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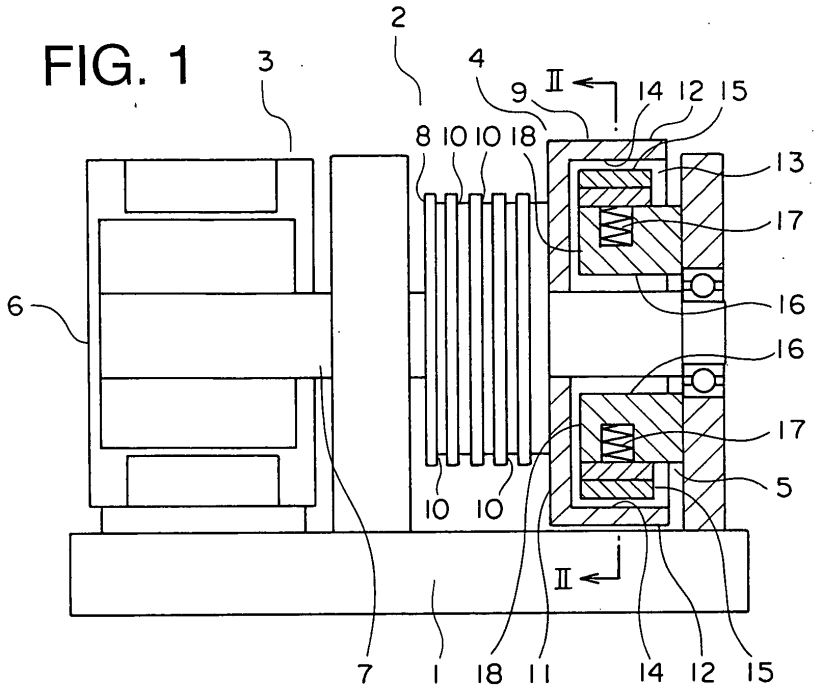
(54) HOIST OF ELEVATOR

(57) In an elevator hoisting machine, a hoisting machine main body has a motor, and a rotation shaft rotated by the motor. Fixed to the rotation shaft is a driving sheave capable of rotating integrally with the rotation shaft. The driving sheave has an annular portion around the outer peripheral portion of which a main rope is looped. Inside the annular portion, there is provided a brake device. The brake device has a braking member capable of being brought into and out of contact with the inner peripheral surface of the annular portion and a displacement device displacing the braking member.

FIG. 1



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Description

Technical Field

[0001] The present invention relates to an elevator hoisting machine for raising and lowering a car and a counterweight.

Background Art

[0002] As a conventional elevator hoisting machine, there has been proposed one in which a plurality of pads are pressed against a brake disc fixed to a pulley to thereby brake the rotation of the pulley, around which a main rope is looped. The outer diameter of the brake disc is larger than the outer diameter of the pulley. Each pad is pressed against the outer peripheral portion of the brake disc by an electromagnetic brake device arranged around the brake disc (see Patent Document 1).

[0003] [Patent Document 1] JP 11-157766 A

Disclosure of the Invention

Problems to be solved by the Invention

[0004] In a conventional elevator hoisting machine, however, an electromagnetic brake device is provided around a brake disc, so that the size of the entire hoisting machine is rather large.

Further, since each pad is pressed against an outer peripheral portion of the brake disc, oil of a main rope scattered as a result of the rotation of the pulley adheres to the outer peripheral portion of a brake disc, resulting in a reduction in a braking force obtained through the pressing of each pad against the brake disc.

[0005] The present invention has been made with a view toward solving the above-mentioned problems. It is an object of the present invention to provide an elevator hoisting machine allowing a reduction in size and capable of achieving a reduction in the braking force for the rotation of a driving sheave.

Means for solving the Problems

[0006] An elevator hoisting machine according to the present invention includes a hoisting machine main body having a motor and a rotation shaft rotated by the motor; a driving sheave which has an annular portion around an outer peripheral portion of the annular portion an elevator main rope is looped, which is spaced apart from the motor in an axial direction of the rotation shaft, and which can rotate integrally with the rotation shaft; and a brake device which has a braking member capable of being brought into and out of contact with an inner peripheral surface of the annular portion and a displacement device displacing the braking member so that the braking member is brought into and out of contact with the inner peripheral surface, and which is provided inside the annular portion.

Brief Description of the Drawings

[0007]

[Fig. 1] A sectional view of an elevator hoisting machine according to Embodiment 1 of the present invention.

[Fig. 2] A sectional view taken along a line II-II of Fig. 1.

[Fig. 3] A sectional view of an elevator hoisting machine according to Embodiment 2 of the present invention.

[Fig. 4] A sectional view taken along a line IV-IV of Fig. 3.

Best Mode for carrying out the Invention

[0008] In the following, preferred embodiments of the present invention will be described with reference to the drawings.

Embodiment 1

[0009] Fig. 1 is a view, partially in section, of an elevator hoisting machine according to Embodiment 1 of the present invention. Fig. 2 is a sectional view taken along a line II-II of Fig. 1. In the drawings, in the upper portion of a hoistway (not shown), a support base 1 is fixed in position. Provided on the support base 1 is a hoisting machine 2 for raising and lowering a car and a counterweight (none of which is shown). The hoisting machine 2 has a hoisting machine main body 3, a driving sheave 4 provided on the hoisting machine main body 3 and rotated by the hoisting machine main body 3, and a pair of brake devices 5 for braking the rotation of the driving sheave 4. A plurality of main ropes (not shown) for suspending the car and the counterweight are looped around the driving sheave 4. The car and the counterweight are raised and lowered within the hoistway through the rotation of the driving sheave 4.

[0010] The hoisting machine main body 3 has a motor 6 supported by the support base 1 and a rotation shaft 7 extending horizontally from the motor 6 and rotated by the motor 6. The forward end portion of the rotation shaft 7 is rotatably supported by the support base 1. The driving sheave 4 is fixed to the intermediate portion of the rotation shaft 7. As a result, the driving sheave 4 and the rotation shaft 7 can rotate integrally.

[0011] The driving sheave 4 has a pulley portion 8 around which the main ropes are looped and a braking drum 9 fixed to a side portion of the pulley portion 8 so as to be adjacent thereto in the axial direction of the rotation shaft 7. In the outer peripheral surface of the pulley portion 8, there are provided a plurality of groove portions 10 extending in the circumferential direction of the pulley portion 8. Each main rope is looped around the pulley portion 8 along each groove portion 10. The braking drum 9 is fixed to the side portion of the pulley portion 8 on the

side opposite to the hoisting machine main body 3. The braking drum 9 has a fixing portion 11 fixed to the pulley portion 8 and an annular portion 12 provided on the outer peripheral portion of the fixing portion 11 on the side opposite to the pulley portion 8. That is, the braking drum 9 has a recess 13 open on the rotation shaft 7 forward end portion side and formed by the fixing portion 11 and the annular portion 12. The inner peripheral surface of the annular portion 12 has a braking surface 14 extending in the circumferential direction of the annular portion 12.

[0012] The brake devices 5 are supported by the support base 1. The brake devices 5 are arranged on the inner side of the annular portion 12, that is, in the recess 13. Further, the brake devices 5 are arranged symmetrically with respect to the axis of the rotation shaft 7. Each brake device 5 has a brake shoe 15 that is a braking member capable of being brought into and out of contact with the braking surface 14, and a displacement device 16 displacing the brake shoe 15 so as to bring it into and out of contact with the braking surface 14. The rotation of the driving sheave 4 is braked by a contact of the brake shoes 15 with the braking surface 14. The braking of the rotation of the driving sheave 4 can be canceled by spacing the brake shoes 15 apart from the braking surface 14.

[0013] Each displacement device 16 has an urging spring 17 for urging the brake shoe 15 so as to bring it into contact with the braking surface 14, and an electromagnet 18 adapted to displace the brake shoe 15 against the urging force of the urging spring 17 so as to space it apart from the braking surface 14. The brake shoes 15 are spaced apart from the braking surface 14 by energizing the electromagnets 18, and are displaced so as to be brought into contact with the braking surface 14 and pressed against the braking surface 14 by stopping the energization of the electromagnets 18. Each brake device 5 is a direct-acting-type brake device in which the urging spring 17 directly urges the brake shoe 15.

[0014] Inside the braking drum 9, there are provided a pair of guide rails 19 for guiding the brake shoes 15. In this example, the brake shoes 15 are guided by the common guide rails 19. The guide rails 19 guide the brake shoes 15 such that they move toward and away from the braking surface 14 in a direction perpendicular to the braking surface 14. Further, the guide rails 19 guide the brake shoes 15 in the direction in which the urging springs 17 urge the brake shoes 15. The guide rails 19 are fixed in position with respect to the support base 1.

[0015] The dimension of the hoisting machine 2 in the axial direction of the rotation shaft 7 is larger than the dimension thereof in the radial direction. That is, the hoisting machine 2 is a non-reduced-thickness type hoisting machine in which the motor 6 and the driving sheave 4 are arranged so as to be spaced apart from each other in the axial direction of the rotation shaft 7.

[0016] Next, an operation of the hoisting machine will be described. During normal operation, the electromagnets 18 are energized. Thus, the brake shoes 15 are spaced apart from the braking surface 14.

[0017] When the energization of the electromagnets 18 is stopped, the brake shoes 15 are displaced toward the braking surface 14, that is, radially outwards, by the urging force of the urging springs 17. At this time, the brake shoes 15 are displaced while guided by the guide rails 19. Thereafter, the brake shoes 15 hit the braking surface 14 and are pressed against the braking surface 14. As a result, the rotation of the driving sheave 4 is braked.

[0018] When the electromagnets 18 are energized, the brake shoes 15 are displaced toward the electromagnets 18, that is, radially inwards, by the electromagnetic attraction of the electromagnets 18 against the urging force of the urging springs 17. At this time also, the brake shoes 15 are displaced while guided by the guide rails 19. As a result, the brake shoes 15 are spaced apart from the braking surface 14, and the braking of the driving sheave 4 is released.

[0019] In this elevator hoisting machine 2, the brake devices 5 are provided on the inner side of the braking drum 9, so it is possible to reduce the size of the hoisting machine 2 in the radial direction thereof, thus making it possible to achieve a reduction in hoisting machine 2 size. Further, the brake shoes 15 are brought into and out of contact with the braking surface 14 in the inner periphery of the braking drum 9, so it is possible to prevent oil of the main rope scattered as a result of the rotation of the driving sheave 4 from adhering to the braking surface 14, thus making it possible to prevent a reduction in the braking force for the rotation of the driving sheave 4.

[0020] Further, the displacement devices 16 have the urging springs 17 urging the brake shoes 15 so as to bring them into contact with the braking surface 14, and the electromagnets 18 adapted to displace the brake shoes 15 so as to space them apart from the braking surface 14 against the urging force of the urging springs 17, so that it is possible to effect reciprocal displacement of the brake shoes 15 more reliably with a simple construction.

[0021] Further, inside the braking drum 9, that is, in the recess 13, there are provided the guide rails 19 for guiding the brake shoes 15, so that it is possible to displace the brake shoes 15 still more reliably. Further, when the brake shoes 15 come into contact with the braking surface 14, it is possible to prevent the brake shoes 15 from being drawn into displacement in the rotating direction of the driving sheave 4.

[0022] While in the above-described example the braking drum 9 is fixed to the side portion of the pulley portion 8 on the opposite side of the hoisting machine main body 3, it is also possible to fix the braking drum 9 to the side portion of the pulley portion 8 on the hoisting machine main body 3 side. In this case, a recess open on the hoisting machine main body 3 side is formed in the braking drum 9. Further, the brake devices 5 and the guide rails 19 are provided in the recess, which is open on the hoisting machine main body 3 side.

Embodiment 2

[0023] Fig. 3 is a view, partially in section, of an elevator hoisting machine according to Embodiment 2 of the present invention. In the drawing, a driving sheave 21 is provided on the intermediate portion of a rotation shaft 7. The driving sheave 21 can rotate integrally with the rotation shaft 7. The driving sheave 21 has an annular portion 22 around the peripheral portion of which main ropes are looped, and a fixing portion 23 provided between the annular portion 22 and the rotation shaft 7 and fixing the annular portion 22 to the rotation shaft 7. Further, the annular portion 22 and the fixing portion 23 of the driving sheave 21 form a recess 24 that is open on the forward end side of the rotation shaft 7. Further, in the outer peripheral surface of the driving sheave 21, there are provided a plurality of groove portions 25 extending in the circumferential direction of the driving sheave 21.

[0024] On the inner side of the annular portion 22, that is, in the recess 24, there are provided a pair of brake devices 5 and a pair of guide rails 19. Constructions of the brake devices 5 and the guide rails 19, respectively, are the same as those of Embodiment 1. The brake devices 5 and the guide rails 19 are supported by the support base 1.

[0025] The inner peripheral surface of the annular portion 22 has a braking surface 26 extending in the circumferential direction of the annular portion 22. The brake shoes 15 of the brake devices 5 are brought into and out of contact with the braking surface 26. Otherwise, the construction and operation of this embodiment are the same as those of Embodiment 1.

[0026] In this elevator hoisting machine, the driving sheave 21 has the annular portion 22 around the outer peripheral portion of which the main ropes are looped, and the brake devices 5 are provided on the inner side of the annular portion 22, that is, in the recess 24, so it is possible to reduce the size of the hoisting machine in the radial direction thereof, and it is possible to reduce the size thereof in the axial direction of the rotation shaft 7 as compared with the hoisting machine 2 of Embodiment 1, thus making it possible to achieve a further reduction in hoisting machine size. Further, the brake shoes 15 are brought into and out of contact with the braking surface 26 in the inner periphery of the annular portion 22, so it is possible to prevent oil of the main rope scattered as a result of the rotation of the driving sheave 4 from adhering to the braking surface 26, thus making it possible to prevent a reduction in the braking force for the rotation of the driving sheave 4.

[0027] While in the above-described example the driving sheave 21 has the recess 24 that is open on the forward end side of the rotation shaft 7, it is also possible to provide the driving sheave 21 with a recess that is open on the hoisting machine main body 3 side. In this case, the brake devices 5 and the guide rails 19 are provided in the recess that is open on the hoisting machine main body 3 side.

[0028] While in the above-described embodiments the number of the brake devices 5 is two, it may also be one or three or more.

Claims

1. An elevator hoisting machine **characterized by** comprising:

   a hoisting machine main body having a motor and a rotation shaft rotated by the motor;
   a driving sheave which has an annular portion around an outer peripheral portion of the annular portion an elevator main rope is looped, which is spaced apart from the motor in the axial direction of the rotation shaft, and which can rotate integrally with the rotation shaft; and
   a brake device which has a braking member capable of being brought into and out of contact with an inner peripheral surface of the annular portion and a displacement device displacing the braking member so that the braking member is brought into and out of contact with the inner peripheral surface, and which is provided inside the annular portion.

2. An elevator hoisting machine **characterized by** comprising:

   a hoisting machine main body having a motor and a rotation shaft rotated by the motor;
   a driving sheave which has a pulley portion around an outer peripheral portion of the pulley portion an elevator main rope is looped and an annular portion adjacent to the pulley portion in an axial direction of the rotation shaft, which is spaced apart from the motor in the axial direction of the rotation shaft, and which can rotate integrally with the rotation shaft; and
   a brake device which has a braking member capable of being brought into and out of contact with an inner peripheral surface of the annular portion and a displacement device displacing the braking member so that the braking member is brought into and out of contact with the inner peripheral surface, and which is provided inside the annular portion.

3. An elevator hoisting machine according to Claim 1 or 2, **characterized in that** the displacement device has an urging spring urging the braking member so that the braking member is brought into contact with the annular portion, and an electromagnet displacing the braking member so that the braking member is spaced apart from the annular portion against the urging force of the urging spring.

4. An elevator hoisting machine according to Claim 3, **characterized by** providing, inside the annular portion, a guide rail for guiding the braking member in a direction in which the urging spring urges the braking member.

FIG. 1

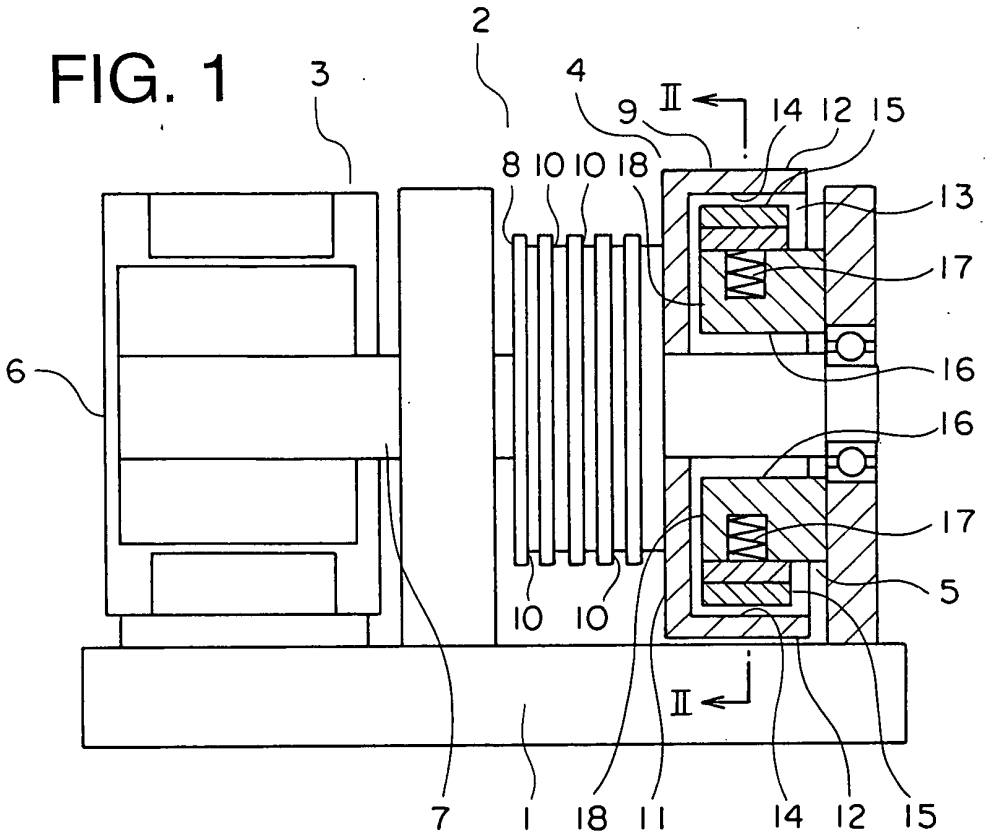
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FIG. 2

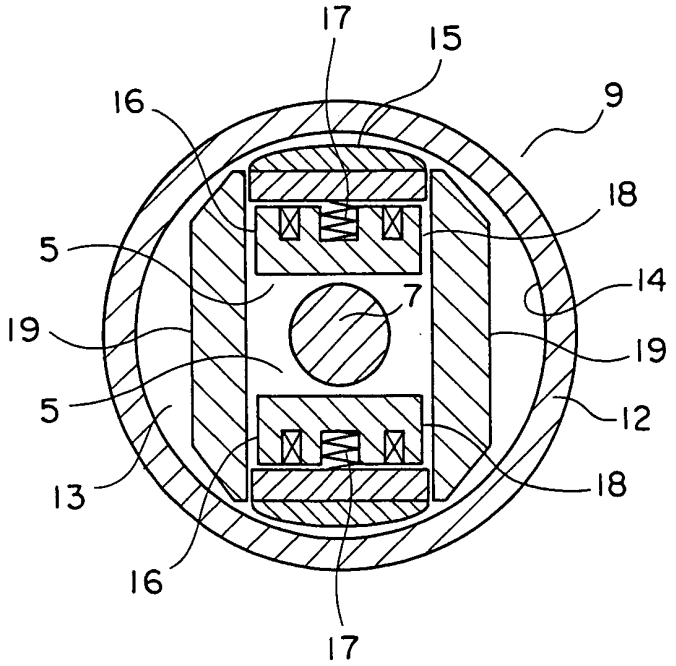
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FIG. 3

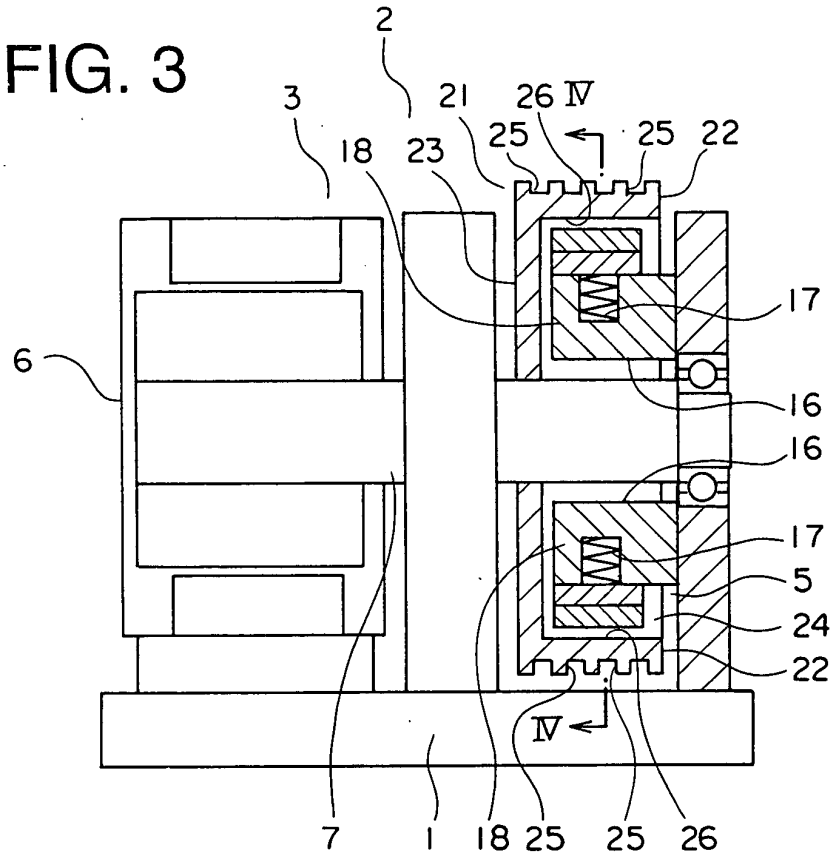
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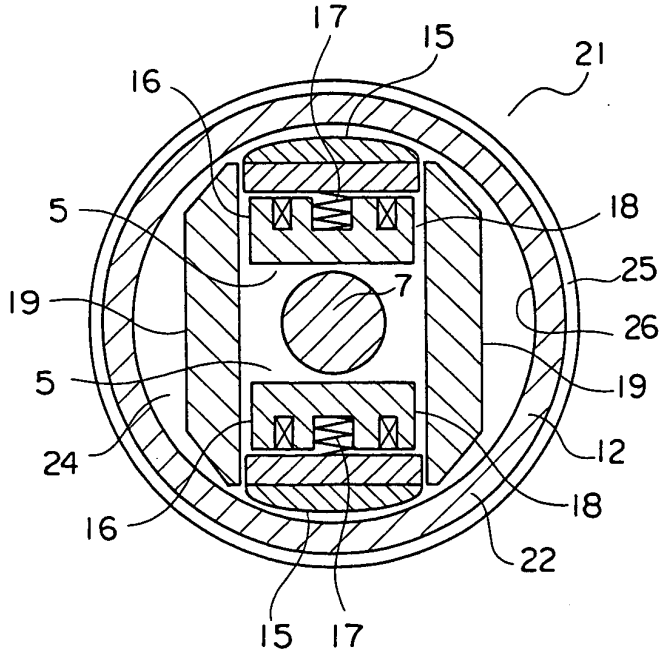
FIG. 4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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/012369

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.
Y	JP 11-157766 A (Hitachi, Ltd.), 15 June, 1999 (15.06.99), Pay attention to abstract; Fig. 1 (Family: none)	1-4
Y	JP 2-106590 A (Mitsubishi Electric Corp.), 18 April, 1990 (18.04.90), Pay attention to Claims; page 2, lower right column, line 19 to page 3, upper right column, line 18; Fig. 1 (Family: none)	1,3-4
Y	JP 2000-302360 A (Mitsubishi Electric Corp.), 31 October, 2000 (31.10.00), Pay attention to Claims; Par. Nos. [0031] to [0032]; Figs. 7 to 9 (Family: none)	2-4

☒ 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 26 May, 2005 (26.05.05)	Date of mailing of the international search report 14 June, 2005 (14.06.05)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/012369

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2003-95086 A (Mitsubishi Electric Corp.), 03 April, 2003 (03.04.03), Pay attention to Par. Nos. [0025] to [0026]; Fig. 5 (Family: none)	4
A	JP 2-28489 A (Toshiba Corp.), 30 January, 1990 (30.01.90), Pay attention to Claims; page 4, upper left column, line 17 to lower left column, line 15; Figs. 4 to 5 (Family: none)	1-4

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 11157766 A **[0003]**