(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 845 051 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 158(3) EPC

(43) Date of publication:
17.10.2007 Bulletin 2007/42

(21) Application number: **04807077.5**

(22) Date of filing: **15.12.2004**

(51) Int Cl.:
B66B 11/04 *(2006.01)*

(86) International application number:
PCT/JP2004/018718

(87) International publication number:
WO 2006/064554 (22.06.2006 Gazette 2006/25)

(84) Designated Contracting States:
DE ES FR PT

(71) Applicant: **Mitsubishi Electric Corporation**
Tokyo 100-8310 (JP)

(72) Inventors:
- **MARUYAMA, Naoyuki,**
  Mitsubishi Denki K. K.
  Tokyo1008310 (JP)
- **ANDO, Eiji,**
  Mitsubishi Denki K. K.
  Tokyo 1008310 (JP)

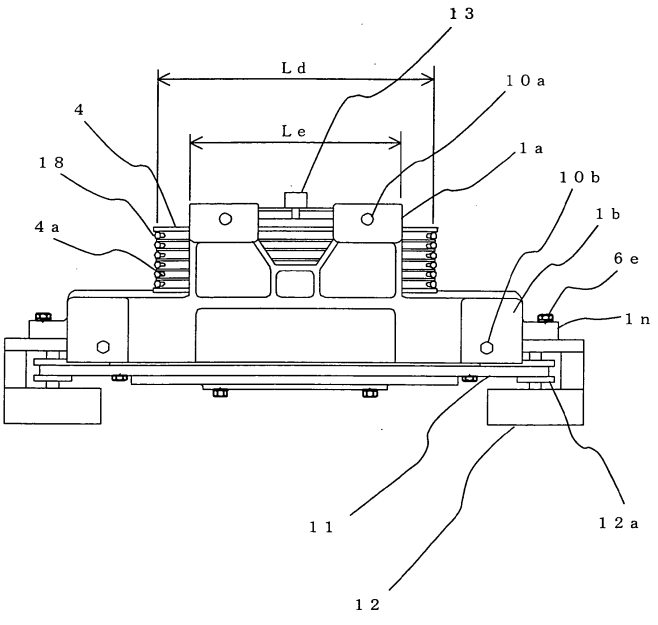
(74) Representative: **HOFFMANN EITLE**
Patent- und Rechtsanwälte
Arabellastrasse 4
81925 München (DE)

(54) HOIST FOR ELEVATOR

(57) It is an object to obtain a small and lightweight elevator hoisting machine that is highly rigid and provides a comfortable ride, and in particular to obtain an elevator hoisting machine applicable to various sizes of hoistways in combination with a deflector sheave in the machine house.

In order to achieve the object, a motor is mounted adjacent to a pillar portion of a base body, a rotatably fixing portion for rotatably supporting a rotary shaft of the motor is provided near the pillar portion, a traction sheave is located outside the base body adjacent to the pillar portion on the other side of the motor and is fixed to a first end portion of the rotary shaft, and a rotor with field magnets of the motor is located in the outer side of the rotatably fixing portion and is fixed to a second end portion of the rotary shaft.

Fig.3



EP 1 845 051 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to an elevator hoisting machine that is configured with a base body and a motor, which drive a traction sheave, and is made thin so that an outside dimension along a rotary shaft for a traction sheave is small.

BACKGROUND ART

[0002] A conventional elevator hoisting machine is configured so that a rotor is rotatably fixed via a bearing to a fixed shaft formed upright from a pillar portion of a base body that is bowl shaped and opens toward one side, to the opening side. Stator coils of a motor are provided in the base body, and field magnets arranged facing the stator coils are firmly fixed to the rotor. The stator coils and the field magnets constitute a disc-type motor. A traction sheave is formed integrally with the rotor, and located outside the opening of the base body. In addition, the pillar portion of the base body supporting the hanging load acting on the traction sheave via a suspending member is placed apart on the other side of the traction sheave. A brake disc is provided on the rotor, and brakes corresponding to the brake disc are provided. Moreover, in order to install on a mount in the machine house, a supporter is attached to the pillar portion of the base body placed apart on the other side of the traction sheave. The supporter is composed of a platy base, a supporting plate, and a bracket, and fixed on the mount in the machine house, deviated from a range of the hanging load acting on the traction sheave via the suspending member. (e.g., see patent document 1)

[0003] In the meantime, another conventional elevator hoisting machine is configured so that a bowl-shaped rotor is rotatably fixed to a fixed shaft held upright toward the inside of the base body from the bottom of the base body, or a pillar portion, that is bowl shaped and opens toward one side. The rotor is placed fitting in the base body. The bottom face of the rotor is placed facing the pillar portion of the base body. A traction sheave is formed integrally with the rotor, placed inside the base body, and covered with the base body. Stator coils of a motor are provided on the inner circumference of the base body, and field magnets arranged facing the stator coils are firmly fixed to the rotor. The stator coils and the field magnets constitute the motor. A braking surface is formed on the inner circumference surface of the rotor, and brakes are provided for performing braking operation, each of which is placed facing the braking surface and has a brake pad. (e.g., see patent document 2)

[0004]

Patent Document 1: Published Japanese Translations of PCT International Publication 511758/H08 (Page 11 and Fig. 4)

Patent document 2: Japanese Laid-open Patent Publication 289954/2000 (Pages 3 through 5, and Figs. 2 and 5)

DISCLOSURE OF THE INVENTION

[Problem that the Invention is to Solve]

[0005] In the first conventional elevator hoisting machine, the pillar portion of the base body is placed apart on the other side of the traction sheave, and the rotor and the traction sheave are integrally formed. Because only a rotating portion is present in the traction sheave side, when trying to fix the hoisting machine in the machine house, a supporter must be attached to the pillar portion of the base body on the other side of the traction sheave. The supporter is fixed in the machine house, deviated from a range of the hanging load acting on the traction sheave via the suspending member. Consequently, an overturning moment due to the hanging load acts on the supporter, so that the whole hoisting machine inclines, and the traction sheave inclines. According to this, the suspending member is tilted with respect to a rope race of the traction sheave. Therefore, during the elevator running, namely during the traction sheave rotation, when the suspending member is going into the rope race, unbalanced load is applied due to inclination of the suspending member with respect to the rope race, so that a comfortable ride in the elevator is disturbed, or the unbalanced load accelerates wear of the rope race. In addition, in order to reduce the inclination, it is required to strengthen the pillar portion of the base body, or to solidly construct the supporter. As the machine gets larger, installability gets worse, and the machine gets uneconomical.

[0006] In the meantime, in the second conventional elevator hoisting machine, the pillar portion of the base body is placed on the side of the traction sheave, and the mounting portion of the base body covers the range of the hanging load, so that the above-described problem does not arise. However, because the traction sheave and the rotor are integrally formed, which are rotatably fixed to the fixed shaft held upright from the pillar portion of the base body toward the inside of the base body, the configuration is such that the traction sheave is placed within the base body for housing the motor, and the base body covers the traction sheave. Therefore, there is the following problem.

[0007] The elevator is so configured that a passenger car and a counterweight are installed within the hoistway, the suspending member is wound on the traction sheave, the passenger car and the counterweight are hanging on the drooping suspending member, and the passenger car and the counterweight is driven upward and downward in a jig-back way by rotational movement of the traction sheave.

[0008] Generally, an elevator in which a hoisting machine is installed within a machine house is configured

so that, as illustrated in Fig. 10, in order to hang the suspending member 18 on the gravity center of a passenger car 19 and a counterweight 20 (approximate center position of the width), the suspending member 18 is wound on a deflector sheave 21 in addition to the traction sheave 4, to widen the spacing of the drooping suspending member 18. For this reason, in order to cope with various passenger car sizes, or hoistway sizes, the horizontal distance between the traction sheave 4 and the deflector sheave 21 must be varied. Here, the drawing angle of the suspending member 18 pulled out from the traction sheave 4 is varied in accordance with an installation position of the deflector sheave 21. In the second conventional elevator hoisting machine, the traction sheave 4 is mounted within the base body, and the drawing opening of the suspending member 18 is arranged approximately in the position where the suspending member 18 droops vertically. Therefore, if the drawing angle of the suspending member 18 is varied by the deflector sheave 21, the base body and the suspending member 18 sometimes interfere with each other. Consequently, the elevator hoisting machine cannot be applied to various sizes of passenger cars. In order to make the machine applicable to various sizes of passenger cars, the drawing opening for the suspending member 18 of the base body must be widened. However, the strength of the base body is lowered on the other hand. In addition, in order to compensate for the deterioration of the strength of the base body, the base body must be solidly constructed. As the machine gets larger, installability gets worse, and the machine gets uneconomical.

[0009] The present invention has been made to resolve such problems, and aims to obtain an elevator hoisting machine that is small, lightweight, and highly rigid, and provides a comfortable ride, and in particular to obtain an elevator hoisting machine applicable to various sizes of hoistways in combination with a deflector sheave in the machine house.

[Means for Solving the Problem]

[0010] In an elevator hoisting machine relevant to the present invention, a motor is mounted adjacent to a pillar portion of a base body, a rotatably fixing portion for rotatably supporting a rotary shaft of the motor is provided near the pillar portion, a traction sheave is located outside the base body adjacent to the pillar portion on the other side of the motor and is fixed to a first end portion of the rotary shaft, and a rotor having field magnets of the motor is located in the outer side of the rotatably fixing portion and is fixed to a second end portion of the rotary shaft.

[Effects of the Invention]

[0011] According to the present invention, the moment acting on the traction sheave due to the hanging load can be made smaller with respect to the base body. Therefore, the inclination of the whole hoisting machine or the inclination of the traction sheave can be reduced without making the base body larger, so that a small and lightweight elevator hoisting machine that provides a comfortable ride can be achieved.

BRIEF DESCRIPTION OF DRAWINGS

[0012]

[Fig. 1] Fig. 1 is a front view of an elevator hoisting machine in Embodiment 1 of the present invention.
[Fig. 2] Fig. 2 is a cross-sectional view along the line A-A in Fig. 1.
[Fig. 3] Fig. 3 is a bottom view of the elevator hoisting machine in Embodiment 1 of the present invention.
[Fig. 4] Fig. 4 is a view illustrating action of the hanging load of the elevator hoisting machine in Embodiment 1 of the present invention.
[Fig. 5] Fig. 5 is a view illustrating other application examples of the elevator hoisting machine in Embodiment 1 of the present invention.
[Fig. 6] Fig. 6 is a view illustrating an elevator hoisting machine in Embodiment 2 of the present invention.
[Fig. 7] Fig. 7 is a view illustrating an elevator hoisting machine in Embodiment 3 of the present invention.
[Fig. 8] Fig. 8 is a front view of an elevator hoisting machine in Embodiment 4 of the present invention.
[Fig. 9] Fig. 9 is a cross-sectional view along the line B-B in Fig. 8.
[Fig. 10] Fig. 10 is a diagram illustrating a normal elevator.

[Description of the Symbols]

[0013] 1: base body; 1a, 1b, 1c, 1d, 1e, 1f, 1g, 1j, 1k: ribs; 1n: brake mounting portion; 2, 2a: bearings; 3, 3a: rotary shafts; 4, 4b: traction sheaves; 4a: rope races; 5, 5a, 5b: rotors; 6a, 6b, 6c, 6d, 6e, 6f, 6g, 6h: bolts; 7: field magnets; 8: stator coils; 9: motor; 10a, 10b: mounting holes; 11: brake wheel; 11a: braking surface; 12: brake; 12a: brake pad; 13: rotation detector; 13a: detector rotary shaft; 14: attachment plate; 15: lubricant agent; 16a, 16b: bearing covers; 17a, 17b: oil seals; 18, 18a: suspending members; 19: passenger car; 20: counterweight; 21: deflector sheave; 22: protecting cover

BEST MODE FOR CARRYING OUT THE INVENTION

[0014] Hereinafter, a preferred embodiment of the present invention will be described in reference to the drawings.

Embodiment 1.

[0015] Fig. 1 through Fig. 3 are views illustrating Embodiment 1 of the present invention. Fig. 1 is a front view; Fig. 2 is a cross sectional view along the line A-A in Fig. 1; and Fig. 3 is a bottom view. As illustrated in the draw-

ings, a base body 1 has first mounting portions 1a and second mounting portions 1b to be attached to a mount not illustrated, and a pillar portion 1c is held upright from the first mounting portions 1a and the second mounting portions 1b. A cylindrical concave portion 1d is formed integrally with the pillar portion 1c, and a cylindrical boss portion 1e is integrally formed in the central portion. Ribs 1f are formed on the boss portion 1e integrally with the pillar portion 1c of the base body 1. A bearing 2 serving as a rotatably fixing portion is housed in the boss portion 1e, and the rotary shaft 3 is rotatably supported by the bearing 2. The bearing 2 is located near the pillar portion 1c. It should be noted that the bearing 2 is a usual ball bearing, which are rotated by spherical balls rolling on the plain track surfaces and are under radial load.

[0016] A traction sheave 4, onto which a suspending member 18 is wound, is located outside the base body 1, adjacent to the pillar portion 1c of the base body 1, and fixed by thermal insert to a first end portion of the rotary shaft 3. In addition, a plurality of rope races 4a are formed on the traction sheave 4 so as to engage with a plurality of ropes constituting the suspending member 18. It should be noted that the fixing of the traction sheave 4 and the rotary shaft 3 by thermal insert is not so limited, and any means for fixing them such as a fixing method by forming the end of the rotary shaft 3 in a tapered shape so that the leading end tapers and pressing the traction sheave 4 can be used. A rotor 5, in which a concave portion opening toward the other side of the opening of the base body 1, is located in the axially outer side of the bearing 2, and is fixed to a second end portion of the rotary shaft 3. In addition, the second end portion of the rotary shaft 3 is formed in a flange shape, to which the rotor 5 is fastened with bolts 6a. It should be noted that the fixing of the rotary shaft 3 and the rotor 5 is not so limited, and any means for fixing them such as fixing by thermal insert can be used. Moreover, although the rotor 5 is located in the axially outer side of the bearing 2 and fixed to the second end portion of the rotary shaft 3, it can be located in the radially outer side of the bearing 2. In this case, the second end portion of the rotary shaft 3 is formed in the radially outer side of the bearing 2, and the rotor 5 is fixed thereto.

[0017] Furthermore, a motor 9, which is composed of field magnets 7 attached on the outer circumference of the concave portion of the rotor 5, and stator coils 8 disposed facing the field magnets 7, is installed within the base body 1.

[0018] The first mounting portions 1a are formed so as to project from the pillar portion 1c toward the traction sheave 4, and the second mounting portions 1b are formed so as to project from the pillar portion 1c toward the motor 9. Each of the first mounting portions 1a is formed integrally with a rib 1g and a rib 1h formed so as to project toward the traction sheave 4. In addition, each first mounting portion 1a is formed in a position where its horizontal width in the axial direction covers the range of the rope races 4a of the traction sheave 4. More specifically, each first mounting portion is formed so as to cover the axial range of the downward hanging load acting on the rope races 4a by the suspending member 18. The mounting portion composed all of the second mounting portions 1b projecting toward the motor 9 and the first mounting portions 1a covers the axial range of the hanging load. In addition, the rib 1g is formed at a height overlapping with the traction sheave 4 in the horizontal projection.

[0019] Each of the second mounting portions 1b is formed integrally with a rib 1j and a rib 1k formed so as to project from the outer circumference of the cylindrical concave portion 1d toward the lower face as illustrated in Fig. 1. In addition, as illustrated in Fig. 3, the width Le of the first mounting portion 1a is formed so as to be smaller than the diameter of the traction sheave 4, or the diameter Ld of the rope races 4a on which the suspending member 18 is wound. Moreover, the base body 1 is attached to the mount with bolts 6b and bolts 6c via the first mounting portions 1a and the second mounting portions 1b. Here, mounting holes 10a and 10b in Fig. 3 are mounting holes through which the bolts 6b and the bolts 6c are fixed, and are formed in the first mounting portions 1a and the second mounting portions 1b, respectively.

[0020] A brake wheel 11 having a braking surface 11a is provided on the outer circumference of the rotor 5, and the brake wheel 11 is fastened with bolts 6d. Brake mounting portions 1n are formed on the base body 1, and a brake 12 is fastened to each of the brake mounting portions 1n with a bolt 6e. A brake pad 12a of each brake 12 is provided facing the braking surface 11a of the brake wheel 11. Each brake pad 12a presses the braking surface 11a or backs off from the braking surface 11a by diminishing or biasing each brake.

[0021] A rotation detector 13 for detecting rotational positions of the traction sheave 4 and the rotor 5 is attached to the elevator hoisting machine according to the present embodiment, and is driven by a detector rotary shaft 13a coupled to the rotary shaft 3. The rotation detector 13 is attached to an attachment plate 14 fastened to the ribs 1g of the base body 1 with bolts 6f.

[0022] Furthermore, in the elevator hoisting machine of the present invention, lubricant agent 15 is encapsulated for lubrication of the bearing 2. Bearing covers 16a and 16b are attached to both sides of the boss 1e, and oil seals 17a and 17b are attached to the bearing covers 16a and 16b. The lubricant agent 15 is sealed by the bearing covers 16a and 16b, and the oil seals 17a and 17b.

[0023] As illustrated in Fig. 1, the suspending member 18 is wound on the traction sheave 4. The passenger car 19 and the counterweight 20 of the elevator are suspended from the suspending member 18. When suspending the passenger car 19 and the counterweight 20, if the suspending position is at their gravity center, the passenger car 19 and the counterweight 20 can be more smoothly driven up and down without slanting. Generally, the gravity center of the passenger car 19 and the counter-

weight 20 is positioned approximately at the center in the width direction. As illustrated in Fig. 1, the suspending member 18 is suspended approximately at the widthwise center of the passenger car 19 and the counterweight 20. In addition, the width W of the passenger car 19 is larger than the diameter Ld of the traction sheave 4, so that if the suspending member 18 is wound on the traction sheave 4 and the passenger car 19 is directly suspended from the drooping suspending member, the gravity center of the passenger car 19 cannot be suspended. Therefore, in addition to the traction sheave 4, a deflector sheave 21 is provided for an elevator, the suspending member 18 is wound on the traction sheave 4 and the deflector sheave 21, and the spacing S of the drooping suspending member 18 is increased so as to adapt the size of the passenger car 19. In addition, the deflector sheave 21 has in its center a main shaft not illustrated, and is rotated about the main shaft. It should be noted that generally the suspending member 18 is composed of a plurality of ropes, which are wound on a plurality of rope races 4a.

[0024] Next, the operation will be described. When the elevator stops, the motor 9 is diminished, and the brakes 12 are also diminished, so that the rotor 5 is braked by the brake pads 12a being pressed on the braking surface 11a. Then the rotary shaft 3 fixed to the rotor 5 and the traction sheave 4 fixed to the rotary shaft 3 are braked. In the meantime, when running the elevator, the motor 9 is biased, and the brakes 12 are also biased, so that the brake pads 12a back off from the braking surface 11a. According to this, the braking of the rotor 5 is released by the pressing of the brake pads 12a on the braking surface 11a being eliminated, and the rotor is driven. Then the rotary shaft 3 fixed to the rotor 5 and the traction sheave 4 fixed to the rotary shaft 3 are driven. Then, the deflector sheave 21 is also rotated via the suspending member 18 wound on the traction sheave 4, so that the elevator passenger car 19 and the counterweight 20 are driven upwardly and downwardly in a jig-back way.

[0025] Next, the action on the hoisting machine by the hanging load on the suspending member 18 suspending the passenger car 19 and the counterweight 20 will be described.

[0026] Fig. 4 schematically illustrates the action of the hanging load. The hanging load by each of the plurality of suspending members 18 acts on the corresponding rope races 4a on the traction sheave 4. The entire hanging load F equivalently acts on the center of the rope races 4a. Then, the hanging load F acts on the rotary shaft 3 via the traction sheave 4. A moment M1 by the hanging load F that is distant by L1 from the bearing 2 supporting the rotary shaft 3 acts on the rotary shaft 3. The moment M1 acts on the boss 1e. The moment M1 acting on the boss 1e is supported by the ribs 1f and the pillar portion 1c. In addition, a moment M2 by the hanging load F that is distant by L2 from the pillar portion 1c acts on the entire pillar portion 1c. The moment M2 acts via the pillar portion 1c on the first mounting portions 1a and the second mounting portions 1b that are fixed to the mount, and is supported by the mount.

[0027] Moreover, each first mounting portion 1a is formed integrally with the rib 1g and the rib 1h, and the moment M2 is supported by the entire portion including the first mounting portions 1a, the ribs 1g and the ribs 1h. Furthermore, each second mounting portion 1b is formed integrally with the rib 1j and the rib 1k, and the moment M2 is also supported by the entire portion including the first mounting portions 1b, the ribs 1j and the ribs 1k. In addition, the concave portion 1d is formed integrally with the pillar portion 1c, so that the moment M2 acting on the pillar portion 1c is also supported by the concave portion 1d.

[0028] In an elevator hoisting machine configured as above, because the traction sheave 4 is adjacent to the pillar portion 1c of the base body 1, the distance L2 between the pillar portion 1c and the hanging load F acting on the traction sheave 4 via the suspending member 18 is small, so that the moment M2 by the hanging load F acting on the pillar portion 1c can be made small. In addition, the moment M2 acting on the first mounting portions la and the second mounting portions 1b that are formed integrally with the pillar portion 1c can be also made small.

[0029] Therefore, the inclination of the overall hoisting machine or the inclination of the traction sheave 4 can be made small, and the inclination of the suspending member 18 with respect to the rope race 4a on the traction sheave 4 can be made small. Therefore, during the elevator running, namely during the traction sheave 4 rotation, unbalanced load is not applied due to the inclination of the suspending member 18 with respect to the rope race 4a when the suspending member 18 is going into the rope race 4a, so that an elevator hoisting machine that provides a comfortable ride can be achieved. In addition, because wear of the rope race 4a is not caused by the unbalanced load, a highly reliable elevator hoisting machine can be achieved. The pillar portion 1c, the first mounting portions 1a, and the second mounting portions 1b can be formed small, because the moment M2 acting on these portions is small. An elevator hoisting machine that are small and lightweight, easy to install, and economical can be achieved.

[0030] Moreover, the first mounting portions 1a are formed so as to project from the pillar portion 1c to near the traction sheave 4, and the mounting portion composed all of the second mounting portions 1b and the first mounting portions 1a includes the axial range of the hanging load, so that, without making the first mounting portions 1a long in the axial direction, the hoisting machine can be prevented from falling down due to the hanging load. Therefore, an elevator hoisting machine that is small and lightweight, and is stably mounted can be achieved.

[0031] Furthermore, on each first mounting portion 1a, the rib 1g and the rib 1h are formed integrally with the pillar portion 1c, and the rib 1j and the rib 1k are formed on each second mounting portion 1b, so that the rigidity

can be increased, and the inclination of the overall hoisting machine can be made small. In addition, the rib 1g is formed at a height overlapping with the traction sheave 4 in the horizontal projection, so that the inclination of the pillar portion 1c due to the hanging load can be made smaller.

[0032] Moreover, because the bearing 2 is arranged near the pillar portion 1c, and the traction sheave is arranged adjacent to the pillar portion 1c, the distance L1 between the bearing 2 and the position where the hanging load F applies can be made small, so that the moment M1 generated by the hanging load F can be made small. Therefore, deformations of the pillar portion 1c and the boss 1e are made smaller, and the inclination of the rotary shaft 3 or the inclination of the traction sheave 4 can be decreased, so that a highly reliable elevator hoisting machine that provides a comfortable ride can be achieved. Furthermore, because on the boss 1e for housing the bearing 2 the rib 1f is formed integrally with the pillar portion 1c, the deformation of the boss 1e due to the moment M1 can be made smaller, so that a highly reliable elevator hoisting machine that provides a more comfortable ride can be achieved. Moreover, because the moment M1 is small, the reaction force acting on the bearing 2 is small, and the life duration of the bearing 2 can be made longer, so that a highly reliable elevator hoisting machine can be achieved.

[0033] It should be noted that, although a usual ball bearing which is rotated by spherical balls rolling on the plain track surface and is under radial load has been described as the bearing 2, an angular ball bearing can be used in which the track surface is formed like the Japanese Katakana "ha" at a slant in the lower half portion of the cross-sectional view in the drawing, to support load at an angle, and spherical balls roll on the track surface. In this case, because the load is supported at an angle, the spacing between the support points of the reaction force acting on the bearing can be equivalently widened, and the moment due to the hanging load is supported at the support points with a large spacing. Therefore, the reaction force acting on the bearing is made further smaller, so that deformations of bearing balls due to the moment is reduced and the life duration of the bearing 2 can be made longer. Accordingly, a higher reliable elevator hoisting machine that provides a more comfortable ride can be achieved. Alternatively, the bearing 2 can be configured to be a taper-roller type in which the track surface is formed like the Japanese Katakana "ha" at a slant in the lower half portion of the cross-sectional view in the drawing, and cylindrical rollers roll thereon. In this case, because the load is supported by the longitudinal direction of the cylindrical rollers, the roller deformation due to the moment is reduced, so that the deformation is made further smaller than an angular ball bearing, and the life duration of the bearing 2 is made longer. Accordingly, a higher reliable elevator hoisting machine that provides a more comfortable ride can be achieved.

[0034] In addition, because the traction sheave 4 is fixed to the rotary shaft 3, and located adjacent to the pillar portion 1c, outside the base body 1, there is nothing to cover around the traction sheave 4. Therefore, the suspending member 18 does not interfere with the base body 1, and is not restricted by the drawing opening thereof, so that the installation position of the deflector sheave 21 is not restricted. Consequently, the elevator hoisting machine is applicable to various sizes of passenger cars, or hoistway sizes. Moreover, because there is nothing to cover around the traction sheave 4, when the suspending member 18 is wound on the traction sheave 4 in the installation or the like, it is not necessary to wind the suspending member 18 thereon from its end. Its intermediate portion is formed in a U-shape, and can be directly wound on the traction sheave 4, so that the winding operation of the suspending member 18 can be made easy. Furthermore, the operation can be externally checked with eyes, which provides good working efficiency. In the meantime, in a maintenance check, the traction sheave 4 can be externally checked with eyes, checking inspection work for wear conditions of the rope race 4a and for foreign matter adhesion thereon can be made easy.

[0035] In addition, because the width Le of the first mounting portion 1a is smaller than the diameter Ld of the traction sheave 4, either side of the suspending member 18 can be suspended down. It is possible to wind the suspending member around as the suspending member 18a illustrated in Fig. 1, and install the deflector sheave 21 in the right side instead of in the left side. The elevator hoisting machine can be applied to various layouts of the hoisting machine and the deflector sheave 21 within the hoistway or the machine house. Fig. 5 illustrates examples in which the elevator hoisting machine of the present embodiment is applied to other elevators. Although Fig. 1 illustrates an example in which the deflector sheave 21 is used and the elevator roping is 1:1, as illustrated in Fig. 5 (a), the elevator hoisting machine can be applied to a small hanging-load elevator in which the elevator roping is 2:1, and the deflector sheave 21 is eliminated. In the meantime, as illustrated in Fig. 5 (b), the elevator hoisting machine can be applied to a relatively small elevator that is a simple-structured elevator without a deflector sheave 21, in which the position of suspending the passenger car 19 is decentered. As described above, the present embodiment can be applied to various kinds of elevators.

[0036] Moreover, in an elevator hoisting machine according to the present embodiment, the traction sheave 4 and the motor 9 are mounted adjacent to the pillar portion 1c of the base body 1, the bearing 2 is provided near the pillar portion 1c, and the rotor 5 is located in the outer side of the bearing 2 and fixed to the second end portion of the rotary shaft 3 rotatably fixed by the bearing 2, so that a thin and lightweight elevator hoisting machine that saves space can be achieved without increasing its axial length.

[0037] In fastening a shaft member and a to-be-fastened member, as illustrated in Fig. 2, a predetermined

shaft length is required for fixing the traction sheave 4 and the rotary shaft 3 by thermal insert to obtain a desired fastening force. However, the second end portion of the rotary shaft 3 is formed in a flange shape, to which the rotor 5 is fixed with the bolts 6a, so that the bolt-fixing distance can be made large, and the rotor can be surely fastened even if the shaft length is short. According to this, a further thinner and more space-saving elevator hoisting machine can be achieved.

[0038] Furthermore, the brake wheel 11 is provided on the outer circumference of the rotor 5, and the brake 12 corresponding to the brake wheel is mounted on the outer circumference of the base body 1, so that a thin and lightweight elevator hoisting machine that has a brake and saves space can be achieved without increasing the axial size of main portions of the hoisting machine.

Embodiment 2.

[0039] Fig. 6 illustrates Embodiment 2 of the present invention. In the present embodiment, compared with Embodiment 1, a bearing 2a is disposed so that a portion thereof overlaps with a rotary shaft 3a in its radial projection as illustrated in Fig. 6. In addition, a first end portion of the rotary shaft 3a is formed in a flange shape, and a traction sheave 4b is fastened to the flange portion with bolts 6g. A rotor 5a is fixed to a second end portion of the rotary shaft 3a by thermal insert. Here, components with the same symbols as in Embodiment 1 indicate corresponding portions.

[0040] In an elevator hoisting machine configured as above, because the bearing 2a is disposed so that a portion thereof overlaps with the rotary shaft 3a in its radial projection, the distance L3 between the bearing 2a and a hanging load F is made small, and the bending moment acting on the rotary shaft 3a is reduced. Therefore, the shaft diameter of the rotary shaft 3a can be reduced. In addition, because the reaction force acting on the bearing 2a is made smaller, the bearing 2a can be downsized and its life duration can be increased, and the moments acting on the boss 1e and the pillar portion 1c are reduced. Accordingly, effects similar to Embodiment 1 are realized, and a more lightweight and higher reliable elevator hoisting machine that provides a more comfortable ride can be achieved.

[0041] Moreover, because the first end portion of the rotary shaft 3a is formed in a flange shape, and the traction sheave 4b is fastened to the flange portion with the bolts 6g, a space-saving elevator hoisting machine that is thin in the axial direction can be achieved. In addition, the traction sheave 4b can be surely fastened, and is replaceable, and the replacement thereof is easy. When foreign matter is adhered to the rope race 4a by an accidental situation and the rope race 4a is damaged, for example, it is required to replace the traction sheave 4b. However, only the traction sheave 4b can be replaced in the present embodiment, which is effective.

Embodiment 3.

[0042] Fig. 7 illustrates Embodiment 3 of the present invention. In the present embodiment, based on Embodiment 1, the rotor 5 and the brake wheel 11 in Fig. 2 are integrally formed, and a rotor 5b having a braking surface 11a is provided. Here, components with the same symbols as in Embodiment 1 indicate corresponding portions. The present embodiment has been described based on Embodiment 1. However, an elevator hoisting machine in which the rotor 5a and the brake wheel 11 are integrally formed based on Embodiment 2 can be configured.

[0043] With such configurations, effects similar to those in Embodiment 1 and Embodiment 2 can be achieved. In addition, the number of components can be reduced, so that an economical elevator hoisting machine can be achieved.

Embodiment 4.

[0044] Fig. 8 and Fig. 9 illustrate Embodiment 4 of the present invention. Fig. 8 is a front view, and Fig. 9 is a cross sectional view along the line B-B in Fig. 8. In the present embodiment, an elevator hoisting machine based on Embodiment 1 is provided with a protecting cover 22 for protecting the traction sheave 4. Components with the same symbols as those in Embodiment 1 indicate the corresponding portions. In addition, as illustrated in Fig. 8 and Fig. 9, the protecting cover 22 is formed so as to cover the traction sheave 4 and the suspending member 18 pulled out from the traction sheave, and is fastened to the base body 1 with bolts 6h. Fig. 8 illustrates a case in which a deflector sheave 21 is present. The protecting cover 22 is made in a sector form, and is formed so as to cover the suspending member 18 pulled out from the traction sheave 4. In the meantime, in a case not illustrated in which a deflector sheave 21 is not present, the protecting cover 22 can be a U-shape and formed so as to cover the suspending member 18 pulled out from the traction sheave 4 in the same manner. Here, the present embodiment has been described based on Embodiment 1. However, a protecting cover 22 can be provided for Embodiment 2 or Embodiment 3 in the same manner.

[0045] In an elevator hoisting machine configured as above, by attaching the protecting cover 22 so as to cover the traction sheave 4 and the suspending member 18 pulled out therefrom, during a maintenance check or the like, even if a checker's hand carelessly comes close to the traction sheave 4, the rotating traction sheave 4 and the openings through which the suspending member 18 goes into the rope race 4a cannot be touched by the checker's hand, so that checking work can be safely performed. Moreover, foreign matter such as dust can be prevented from externally going around the traction sheave 4, so that a highly reliable elevator hoisting machine can be achieved. Furthermore, when checking the traction sheave 4, the protecting cover 22 can be easily

detached by unscrewing the bolts 6h, so that preparation time before checking can be reduced.

[0046] Moreover, a plurality of punch holes can be provided on the surface of the protecting cover 22. In this case, the traction sheave 4 in the inner side of the protecting cover 22 can be externally checked with eyes, so that the checking work of the traction sheave 4 can be performed with the protecting cover 22 being attached.

INDUSTRIAL APPLICABILITY

[0047] As described above, an elevator hoisting machine relevant to the present invention is suitable to be used for a driving mechanism in which a suspending member 18 for suspending a passenger car 19 and a counterweight 20 is wound around, and the passenger car 19 and the counterweight 20 are moved up and down by driving the suspending member.

Claims

1. An elevator hoisting machine installed on a mount in a hoistway or a machine house, for driving a suspending member suspending a passenger car and a counterweight in the hoistway, the elevator hoisting machine comprising:

   a base body (1) attached on the mount, comprising a pillar portion (1c) held upright with respect to the mount, and provided with a motor (9) adjacent to the pillar portion (1c);
   a rotatably fixing portion for rotatably supporting a rotary shaft (3) of the motor (9), provided near the pillar portion (1c) of the base body (1);
   a traction sheave (4), on which the suspending member (18) is wound, located adjacent to the pillar portion (1c) of the base body (1), outside the base body (1) on the other side of the motor (9), and fixed to a first end portion of the rotary shaft (3); and
   a rotor (5), on which a field magnet (7) of the motor (9) is attached, located in the outer side of the rotatably fixing portion, and fixed to a second end portion of the rotary shaft (3).

2. An elevator hoisting machine according to claim 1, **characterized in that** the rotatably fixing portion is disposed so that a portion thereof overlaps with the traction sheave (4) in its radial projection.

3. An elevator hoisting machine according to claim 1 or 2, **characterized in that** the first end portion of the rotary shaft (3) is formed in a flange shape, and the traction sheave (4) is fixed to the flange-shaped rotary shaft (3) end portion.

4. An elevator hoisting machine according to claim 1 or 2, **characterized in that** the second end portion of the rotary shaft (3) is formed in a flange shape, and the rotor (5) is fixed to the flange-shaped rotary shaft (3) end portion.

5. An elevator hoisting machine according to claim 1 or 2, **characterized in that** the base body (1) comprises a mounting portion to be attached to the mount, and the mounting portion is formed so as to include the axial range of a hanging load applied via the suspending member (18) wound on the traction sheave (4).

6. An elevator hoisting machine according to claim 5, **characterized in that** the width of the traction-sheave side of the mounting portion is smaller than the diameter of the traction sheave (4).

7. An elevator hoisting machine according to claim 1, further comprising:

   a brake wheel (11) provided on the outer circumference of the rotor (5), and comprising a braking surface (11a); and
   a brake (12) comprising a brake pad (12a) for braking, disposed facing the braking surface (11a).

8. An elevator hoisting machine according to claim 7, **characterized in that** the rotor (5) is formed integrally with the brake wheel (11).

9. An elevator hoisting machine according to claim 1 or 7, **characterized in that**, in order to keep spacing between the passenger car (19) and the counterweight (20), using a deflector sheave (21) on which the suspending member (18) pulled out from the traction sheave (4) is wound, the spacing between the suspending member (18) suspended from the traction sheave (4) and the suspending member (18) suspended from the deflector sheave (21) is varied.

10. An elevator hoisting machine according to claim 1, further comprising a protecting cover (22) for covering the traction sheave (4) and openings from which the suspending member (18) goes around the traction sheave (4).

Fig.1

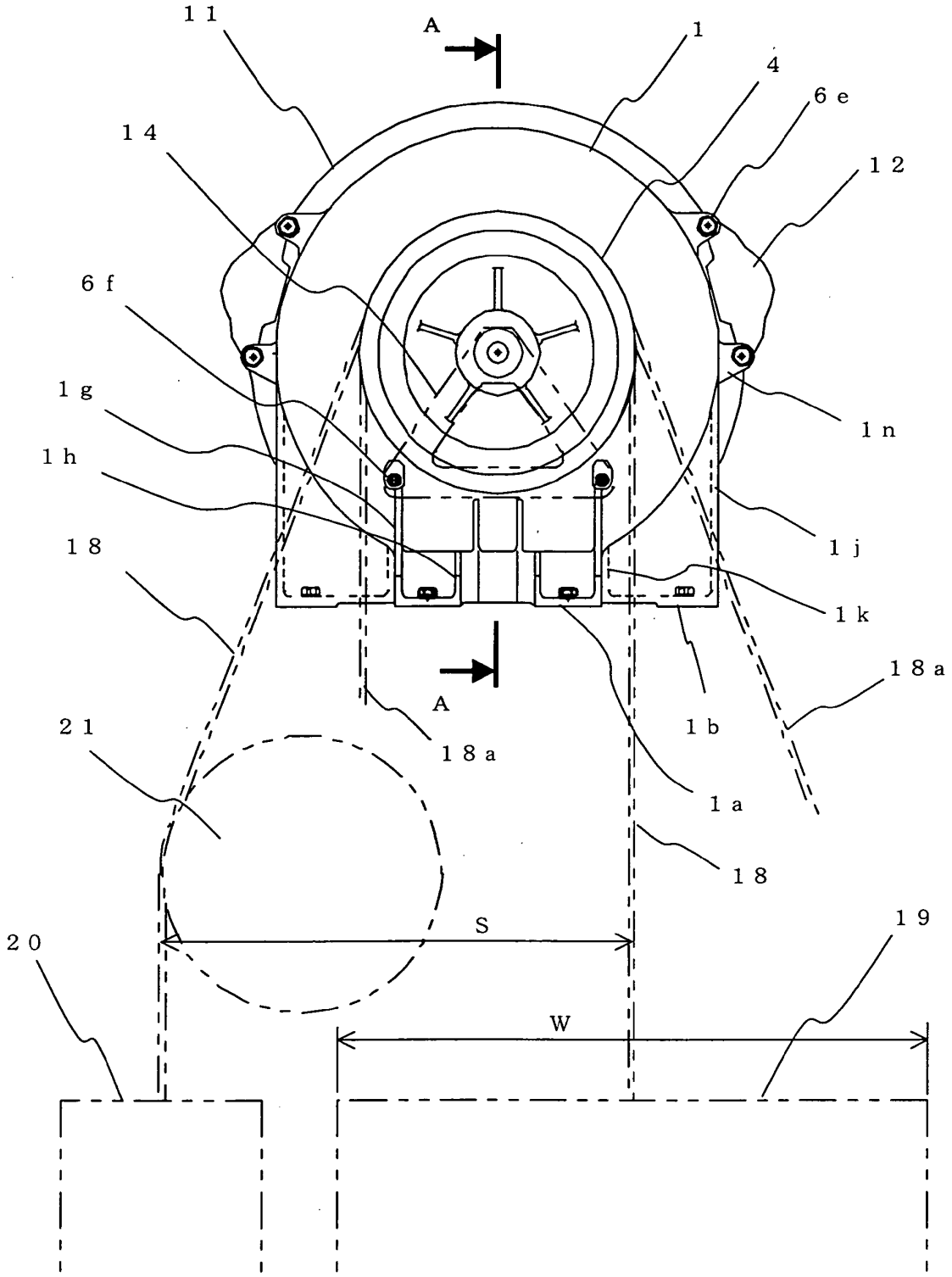


Fig.2

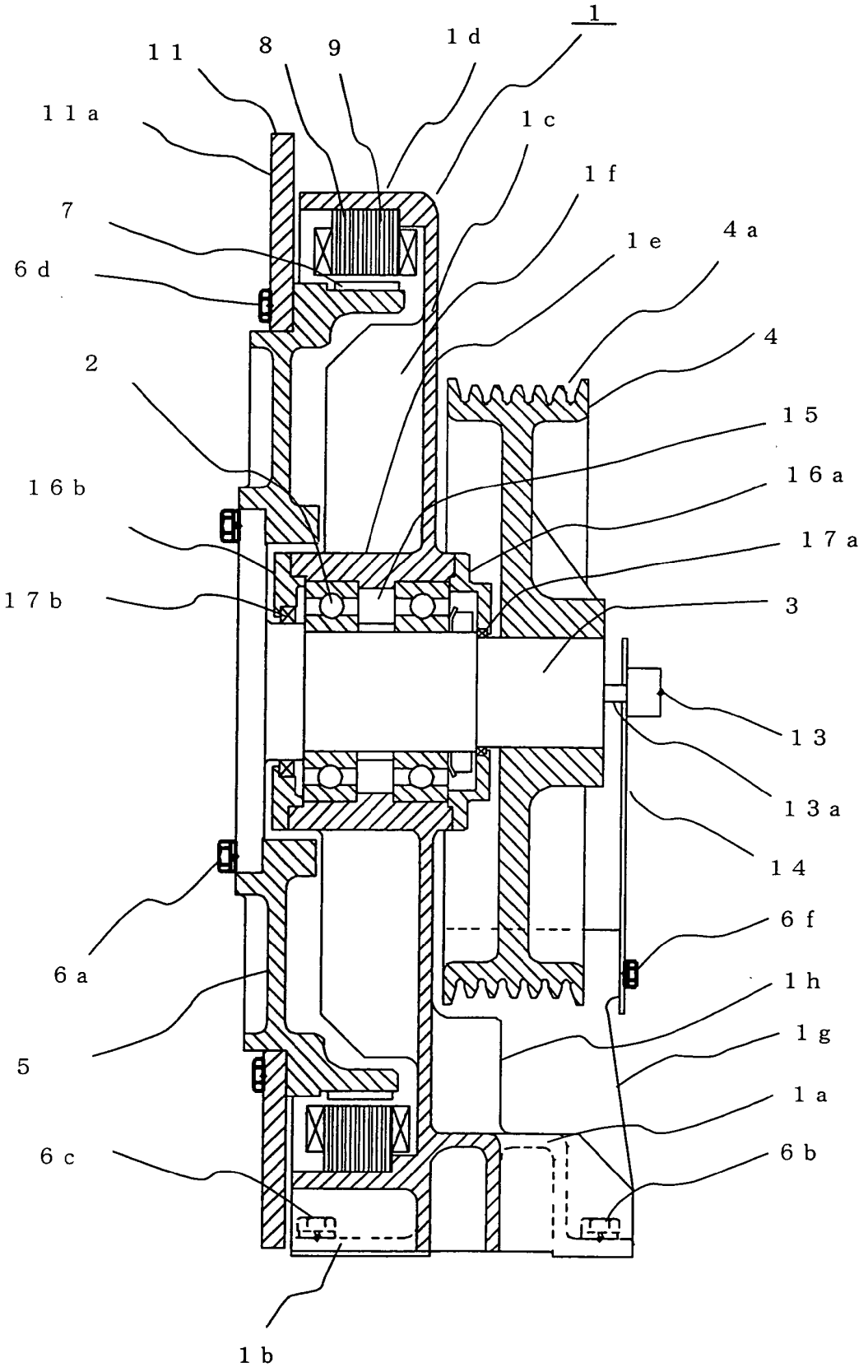

1
11
8
9
1d
11a
1c
1f
7
1e
4a
6d
4
2
15
16b
16a
17a
17b
3
13
13a
14
6f
6a
1h
1g
5
1a
6c
6b
1b

Fig.3

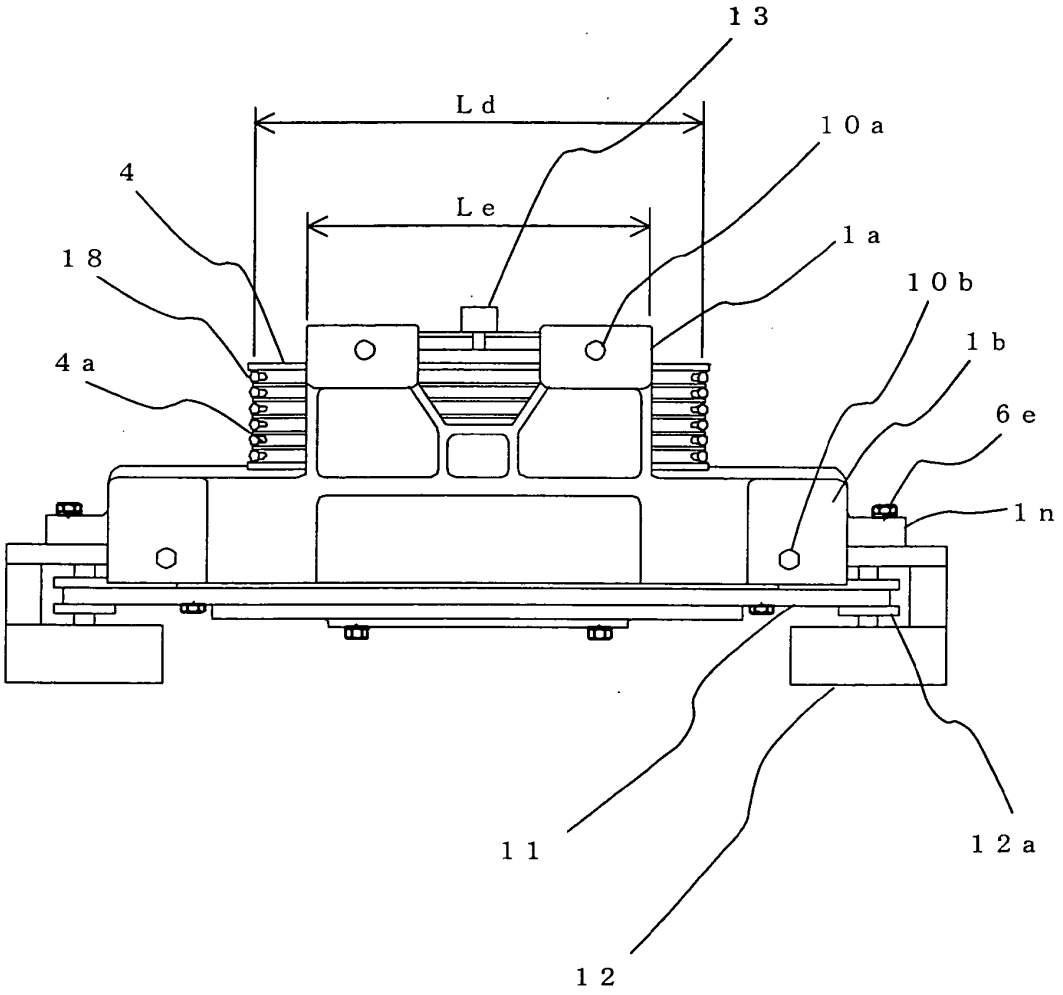


Fig.4

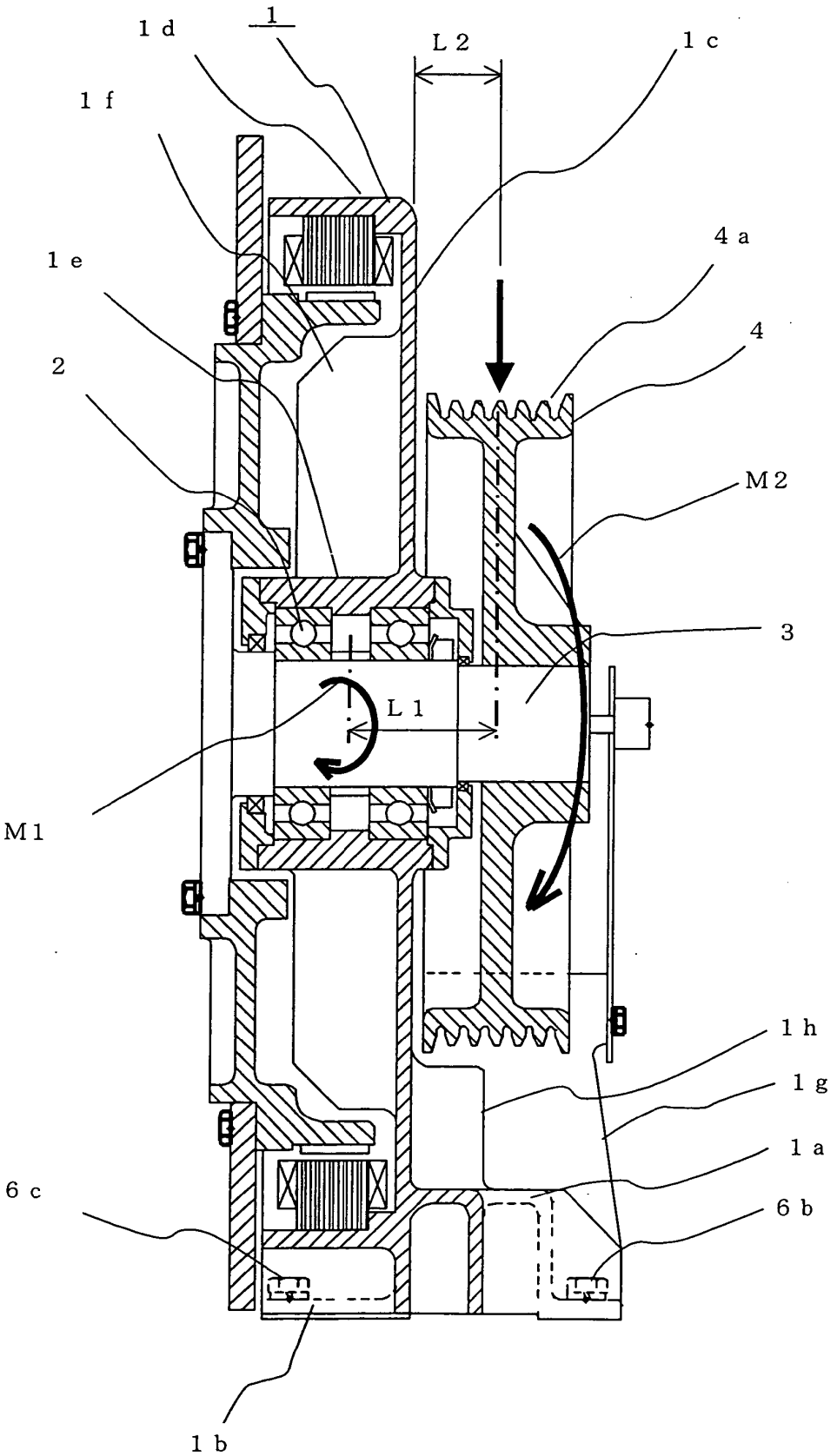


Fig.5

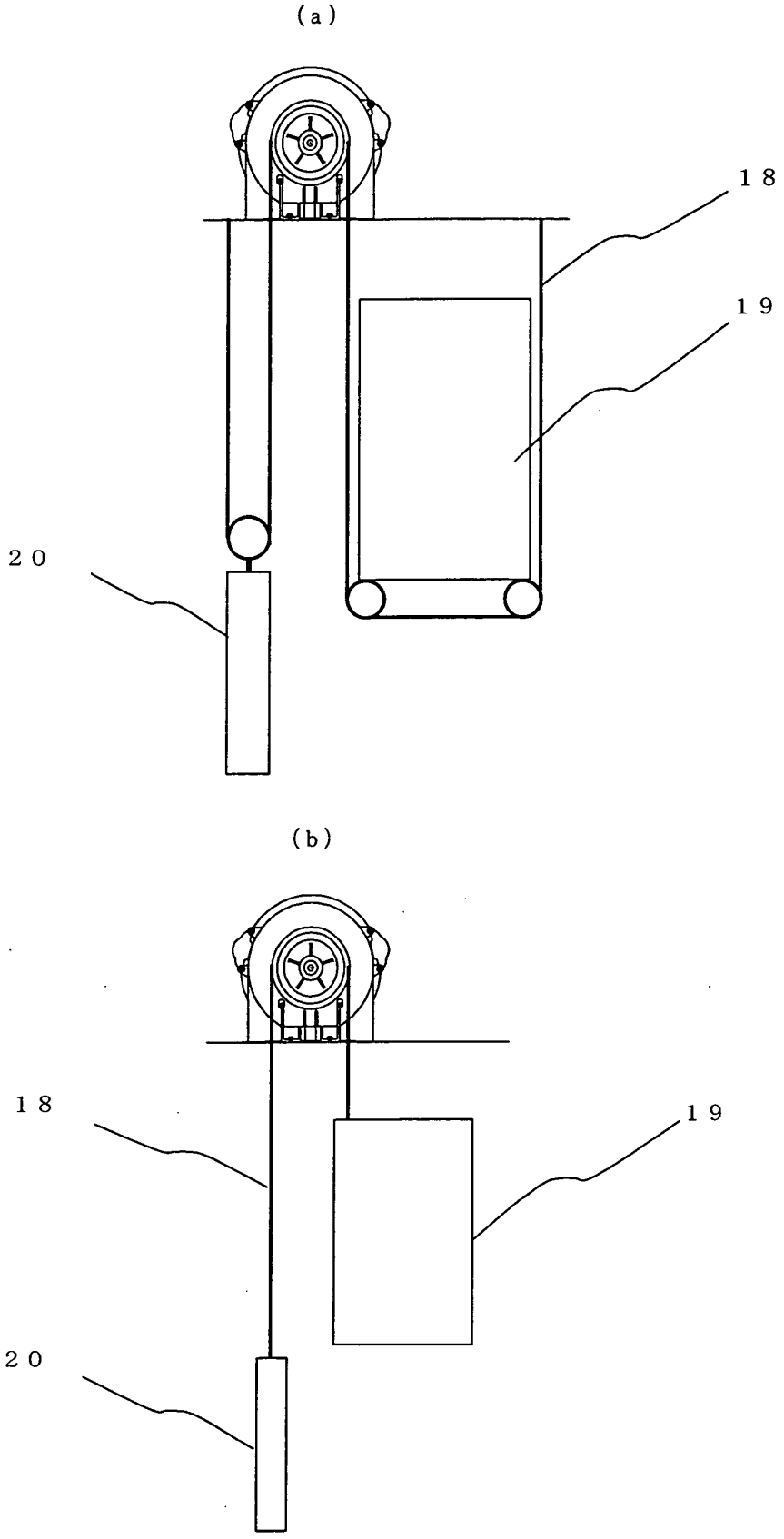


Fig.6

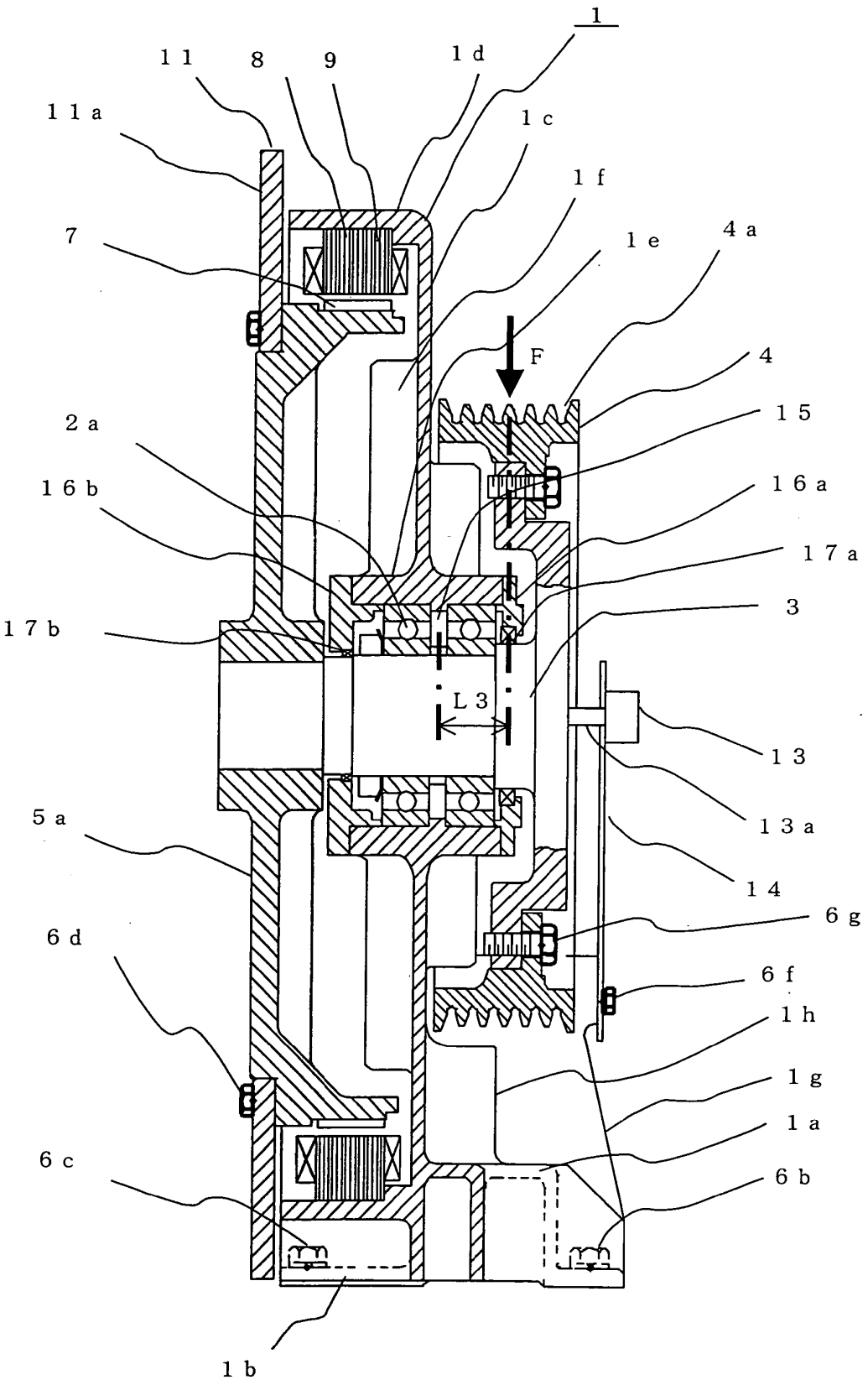

1
11
8
9
1d
11a
1c
1f
7
1e
4a
F
4
2a
15
16b
16a
17a
17b
3
L3
13
13a
5a
14
6g
6d
6f
1h
1g
1a
6c
6b
1b

Fig.7

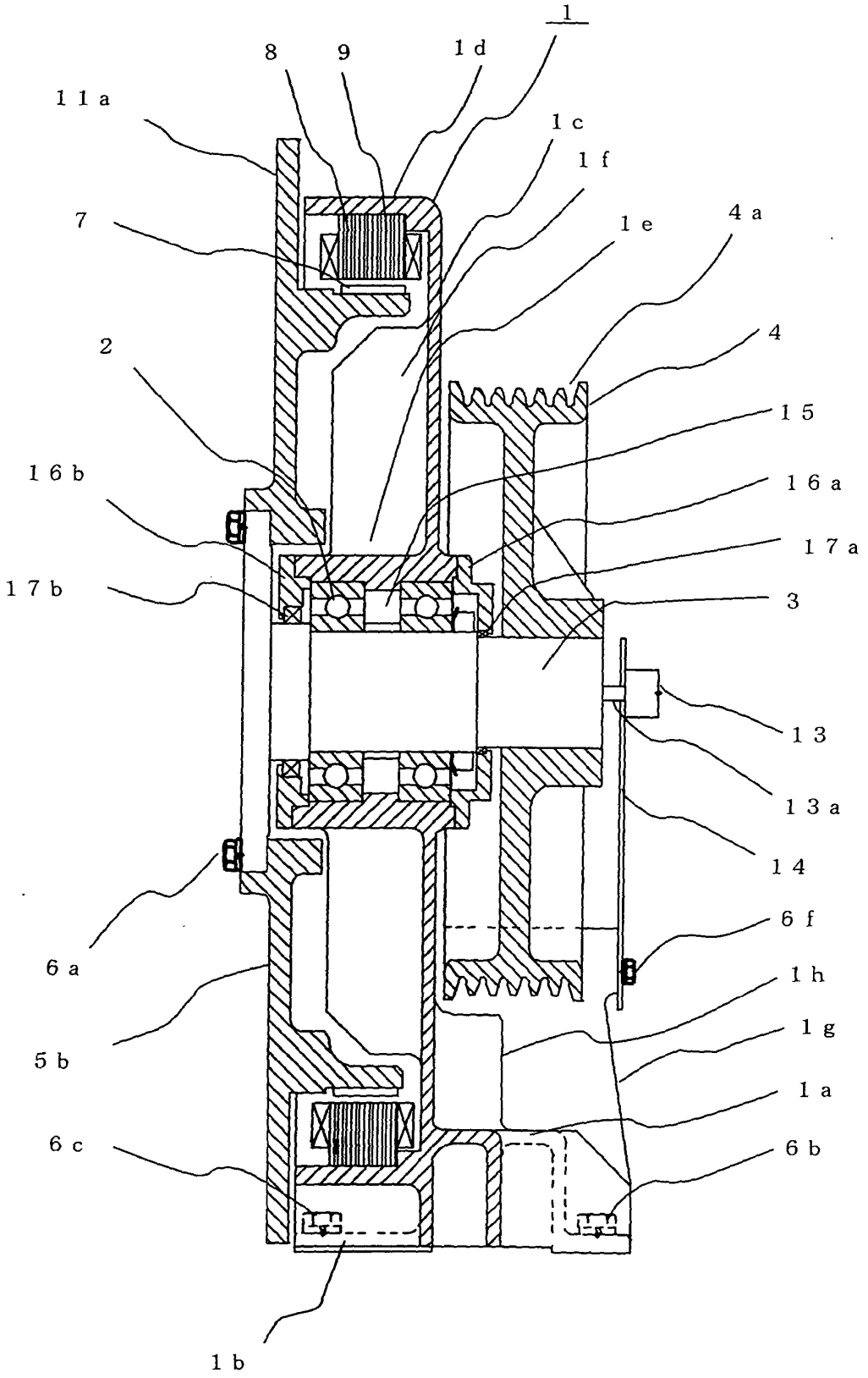

1
8
9
1 d
1 1 a
1 c
1 f
7
1 e
4 a
2
4
1 5
1 6 b
1 6 a
1 7 a
1 7 b
3
1 3
1 3 a
1 4
6 a
6 f
1 h
5 b
1 g
1 a
6 c
6 b
1 b

Fig.8

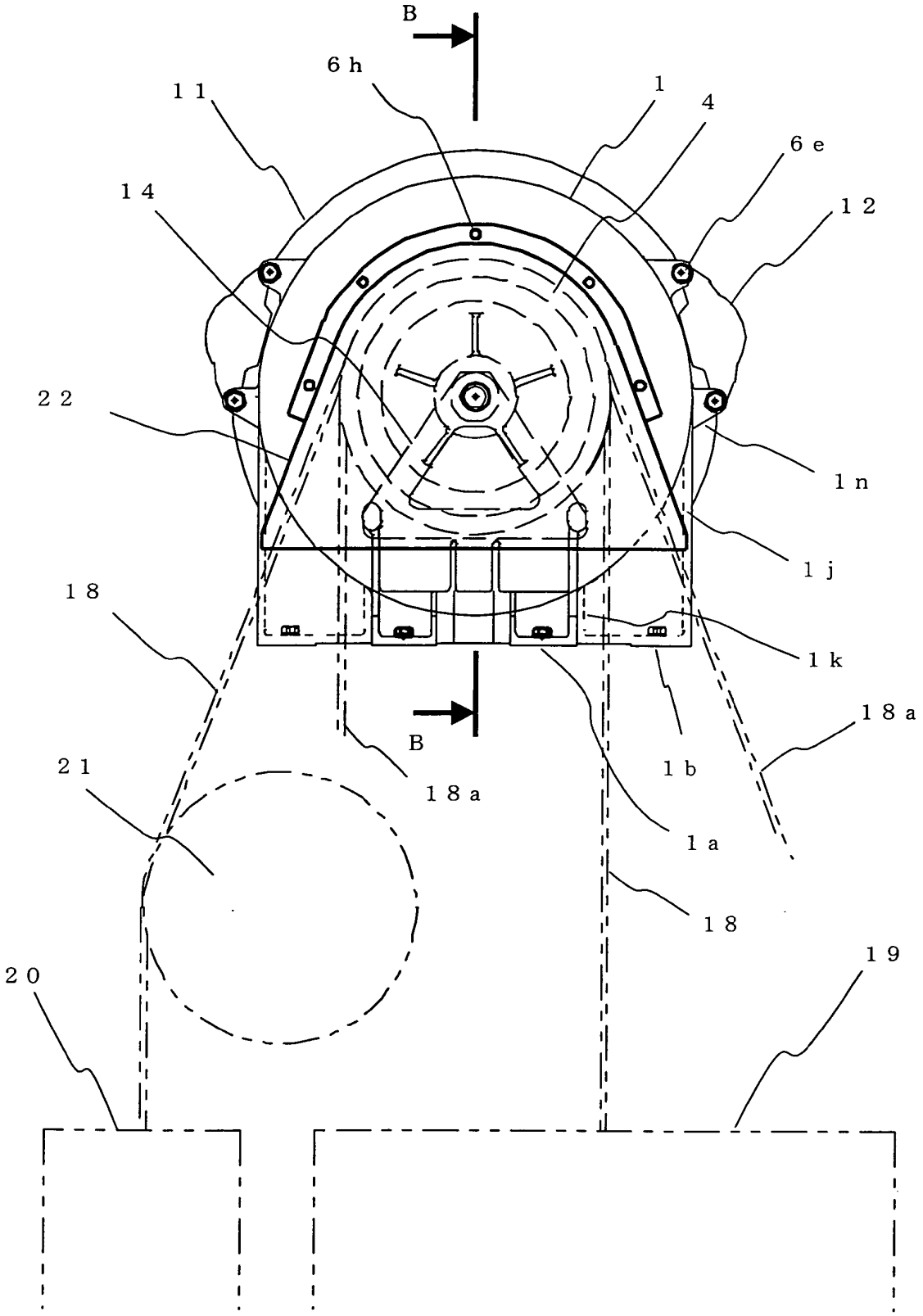


Fig.9

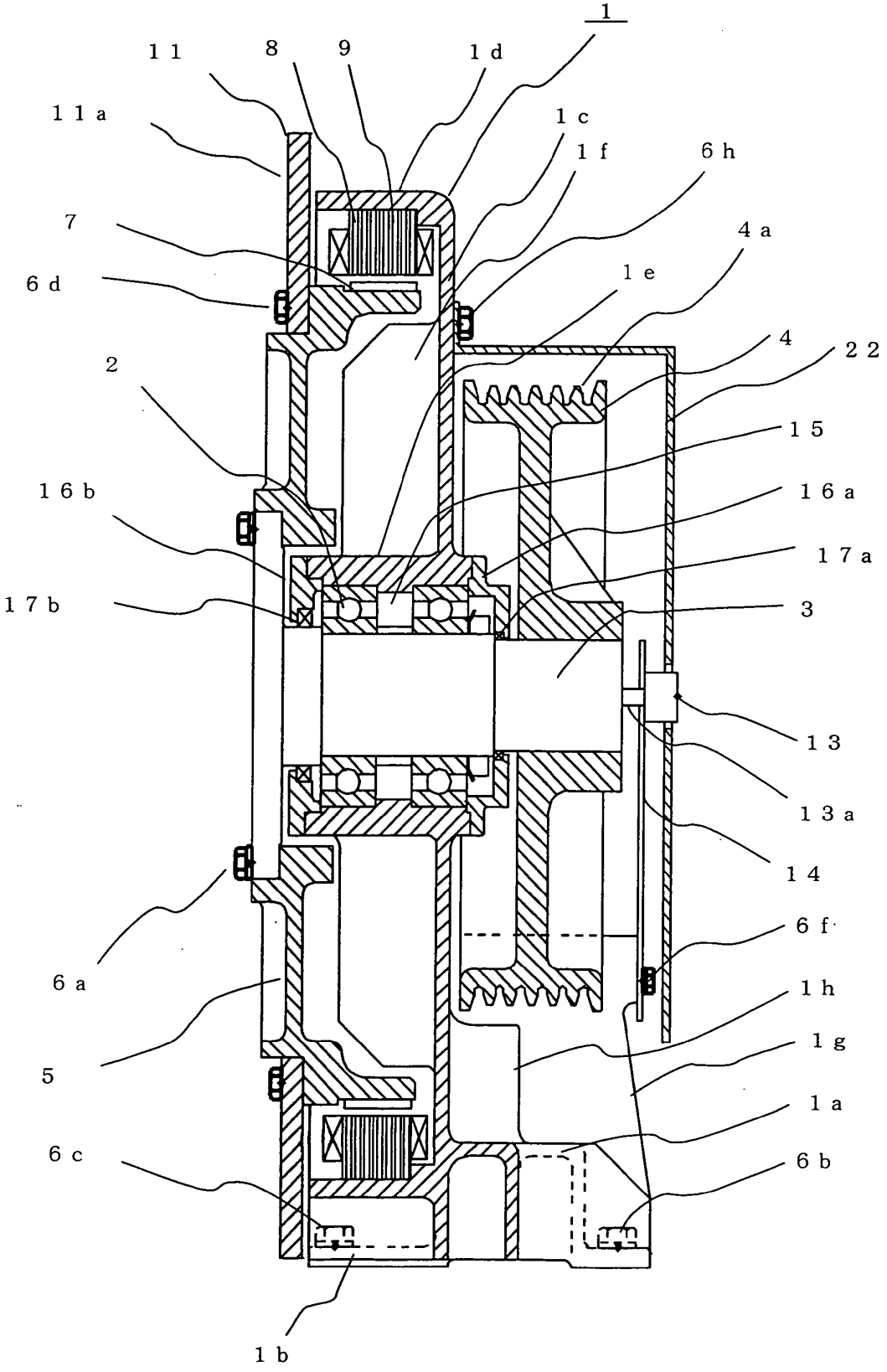
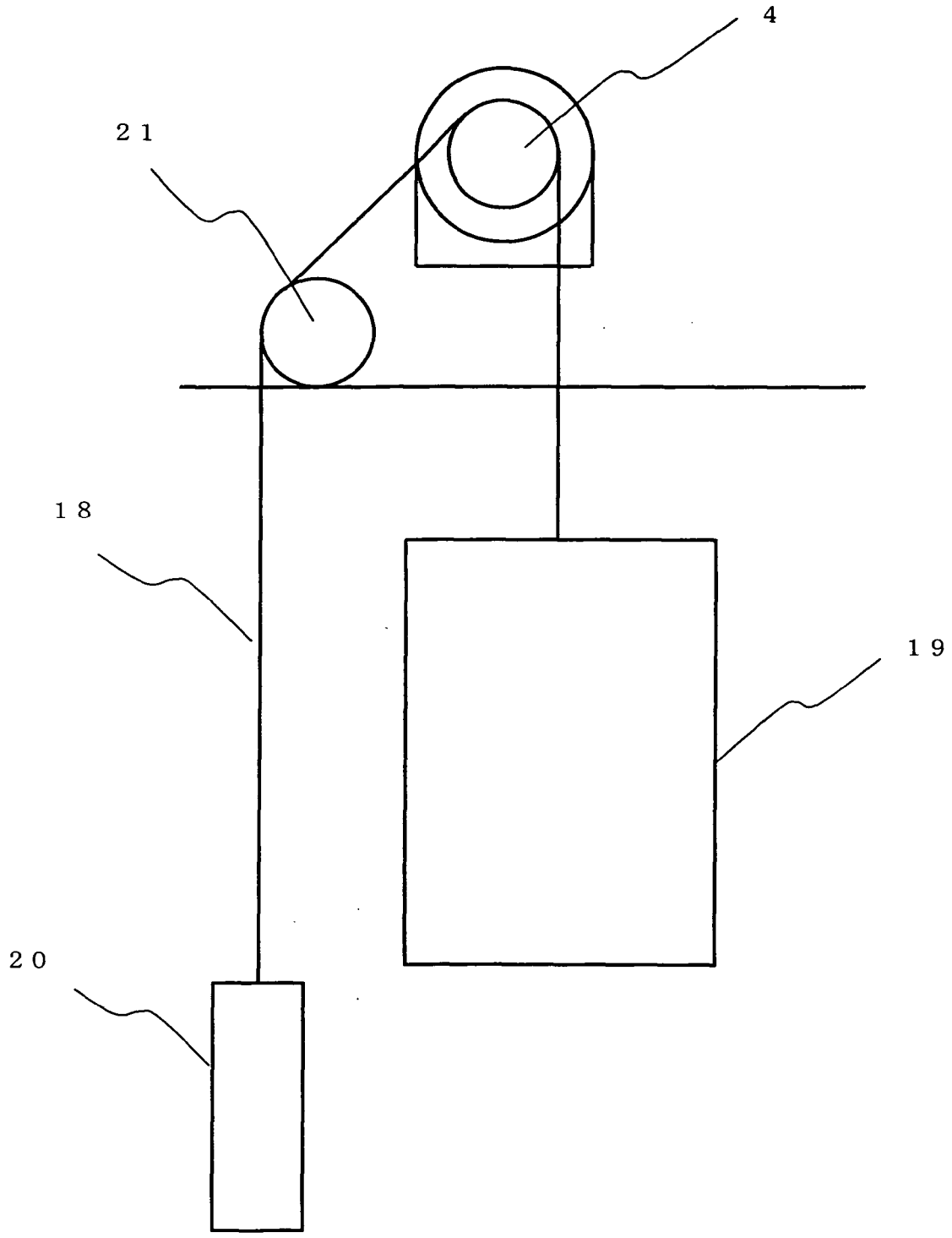

1
11
8
9
1d
11a
1c
1f
6h
7
4a
6d
1e
4
22
2
15
16b
16a
17a
17b
3
13
13a
14
6f
6a
1h
1g
5
1a
6c
6b
1b

Fig.10



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/018718

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] B66B11/04

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-B66B11/08

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 A	JP 2004-338915 A (Hitachi, Ltd.), 02 December, 2004 (02.12.04), Pay attention to Par. Nos. [0011] to [0023]; Figs. 1 to 3 (Family: none)	1-4,10 7-9 5-6
Y	JP 11-130365 A (Hitachi, Ltd.), 18 May, 1999 (18.05.99), Pay attention to Abstract; Fig. 1 (Family: none)	7-8
Y	WO 03/008318 A1 (Mitsubishi Electric Corp.), 30 January, 2003 (30.01.03), Pay attention to Fig. 5 & EP 1405813 A1	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	Date of mailing of the international search report
15 September, 2005 (15.09.05)	04 October, 2005 (04.10.05)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/018718

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 11-79626 A (Hitachi, Ltd.), 23 March, 1999 (23.03.99), Pay attention to Abstract; Fig. 1 (Family: none)	1,5-6

Form PCT/ISA/210 (continuation of second sheet) (January 2004)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 511758H08 W **[0004]**
- JP 2000289954 A **[0004]**