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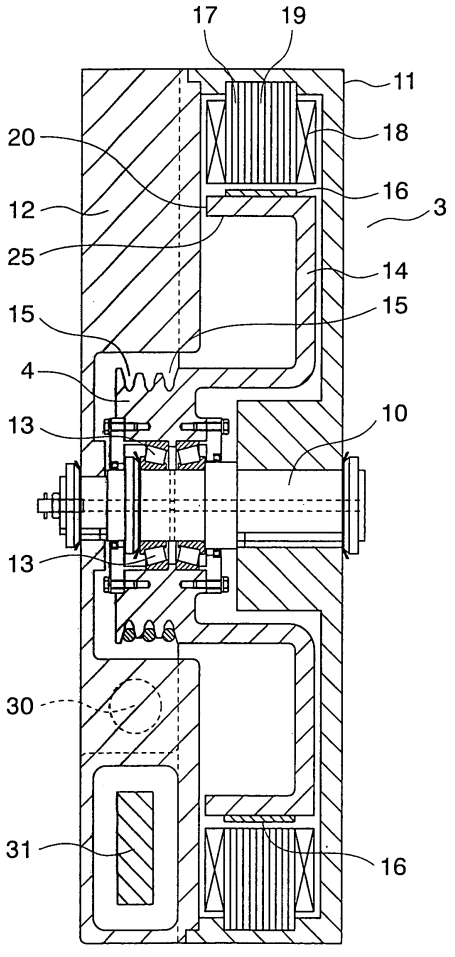
(54) HOIST FOR ELEVATOR

(57) In a winch for an elevator according to this invention, a brake side housing is arranged in opposition to and fixedly secured to a motor side housing with a motor arranged therein. A sheave is rotatably mounted on a fixed shaft that penetrates through these brake side housing and motor side housing and is fixedly attached thereto. A pair of brake arms have their one ends rotatably mounted on the brake side housing, and brake shoes being in sliding contact with braking surfaces of a brake drum are attached to the brake arms, respectively. Brake springs are arranged in the brake side housing between the pair of brake arms for urging the pair of brake arms in a direction away from each other. An electromagnetic magnet is arranged in the brake side housing between the other ends of the pair of brake arms for attracting the other ends against the resilient forces of the brake springs thereby to rotate the brake arms.

FIG. 3



EP 1 790 609 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a winch for an elevator that serves to drive a rope to move a car in a vertical direction.

BACKGROUND ART

[0002] As a conventional winch for an elevator, there has been known one in which a brake device composed of a brake arm, a brake shoe, etc., is installed on the back side of a sheave (see, for example, Japanese patent application laid-open No. 2000-289954).

[0003] However, in this case, when both of the sheave and the brake device are maintained and checked respectively, it is necessary to carry out their maintenance or check from the opposite sides thereof, so there has been a problem that when the winch is arranged between a wall surface of a hoistway and a car virtually moving therealong, a space for maintenance and check protruded in a direction opposite to the car need be provided, for instance, in a wall area opposing to the sheave.

[0004] In addition, there has been a further problem that in case of the absence of the above-mentioned space, an operator can not directly visually verify the amount of wear in grooves of the sheave, the amount of gap between the rope and a rope latch, etc., so he or she verifies the amount of wear from the car side with the use of a special mirror and also verifies the amount of gap using a special thickness gauge, as a result of which it is necessary to perform a maintenance and check operation for the sheave at much expense in time and effort by using the special mirror and the special thickness gauge.

DISCLOSURE OF INVENTION

[0005] The present invention is intended to obviate the problems as referred to above, and has for its object to obtain a winch for an elevator in which a sheave can be directly maintained and checked, together with a brake device, by visual inspection from the same direction as that in which the brake device is maintained and checked, and there is no need to provide any space for maintenance and check that is protruded to a side opposite to a car in a wall area opposing to the sheave, while making it possible to do the maintenance and check operation of the sheave in an easy manner.

[0006] In order to achieve the above object, according to one aspect of the present invention, there is provided a winch includes: a motor side housing with a motor arranged therein; a brake side housing that is arranged in opposition to and fixedly attached to the motor side housing; a fixed shaft that penetrates through the brake side housing and the motor side housing and is fixedly secured thereto; a sheave that is rotatably mounted on the fixed shaft in the brake side housing; a brake drum that is mounted on the motor side housing so as to rotate together with the sheave; a pair of brake arms that have their one ends rotatably mounted on the brake side housing; brake shoes that are mounted on the brake arms, respectively, so as to be in sliding contact with braking surfaces, respectively, of the brake drum; brake springs that are arranged in the brake side housing between the pair of brake arms so that the pair of brake arms are urged in a direction away from each other; and an electromagnetic magnet that is arranged in the brake side housing between the other ends of the pair of brake arms so as to attract the other ends against resilient forces of the brake springs thereby to rotate the brake arms.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

Fig. 1 is a configuration view showing a state in which a winch according to a first embodiment of the present invention is installed to a hoistway.
Fig. 2 is a front elevational view showing a released state of a brake device in the winch of Fig. 1, but including a partially notched cross sectional view in a brake arm and its neighborhood.
Fig. 3 is a cross sectional arrow view when the winch of Fig. 2 is cut away along line A-A.
Fig. 4 is a plan view of the winch of Fig. 2.
Fig. 5 is a right side view of the winch of Fig. 2, but including a partially notched cross sectional view in a motor side housing.
Fig. 6 is a cross sectional arrow view when the winch of Fig. 2 is cut away along line B - B.
Fig. 7 is a bottom view of the winch of Fig. 2.
Fig. 8 is a front elevational view showing a braking state of the brake device in the winch of Fig. 1.

BEST MODE FOR CARRYING OUT THE INVENTION

[0008] Hereinafter, preferred embodiments of the present invention will be described in detail while referring to the accompanying drawings. The same or equivalent members and parts are identified by the same symbols throughout the respective figures.

Embodiment 1.

[0009] Fig. 1 is a configuration view that illustrates a state in which a winch 3 according to a first embodiment of the present invention is installed to a hoistway 1.

[0010] In this elevator, the winch 3 is fixedly attached to a wall of the hoistway 1 through a beam 2. A rope 5 is wrapped around a sheave 4 of the winch 3. The rope 5 has one end connected with a car 7 through car side return wheels 6, and the other end connected with a balance weight 9 through weight side return wheels 8.

[0011] Fig. 2 is a front elevational view that shows the

winch 3 of Fig. 1. Fig. 3 is a cross sectional arrow view when the winch 3 of Fig. 2 is cut away along line A - A.

[0012] In this winch 3, a motor side housing 11 and a brake side housing 12 are arranged in opposition to each other and fixedly secured to each other. A fixed shaft 10 is fixedly secured at its opposite ends to the central portions of the motor side housing 11 and the brake side housing 12, respectively. The sheave 4 is rotatably mounted on this fixed shaft 10 through a bearing 13. The sheave 4 having a plurality of grooves 15 formed along the rotational direction thereof is formed continuously with a concave-shaped brake drum 14 that extends in a diametral direction and protrudes in an axial direction. The brake drum 14 has its outermost peripheral end face 20 arranged at a location nearer to the motor side housing 11 than to the grooves 15. A plurality of permanent magnets 16 are fixedly attached at equal intervals to the outer peripheral surface of the brake drum 14 along the rotational direction of the sheave 4. On the outer diameter side of the brake drum 14, there is arranged a stator 19 in opposition to the permanent magnets 16, the stator 19 being fixedly secured to the motor side housing 11. The stator 19 is composed of an annular core 17 and a coil 18 with its conductor wound around the core 17. Here, note that the permanent magnets 16 and the stator 19 together constitute a motor.

[0013] In the brake side housing 12, there are received a pair of brake arms 22 that are arranged in symmetrical positions with respect to the above-mentioned line A - A in a manner rotatable about support pins 21, respectively.

[0014] Each of the brake arms 22 has its intermediate portion protruded toward the motor side housing 11 in a triangular shape, as shown in Fig. 5. A shoulder bolt 23 penetrates through the protruded portion of each brake arm, as shown in Fig. 2, and a brake shoe 24, which can be placed into pressure contact with braking surfaces 25 formed on the inner side of the brake drum 14, is threaded to a tip end of each shoulder bolt 23. A hemispherical concave portion 26 is formed in each brake shoe 24 at a side opposite to a corresponding braking surface 25. A spherical washer 27 is arranged between the brake shoe 24 and a corresponding brake arm 22 in a manner rotatable with respect to the concave portion 26. A coil spring 29 is arranged under compression between a head 28 of each shoulder bolt 23 and a corresponding brake arm 22. Each brake shoe 24 is urged toward a corresponding brake arm 22 by means of the resilient force of a corresponding coil spring 29.

[0015] As shown in Fig. 3 and Fig. 5, a pair of brake springs 30 are arranged fixed to the brake side housing 12 at locations right under the sheave 4. These brake springs 30 serve to urge the pair of brake arms 22 in a direction away from each other.

[0016] Also, as shown in Fig. 3 and Fig. 5, an electromagnetic magnet 31 is arranged fixed to the brake side housing 12 at a location right under the sheave 4.

[0017] As shown in Fig. 4, Fig. 6 and Fig. 7, in the vicinity of the sheave 4, a pair of L-shaped rope latches 32 are arranged fixed to the brake side housing 12, so that the rope 5 is prevented from disengaging from the grooves 15 in the sheave 4 by means of these rope latches 32.

[0018] In the winch 3 as constructed above, by supplying current to the coil 18, the brake drum 14 and the sheave 4 integrally formed therewith are caused to rotate under the action of an electromagnetic induction generated between the stator 19 and the permanent magnets 16. The car 7 hung on the rope 5, which is wrapped around the sheave 4, is driven to move up and down.

[0019] When the sheave 4 is driven to rotate, the electromagnetic magnet 31 is supplied with current thereby to generate an electromagnetic force, so that it attracts the tip ends of the respective brake arms 22 against the resilient forces of the brake springs 30, as shown in Fig. 2. That is, the pair of brake arms 22 are caused to rotate about the corresponding support pins 21, respectively, and the brake shoes 24 fixed to the brake arms 22 are moved away from the braking surface 25 of the brake drum 14.

[0020] On the other hand, when the current supplied to the electromagnetic magnet 31 is interrupted, the electromagnetic force from the electromagnetic magnet 31 disappears so the brake arms 22 are caused to rotate about the support pins 21, respectively, by the resilient forces of the brake springs 30 to place the brake shoe 24 in pressure contact with the braking surface 25 of the brake drum 14, as a result of which the rotations of the brake drum 14 and the sheave 4 integrally formed therewith are stopped.

[0021] Here, note that the brake shoes 24 are arranged away from the rotating surfaces of the brake arms 22 in a direction toward the motor side housing 11, as can be seen from Fig. 5, so an offset or unbalanced load acts on the brake shoes 24, and hence the load might influence the braking surfaces 25 as it is. To cope with this, the washers 27 with some play are interposed between the corresponding brake arms 22 and brake shoes 24, respectively, so that the offset load on the braking surfaces 25 of the brake shoes 24 is suppressed by the washers 27.

[0022] As described in the foregoing, according to the winch 3 for an elevated of this embodiment, the pair of brake arms 22, the brake shoes 24, the brake springs 30 and the electromagnetic magnet 31, which together constitute the brake device, are arranged at a side near the sheave, so the sheave 4 and the respective components constituting the brake device can be directly maintained and checked by visual inspection from the same direction, thus making it possible to improve a maintenance and check operation.

[0023] In particular, the winch 3 is fixedly attached to the wall surface of the hoistway 1 in such a manner that the sheave 4 faces to the side of the car 7 that moves up and down in the hoistway 1, so an operator can perform the maintenance and check operation in a wide space. As a result, there is no need to take the trouble of pro-

viding a special space for maintenance and check that is protruded to a side opposite to the car 7 in a wall region opposing to the winch 3.

[0024] In addition, since the washers 27 are slidable with respect to the corresponding hemispherical concave portions 26, the offset load applied to the braking surfaces 25 of the brake shoes 24 from the brake arms 22 is suppressed, so the braking performance becomes stabilized. Further, localized wear or abnormal wear of the brake shoes 24, which are in sliding contact with the braking surfaces 25, can be reduced, and at the same time the amount of wear of the braking surfaces 25 of the brake drum 14 can also be reduced.

[0025] Moreover, since the rope latches 32 are mounted on the brake side housing 12 to cover the grooves 15 in the sheave 4 so as to prevent the disengagement of the rope 5 from the grooves 15, when the maintenance and check of the sheave 4 and the respective components constituting the brake device are carried out, the gaps between the rope and the rope latches 32 can be checked directly from the same direction without using any special mirror or any special thickness gauge.

Claims

1. A winch for an elevator comprising:

a motor side housing with a motor arranged therein;
a brake side housing that is arranged in opposition to and fixedly attached to said motor side housing;
a fixed shaft that penetrates through said brake side housing and said motor side housing and is fixedly secured thereto;
a sheave that is rotatably mounted on said fixed shaft in said brake side housing;
a brake drum that is mounted on said motor side housing so as to rotate together with said sheave;
a pair of brake arms that have their one ends rotatably mounted on said brake side housing;
brake shoes that are mounted on said brake arms, respectively, so as to be in sliding contact with braking surfaces, respectively, of said brake drum;
brake springs that are arranged in said brake side housing between said pair of brake arms so that said pair of brake arms are urged in a direction away from each other; and
an electromagnetic magnet that is arranged in said brake side housing between the other ends of said pair of brake arms so as to attract said other ends against resilient forces of said brake springs thereby to rotate said brake arms.

2. The winch for an elevator as set forth in claim 1, further comprising:

spherical washers that are slidable with respect to hemispherical concave portions formed in surfaces of said brake shoes at a side opposite to the braking surfaces of said brake shoes, respectively;
bolts that penetrate through said brake arms and said washers to fixedly secure said brake shoes to said brake arms by their tip ends, respectively; and
springs that are arranged between heads of base end portions of said bolts and said brake arms to urge said brake shoes to said brake arms, respectively.

3. The winch for an elevator as set forth in claim 1 or 2, wherein rope latches are mounted on said brake side housing so as to cover said grooves in said sheave thereby to prevent said rope from disengaging from said grooves.

4. The winch for an elevator as set forth in any one of claims 1 through 3, wherein said winch is fixedly attached to a wall surface of said hoistway in such a manner that said sheave faces to a side of said car that moves up and down in said hoistway.

FIG. 1

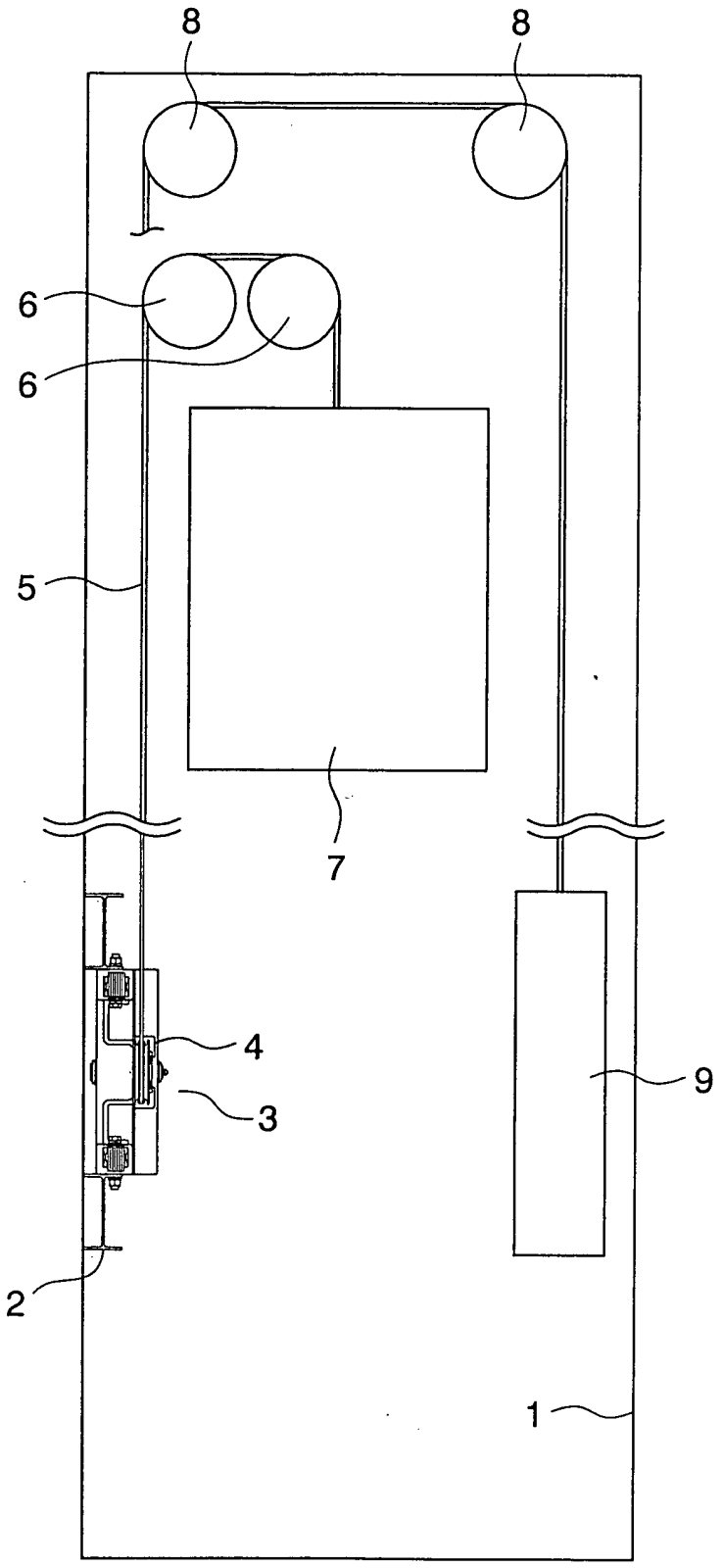


FIG. 2

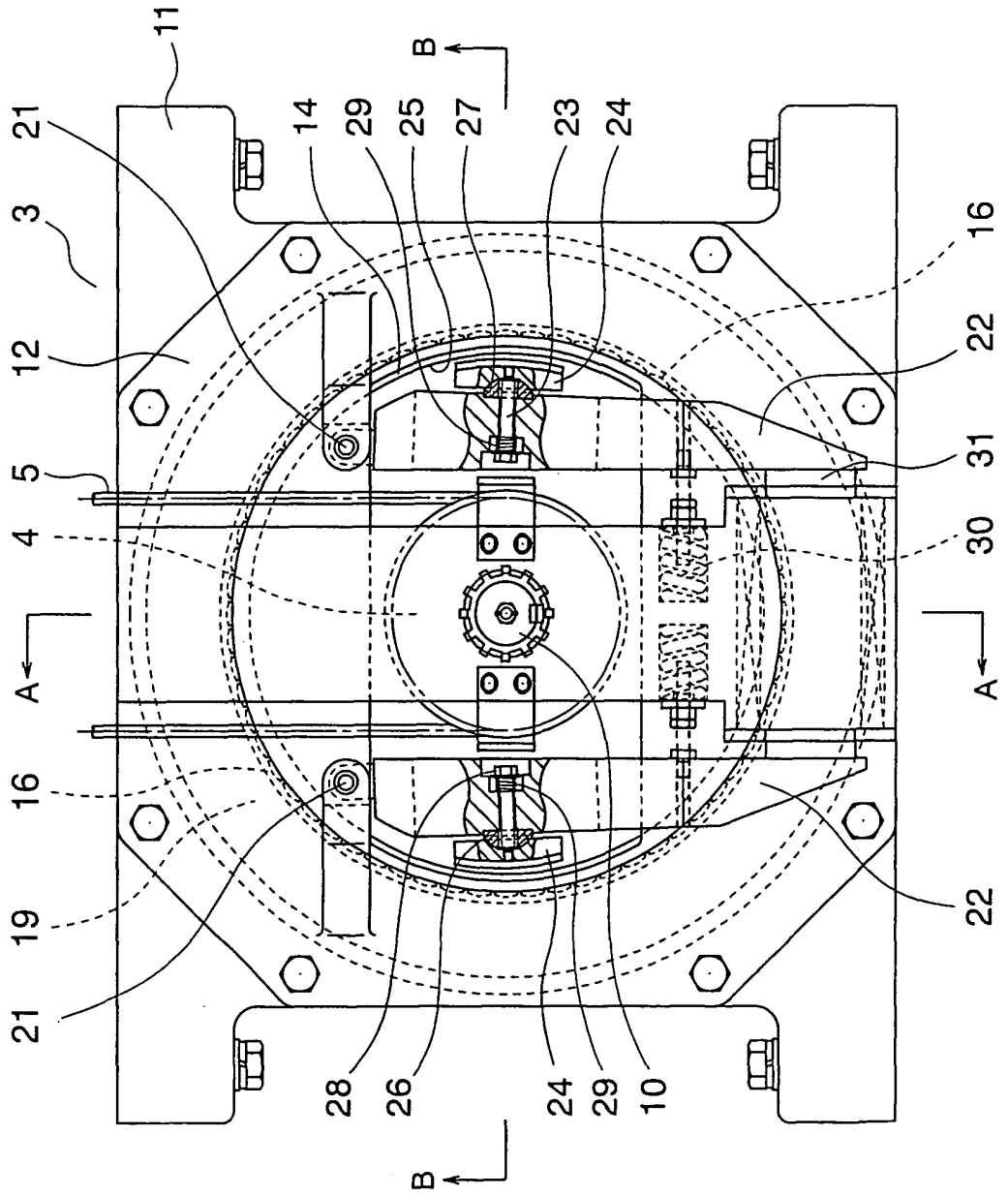

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FIG. 3

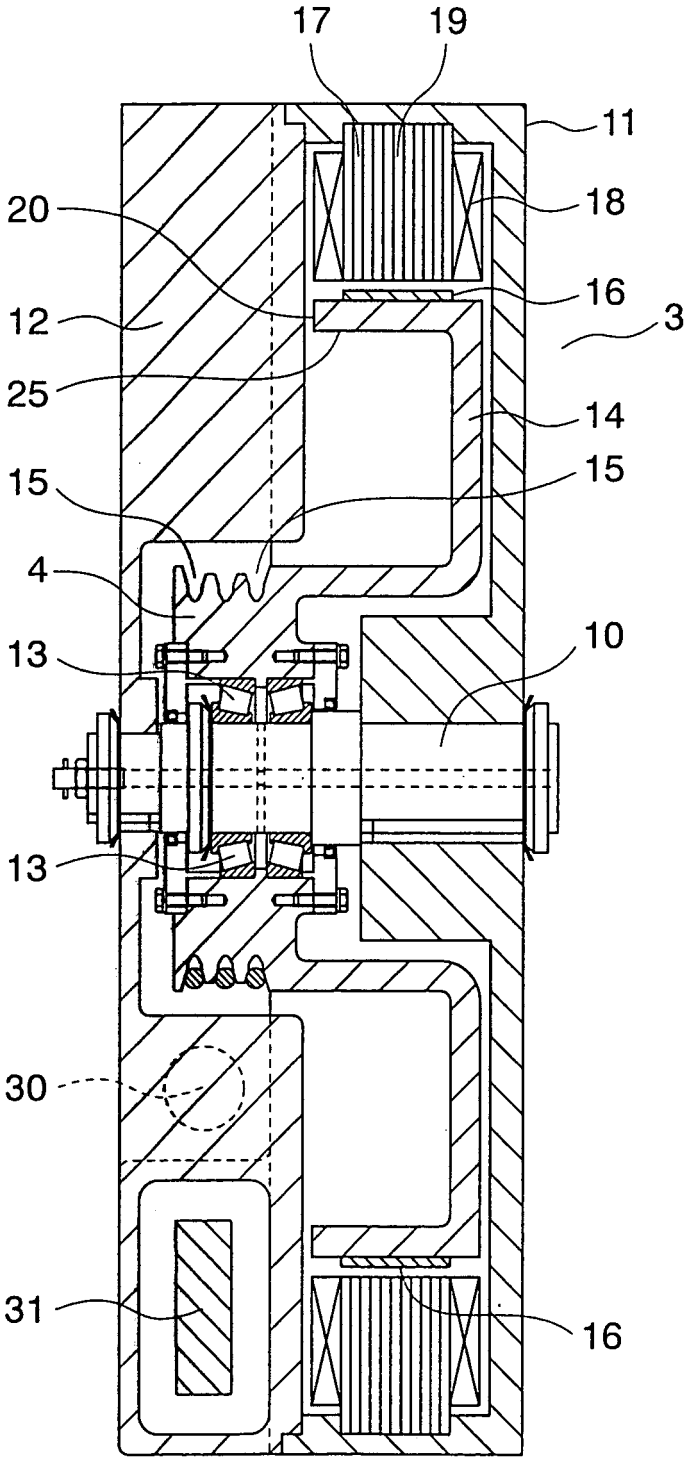


FIG. 4

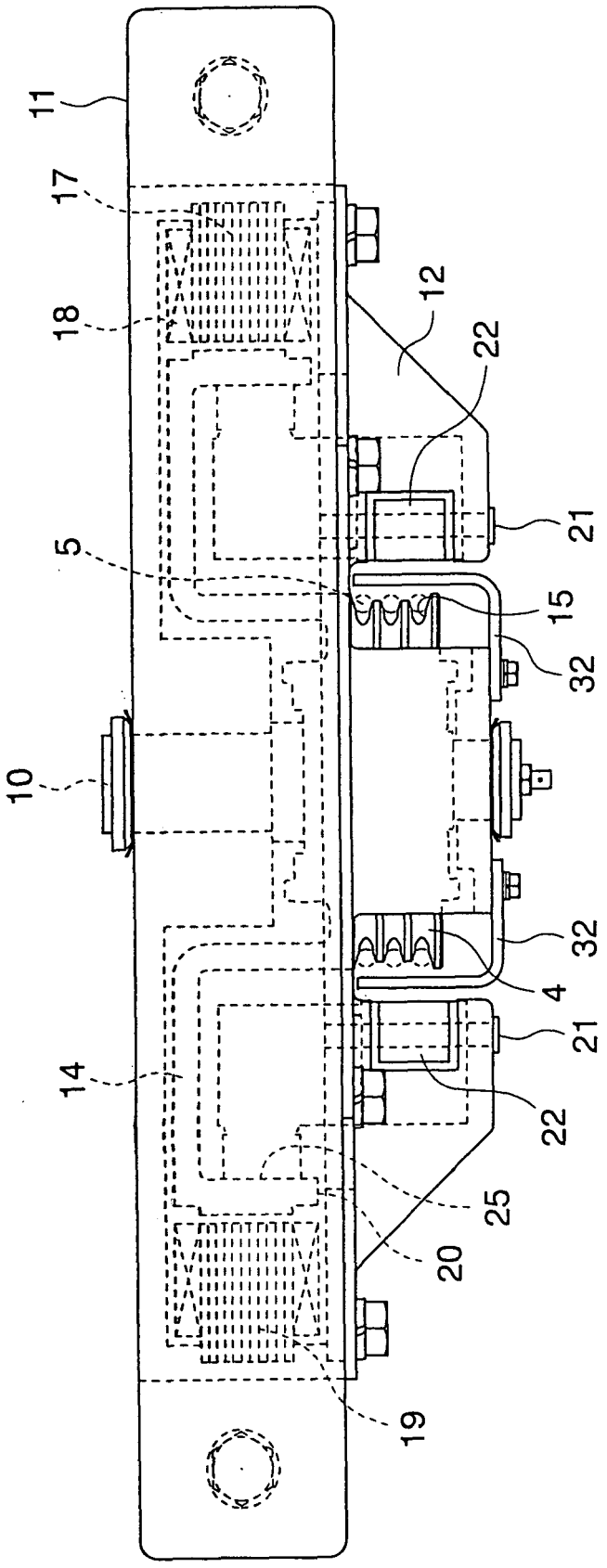


FIG. 5

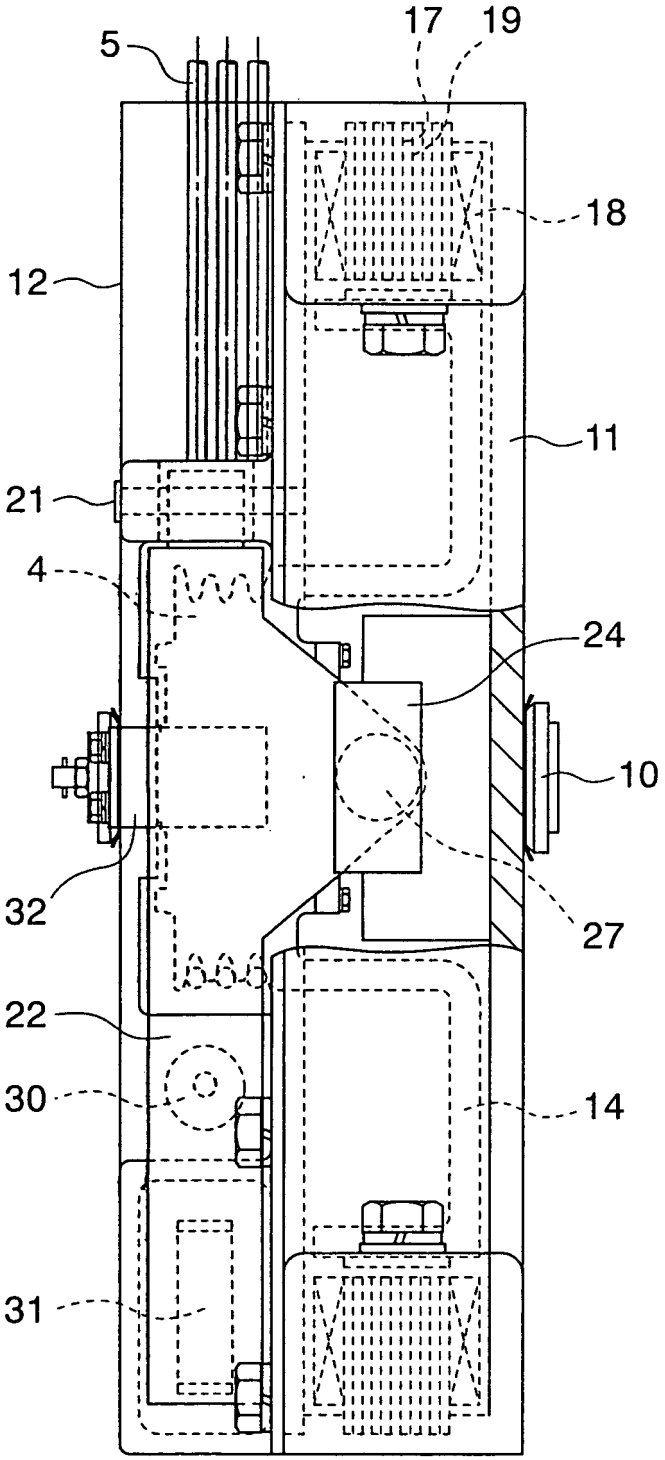


FIG. 6

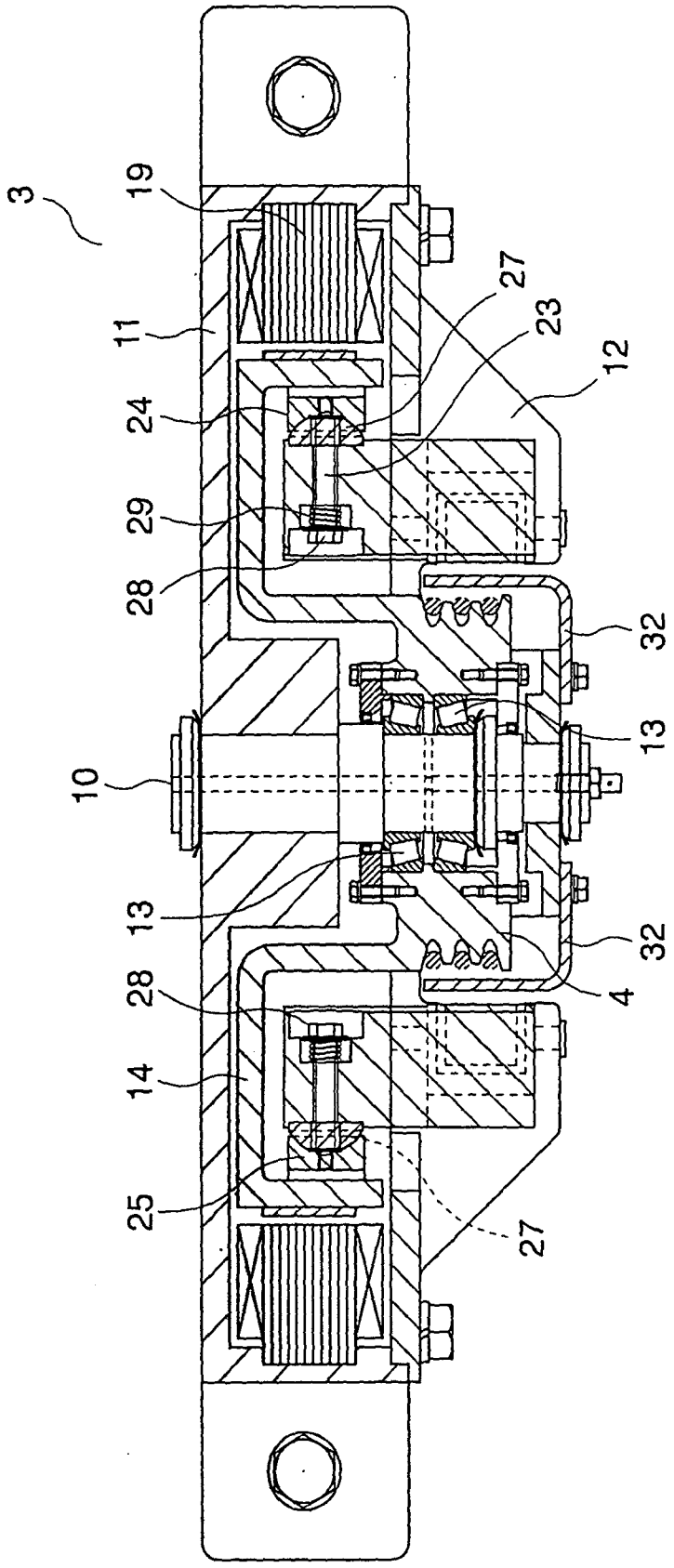


FIG. 7

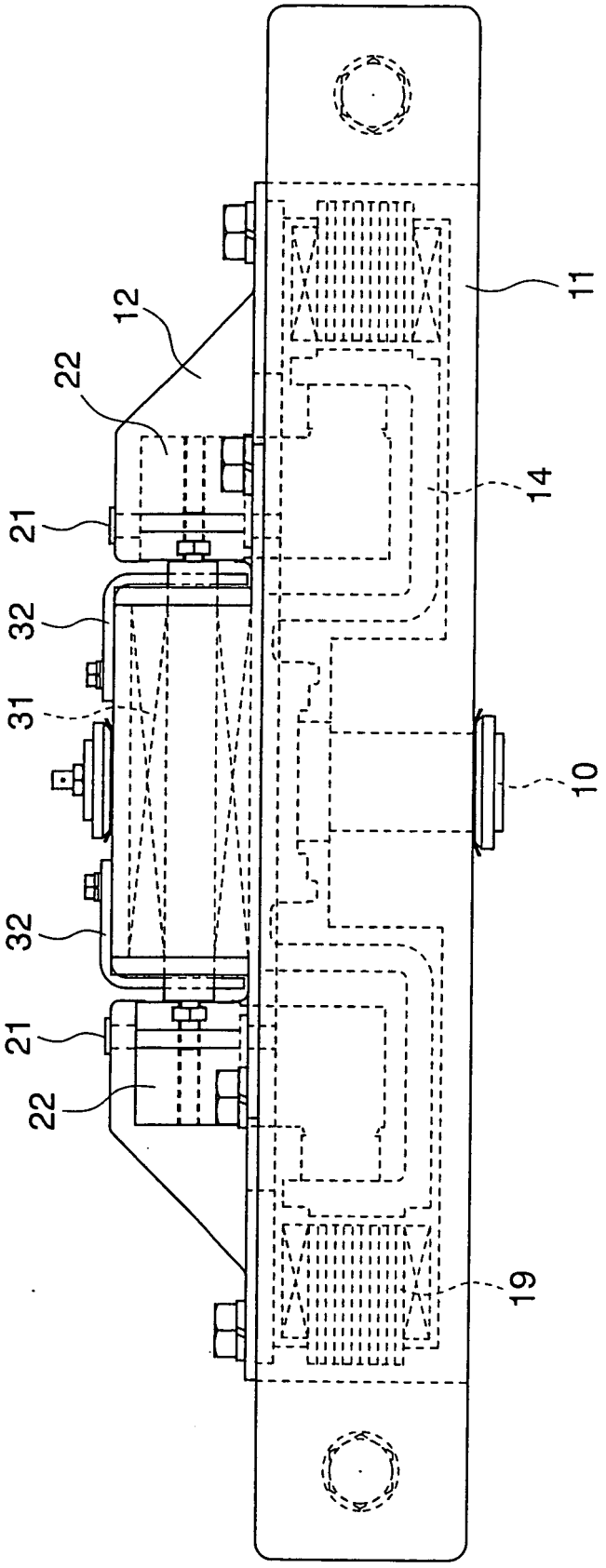
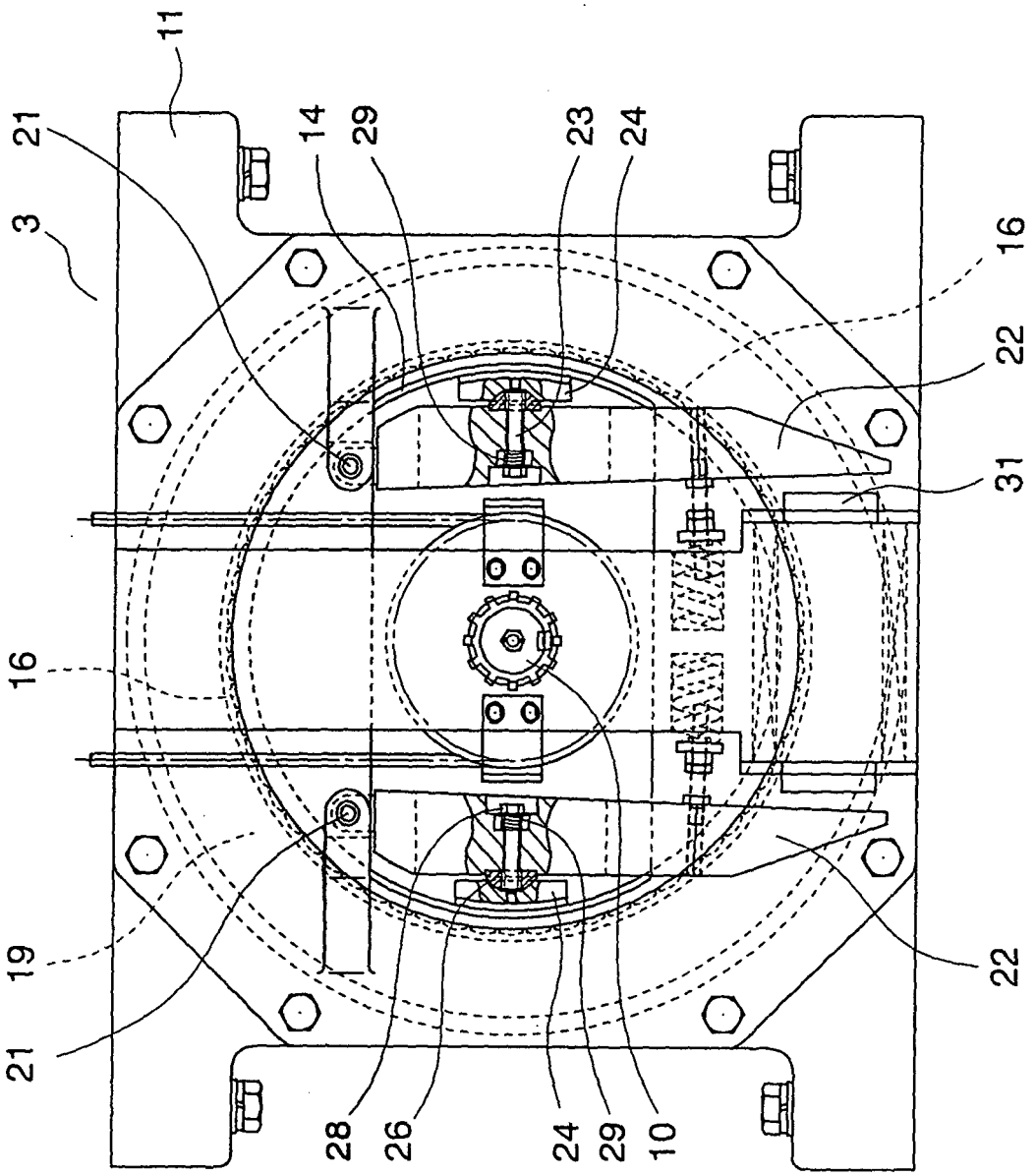


FIG. 8



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/010842

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] B66B11/08

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] B66B11/00-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.
A	JP 2002-362861 A (Mitsubishi Electric Corp.), 18 December, 2002 (18.12.02), (Family: none)	1-2
A	JP 8-40676 A (Kone OY), 13 February, 1996 (13.02.96), & US 5899301 A & EP 0891939 A1 & FI 943043 A & AU 2173595 A & BR 9502924 A & CN 1117938 A & CA 2152292 A	1,3
A	JP 2000-16727 A (Hitachi, Ltd.), 18 January, 2000 (18.01.00), & EP 0970912 A2 & CN 1241528 A	1,4

☒ 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	Date of mailing of the international search report
25 April, 2005 (25.04.05)	27 May, 2005 (27.05.05)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/010842

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 10-203761 A (Mitsubishi Electric Corp.), 04 August, 1998 (04.08.98), (Family: none)	1

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2000289954 A **[0002]**