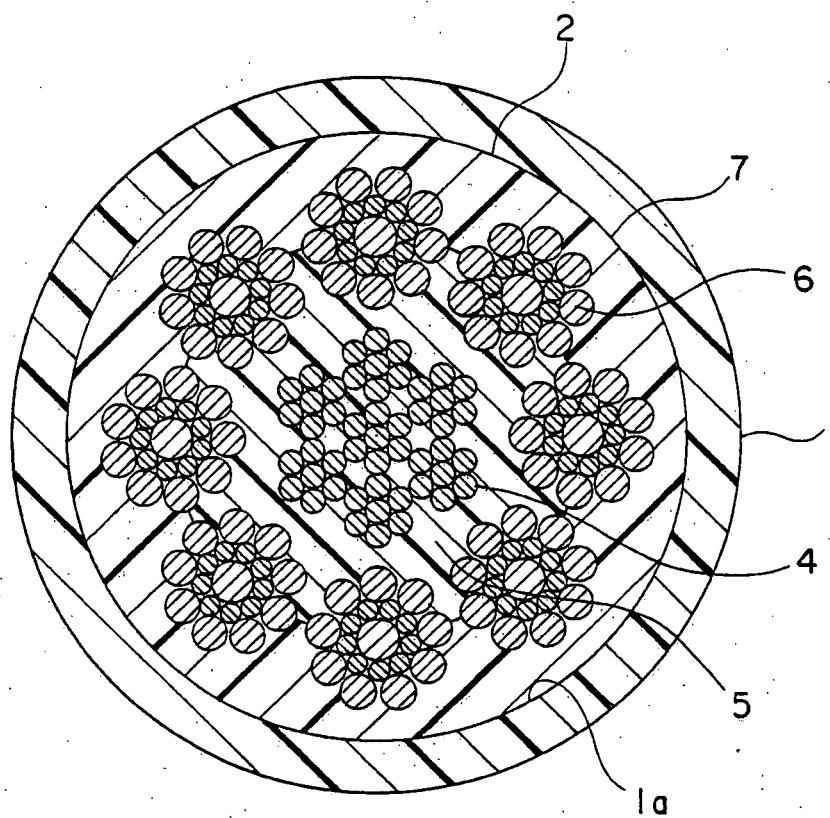


FIG. 4

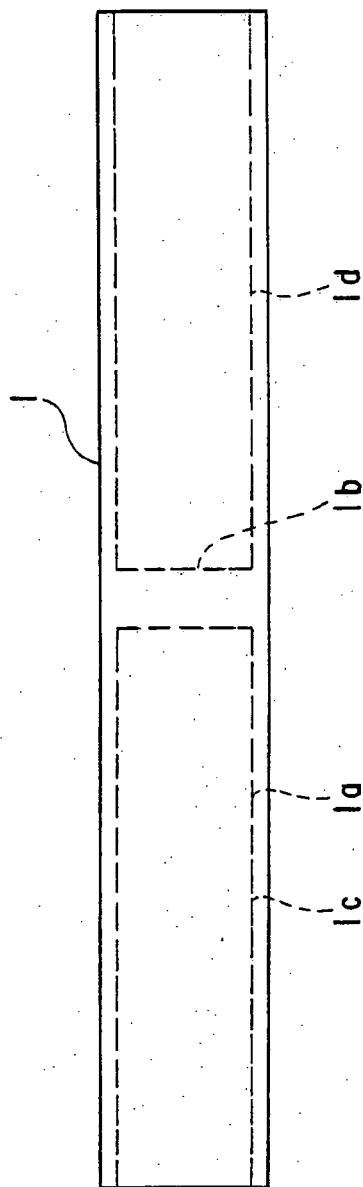


FIG. 5

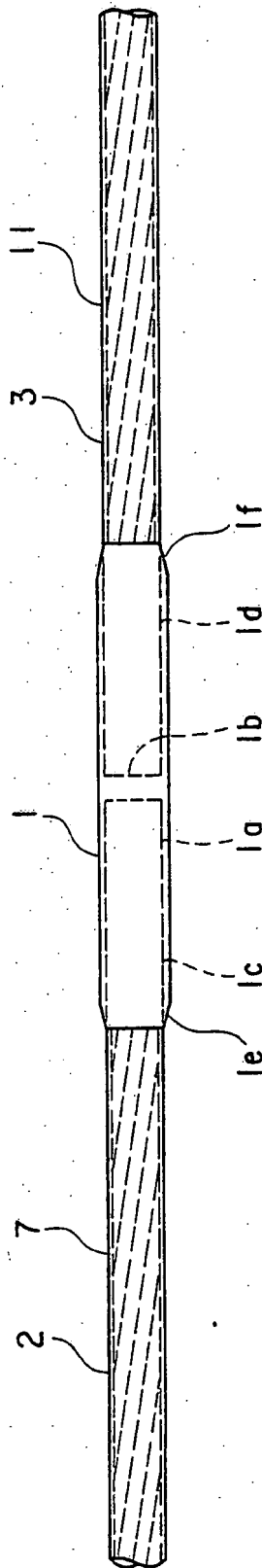
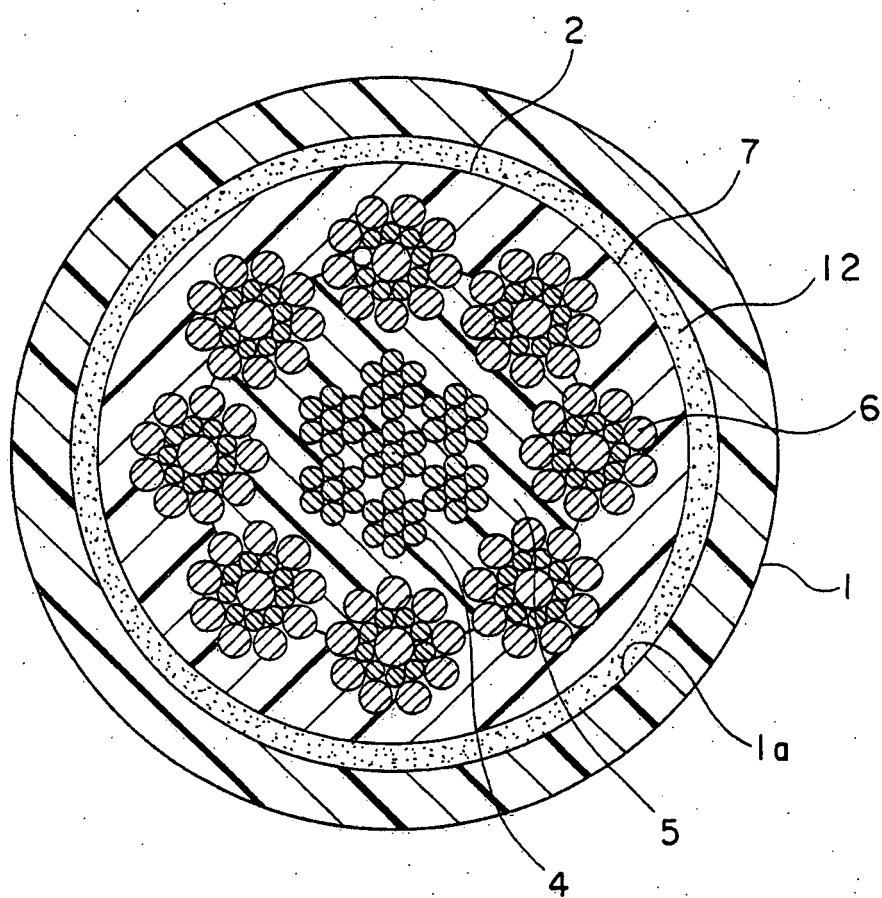


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2007/060883

A. CLASSIFICATION OF SUBJECT MATTER

B66B7/06(2006.01) i

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)

B66B7/00-B66B7/12

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

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2007
Kokai Jitsuyo Shinan Koho	1971-2007	Toroku Jitsuyo Shinan Koho	1994-2007

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 185131/1983 (Laid-open No. 94937/1985) (Showa Electric Wire & Cable Co., Ltd.), 28 June, 1985 (28.06.85), Description, page 4, line 16 to page 7, line 13; Figs. 1 to 3 (Family: none)	1-6
A	JP 62-147904 A (Meito Denki Koji Kabushiki Kaisha), 01 July, 1987 (01.07.87), Page 2, upper right column, line 5 to page 3, upper left column, line 10; Figs. 1 to 5 (Family: none)	1-6

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

* Special categories of cited documents:

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Date of the actual completion of the international search
18 December, 2007 (18.12.07)Date of mailing of the international search report
25 December, 2007 (25.12.07)Name and mailing address of the ISA/
Japanese Patent Office

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2007/060883

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 63-92856 A (Meito Denki Koji Kabushiki Kaisha), 23 April, 1988 (23.04.88), Page 2, lower left column, line 3 to page 3, upper right column, line 2; Figs. 1 to 3 & US 4733442 A1	1-6
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 008118/1978 (Laid-open No. 116635/1979) (Hitachi Cable, Ltd.), 15 August, 1979 (15.08.79), Description, page 2, line 10 to page 3, line 15; Figs. 1 to 3 (Family: none)	1-6
A	JP 3851922 B1 (Sumitomo Denko Steel Wire Kabushiki Kaisha), 29 November, 2006 (29.11.06), Par. Nos. [0019] to [0041]; Figs. 1 to 14 & WO 2007-000992 A	1-6

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2001080827 A [0004]