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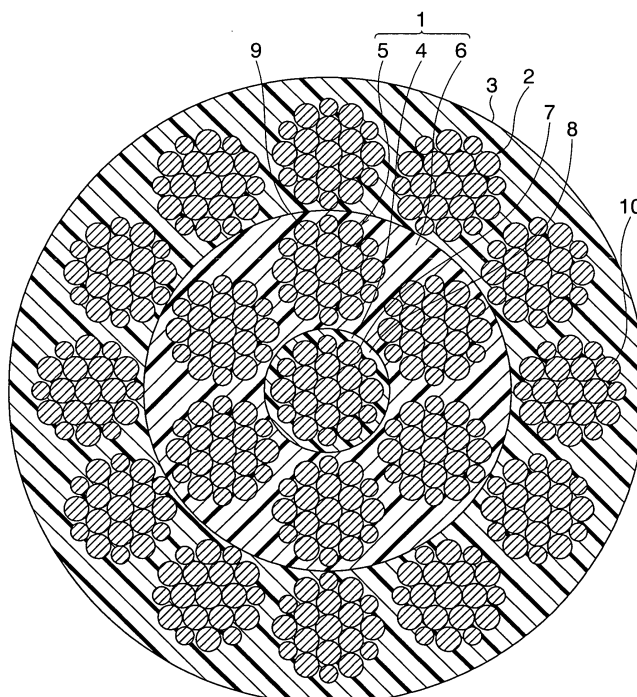
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(54) **ROPE FOR ELEVATOR AND ELEVATOR**

(57) In an elevator rope, a plurality of core rope strands are laid together around a core strand. A core rope strand assembly is constituted by these core rope strands. The core strand has a core strand main body and a resin core strand coating body that coats the core strand main body. Each of the core rope strands has a

core rope strand main body. The core rope strand assembly is coated by a resin core rope coating body. A plurality of outer layer strands are laid together around the core rope coating body. An outer layer strand assembly is constituted by these outer layer strands. The outer layer strand assembly is coated by a resin outer layer coating body.

FIG. 1



Description

TECHNICAL FIELD

[0001] The present invention relates to an elevator rope that has a resin outer layer coating body disposed on an outer portion, and to an elevator apparatus in which that rope is used.

BACKGROUND ART

[0002] In conventional elevator apparatuses, sheaves that have a diameter greater than or equal to forty times a rope diameter are used in order to prevent early rope abrasion and wire breakage. Consequently, in order to reduce sheave diameter, it is also necessary to reduce rope diameter. However, if the rope diameter is reduced, there is a risk that a car may be easily vibrated by load fluctuations due to freight loaded onto the car, or passengers getting on and off, etc., or that vibrations in the ropes at the sheaves may propagate to the car. Furthermore, the number of ropes must be increased, making the configuration of the elevator apparatus complicated.

[0003] In answer to this, elevators have been proposed in which a rope coating is disposed on an entire outer portion of a rope, and a wire coating is disposed on wires constituting the ropes (see Patent Literature 1, for example).

[0004] Patent Document 1: Japanese Patent Laid-Open No. 2001-262482

DISCLOSURE OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0005] However, in cross-sectional constructions of conventional elevator ropes such as those described above, steel wire packing density is insufficient, making additional improvements in effective cross-sectional area desirable.

[0006] The present invention aims to solve the above problems and an object of the present invention is to provide an elevator rope that enables effective cross-sectional area to be improved by improving wire packing density, and to provide an elevator apparatus in which that rope is used.

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 including: a core strand having a core strand main body that is formed by laying together a plurality of steel wires, and a resin core strand coating body that coats the core strand main body; a core rope strand assembly that is constituted by a plurality of core rope strands that each have a core rope strand main body that is formed by laying together a plurality of steel wires, the

core rope strands being laid together around the core strand so as to be centered around the core strand; a resin core rope coating body that coats the core rope strand assembly; an outer layer strand assembly that is constituted by a plurality of outer layer strands that each have an outer layer strand main body that is formed by laying together a plurality of steel wires, the outer layer strands being laid together around the core rope coating body; and a resin outer layer coating body that coats the outer layer strand assembly.

According to another aspect of the present invention, there is provided An elevator apparatus including: a driving machine having a driving machine main body, and a drive sheave that is rotated by the driving machine main body, the driving machine being disposed in a lower portion of a hoistway; a plurality of elevator ropes that are wound around the drive sheave; a car and a counterweight that are suspended inside the hoistway by the elevator ropes using a one-to-one (1:1) roping method; and a plurality of return sheaves that are disposed in an upper portion of the hoistway and that direct the elevator ropes from the drive sheave toward the car and the counterweight, each of the elevator ropes including: a core strand having a core strand main body that is formed by laying together a plurality of steel wires, and a resin core strand coating body that coats the core strand main body; a core rope strand assembly that is constituted by a plurality of core rope strands that each have a core rope strand main body that is formed by laying together a plurality of steel wires, the core rope strands being laid together around the core strand so as to be centered around the core strand; a resin core rope coating body that coats the core rope strand assembly; an outer layer strand assembly that is constituted by a plurality of outer layer strands that each have an outer layer strand main body that is formed by laying together a plurality of steel wires, the outer layer strands being laid together around the core rope coating body; and a resin outer layer coating body that coats the outer layer strand assembly, and a diameter of at least one of the return sheaves being less than or equal to twenty times a diameter of the elevator ropes.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Figure 1 is a cross section of an elevator rope according to Embodiment 1 of the present invention; Figure 2 is a side elevation showing the elevator rope from Figure 1 cut away in layers;

Figure 3 is a cross section of an elevator rope according to Embodiment 2 of the present invention; Figure 4 is a cross section of an elevator rope according to Embodiment 3 of the present invention; Figure 5 is a cross section of an elevator rope according to Embodiment 4 of the present invention; Figure 6 is a plan showing an elevator apparatus

according to Embodiment 5 of the present invention;
and
Figure 7 is a front elevation showing the elevator
apparatus from Figure 6.

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 cross section of an elevator rope according to Embodiment 1 of the present invention, and Figure 2 is a side elevation showing the elevator rope from Figure 1 cut away in layers.

In the figures, an elevator rope includes: a core rope 1; an outer layer strand assembly 2 that is disposed around the core rope 1; and a resin outer layer coating body 3 that coats the outer layer strand assembly 2. The core rope 1 includes: a core strand 4; a core rope strand assembly 5 that is disposed around the core strand 4; and a resin core rope coating body 6 that coats the core rope strand assembly 5.

[0011] The core strand 4 includes: a core strand main body 7 that is formed by laying together a plurality of steel wires; and a resin core strand coating body 8 that coats the core strand main body 7.

[0012] The core rope strand assembly 5 is constituted by a plurality of core rope strands 9 (in this case six). In this example, each of the core rope strands 9 is constituted only by a core rope strand main body that is formed by laying together a plurality of steel wires. The core rope strands 9 are laid together around the core strand 4 so as to be centered around the core strand 4.

[0013] The outer layer strand assembly 2 is constituted by a plurality of outer layer strands 10 (in this case twelve). In this example, each of the outer layer strands 10 is constituted only by an outer layer strand main body that is formed by laying together a plurality of steel wires. The outer layer strands 10 are laid together around the core rope coating body 6.

[0014] The core strand coating body 8 and the core rope coating body 6 are made of a polyethylene resin, for example. The outer layer coating body 3 is made of a high-friction resin material having a coefficient of friction greater than or equal to 0.2, such as a polyurethane resin, for example.

[0015] The cross-sectional construction of the core strand main body 7 is warrington (JIS G 3525), but it can also be made warrington, warrington-seale, or filler. The cross-sectional constructions of the core strand main body 7, the core rope strands 8 (core rope strand main bodies), and the outer layer strands 9 (outer layer strand main bodies) are similar to each other. The core strand main body 7, the core rope strands 9, and the outer layer strands 10 are configured by parallel laying steel wires into three or more layers.

[0016] A rope diameter excluding the outer layer coating body 3, i.e., an outside diameter of the outer layer strand assembly 2, is greater than or equal to twenty times a diameter of the steel wires. Diameters of all of the steel wires are set to less than or equal to 1/400 of a diameter of sheaves with which they are used, i.e., sheaves (or pulleys) around which the elevator rope is wound.

[0017] As shown in Figure 2, a direction of lay of the outer layer strands 10 is a reverse direction to a direction of lay of the core rope strands 9. A direction of lay of the steel wires of the core strand main body 7 is also a reverse direction to a direction of lay of the core rope strands 9.

[0018] In an elevator rope of this kind, packing density of the steel wires is improved compared to conventional ropes, enabling effective cross-sectional area to be improved. Because the strands (or main bodies) 7, 9, and 10 in each layer are separated from each other by the coating bodies 8, 6, and 3, abrasion of the steel wires can be prevented since the steel wires do not contact each other directly. In addition, bending stresses arising in the steel wires can be alleviated due to a buffer action of the coating bodies 8, 6, and 3.

[0019] Because the core strand main body 7, the core rope strands 9, and the outer layer strands 10 are configured by parallel laying steel wires into three or more layers, air gaps between the wires are reduced since the steel wires are in line contact with each other, enabling packing density of the steel wires to be further improved and also enabling abrasive wear of the steel wires to be further reduced.

[0020] In addition, by using twelve or more outer layer strands 10, diameters δ of the steel wires in the outer layer strands 10 can be reduced without making configuration of the outer layer strands 10 complicated, enabling a relationship with the rope diameter d excluding the outer layer coating body 3 to be made $d/\delta \geq 20$, thereby enabling generated bending stresses to be reduced. In addition, since the diameter of the core rope 1 can be increased to a certain extent, strength degradation of the steel wires due to abrasion can be suppressed without the steel wires inside the core rope 1 becoming extremely slender.

[0021] Because the diameters of all of the steel wires are set to less than or equal to 1/400 of the diameter of the sheaves with which they are used, bending fatigue service life can be sufficiently ensured. Furthermore, the sheave diameter can be set to a minimum of 200 mm relative to a rope diameter of 10 mm. Consequently, extension of fatigue life or reductions in diameter of the sheaves can be achieved.

[0022] By using one core strand 4, six core rope strands 9, and twelve outer layer strands 10, respectively, the diameters of all of the strands 4, 9, and 10 can be made generally equal. Consequently, the cross-sectional constructions of the core strand main body 7, the core rope strand main body, and the outer layer strand main body can be made similar to each other by adjusting the

thickness of the coating bodies 8, 6, and 3, enabling manufacturing of the entire rope to be facilitated.

[0023] In addition, by twisting the core rope strands 9 in a reverse direction to the core strand main body 7 and twisting the outer layer strands 10 in a reverse direction to the core rope strands 9, rotational torque in interior portions can be balanced, enabling overall twisting return torque of the rope to be reduced.

[0024] Furthermore, since the outer layer coating body 3 is disposed outermost, abrasion of the sheaves can also be prevented, enabling a degree of freedom in selecting materials for the wires of the outer layer strands 10 and the sheaves to be improved. Consequently, overall strength can be increased further and the sheaves can be configured inexpensively.

[0025] Because the outer layer coating body 3, which comes into contact with a drive sheave, is constituted by a high-friction resin material, sufficient driving force transfer efficiency can be ensured even if drive sheave diameter is reduced. Consequently, it is no longer necessary to add weight to a car in order to increase friction between the elevator rope and the drive sheave, or to add guiding pulleys in order to increase contact angle of the elevator rope on the drive sheave, etc., preventing the configuration of an elevator apparatus from becoming complicated.

Here, soft or hard polyurethane resins can be selected freely, but in order to ensure abrasion resistance performance against minute slippage on the surface of the sheaves, it is preferable to use hard polyurethane resins that have a hardness of 90 or more. In addition, in order to prevent hydrolysis from occurring in the service environment, it is also desirable that the resins be ether-based rather than ester-based.

[0026] In addition, flexing resistance can be reduced by selecting materials that slide freely and easily when the elevator rope is bent at the sheaves as materials for the core strand coating body 8 and the core rope coating body 6. Furthermore, the core strand coating body 8 and the core rope coating body 6 require a hardness that can resist being crushed between the steel wires. Hard, low-friction polyethylene materials are suitable for these materials.

The core strand coating body 8 and the core rope coating body 6 do not require such a large coefficient of friction as the outer layer coating body 3, and since bending by the sheaves is not as great, they do not necessarily require superior stretching characteristics. Consequently, resins such as nylons, silicon, polypropylenes, or polyvinyl chloride, etc., for example, may also be used as the materials for the core strand coating body 8 and the core rope coating body 6.

Embodiment 2

[0027] Next, Figure 3 is a cross section of an elevator rope according to Embodiment 2 of the present invention. In the figure, core rope strands 9 include: a core rope

strand main body 11 that is formed by laying together a plurality of steel wires; and a resin core rope strand coating body 12 that coats the core rope strand main body 11. Outer layer strands 10 include: an outer layer strand main body 13 that is formed by laying together a plurality of steel wires; and a resin outer layer strand coating body 14 that coats the outer layer strand main body 13. The core rope strand coating bodies 12 and the outer layer strand coating bodies 14 are made of a similar material to that of the core strand coating body 8 and the core rope coating body 6, such as a polyethylene resin, for example. The rest of the configuration is similar to that of Embodiment 1.

[0028] In an elevator rope of this kind, because the coating bodies 8, 12, and 14 are disposed around all of the strands 4, 9, and 10, steel wires in each layer can be prevented from coming into contact with each other more reliably at a manufacturing stage, enabling abrasion of and damage to the steel wires to be prevented.

Embodiment 3

[0029] Next, Figure 4 is a cross section of an elevator rope according to Embodiment 3 of the present invention. In the figure, outer layer strands 10 are constituted only by outer layer strand main bodies that are formed by laying together a plurality of steel wires. Cross sections of steel wires in the outer layer strand main bodies are modified by compressing the outer layer strand main bodies from outside. The rest of the configuration is similar to that of Embodiment 2.

[0030] In an elevator rope of this kind, if spacing between mutually-adjacent outer layer strands 10 is small, contact pressure is reduced even if the outer layer strands 10 come into contact with each other. Packing density of the steel wires in the outer layer strands 10 can also be improved.

Thus, cross-sectional constructions of the strands 4, 9, and 10 in each of the layers may also be made to differ from each other.

Embodiment 4

[0031] Next, Figure 5 is a cross section of an elevator rope according to Embodiment 4 of the present invention. In the figure, outer layer strands 10 are constituted only by outer layer strand main bodies that are formed by laying together a plurality of steel wires in a similar manner to Embodiment 1. Cross sections of steel wires in a core strand main body 7 and core rope strand main bodies 11 are modified by compressing the strand main bodies 7 and 11 from outside. The rest of the configuration is similar to that of Embodiment 2.

[0032] In an elevator rope of this kind, packing density of the steel wires can also be improved because the cross sections of the steel wires in the core strand main body 7 and the core rope strand main bodies 11 are modified.

Embodiment 5

[0033] Next, Figure 6 is a plan showing an elevator apparatus according to Embodiment 5 of the present invention, and Figure 7 is a front elevation showing the elevator apparatus from Figure 6. First and second car guide rails 22a and 22b and a pair of counterweight guide rails 23a and 23b are installed inside a hoistway 21. A car 24 is raised and lowered inside the hoistway 21 along the car guide rails 22a and 22b. A counterweight 25 is raised and lowered inside the hoistway 21 along the counterweight guide rails 23a and 23b. The counterweight 25 is disposed so as to face a back surface of the car 24 when positioned level with the car 24.

[0034] A driving machine 26 for raising and lowering the car 24 and the counterweight 25 is installed in a lower portion inside the hoistway 21. The driving machine 26 includes: a driving machine main body 27 that includes the motor; and a drive sheave 28 that is rotated by the driving machine main body 27. A brake (not shown) that brakes rotation of the drive sheave 28 is also mounted internally into the driving machine 26. In addition, a thin hoisting machine in which an axial dimension is less than an outside diameter dimension that is perpendicular to the axial direction is used for the driving machine 26.

[0035] The driving machine 26 is disposed between a side surface of the car 24 and a hoistway wall 21a that faces that side surface when viewed from above. In addition, the driving machine 26 is disposed such that a rotating shaft of the drive sheave 28 is parallel to a width direction of the car 24 and horizontal.

[0036] A main rope group 30 is wound around the drive sheave 28. The car 24 and the counterweight 25 are suspended inside the hoistway 21 by the main rope group 30 using a one-to-one (1 : 1) roping method. The main rope group 30 includes: a plurality of first elevator ropes 31; and a plurality of second elevator ropes 32. Each of the elevator ropes 31 and 32 has a configuration identical to any one of Embodiments 1 through 4.

[0037] First and second rope connecting portions 33 and 34 are disposed on two width end portions of a lower end portion of the car 24. Each of the first elevator ropes 31 includes: a first end portion that is connected to the first rope connecting portion 33; and a second end portion that is connected to an upper portion of the counterweight 25. Each of the second elevator ropes 32 includes: a third end portion that is connected to the second rope connecting portion 34; and a fourth end portion that is connected to an upper portion of the counterweight 25.

[0038] First through third car return sheaves 35 through 37 that direct the elevator ropes 31 and 32 from the drive sheave 28 toward the car 24 and a counterweight return sheave 38 that directs the elevator ropes 31 and 32 from the drive sheave 28 toward the counterweight 25 are disposed in an upper portion inside the hoistway 21.

[0039] The first elevator ropes 31 are wound from the first end portions sequentially around the first car return

sheave 35, the second car return sheave 36, the drive sheave 28, and the counterweight return sheave 38. The second elevator ropes 32 are wound from the third end portions sequentially around the third car return sheave 37, the drive sheave 28, and the counterweight return sheave 38. In other words, the first and second elevator ropes 31 and 32 are distributed from the drive sheave 28 to the second and third car return sheaves 36 and 37, which are not parallel to each other.

[0040] The first and second car return sheaves 35 and 36 and the counterweight return sheave 38 are disposed such that rotating shafts thereof are parallel to a depth direction of the car 24 and horizontal. The third car return sheave 37 is disposed such that a rotating shaft thereof is parallel to a width direction of the car 24 and horizontal. The return sheaves 35 through 38 are disposed outside a region of the car 24, i.e., disposed so as not to overlap with the car 24 when viewed from above.

[0041] A diameter of at least one of the return sheaves 35 through 38, in this case the first and second car return sheaves 35 and 36, is less than or equal to twenty times a diameter of the elevator ropes 31 and 32.

[0042] The first and second rope connecting portions 33 and 34 are disposed such that a straight line that connects them passes through a center of gravity of the car 24 or a vicinity thereof when viewed from above. Because of this, the first rope connecting portion 33 is disposed behind the first car guide rail 22a, and the second rope connecting portion 34 is disposed in front of the second car guide rail 22b. Thus, the car 24 is suspended substantially at its center of gravity.

[0043] In an elevator apparatus of this kind, because elevator ropes 31 and 32 that have configurations identical to any one of Embodiments 1 through 4 are used, diameters of the return sheaves 35 through 38 can be reduced. Specifically, the diameters of the first and second car return sheaves 35 and 36 can be reduced to approximately twenty times the diameter of the elevator ropes 31 and 32. The first and second car return sheaves 35 and 36 can thereby be disposed outside the region of the car 24 when viewed from above without enlarging the area of the hoistway 21. Consequently, an upper-portion space inside the hoistway 21 can be reduced without the car 24 interfering with the return sheaves 35 and 36 when the car 24 is moved to an uppermost portion inside the hoistway 21. Because the diameter of the drive sheave 28 can also be reduced, load torque that acts on the driving machine 26 can be reduced, enabling reductions in the size of the driving machine 26 to be achieved.

Claims

1. An elevator rope comprising:

a core strand having a core strand main body that is formed by laying together a plurality of steel wires, and a resin core strand coating body

- that coats the core strand main body;
 a core rope strand assembly that is constituted by a plurality of core rope strands that each have a core rope strand main body that is formed by laying together a plurality of steel wires, the core rope strands being laid together around the core strand so as to be centered around the core strand;
 a resin core rope coating body that coats the core rope strand assembly;
 an outer layer strand assembly that is constituted by a plurality of outer layer strands that each have an outer layer strand main body that is formed by laying together a plurality of steel wires, the outer layer strands being laid together around the core rope coating body; and
 a resin outer layer coating body that coats the outer layer strand assembly.
2. The elevator rope according to Claim 1, wherein the core strand main body, the core rope strand main bodies, and the outer layer strand main bodies are configured by parallel laying steel wires into three or more layers.
3. The elevator rope according to Claim 1, wherein twelve or more of the outer layer strands are used.
4. The elevator rope according to Claim 1, wherein an outside diameter of the outer layer strand assembly is greater than or equal to twenty times a diameter of a steel wire.
5. The elevator rope according to Claim 1, wherein a diameter of a steel wire is set so as to be less than or equal to 1/400 of a diameter of a sheave with which the steel wire is used.
6. The elevator rope according to Claim 1, wherein:
 one of the core strands, six of the core rope strands, and twelve of the outer layer strands are used; and
 cross-sectional constructions of the core strand main body, the core rope strand main bodies, and the outer layer strand main bodies are similar to each other.
7. The elevator rope according to Claim 1, wherein the core rope strands further comprise a resin core rope strand coating body that coats the core rope strand main body.
8. The elevator rope according to Claim 1, wherein the outer layer strands further comprise a resin outer layer strand coating body that coats the outer layer strand main body.
9. The elevator rope according to Claim 1, wherein a steel wire cross section in at least one strand main body among the core strand main body, the core rope strand main bodies, and the outer layer strand main bodies is modified by compressing the strand main body from outside.
10. The elevator rope according to Claim 1, wherein a direction of lay of the outer layer strands is a reverse direction to a direction of lay of the core rope strands.
11. An elevator apparatus comprising:
 a driving machine having a driving machine main body, and a drive sheave that is rotated by the driving machine main body, the driving machine being disposed in a lower portion of a hoistway; a plurality of elevator ropes that are wound around the drive sheave;
 a car and a counterweight that are suspended inside the hoistway by the elevator ropes using a one-to-one (1:1) roping method; and
 a plurality of return sheaves that are disposed in an upper portion of the hoistway and that direct the elevator ropes from the drive sheave toward the car and the counterweight,
 each of the elevator ropes comprising:
 a core strand having a core strand main body that is formed by laying together a plurality of steel wires, and a resin core strand coating body that coats the core strand main body;
 a core rope strand assembly that is constituted by a plurality of core rope strands that each have a core rope strand main body that is formed by laying together a plurality of steel wires, the core rope strands being laid together around the core strand so as to be centered around the core strand;
 a resin core rope coating body that coats the core rope strand assembly;
 an outer layer strand assembly that is constituted by a plurality of outer layer strands that each have an outer layer strand main body that is formed by laying together a plurality of steel wires, the outer layer strands being laid together around the core rope coating body; and
 a resin outer layer coating body that coats the outer layer strand assembly, and
 a diameter of at least one of the return sheaves being less than or equal to twenty times a diameter of the elevator ropes.

FIG. 1

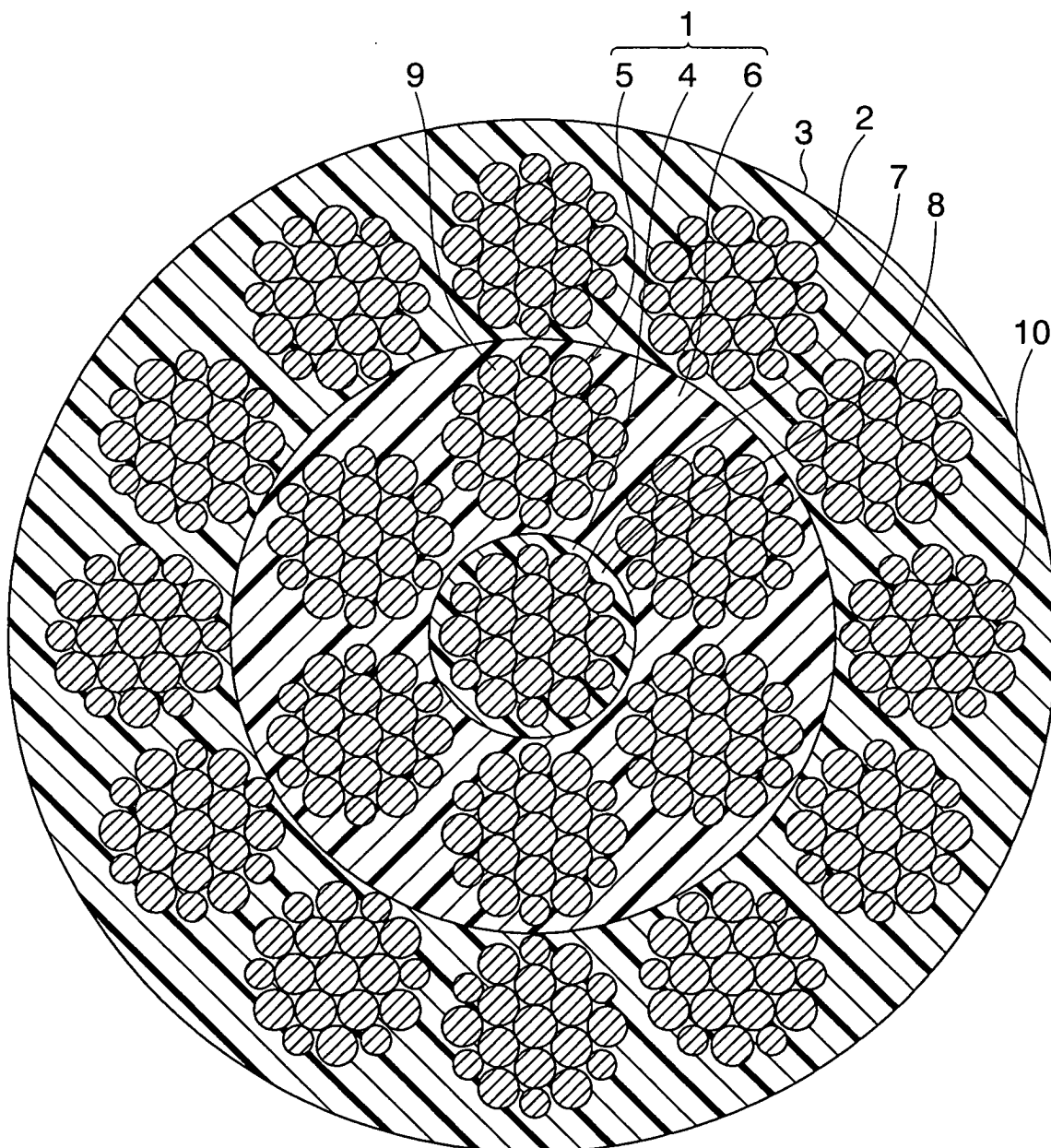


FIG. 2

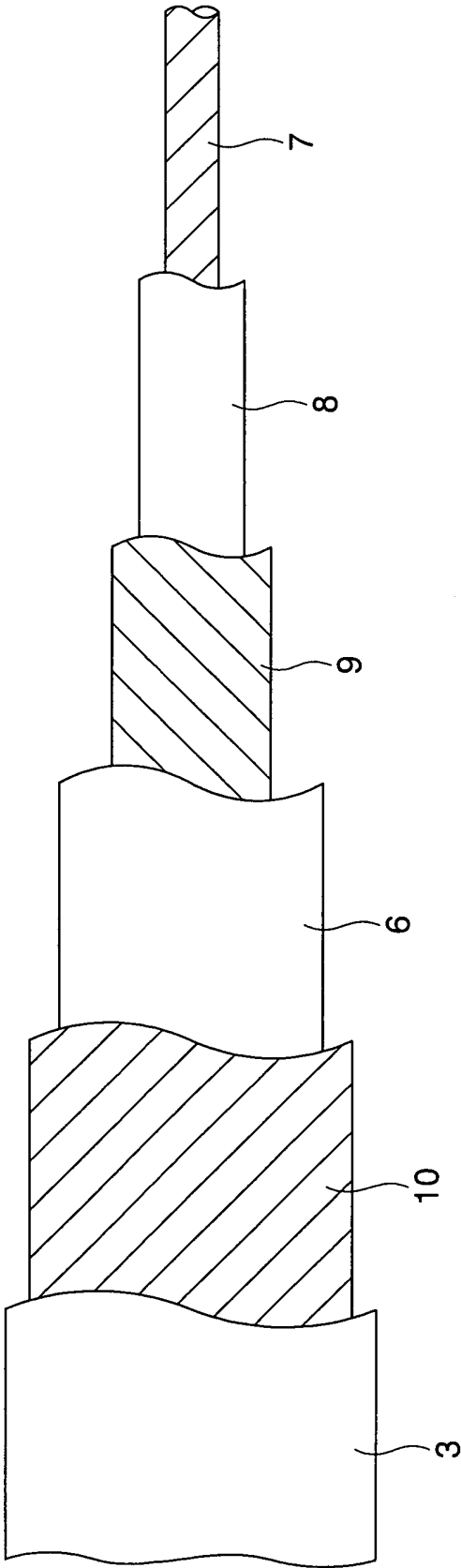


FIG. 3

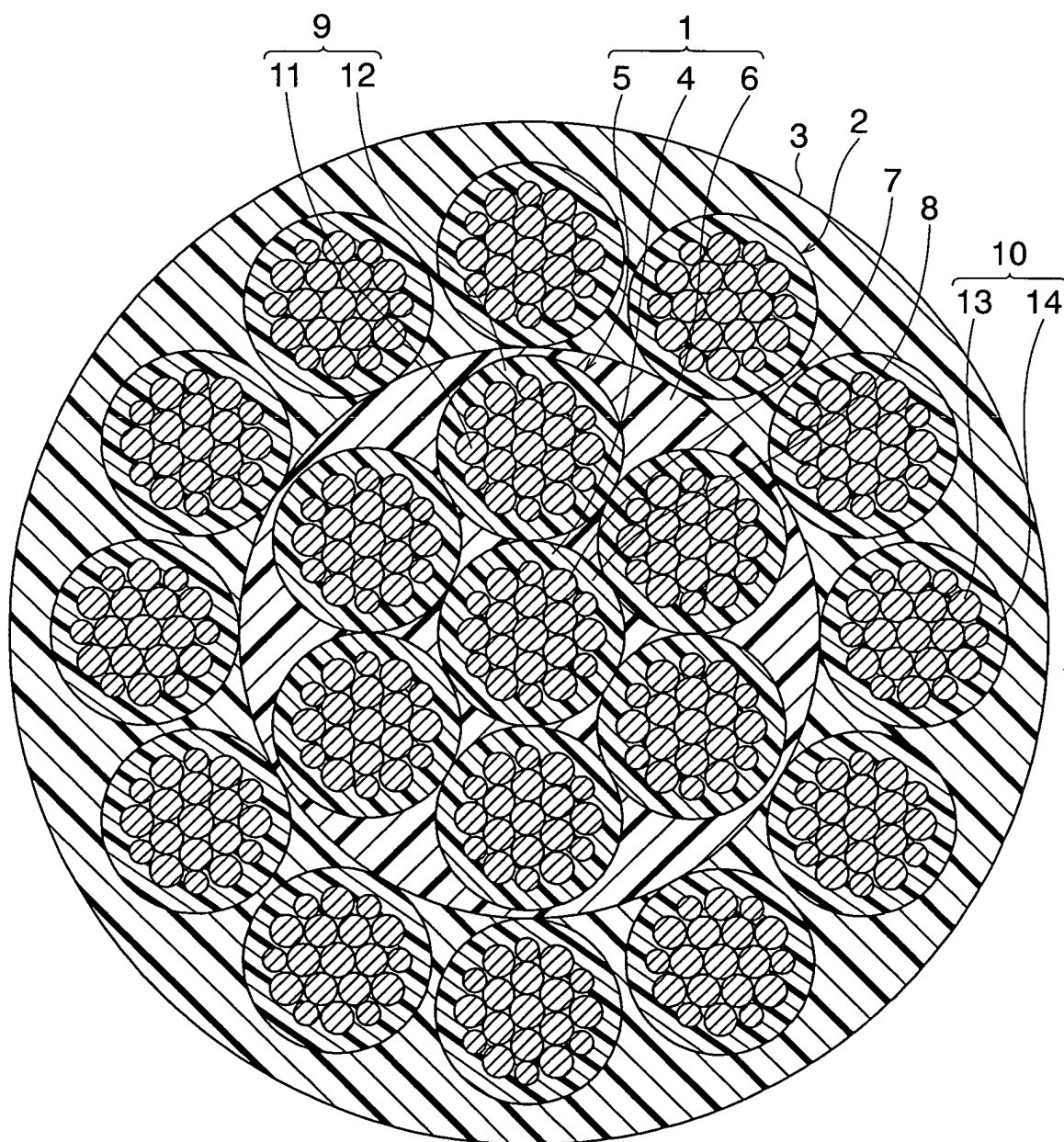


FIG. 4

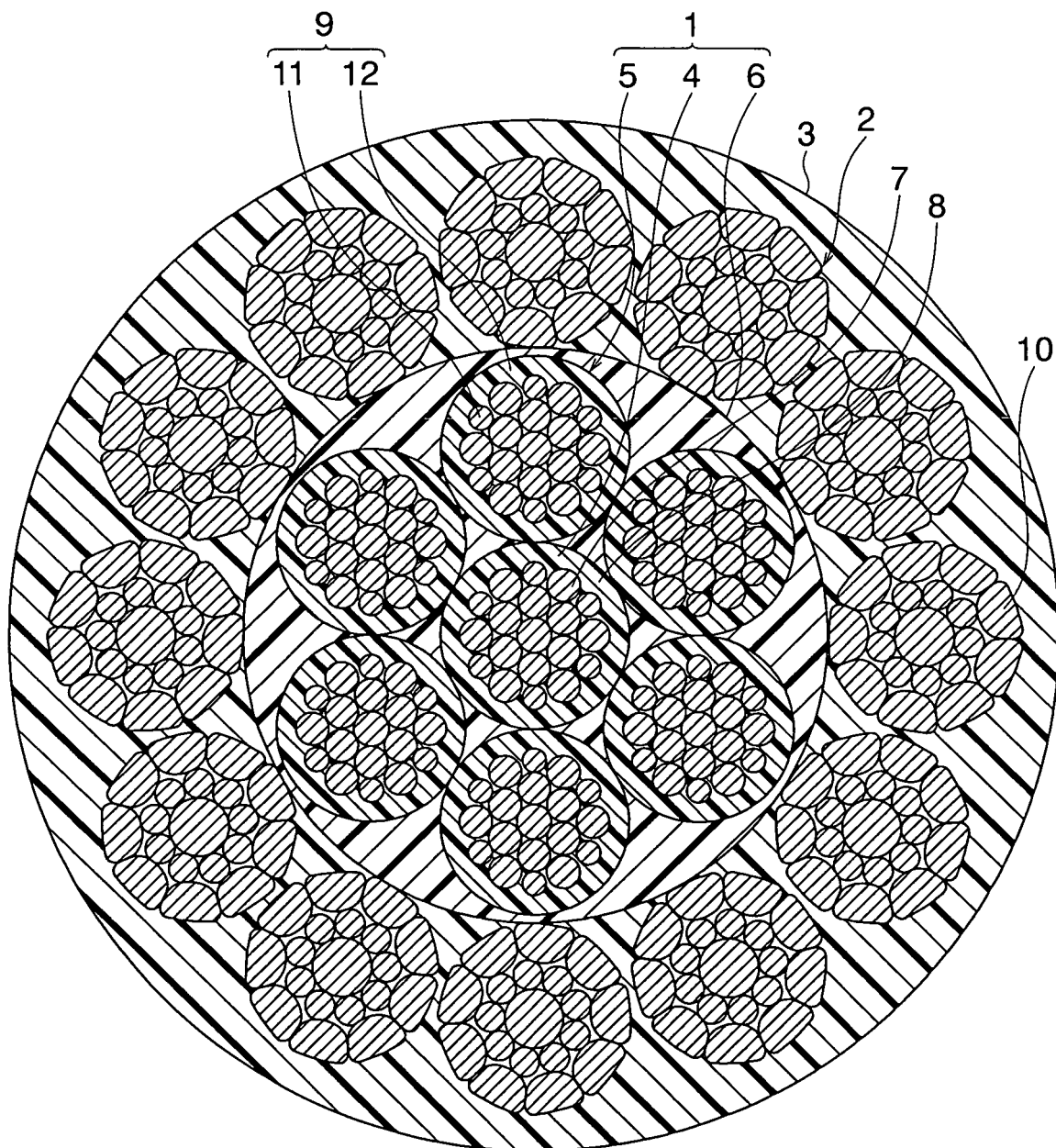


FIG. 5

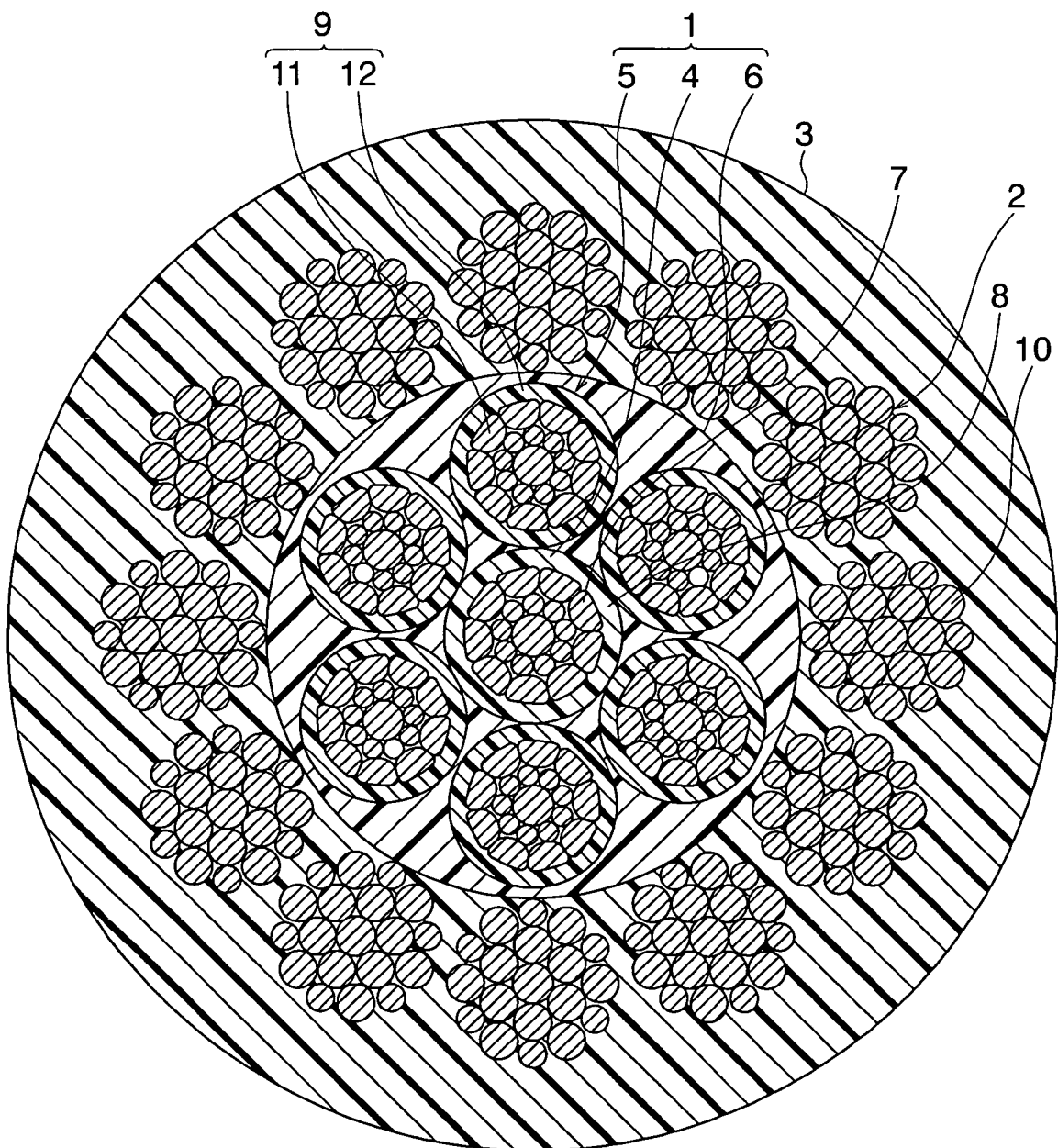


FIG. 6

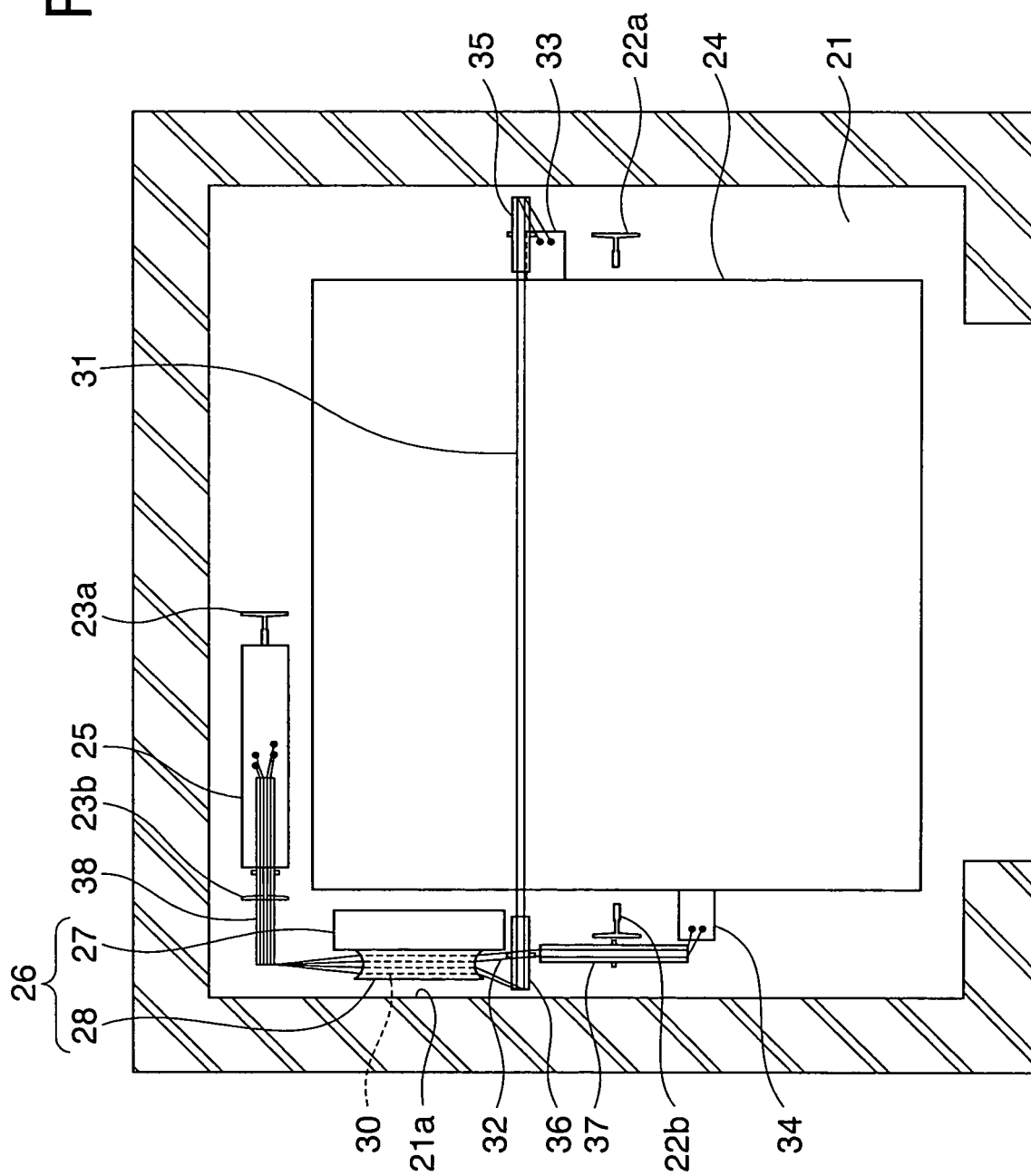
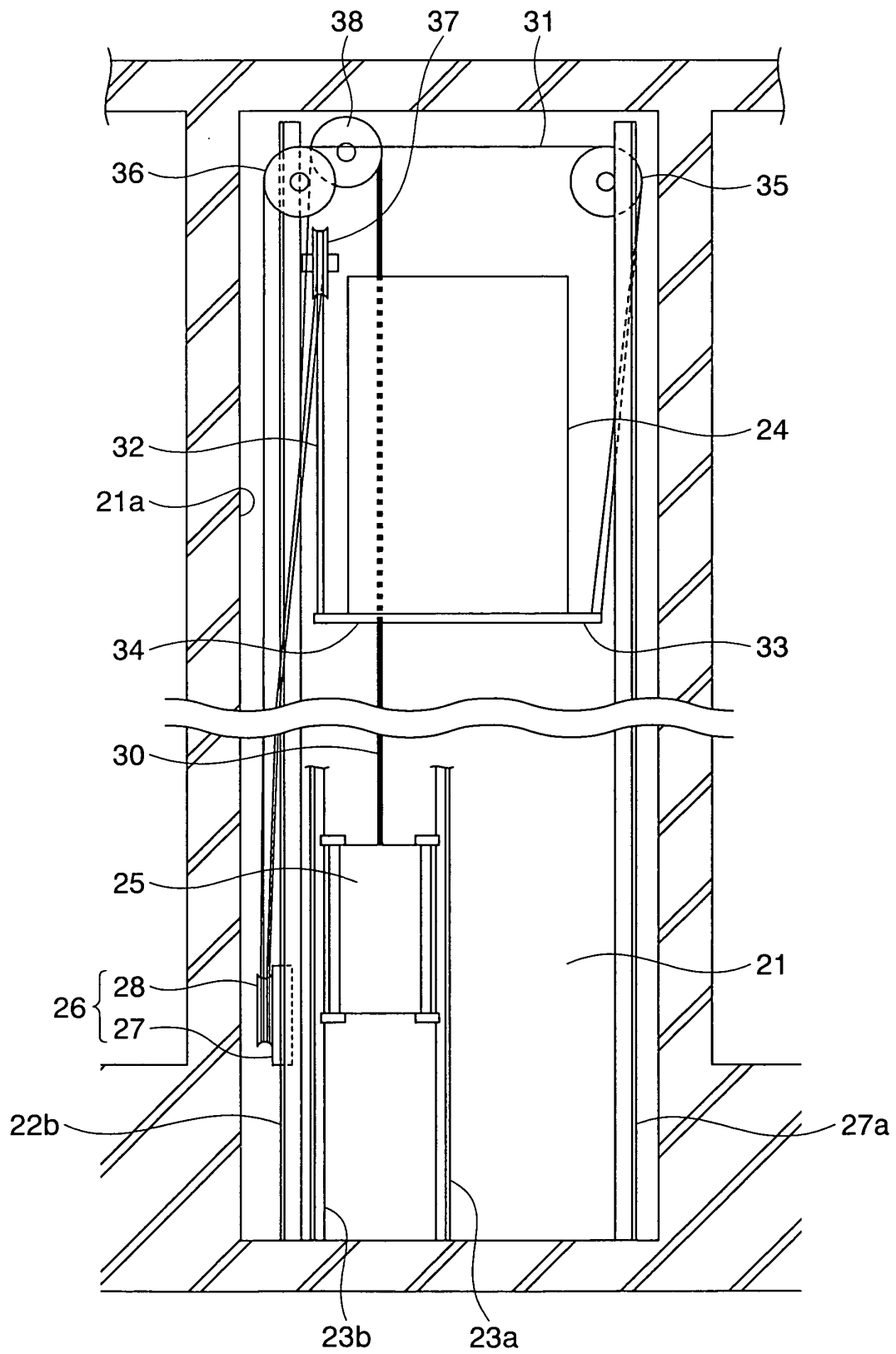


FIG. 7



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2004/018265

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl. ⁷ B66B7/06		
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) Int.Cl. ⁷ B66B7/06, D07B1/16		
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 1996-2005 Kokai Jitsuyo Shinan Koho 1971-2005 Toroku Jitsuyo Shinan Koho 1994-2005		
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.
X Y	JP 2003-41493 A (Tokyo Rope Manufacturing Co., Ltd.), 13 February, 2003 (13.02.03), Par. Nos. [0067] to [0071], Figs. 18 to 19; Par. No. [0028], Figs. 6 to 8 (Family: none)	1,3-4,6,10 2,5,7-9,11
Y	WO 03/050348 A1 (Mitsubishi Electric Corp.), 19 June, 2003 (19.06.03), Claims 1 to 20; description, page 5, lines 11 to 17; Figs. 1 to 2, 4 & US 2004/0026178 A1 & GB 2385867 A	2,5,9
☐ 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 07 September, 2005 (07.09.05)		Date of mailing of the international search report 20 September, 2005 (20.09.05)
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Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2004/018265

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	JP 2001-262482 A (Hitachi, Ltd.), 26 September, 2001 (26.09.01), Par. Nos. [0038] to [0041]; Figs. 5 to 8 (Family: none)	1

REFERENCES CITED IN THE DESCRIPTION

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