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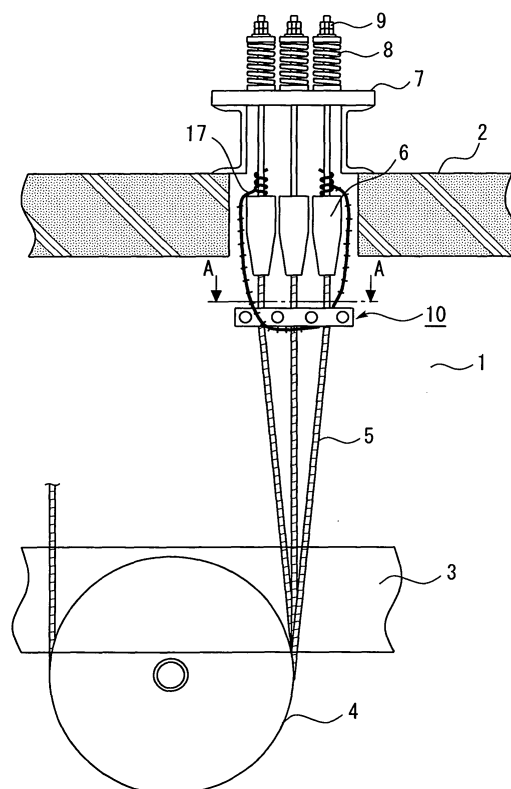
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(54) **ELEVATOR ROPE HOLDING STRUCTURE**

(57) A plurality of rope grippers (6) gripping an end of each rope (5) of a plurality of parallel elevator ropes (5) is supported by a supporting part (7). A rope regulator (10) arranged in the vicinity of the rope grippers (6) has through holes (15) corresponding to each rope (5) of the plurality of elevator ropes (5), and each of the plurality of ropes (5) is passed with a gap through the through holes (15) and gripped by the rope grippers (6). The rope regulator is suspended by a flexible member (17), and the flexible member (17) is fastened to the rope grippers (6) or to the supporting part (7).

Fig. 1



Description

Technical Field

[0001] The present invention relates to a gripping structure of elevator ropes of a traction-type elevator.

Background Art

[0002] In a conventional elevator, the ends of the ropes that suspend the elevator car or the counterweight are gripped by a plurality of rope grippers. The rope grippers are parallelly arranged, and supported by a supporting part provided on, for example, the machineroom floor, via elastic bodies such as coil springs or the like.

[0003] Here, in such a case where the elevator car is stopped at the lowest floor, that is, in the case where there is ample distance between the rope grippers and the suspension sheave for the car mounted on the elevator car, the rope grippers are supported almost vertically by the supporting part. However, when the rope grippers and the suspension sheave for the car get close to each other according to the ascent or descent of the elevator car, the distances between the elevator ropes in the vicinity of the rope grippers become short, and there is the fear of mutual interference of the rope grippers. For this reason, in order to solve this problem, it is necessary to widen the arrangement interval between the rope grippers at the supporting part, or to enlarge the clearance in the top part of the hoistway, i.e., the distance between the suspension sheave for the car and the rope grippers in the case where the elevator car becomes the closest to the rope grippers. As a result of this, the problem that the space occupied by the elevator becomes large arises.

[0004] Furthermore, in Japanese unexamined laid-open utility model publication No. Sho 52-27052, there is disclosed a rope-holding device wherein vibration in the horizontal direction and rotation around the axis line of the rope grippers are prevented by providing a vibration-proof block which fits the rope grippers with a little gap. However, since the rope grippers, which are rigid bodies, are held by fixation, when vibration in the horizontal direction or rotation around the axis line occur, load is applied to the rope grippers, and this brings concern of damage to the rope grippers.

[0005] The present invention has as its object the prevention of mutual interference of the rope grippers without widening the arrangement interval between the rope grippers at the supporting part or enlarging the clearance in the top part of the hoistway, as in the conventional way.

Disclosure of the Invention

[0006] The gripping structure of elevator ropes in the present invention comprises a plurality of rope grippers which grip an end of each rope of a plurality of parallel

elevator ropes, and a supporting part which supports the plurality of rope grippers. A rope regulator with through holes corresponding to each rope of the plurality of elevator ropes is arranged in the vicinity of the rope grippers, and each rope of the plurality of elevator ropes is passed with a gap through the through holes of the rope regulator and gripped by a rope gripper.

[0007] Furthermore, the rope regulator is suspended by a flexible member, and the flexible member is fastened to the rope grippers or to the supporting part.

[0008] Moreover, at least around the inner wall of the through holes of the rope regulator is formed of a material softer than the material of the outer layer of the elevator rope.

[0009] According to the aforementioned invention, it is possible to prevent mutual interference of the rope grippers without widening the arrangement interval between the rope grippers at the supporting part or enlarging the clearance in the top part of the hoistway, and to secure the original durability of the rope grippers. Moreover, since the elevator ropes are passed with a gap through the rope regulator, and more preferably, the rope regulator is formed of a material softer than the material of the outer layer of elevator rope, damage to the elevator ropes may be prevented, and the original durability of the elevator rope may be secured.

Brief Description of the Drawings

[0010]

Figure 1 is a diagram illustrating a gripping structure of elevator ropes in accordance with a first embodiment of the present invention;

Figure 2 is a cross-sectional view taken on line A-A; Figure 3 is a cross-sectional view illustrating the rope regulator in accordance with a second embodiment of the present invention; and

Figure 4 is a diagram illustrating a gripping structure of elevator ropes in accordance with a third embodiment of the present invention.

Best Mode for Carrying out the Invention

[0011] To describe the present invention in more detail, the invention will be described referring to the accompanying drawings. In each of the drawings, the same numerals are given to the same parts or the corresponding parts, and repeated explanation will be appropriately simplified or omitted.

First Embodiment

[0012] Figure 1 is a diagram illustrating a gripping structure of elevator ropes in accordance with the first embodiment of the present invention; and Figure 2 is a cross-sectional view taken on line A-A.

[0013] In Figure 1, the elevator ropes 5, which are ar-

ranged in parallel, have one end passed around a suspension sheave 4 that is provided at an upper part of the elevator car 3 that ascends and descends through the hoistway 1. Each of the elevator ropes 5 has an end gripped by a plurality of rope grippers 6. The rope grippers 6 are arranged in parallel, and are fastened with nuts 9 to a supporting part 7 which is provided on the machineroom floor 2 via elastic bodies formed of coil springs 8.

[0014] Next: a rope regulator 10 is arranged in the vicinity of the rope grippers 6. As shown in Figure 2, the rope regulator 10 has a plurality of through holes 15 which are formed by assembling two outer plates 11 and an inner plate 12 which all have semicircle-shaped grooves. The outer plates 11 and the inner plate 12 are fixed with throughbolts 13 and nuts 14. These through holes 15 are formed so as to correspond to each rope 5 of the plurality of elevator ropes 5, and the elevator ropes 5 are passed with a gap through the through holes 15. That is, the diameter of the through holes 15 of the rope regulator 10 is formed to be larger than the diameter of the elevator ropes 5. Furthermore, the through holes 15 are provided at an interval in which the rope grippers 6 do not interfere with each other in the case where the elevator car 3 is stopped at the highest floor, i.e., in the case where the rope grippers 6 and the suspension sheave 4 on the upper part of the car 3 become the closest.

[0015] Moreover, the rope regulator 10 is formed of a material softer than the material of the outer layer of the steel elevator ropes 5, for example, synthetic resin such as polyethylene or wood. That is, the material used for the rope regulator 10 is a material that does not damage the elevator ropes 5 when touched by the ropes 5.

[0016] Furthermore, since the elevator ropes 5 is passed with a gap through the rope regulator 10, in order to maintain the rope regulator 10 in the vicinity of the rope grippers 6, the rope regulator 10 is suspended by a flexible member 17. Both ends of the flexible member 17 are fastened to the rope grippers 6. The rope grippers 6 are in positions near the rope regulator 10, thus they are suitable as locations to which the flexible member 17 is to be fastened. As the flexible member 17, a wire, for example, is used; however, other objects may also be used as long as they are capable of supporting the weight of the rope regulator 10 without problems.

[0017] According to the above-described first embodiment, the elevator ropes 5, which have an end gripped by a plurality of rope grippers 6 arranged in parallel, are passed through through holes 15 that are formed in the rope regulator 10 and maintained at a designated interval. For this reason, even in the case where the suspension sheave 4 becomes close to the rope grippers 6 due to the ascent and descent of the elevator car 3, although the elevator ropes 5 in the vicinity of the rope grippers 6 tend to approach each other, mutual interference of the rope grippers 6 is avoided since the positions of the ropes 5 are maintained because the ropes 5 touch the

through holes 15.

[0018] Moreover, the elevator ropes 5 are passed with a gap through the rope regulator 10, thus the elevator ropes 5 may rotate in the circumferential direction against the through holes 15. For this reason, even in the case where untwisting of the elevator ropes 5 occurs, no load is applied to the ropes since the elevator ropes 5 are not caught by the rope regulator 10. Accordingly, the durability of the elevator ropes 5 is not damaged.

[0019] Furthermore, since the elevator ropes 5 are movable also in the longitudinal direction of the ropes 5, in the case where the tension of the elevator ropes 5 is to be adjusted at maintenance, it is possible to adjust the tension of each of the elevator ropes 5 without removing the rope regulator 10.

[0020] Moreover, since the rope regulator 10 is formed of a material softer than the material of the outer layer of the elevator ropes 5, even in the case where the elevator ropes 5 touch the rope regulator 10, it is possible to avoid damage to the elevator ropes 5.

Second Embodiment

[0021] Figure 3 is a cross-sectional view illustrating the rope regulator in accordance with the second embodiment of the present invention.

[0022] Also in the second embodiment, a rope regulator 10 is arranged in the vicinity of rope grippers 6 and the rope regulator 10 is suspended by a flexible member 17 in accordance with Figure 1, as in the first embodiment. Further, both ends of the flexible member 17 are fastened to the rope grippers 6.

[0023] Here, as shown in Figure 3, also in the second embodiment, the rope regulator 10 is formed by assembling two outer plates 11 and an inner plate 12. However, only around the inner wall 16 of the through holes 15 of the rope regulator 10, through which the elevator ropes 5 are passed, is formed of a material softer than the material of the outer layer of the elevator ropes 5 such as a synthetic resin material such as polyethylene or the like. Also by this type of formation, it is possible to avoid damage to the elevator ropes 5 in the case where the elevator ropes 5 touch the rope regulator 10. The other structures are the same as the first embodiment, so the same numerals are given to the same parts or the corresponding parts, and repeated explanation will be omitted.

[0024] According to the aforementioned second embodiment, elevator ropes 5 which have an end gripped by the rope grippers 6, are passed through through holes 15 that are formed in the rope regulator 10 and maintained at a designated interval. For this reason, even in the case where the suspension sheave 4 becomes close to the rope grippers 6 due to the ascent and descent of the elevator car 3, although the elevator ropes 5 in the vicinity of the rope grippers 6 tend to approach each other, mutual interference of the rope grippers 6 is avoided since the positions of the ropes 5 are maintained because the ropes 5 touch the

pers 6 is avoided since the positions of the ropes 5 are maintained because the ropes 5 touch the through holes 15.

[0025] Moreover, since only around the inner wall 16 of the through holes 15 of the rope regulator 10 is formed of a material softer than the outer layer of the elevator ropes 5, even in the case where the necessity for replacement of the rope regulator 10 arises in the future, it is not necessary to replace the whole rope regulator 10, but only around the inner wall 16 of the through holes 15 of the rope regulator 10.

[0026] In addition to the above, the same effects as the first embodiment may be attained.

Third Embodiment

[0027] Figure 4 is a diagram illustrating a gripping structure of elevator ropes in accordance with the third embodiment of the present invention.

[0028] Also in the third embodiment, a rope regulator 10 is arranged in the vicinity of rope grippers 6, and the rope regulator 10 is suspended by a flexible member 17.

[0029] Here, as shown in Figure 4, unlike in the first embodiment, both ends of the flexible member 17 are fastened to a supporting part 7. It is also possible to have the rope regulator 10 held in this kind of manner; and to which of the rope grippers 6 or the supporting part 7 the flexible member 17 is to be fastened may be suitably decided taking the workability at installation of the equipment into consideration.

[0030] Next: as shown in Figure 2, the whole rope regulator 10 may be formed of a material softer than the material of the outer layer of the elevator ropes 5. It is also possible to form only around the inner wall 16 of the through holes 15 of the rope regulator 10 of a material softer than the material of the outer layer of the elevator ropes 5. The other structures are the same as the first and second embodiments, so the same numerals are given to the same parts or the corresponding parts, and repeated explanation will be omitted.

[0031] According to the aforementioned third embodiment, the elevator ropes 5, which have an end gripped by a plurality of rope grippers 6 arranged in parallel, are passed through through holes 15 that are formed in the rope regulator 10 and maintained at a designated interval. For this reason, even in the case where the suspension sheave 4 becomes close to the rope grippers 6 due to the ascent and descent of the elevator car 3, although the elevator ropes 5 in the vicinity of the rope grippers 6 tend to approach each other, mutual interference of the rope grippers 6 is avoided since the positions of the ropes 5 are maintained because the ropes touch the through holes 15.

[0032] In addition to the above, the same effects as the first and second embodiments may be attained.

[0033] In the above-described embodiments, explanation on the end of the elevator ropes 5 at the side of the elevator car 3 is given; however, since the other end

of the elevator ropes 5 that extend from the elevator car 3 and are passed around the suspension sheave of the counterweight via the hoisting machine is of the same formation, explanation will be omitted.

[0034] Furthermore, in the above-described embodiments, an example wherein the supporting part 7 is provided on the machineroom floor 2 is given. However, there are cases in which the supporting part 7 is provided at an upper part of the hoistway via a support bench, or on the upper surface of the elevator car or of the counterweight via a beam. In these cases and also in other cases, the gripping structure of elevator ropes in accordance with the present invention may be applied.

Industrial Applicability

[0035] As aforementioned, in the gripping structure of elevator ropes in accordance with the present invention, elevator ropes are passed with a gap through a rope regulator in the vicinity of rope grippers. Thus, it is possible to prevent mutual interference of the rope grippers and to secure the original durability of the rope grippers without widening the arrangement interval between the rope grippers at the supporting part or enlarging the clearance at the top part of the hoistway. Furthermore, since the elevator ropes are passed with a gap through the rope regulator, and preferably the rope regulator is formed of a material softer than the outer layer of the elevator ropes, damage to the elevator ropes may be prevented, and the original durability of the elevator ropes may be secured.

[0036] Accordingly, the present invention is useful as a gripping structure of elevator ropes wherein durability of the rope grippers and the elevator ropes and savings in space may be improved.

Claims

1. A gripping structure of elevator ropes **characterized in** comprising:

a plurality of rope grippers which grip an end of each rope of a plurality of parallel elevator ropes;
a supporting part for supporting said plurality of rope grippers; and
a rope regulator having through holes corresponding to each rope of said plurality of elevator ropes and provided in the vicinity of said plurality of rope grippers;

wherein said plurality of elevator ropes are passed with a gap through said through holes of said rope regulator and gripped by said rope grippers.

2. The gripping structure of elevator ropes according

to claim 1, **characterized in that** at least the inner wall of said through holes of said rope regulator are formed of a material softer than the material of the outer layer of said elevator ropes.

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3. The gripping structure of elevator ropes according to any one of claim 1 or claim 2, **characterized in that** said rope regulator is suspended by a flexible member which is fastened to said rope grippers.

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4. The gripping structure of elevator ropes according to any one of claim 1 or claim 2, **characterized in that** said rope regulator is suspended by a flexible member which is fastened to said supporting part.

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Fig. 1

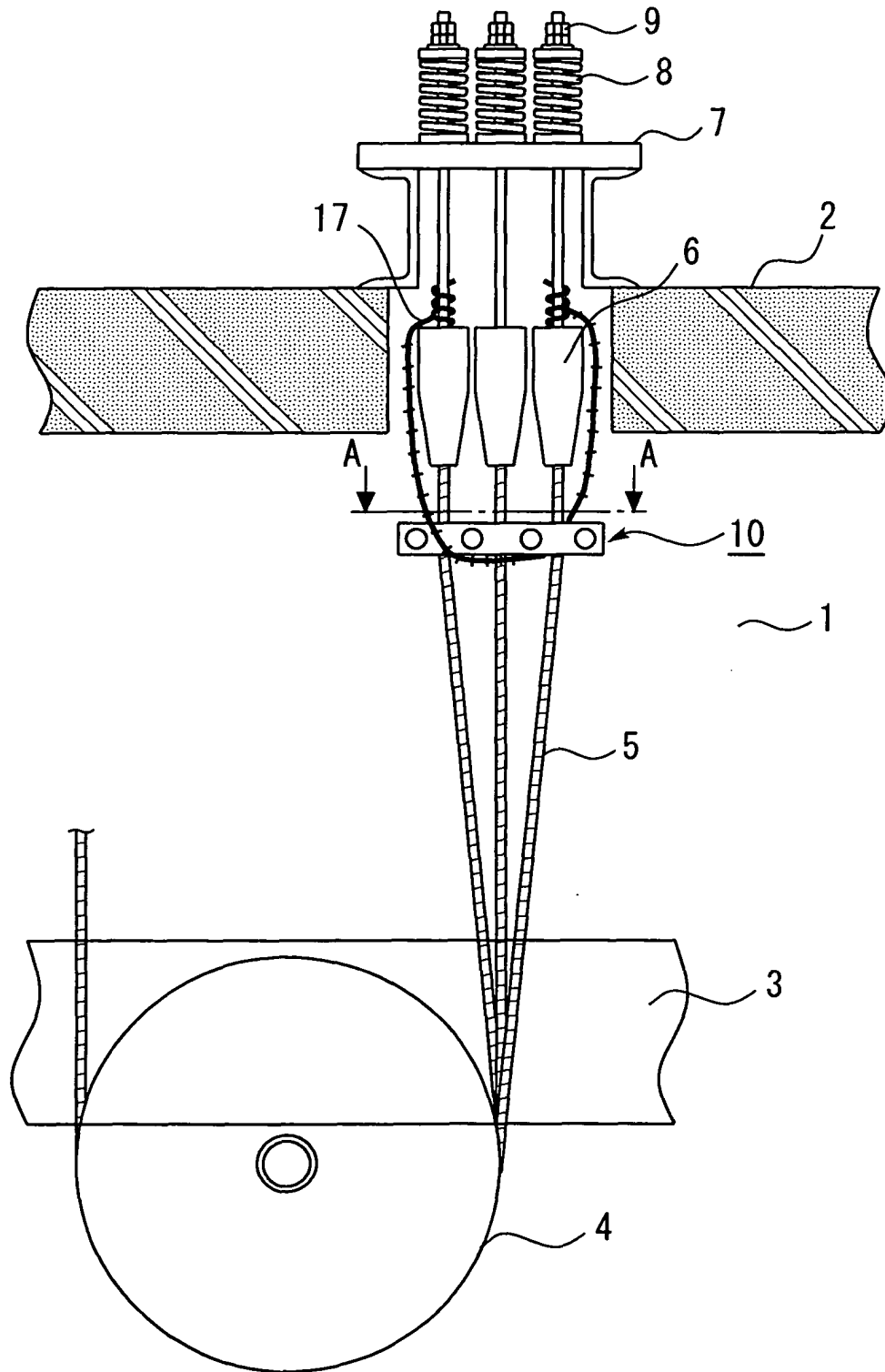


Fig. 2

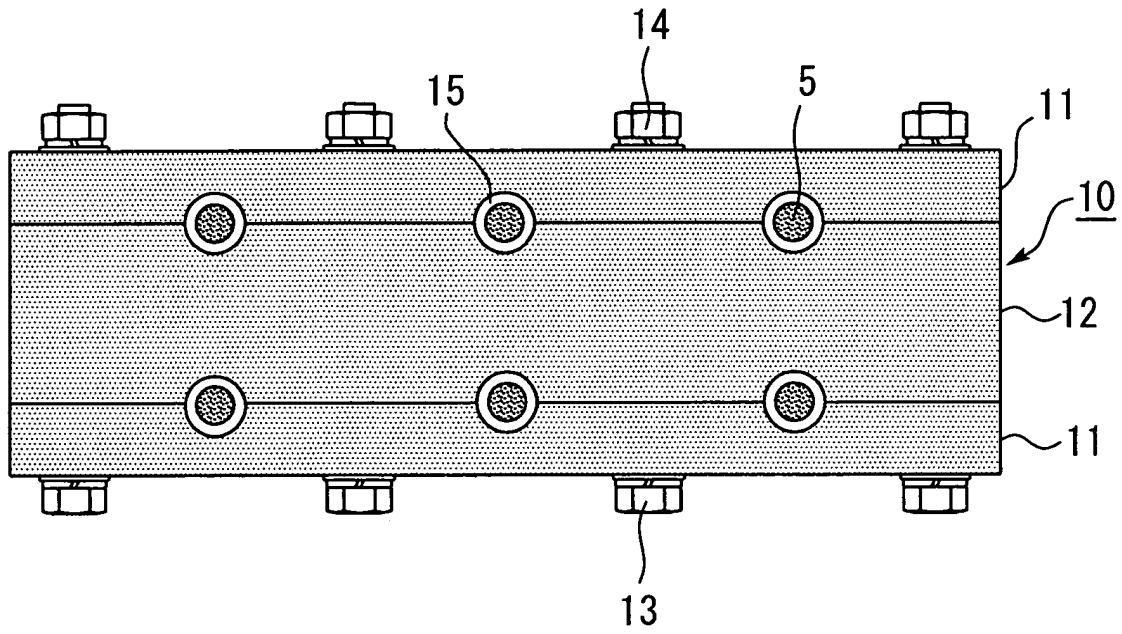


Fig. 3

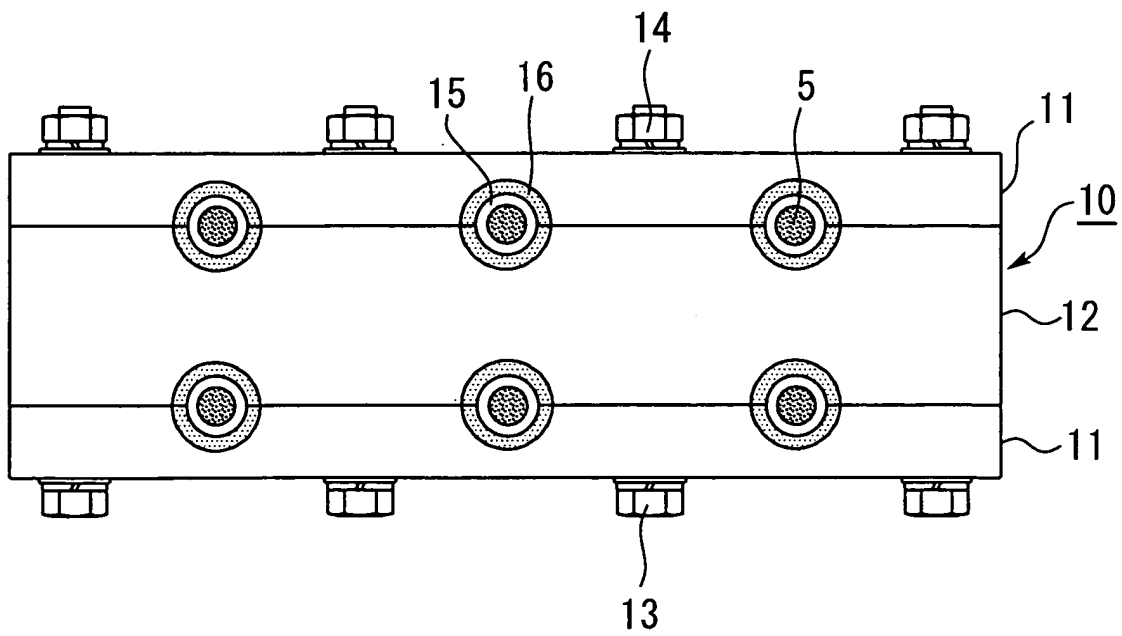
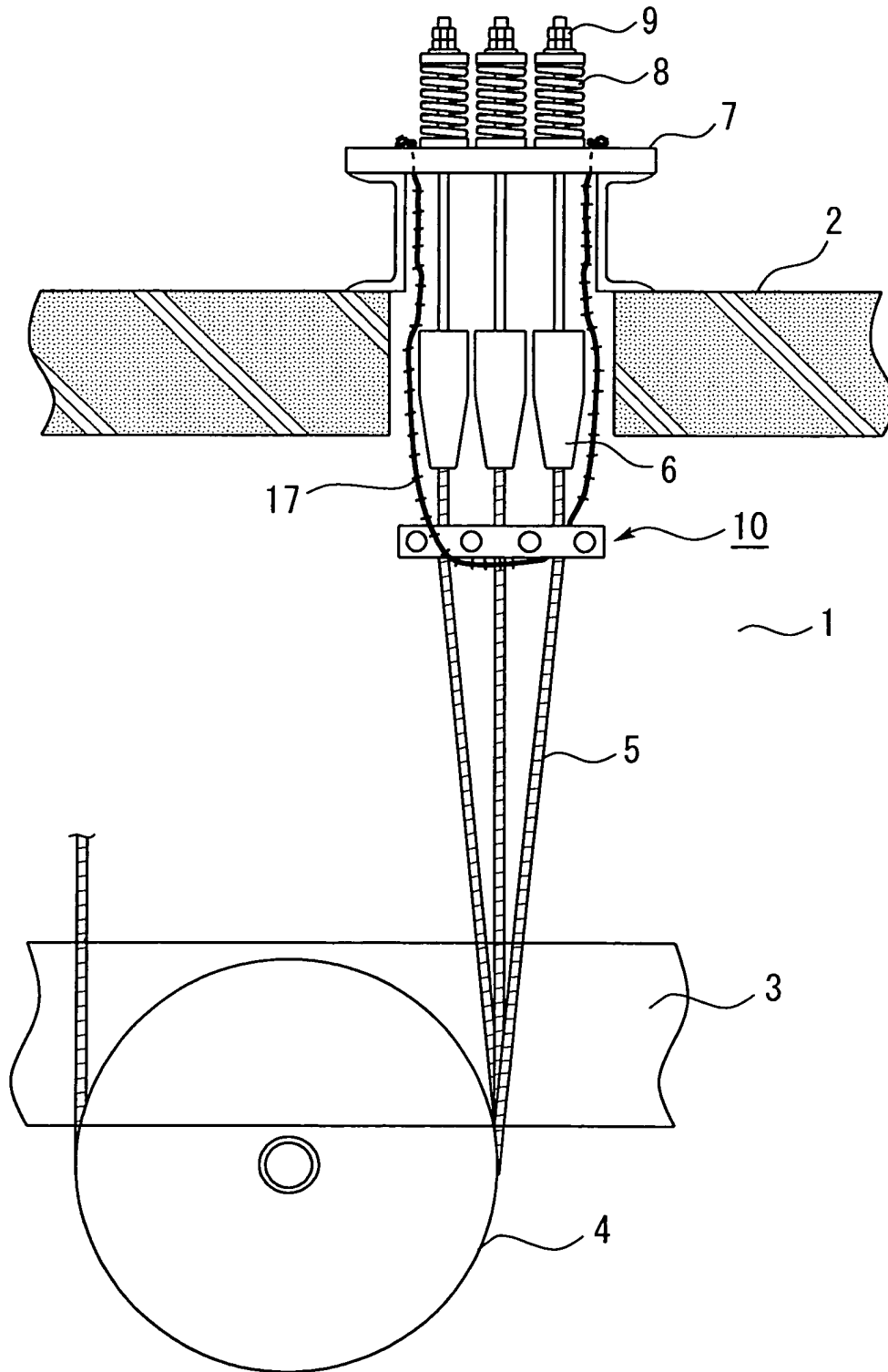


Fig. 4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP03/03272

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl ⁷ B66B7/08				
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 B66B7/00-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 1996-2003 Kokai Jitsuyo Shinan Koho 1971-2003 Toroku Jitsuyo Shinan Koho 1994-2003				
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 2003-2558 A (Mitsubishi Electric Corp.), 08 January, 2003 (08.01.03), Par. Nos. [0012] to [0014] (Family: none)	1 2-4		
Y	JP 7-97165 A (Otis Elevator Co.), 11 April, 1995 (11.04.95), Par. Nos. [0015] to [0016] (Family: none)	2		
Y	JP 9-58944 A (Hitachi Building Systems Co., Ltd.), 04 March, 1997 (04.03.97), Par. No. [0013] (Family: none)	3-4		
☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.				
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Date of the actual completion of the international search 15 December, 2003 (15.12.03)		Date of mailing of the international search report 13 January, 2004 (13.01.04)		
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer		
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP03/03272

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 2001-163550 A (Hitachi, Ltd.), 19 June, 2001 (19.06.01), (Family: none)	1
A	JP 5-32385 A (Toshiba Corp.), 09 February, 1993 (09.02.93), (Family: none)	1
A	JP 2001-48443 A (Hitachi Building Systems Co., Ltd.), 20 February, 2001 (20.02.01), (Family: none)	2

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