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(54) ELEVATOR HOIST AND ELEVATOR DEVICE

(57) The invention relates to an elevator hoisting machine having mechanisms (20 to 24) which are provided on arms (6) for supporting linings (2) and which adjust a gap between the linings (2), the linings being formed so as to be able to come into and out of contact with a brake drum (1), and the brake drum (1) when the linings (2) are detached from the brake drum (1). As a result, a gap between the linings (2) and the brake drum (1) can be adjusted readily within a short period of time.

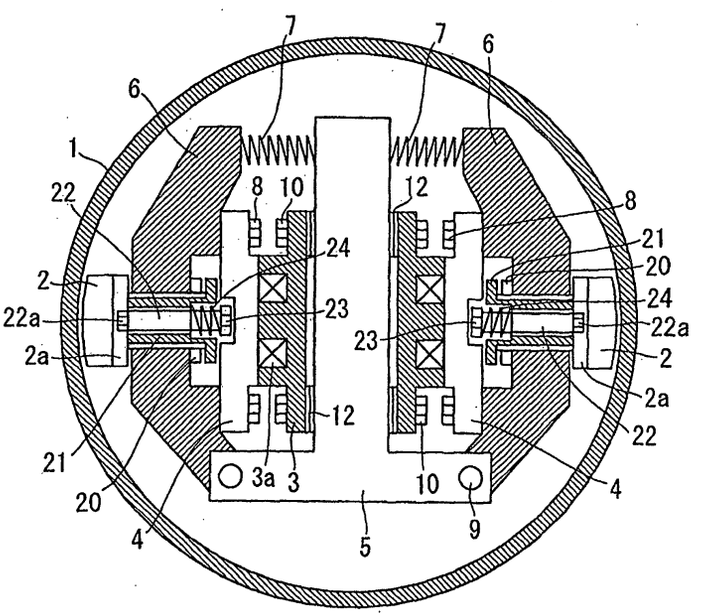

Fig. 1

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Description

THCHNICALE FIELD

[0001] The invention relates to an elevator hoisting machine and an elevator system for causing a passenger car and a counterweight to ascend and descend by means of driving a pull rope, and more particularly, to an elevator hoisting machine and an elevator system, each having a brake section in the vicinity of a brake drum.

BACKGROUND ART

[0002] An elevator hoisting machine having a brake section for braking rotation of a brake drum housed in the brake drum has hitherto been known.

[0003] A known elevator hoisting machine will be described hereinbelow by reference to Fig. 6. Fig. 6 is a schematic cross-sectional view showing a known elevator hoisting machine.

[0004] As illustrated, a brake section is housed in a brake drum 1 in which a main spindle is rotated upon receipt of thrust. The brake section is in principle constituted of linings 2, brake coils 3, armatures 4, a coil mount section 5, arms 6, compression springs 7, and metal pieces 12.

[0005] More specifically, the coil mount section 5 is fixedly disposed at the center of the inside of the brake drum 1. Members, such as one of the lining 2, one of the brake coils 3, one of the armatures 4, one of the arms 6, one of the compression springs 7, and some of the metal pieces 12, are provided on either side of the coil mount section 5. The brake coils 3 are fastened to both sides of the coil mount section 5 with use of bolts 10 by way of a predetermined number of metal pieces 12 to be described later. Here, each of the brake coils 3 has a coil section 3a in which a coil is wrapped. Desired electromagnetic force develops as a result of energization of the coil section 3a.

[0006] An arm 6 is provided, by use of a pin 9, on either side of the coil mount section 5 in a pivotable manner with use of a pin 9. The armature 4 is seated on a portion of each arm 6, which portion opposes the coil mount section 5, so as to oppose a corresponding brake coil 3. The armature 4 is attracted to the brake coil 3 by means of electromagnetic force developing as a result of energization of the brake coil 3.

[0007] The lining 2 is supported on a portion of the arm 6 opposing the brake drum 1. More specifically, the lining 2 has a receiving section (shoe) 2a having through holes formed therein for fastening bolts 11. The arm 6 has female screw sections corresponding to the through holes formed in the receiving section 2a. The lining 2 is fixed to the arm 6 by means of fastening the bolts 11 onto the female screw sections through the through holes.

[0008] One end of the compression spring 7 is supported by the extremity of the arm 6 distant from the pin 9, and the other end of the same is supported at a predetermined position on the coil fixing section 5 opposing the extremity.

[0009] Although not illustrated, four bolts 8, four bolts 10, and four bolts 11 are provided within a plane for fastening members together.

[0010] In an elevator hoisting machine having the foregoing construction, the linings 2 are brought into and out of contact with the brake drum 1 in association with actuation of the armatures 4 stemming from electromagnetic force of the brake coils 3. When the coil sections 3a of the brake coils 3 are energized, the armatures 4 are attracted to the brake coils 3 by means of electromagnetic force developing in the coil sections 3a. In association with attracting action of the brake coils 3, the linings 2 are detached from the brake drum 1. In contrast, when the coil sections 3a are subjected to non-energization, the armatures 4 are released from the brake coils 3 in association with vanishing of electromagnetic force. The linings 2 are brought into contact with the brake drum 1 at a predetermined pressure, by means of the spring force of the compression springs 7. In this way, rotation of the brake drum 1 is controlled by means of bringing the linings 2 into and out of contact with the brake drum 1.

[0011] Although omitted from illustrations, magnets are provided along an outer peripheral section of the brake drum 1. Stators, each of which is wrapped with a coil, are also fixedly disposed with a clearance along an outer periphery of the magnets. As a result, a so-called dynamo electric motor is constituted. Upon receipt of thrust of the dynamo electric motor, the brake drum 1 rotates around an unillustrated main spindle in either direction. As a result, a towing rope wrapped around the drum main body provided coaxially with the brake drum 1 is driven, whereby the passenger car and the counterweight, both being connected to the towing rope, are caused to ascend and descend.

[0012] The foregoing, known elevator hoisting machine encounters extreme difficulty in adjusting the brake section.

[0013] The difficulty will now be described in detail. Among factors relating to adjustment of the brake section, two factors are important and affect the braking performance of the brake section. One factor is adjustment of a gap existing between the brake drum 1 and the linings 2 when the linings 2 are detached from the brake drum 1. The gap existing when the linings 2 are detached from the brake drum 1 improves a response (i . e . , a time required to bring the linings 2 into contact with the brake drum 1) for bringing the linings 2 into contact with the drum 1. Further, the gap reduces sound of collision developing when the linings 2 are brought into contact with the brake drum 1. In order to minimize the electromagnetic force to be produced by the brake coil 3 and make the brake coil 3 compact, the gap must be made minute and adjusted accurately.

[0014] Another factor is adjustment of the parallelism between the surfaces of the armatures 4 and the surfaces of the corresponding brake coils 3 when the linings 2 are in contact with the brake drum 1. In order to cause the electromagnetic force developing in the brake coils 3 to efficiently act on the armatures 4 and improve adsorption developing between the armatures 4 and the corresponding brake coils 3, the parallelism must be adjusted accurately.

[0015] In the known elevator hoisting machine, gaps existing between the brake drum 1 and the linings 2 and the parallelism existing between the armatures 4 and the brake coils 3 are adjusted by means of the metal pieces 12 interposed between the coil mount section 5 and the brake coils 3. Detailed adjustment procedures are as follows.

[0016] The parallelism between the armatures 4 and the brake coils 3 is checked while the linings 2 remain in contact with the brake drum 1, by means of, e.g., a feeler gauge or an optical method. In order to adjust the number of metal pieces 12 to be disposed in individual sections in accordance with the degree of the thus-checked parallelism, the brake coils 3 are re-assembled by removing the bolts 10. As a result, the attitude (height of each support section) of each brake coil 3 is adjusted with respect to the coil mount section 5. Relatively, the parallelism between the coil mount section 5 and the armatures 4 is adjusted to fall within the range of a predetermined value.

[0017] Next, gaps existing between the linings 2 and the brake drum 1 are checked while the linings 2 are detached from the brake drum 1 manually or by energization of the brake coil 3, through use of a feeler gauge or an optical method. The bolts 10 are removed, to thereby re-assemble the brake coils 3 for increasing or decreasing the number of metal pieces 12 while a difference between the sections in terms of the number of lining pieces having already provided therein (the sections) is maintained in accordance with the degree of the thus-checked gaps. As a result, the height of each brake coil 3 with respect to the coil mount section 5 is adjusted while the parallelism that has already been adjusted is maintained. In accordance with such an adjustment, the gaps existing between the linings 2 and the brake drum 1 are adjusted to fall within the range of a predetermined value.

[0018] The adjustment operation is achieved by alternating iteration of an operation for checking parallelism or a gap and an operation for re-assembling the brake coil 3, which is comparatively heavy. Thus, the adjustment operation involves consumption of much time and effort. Further, the metal pieces 12 are usually formed to a thickness of about 0.1 mm, andvariations in lining pieces must be diminished by means of enhancing the accuracy of lining pieces. Further, adjustment of a gap can be performed by only an amount proportional to the thickness of the lining piece.

[0019] The invention has been conceived to solve the problem and aims at providing a highly-reliable elevator hoisting machine and a highly-reliable elevator system which enable comparatively easy performance of an operation for adjusting a gap arising between linings and a brake drum when the linings are detached from the brake drum and an operation for adjusting the parallelism between a brake coil and an armature when the lining is in contact with the brake drum; and which enable adjustment within a highly-accurate range.

DISCLOSURE OF THE INVENTION

[0020] The invention relates to an elevator hoisting machine, wherein arms for supporting linings are provided with a mechanism for adjusting gaps between a brake drum and linings, the linings being provided so as to be removable from the brake drum, when the linings are detached from the brake drum. As a result, the gap between the linings and the brake drum can be adjusted without removal of constituent members and within a short period of time.

[0021] In relation to the improved elevator hoisting machine of the invention, a female screw section is formed in an arm so as to penetrate through the arm. A bolt formed integrally with the lining is fitted into the female screw section, thereby constituting a gap adjustment mechanism. As a result, a gap between the lining and the brake drum can be adjusted readily within a short period of time. The lining is actuated consecutively in minute units by means of screwing action, thereby enabling highly-accurate adjustment of a gap.

[0022] In relation to the improved elevator hoisting machine of the invention, the bolt is imparted with a hollow structure, and a support shaft and a compression spring are provided in the hollow section, whereby the bolt is formed integrally with the lining. As a result, a gap between the lining and the brake drum can be readily adjusted within a short period of time. By means of screwing action, the lining is actuated consecutively in minute units, thereby enabling highly-accurate adjustment of a gap.

[0023] In relation to the elevator hoisting machine of the invention, an arm for supporting the lining and an armature is further provided with a mechanism for adjusting a gap between the lining and the brake drum when the lining is detached from the drum, and a mechanism for adjusting the parallelism between the armature and the brake coil when the lining is in contact with the brake drum. As a result, adjustment of a gap between the lining and the brake drum and adjustment of the parallelism between the armature and the brake coil can be readily performed within a short period of time without removal of the constituent members.

[0024] In relation to the improved elevator hoisting machine of the invention, a plurality of bolts projecting toward the armature are provided on the arm. Two nuts are screwed onto each bolt so as to clamp the armature from both sides, thereby constituting a gap adjustment

mechanism and a parallelism adjustment mechanism. By means of the mechanism, adjustment of a gap between the lining and the brake drum and adjustment of the parallelism between the armature and the brake coil can be readily performed within a short period of time. Since the armature is consecutively actuated in minute units by means of screwing action, highly-accurate gap adjustment and parallelism adjustment can be achieved.

[0025] In relation to the improved elevator hoisting machine of the invention, a plurality of bolts projecting toward the armature are provided on the arm. A nut is screwed onto one side of each bolt, and a compression spring for loading the armature is provided on the other side of the bolt with the armature interposed between the bolt and the spring, thereby constituting a gap adjustment mechanism and a parallelism adjustment mechanism. By means of the mechanism, adjustment of a gap between the lining and the brake drum and adjustment of the parallelism between the armature and the brake coil can be readily performed within a short period of time. Since the armature is consecutively actuated in minute units by means of screwing action, highly-accurate gap adjustment and parallelism adjustment can be achieved.

[0026] Further, in relation to the elevator hoisting machine of the invention, a coil mount section for supporting brake coils is further provided with a mechanism for adjusting a gap between the lining and the brake drum when the lining is detached from the drum, and a mechanism for adjusting the parallelism between the armature and the brake coil when the lining is in contact with the brake drum. As a result, adjustment of a gap between the lining and the brake drum and adjustment of the parallelism between the armature and the brake coil can be readily performed within a short period of time without removal of the constituent members.

[0027] In relation to the improved elevator hoisting machine of the invention, a plurality of bolts projecting toward the armature are provided on the coil mount section. Two nuts are screwed onto each bolt such that the brake coil is interposed between the nuts, thus constituting a gap adjustment mechanism and a parallelism adjustment mechanism. By means of the mechanism, adjustment of a gap between the lining and the brake drum and adjustment of the parallelism between the armature and the brake coil can be readily performed within a short period of time. Since the armature is consecutively actuated in minute units by means of screwing action, highly-accurate gap adjustment and parallelism adjustment can be achieved.

[0028] In relation to the improved elevator hoisting machine of the invention, a plurality of bolts projecting toward the armature are provided on the coil mount section. A nut is screwed onto one side of each bolt, and a compression spring for loading the brake coil is provided on the other side of the bolt with the brake coil interposed between the bolt and the spring, thereby constituting a gap adjustment mechanism and a parallelism adjustment mechanism. By means of the mechanism, adjustment of a gap between the lining and the brake drum and adjustment of the parallelism between the armature and the brake coil can be readily performed within a short period of time. Since the armature is consecutively actuated in minute units by means of screwing action, highly-accurate gap adjustment and parallelism adjustment can be achieved.

[0029] The invention also relates to an elevator system having the foregoing improved elevator hoisting machine. As a result, a brake section of the elevator hoisting machine in the elevator system can be readily adjusted within a short period of time.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030]

Fig. 1 is a schematic cross-sectional view showing a first preferable elevator hoisting machine according to the invention;

Fig. 2 is a schematic cross-sectional view showing a second preferable elevator hoisting machine according to the invention;

Fig. 3 is a schematic cross-sectional view showing a third preferable elevator hoisting machine according to the invention;

Fig. 4 is a schematic cross-sectional view showing a fourth preferable elevator hoisting machine according to the invention;

Fig. 5 is a schematic cross-sectional view showing a fifth preferable elevator hoisting machine according to the invention; and

Fig. 6 is a schematic cross-sectional view showing a known elevator hoisting machine.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0031] The invention will be described in more detail by reference to the accompanying drawings.

[0032] Fig. 1 is a schematic cross-sectional view showing a first preferable elevator hoisting machine according to the invention.

[0033] As illustrated, a brake drum 1 which rotates around an unillustrated main shaft upon receipt of thrust houses a brake section, which primarily comprises linings 2; brake coils 3; armatures 4; a coil mount section 5; arms 6; compression springs 7; and metal pieces 12.

[0034] The brake coils 3 are fastened to respective sides of the coil mount section 5 by way of the metal pieces 12 and by use of bolts 10.

[0035] Further, the arms 6 are pivotably provided on the respective sides of the coil mount section 5 by use of pins 9. By use of bolts 8, each of the armatures 4 is fastened to a portion of each arm 6 opposing the coil mount section 5 so as to oppose the corresponding

brake coil 3.

[0036] The linings 2 are respectively supported on a portion of each arm 6 opposing the brake drum 1. Specifically, the arm 6 has a female screw section formed so as to penetrate through the arm 6. The lining 2 has a hollow bolt 21 to be fitted to the female screw section. The hollow bolt 21 is fitted to the female screw section of the arm 6. A fixing nut 20 is fastened to a portion of the hollow bolt 21 opposing the armature 4. By means of the effect of the so-called double nuts, the hollow bolt 21 is fixed to the arm 6.

[0037] Each of the linings 2 further has a compression spring 24 and a support shaft 22 having a nut 23. As a result, the hollow bolt 21 is supported by the lining 2. Specifically, the hollow bolt 21 has a hollow section so as to penetrate through the hollow bolt along the center axis thereof. The support shaft 22 is provided in the hollow section. A male screw section is formed on both ends of the support shaft 22. One end 22a of the support shaft 22 is fitted to the female screw section formed in the receiving section 2a of the lining 2. A nut 23 is fitted to the other end of the support shaft 22. The compression spring 24 is supported such that one end of the spring is supported on the nut 23 of the support shaft 22 while the nut 23 is taken as a seat and such that the other end of the spring is supported on the end face of the hollow section of the hollow bolt 21 opposing the armature 4 while the end face is taken as a seat. In this way, the hollow bolt 21 is supported by the lining 2 at all times and at a predetermined pressure by means of the spring force of the compression spring 24.

[0038] One end of the compression spring 7 is supported by the extremity of the arm 6 spaced apart from the pin 9, and the other end of the same is supported at a predetermined position on the coil mount section 5 opposing the extremity.

[0039] Although not illustrated, four bolts 8 and four bolts 10 are provided within a plane for fastening members together.

[0040] In an elevator hoisting machine having the foregoing construction, the linings 2 are brought into and out of contact with the brake drum 1 in association with actuation of the armatures 4 stemming from electromagnetic force of the brake coils 3.

[0041] Although omitted from illustrations, magnets are provided along an outer peripheral section of the brake drum 1. Stators, each of which is wrapped with a coil, are also fixedly disposed with a clearance along an outer periphery of the magnets. As a result, a so-called a dynamo electric motor is constituted. Upon receipt of thrust of the dynamo electric motor, the brake drum 1 rotates around an unillustrated min spindle in either direction. As a result, a towing rope wrapped around the drum main body provided coaxially with the brake drum 1 is driven, whereby the passenger car and the counterweight, both being connected to the towing rope, are caused to ascend and descend.

[0042] Procedures for adjusting the brake section in the elevator hoisting machine of the first embodiment will now be described. First, the parallelism between the armature 4 and the brake coil 3 is adjusted in the same manner as under the known method. More specifically, the parallelism between the armature 4 and the brake coil 3 is checked while the lining 2 is brought into contact with the brake drum 1. In order to adjust the number of metal pieces 12 placed in respective sections in accordance with the degree of the thus-checked parallelism in accordance with the degree of the thus-checked parallelism, the bolts 10 are removed, thereby re-assembling the brake coil 3. As a result, the attitude of the brake coil 3 in relation to the coil mount section 5 is adjusted, whereby the parallelism between the brake coil 3 and the armature 4 is also relatively adjusted so as to fall within a predetermined range.

[0043] Next, the hollow bolt 21 fitted to the female screw section of the arm 6 is rotated while gaps existing between the linings 2 and the brake drum 1 are being checked through use of a feeler gauge or an optical method with the linings 2 being detached from the brake drum 1. In accordance with rotation of the hollow bolt 21, the linings 2 are continuously actuated. When a gap between the linings 2 and the brake drum 1 has fallen within a predetermined range, rotation of the hollow bolt 21 is stopped. The fixing nut 20 is fastened, to thereby fix the position of the hollow bolt 21. In this way, the gap between the linings 2 and the brake drum 1 is adjusted.

[0044] As has been described, according to the elevator hoisting machine of the first embodiment, the arms 6 are formed so as to be able to adjust a gap between the brake drum 1 and the linings 2 when the linings 2 are detached from the brake drum 1. In other words, an operation for adjusting a gap developing between the linings 2 and the brake drum 1 when the linings 2 are detached from the brake drum 1 can be performed with relative ease by means of merely rotating the hollow bolt 21 so as to fasten the fixing nut 20. The hollow bolt 21 is continuously actuated in minute units by means of action of the screw section. Hence, adjustment in a highly-accurate range can be effected.

[0045] In the first embodiment, the hollow bolt 21 is supported on each lining 2 by means of the support shaft 22, the nut 23, and the compression sprint 24. Alternatively, a female section is provided on a receiving table 2a of the lining 2, whereby a bolt, such as the hollow bolt 21, can be supported directly on the lining 2. Even in this case, there is yielded the same advantage as that yielded in the first embodiment.

[0046] Fig. 2 is a schematic cross-sectional view showing an elevator hoisting machine according to a second embodiment of the invention.

[0047] As illustrated, the coil mount section 5 is fixedly provided in the center of the brake drum 1 within the brake drum 1 in the same manner as in the first embodiment. The brake coils 3 are fastened directly to the coil mount section 5 with use of the bolts 10. The arms 6 are pivotably mounted on the coil mount section 5 with use

of the pins 9. The armatures 4 are supported on the portions of the arms 6 opposing the brake coils 3.

[0048] Specifically, a plurality of bolts 27 projecting toward the armatures 4 are provided on the respective arms 6. Aplurality of through holes corresponding to the respective bolts 27 are formed in the respective armatures 4. Although not shown, four bolts 27 are provided within the surfaces of the arms 6 opposing the armatures 4. Corresponding four through holes are formed in the surfaces of the armatures 4 opposing the arms 6. The bolts 27 are fitted into the female screw sections formed in the arms 6, and the fixing nuts 28 are fastened so as to come into contact with the corresponding arms 6. As a result, so-called double nuts are formed, whereby the bolts 27 are fixed to the arms 6. The bolts 27 fixed to the arms 6 penetrate through the through holes of the armatures 4, whereby adjustment nuts 29 and fixing nuts 30 are fitted into both sides of each armature 6. Thus, the armatures 4 are supported on the arms 6 by means of the bolts 27 and the nuts 28, 29, 30.

[0049] The linings 2 are fastened to the portions of the arms 6 opposing the brake drum 1, by means of the bolts 11. The compression springs 7 are supported between the extremities of the arms 6 and the coil mount section 5.

[0050] In the elevator hoisting machine having the foregoing construction, the linings 2 are brought into and out of contact with the brake drum 1 in associationwith actuation of the armatures 4 by means of the electromagnetic force developing in the brake coil 3.

[0051] Procedures for adjusting the brake section in the elevator hoisting machine of the second embodiment will now be described. First, the parallelism between the armatures 4 and the brake coils 3 is checked with the linings 2 remaining in contact with the brake drum 1. In this state, the nuts 29 fitted around the respective bolts 27 and provided on the armatures 4 are independently rotated in accordance with the shapes of the screws. In accordance with the rotation of the nut 29, the attitudes of the surfaces of the armatures 4 opposing the brake coils 3 are changed continuously by means of pressing the armatures 4 against the brake coils 3 at all times. When the parallelism between the armatures 4 and the brake coils 3 has fallen into a range of predetermined value, rotation of the nuts 29 is stopped, whereby the nuts 30 are fastened temporarily. In this way, the armatures 4 are fixed at temporary positions. Thus, the parallelism between the armatures 4 and the brake coils 3 is adjusted.

[0052] The adjustment nuts 29 are turned in a synchronous manner while the gaps between the linings 2 and the brake drum 1 are checked with the linings 2 being detached from the brake drum 1. As a result, the linings 2 are consecutively actuated with respect to the brake drum 1 while the parallelism between the armatures 4 and the brake coils 3 is maintained in accordance with rotation of the adjustment nuts 29. When the gaps between the linings 2 and the brake drum 1 have fallen into the range of a predetermined value, turning of the adjustment nuts 29 is stopped. The positions of the armatures 4 are fixed by means of fastening the fixing nuts 30. The gap between the linings 2 and the brake drum 1 are adjusted.

[0053] As has been described, according to the elevator hoisting machine of the second embodiment, the arms 6 are formed so as to be able to adjust the gaps between the linings 2 and the brake drum 1 when the linings 2 are detached from the brake drum 1 and the parallelism between the armatures 4 and the brake coils 3 when the linings 2 are in contact with the brake drum 1. Specifically, an operation for adjusting the parallelism between the armatures 4 and the brake coils 3 when the linings 2 are in contact with the brake drum 1 and an operation for adjusting a gap between the linings 2 and the brake drum 1 when they are detached from each other can be performed relatively easily by turning only the nuts 29 and 30 fitted to the respective bolts 27. Since the armatures 4 are consecutively actuated in minute units by means of movement of the screw sections, thereby enabling adjustment in a highly-accurate range.

[0054] Fig. 3 is a schematic cross-sectional view showing an elevator hoisting machine according to a third embodiment of the invention.

[0055] The elevator hoisting machine of the third embodiment differs from that of the second embodiment in terms of the structure of a member for supporting the armatures 4 on the arms 6.

[0056] As illustrated, the brake coils 3 are fastened to the coils mount section 5 with the bolts 10 in the same manner as in the second embodiment. Further, the arms 6 are pivotably disposed by use of the pins 9. The armatures 4 are supported on portions of the arms 6 opposing the brake coils 3.

[0057] As in the case of the second embodiment, a plurality of bolts 27 are disposed on the arms 6 so as to project toward the armatures 4. A plurality of through holes corresponding to the plurality of bolts 27 are formed in the armatures 4. Although omitted from the drawings, four bolts 27 are provided on the surfaces of the arms 6 opposing the armatures 4. Further, corresponding four through holes are formed in the surfaces of the armatures 4 opposing the arms 6. The bolts 27 are fitted into the female screw sections formed in the arms 6, and the fixing nuts 28 are fastened so as to come into contact with the arms 6. As a result, so-called double nuts are constituted, and the bolts 27 are fixed to the arms 6. The bolts 27 fixed to the arms 6 penetrate through the through holes of the armatures 4. The adjustment nuts 29 are fitted to the portions of the armatures 4 opposing the brake coils 3. Compression springs 35 are interposed between the armatures 4 and the arms 6. Here, the bolts 27 are inserted into the inner-diameter portions of the compression springs 35. One ends of the compression springs 35 are supported by the nuts 28 remaining in contact with the arms 6, and the other ends of the compression springs 35 are sup-

ported on the ends faces of the armatures 4 located in the vicinity of the through holes. In this way, the armature 4 are supported on the arms 6 by means of the bolts 27, the nuts 28, 29, and the compression springs 35.

[0058] As in the case of the second embodiment, the linings 2 are fastened to the portions of the arms 6 opposing the brake drum 1 with use of the bolts 11. The compression springs 7 are supported between the extremities of the arms 6 and the coil mount section 5.

[0059] In the elevator hoisting machine having the foregoing construction, as in the case of the second embodiment, the linings 2 are brought into and out of contact with the brake drum 1 in association with actuation of the armatures 4 by means of electromagnetic force developing in the brake coil 3.

[0060] Procedures for adjusting a brake section in the elevator hoisting machine of the third embodiment will now be described. First, the parallelism between the armatures 4 and the brake coils 3 is checked with the linings 2 remaining in contact with the brake drum 1. In this state, the nuts 29 fitted around the respective bolts 27 and provided on the brake coils 3 are independently rotated in accordance with the shapes of the screws. At this time, the armatures 4 are pressed against the brake coils 3 at all times under the spring force of the compression springs 35. In accordance with the rotation of the nut 29, the attitudes of the surfaces of the armatures 4 opposing the brake coils 3 are changed continuously. When the parallelism between the armatures 4 and the brake coils 3 has fallen into a range of predetermined value, rotation of the nuts 29 is stopped. In this way, the parallelism between the armatures 4 and the brake coils 3 is adjusted.

[0061] The adjustment nuts 29 are turned in a synchronous manner while the gaps between the linings 2 and the brake drum 1 are checked with the linings 2 being detached from the brake drum 1. At that time, the armatures 4 are pressed against the brake coils 3 at all times by means of the spring force of the compression springs 35. As a result, the linings 2 are consecutively actuated with respect to the brake drum 1 in accordance with rotation of the adjustment nuts 29 while the parallelism between the armatures 4 and the brake coils 3 is maintained. When the gaps between the linings 2 and the brake drum 1 have fallen into the range of a predetermined value, turning of the adjustment nuts 29 is stopped. The gap between the linings 2 and the brake drum 1 are adjusted.

[0062] As has been described, according to the elevator hoisting machine of the third embodiment, the arms 6 are formed so as to be able to adjust the gaps between the linings 2 and the brake drum 1 when the linings 2 are detached from the brake drum 1 and the parallelism between the armatures 4 and the brake coils 3 when the linings 2 are in contact with the brake drum 1. Specifically, an operation for adjusting the parallelism between the armatures 4 and the brake coils 3 when the linings 2 are in contact with the brake drum 1 and an operation for adjusting a gap between the linings 2 and the brake drum 1 when they are detached from each other can be performed relatively easily by turning only the nuts 29 fitted to the respective bolts 27. Since the armatures 4 are consecutively actuated in minute units by means of movement of the screw sections, thereby enabling adjustment in a highly-accurate range.

[0063] Fig. 4 is a schematic cross-sectional view showing an elevator hoisting machine according to a fourth embodiment of the invention.

[0064] As illustrated, as in the case of the respective embodiments, the coil mount section 5 is fixedly disposed in the center of the brake drum 1. The brake coils 3 are supported on the coil mount section 5.

[0065] Specifically, a plurality of bolts 37 projecting toward the brake coils 3 are provided on the coil mount section 5. A plurality of through holes corresponding to the respective bolts 27 are formed in the respective brake coils 3. Although not shown, four bolts 37 are provided within the surfaces of the coil mount section 5 opposing the brake coils 3. Corresponding four through holes are formed in the surfaces of the brake coils 3 opposing the coil mount section 5. The bolts 37 are fitted into the female screw sections formed in the coil mount section 5, and the fixing nuts 38 are fastened so as to come into contact with the coil mount section 5. As a result, so-called double nuts are formed, whereby the bolts 37 are fixed to the coil mount section 5. The bolts 37 fixed to the coil mount section 5 penetrate through the through holes of the brake coils 3, whereby adjustment nuts 39 and fixing nuts 40 are fitted into both sides of the respective brake coils 3. Thus, the brake coils 3 are supported on the coil mount section 5 by means of the bolts 37 and the nuts 38, 39, 40.

[0066] As in the case of the respective embodiments, the arms 6 are provided on the coil mount section 5 in a pivotable manner with use of the pins 9. The armatures 4 are fastened directly to portions of the arms 6 opposing the brake coils 3 with use of the bolts 8.

[0067] The linings 2 are fastened to the portions of the arms 6 opposing the brake drum 1, by means of the bolts 11. The compression springs 7 are supported between the extremities of the arms 6 and the coil mount section 5.

[0068] In the elevator hoisting machine having the foregoing construction, the linings 2 are brought into and out of contact with the brake drum 1 in association with actuation of the armatures 4, as in the case of the previous embodiments, by means of the electromagnetic force developing in the brake coil 3.

[0069] Procedures for adjusting the brake section in the elevator hoisting machine of the fourth embodiment will now be described. First, the parallelism between the armatures 4 and the brake coils 3 is checked with the linings 2 remaining in contact with the brake drum 1. In this state, the nuts 39 fitted around the respective bolts 37 and provided on the armatures 4 are independently rotated in accordance with the shapes of the screws. In

accordance with the rotation of the nuts 39, the attitudes of the surfaces of the brake coils 3 opposing the armatures 4 are changed continuously in accordance with rotation of the nuts 39 by means of pressing the brake coils 3 against the armatures 4 at all times. When the parallelism between the armatures 4 and the brake coils 3 has fallen into a range of predetermined value, rotation of the nuts 39 is stopped, whereby the nuts 40 are fastened temporarily. In this way, the armatures 4 are fixed at temporary positions. Thus, the parallelism between the armatures 4 and the brake coils 3 is adjusted.

[0070] The adjustment nuts 39 are turned in a synchronous manner while the gaps between the linings 2 and the brake drum 1 are checked with the linings 2 being detached from the brake drum 1. As a result, the linings 2 are consecutively actuated with respect to the brake drum 1 while the parallelism between the armatures 4 and the brake coils 3 is maintained in accordance with rotation of the adjustment nuts 29. When the gaps between the linings 2 and the brake drum 1 have fallen into the range of a predetermined value, turning of the adjustment nuts 39 is stopped. The positions of the brake coils 3 are fixed by means of fastening the fixing nuts 40. The gap between the linings 2 and the brake drum 1 is adjusted.

[0071] As has been described, according to the elevator hoisting machine of the fourth embodiment, the coil mount section 5 is formed so as to be able to adjust the gaps between the linings 2 and the brake drum 1 when the linings 2 are detached from the brake drum 1 and the parallelism between the armatures 4 and the brake coils 3 when the linings 2 are in contact with the brake drum 1. Specifically, an operation for adjusting the parallelism between the armatures 4 and the brake coils 3 when the linings 2 are in contact with the brake drum 1 and an operation for adjusting a gap between the linings 2 and the brake drum 1 when they are detached from each other can be performed relatively easily by turning only the nuts 39 and 40 fitted to the respective bolts 37. Since the brake coils 3 are consecutively actuated in minute units by means of movement of the screw sections, thereby enabling adjustment in a highly-accurate range.

[0072] Fig. 5 is a schematic cross-sectional view showing an elevator hoisting machine according to a fifth embodiment of the invention.

[0073] The elevator hoisting machine of the fifth embodiment differs from that of the fourth embodiment in terms of the configuration of the member supporting the brake coils 3 on the coil mount section 5.

[0074] As illustrated, the brake coils 3 are supported on the coil mount section 5.

[0075] Specifically, as in the case of the fourth embodiment, the plurality of bolts 37 projecting toward the brake coils 3 are provided on the coil mount section 5. A plurality of through holes corresponding to the respective bolts 37 are formed in the respective brake coils 3. Although not shown, four bolts 37 are provided within the surfaces of the coil mount section 5 opposing the brake coils 3. Corresponding four through holes are formed in the surfaces of the brake coils 3 opposing the coil mount section 5. The bolts 37 are fitted into the female screw sections formed in the coil mount section 5, and the fixing nuts 38 are fastened so as to come into contact with the coil mount section 5. As a result, so-called double nuts are formed, whereby the bolts 37 are fixed to the coil mount section 5. The bolts 37 fixed to the coil mount section 5 penetrate through the through holes of the brake coils 3, whereby adjustment nuts 39 are fitted to the portions of the brake coils 3 opposing the armatures 4. The compression springs 42 are interposed between the brake coils 3 and the coil mount section 5. Here, the bolts 37 are fitted into the internal diameter sections of the compression springs 42. The compression springs 43 supported by the nuts 38 remaining in contact with the coil mount section 5 through the bolts 37. The compression springs 44 are supported on the end faces of the brake coils 3 located in the vicinity of the through holes. In this way, the brake coils 3 are supported on the coil mount section 5 by means of the bolts 37 and the nuts 38, 39, and the compression springs 42.

[0076] As in the case of the fourth embodiment, the arms 6 are provided on the coil mount section 5 in a pivotable manner with use of the pins 9. The armatures 4 are fastened directly to portions of the arms 6 opposing the brake coils 3 with use of the bolts 8.

[0077] As in the case of the fourth embodiment, the linings 2 are fastened to the portions of the arms 6 opposing the brake drum 1, by means of the bolts 11. The compression springs 7 are supported between the extremities of the arms 6 and the coil mount section 5.

[0078] In the elevator hoisting machine having the foregoing construction, the linings 2 are brought into and out of contact with the brake drum 1 in associationwith actuation of the armatures 4, as in the case of the previous embodiments, by means of the electromagnetic force developing in the brake coil 3.

[0079] Procedures for adjusting the brake section in the elevator hoisting machine of the fifth embodiment will now be described. First, the parallelism between the armatures 4 and the brake coils 3 is checked with the linings 2 remaining in contact with the brake drum 1. In this state, the nuts 39 fitted around the respective bolts 37 and provided on the armatures 4 are independently rotated in accordance with the shapes of the screws. At this time, the brake coils 3 are pressed against the armatures 4 at all times under the spring force of the compression springs 42. In accordance with the rotation of the nuts 39, the attitudes of the surfaces of the brake coils 3 opposing the armatures 4 are changed continuously in accordance with rotation of the nuts 39. When the parallelism between the armatures 4 and the brake coils 3 has fallen into a range of predetermined value, rotation of the nuts 39 is stopped. In this way, the parallelism between the armatures 4 and the brake coils 3 is

adjusted.

[0080] The adjustment nuts 39 are turned in a synchronous manner while the gaps between the linings 2 and the brake drum 1 are checked with the linings 2 being detached from the brake drum 1. At this time, the brake coils 3 are pressed against the armatures 4 at all times by means of the spring force of the compression springs 42. As a result, the linings 2 are consecutively actuated with respect to the brake drum 1 while the parallelism between the armatures 4 and the brake coils 3 is maintained in accordance with rotation of the adjustment nuts 39. When the gaps between the linings 2 and the brake drum 1 have fallen into the range of a predetermined value, turning of the adjustment nuts 39 is stopped. The gap between the linings 2 and the brake drum 1 is adjusted.

[0081] As has been described, according to the elevator hoisting machine of the fifth embodiment, the coil mount section 5 is formed so as to be able to adjust the gaps between the linings 2 and the brake drum 1 when the linings 2 are detached from the brake drum 1 and the parallelism between the armatures 4 and the brake coils 3 when the linings 2 are in contact with the brake drum 1, as in the case of the fourth embodiment. Specifically, an operation for adjusting the parallelism between the armatures 4 and the brake coils 3 when the linings 2 are in contact with the brake drum 1 and an operation for adjusting a gap between the linings 2 and the brake drum 1 when they are detached from each other can be performed relatively easily by turning only the nuts 39 fitted to the respective bolts 37. Since the brake coils 3 are consecutively actuated in minute units by means of movement of the screw sections, thereby enabling adjustment in a highly-accurate range.

[0082] In the respective embodiments, the invention is applied to a so-called internal-expanding brake, in which a brake section is housed in a brake drum, thereby bringing the linings against an interior wall of the brake drum. The invention can also be applied to an external expanding brake in which linings are brought into contact with an exterior wall of a brake drum. Similarly, the invention can also be applied to a disk brake in which linings are brought into contact with side walls of a brake drum. Even in these cases, there are yielded the same effects as those yielded in the previous embodiments.

[0083] The invention is not limited to the embodiments set forth. Evidently, the embodiments set forth are susceptible to modifications, as required, within the scope of the invention in a manner other that those described in connection with the embodiments. The number, positions, and shapes of the constituent members are not limited to those set in the embodiments. Any number, positions, and shapes suitable for implementing the invention may be adopted. Throughout the drawings, like constituent elements are assigned like reference numerals.

INDUSTRIAL APPLICABILITY

[0084] As has been described, in an elevator hoisting machine of the invention, arms for supporting linings are provided with a mechanism for adjusting gaps between a brake drum and linings, the linings being provided so as to be removable from the brake drum, when the linings are detached from the brake drum. As a result, the gap between the linings and the brake drum can be adjusted without removal of constituent members and within a short period of time. Therefore, the elevator hoisting machine is utilized as an elevator hoisting machine having superior workability and suitable for mass production.

[0085] In relation to the improved elevator hoisting machine of the invention, a female screw section is formed in an arm so as to penetrate through the arm. A bolt formed integrally with the lining is fitted into the female screw section, thereby constituting a gap adjustment mechanism. As a result, a gap between the lining and the brake drum can be adjusted readily within a short period of time. The lining is actuated consecutively in minute units by means of screwing action, thereby enabling highly-accurate adjustment of a gap. Therefore, the elevator hoisting machine is utilized as an elevator hoisting machine having superior workability and suitable for mass production.

[0086] In relation to the improved elevator hoisting machine of the invention, the bolt is imparted with a hollow structure, and a support shaft and a compression spring are provided in the hollow section, whereby the bolt is formed integrally with the lining. As a result, a gap between the lining and the brake drum can be readily adjusted within a short period of time. By means of screwing action, the lining is actuated consecutively in minute units, thereby enabling highly-accurate adjustment of a gap. Therefore, the elevator hoisting machine is utilized as an elevator hoisting machine having superior workability and suitable for mass production.

[0087] In relation to the elevator hoisting machine of the invention, an arm for supporting the lining and an armature is further provided with a mechanism for adjusting a gap between the lining and the brake drum when the lining is detached from the drum, and a mechanism for adjusting the parallelism between the armature and the brake coil when the lining is in contact with the brake drum. As a result, adjustment of a gap between the lining and the brake drum and adjustment of the parallelism between the armature and the brake coil can be readily performed within a short period of time without removal of the constituent members. Therefore, the elevator hoisting machine is utilized as an elevator hoisting machine having superior workability and suitable for mass production.

[0088] In relation to the improved elevator hoisting machine of the invention, a plurality of bolts projecting toward the armature are provided on the arm. Two nuts are screwed onto each bolt so as to clamp the armature

from both sides, thereby constituting a gap adjustment mechanism and a parallelism adjustment mechanism. By means of the mechanism, adjustment of a gap between the lining and the brake drum and adjustment of the parallelism between the armature and the brake coil can be readily performed within a short period of time. Since the armature is consecutively actuated in minute units by means of screwing action, highly-accurate gap adjustment and parallelism adjustment can be achieved. Therefore, the elevator hoisting machine is utilized as an elevator hoisting machine having superior workability and suitable for mass production.

[0089] In relation to the improved elevator hoisting machine of the invention, a plurality of bolts projecting toward the armature are provided on the arm. A nut is screwed onto one side of each bolt, and a compression spring for loading the armature is provided on the other side of the bolt with the armature interposed between the bolt and the spring, thereby constituting a gap adjustment mechanism and a parallelism adjustment mechanism. By means of the mechanism, adjustment of a gap between the lining and the brake drum and adjustment of the parallelism between the armature and the brake coil can be readily performed within a short period of time. Since the armature is consecutively actuated in minute units by means of screwing action, highly-accurate gap adjustment and parallelism adjustment can be achieved. Therefore, the elevator hoisting machine is utilized as an elevator hoisting machine having superior workability and suitable for mass production.

[0090] Further, in relation to the elevator hoisting machine of the invention, a coil mount section for supporting brake coils is further provided with a mechanism for adjusting a gap between the lining and the brake drum when the lining is detached from the drum, and a mechanism for adjusting the parallelism between the armature and the brake coil when the lining is in contact with the brake drum. As a result, adjustment of a gap between the lining and the brake drum and adjustment of the parallelism between the armature and the brake coil can be readily performed within a short period of time without removal of the constituent members. Therefore, the elevator hoisting machine is utilized as an elevator hoisting machine having superior workability and suitable for mass production.

[0091] In relation to the improved elevator hoisting machine of the invention, a plurality of bolts projecting toward the armature are provided on the coil mount section. Two nuts are screwed onto each bolt such that the brake coil is interposed between the nuts, thus constituting a gap adjustment mechanism and a parallelism adjustment mechanism. By means of the mechanism, adjustment of a gap between the lining and the brake drum and adjustment of the parallelism between the armature and the brake coil can be readily performed within a short period of time. Since the armature is consecutively actuated in minute units by means of screwing action, highly-accurate gap adjustment and parallelism adjustment can be achieved. Therefore, the elevator hoisting machine is utilized as an elevator hoisting machine having superior workability and suitable for mass production.

[0092] In relation to the improved elevator hoisting machine of the invention, a plurality of bolts pro jecting toward the armature are provided on the coil mount section. A nut is screwed onto one side of each bolt, and a compression spring for loading the brake coil is provided on the other side of the bolt with the brake coil interposed between the bolt and the spring, thereby constituting a gap adjustment mechanism and a parallelism adjustment mechanism. By means of the mechanism, adjustment of a gap between the lining and the brake drum and adjustment of the parallelism between the armature and the brake coil can be readily performed within a short period of time. Since the armature is consecutively actuated in minute units by means of screwing action, highly-accurate gap adjustment and parallelism adjustment can be achieved. Therefore, the elevator hoisting machine is utilized as an elevator hoisting machine having superior workability and suitable for mass production.

[0093] The invention also relates to an elevator system having the foregoing improved elevator hoisting machine. As a result, a brake section of the elevator hoisting machine in the elevator system can be readily adjusted within a short period of time. Therefore, the elevator hoisting machine is utilized as an elevator system having superior workability and suitable for mass production.

Claims

1. An elevator hoisting machine comprising:

a brake drum which rotates around a main shaft upon receipt of thrust;
a lining which brake rotation of the brake drum by coming into contact with the brake drum;
a brake coil which is wound with coils and produce electromagnetic force when energized;
a coil mount section for supporting the brake coil;
an armature which is actuated by means of the electromagnetic force developing in the brake coil; and
an arm which support the lining and the armature and which is supported by the coil mount section in a pivotable manner and bring the linings into and out of contact with the brake drum in association with actuation of the armature by means of the electromagnetic force, wherein
the arm is formed so as to be able to adjust a gap existing between the brake drum and the lining when the lining is detached from the

brake drum.

2. The elevator hoisting machine according to claim 1, wherein the lining comes into contact with an interior wall of the brake drum.

3. The elevator hoisting machine according to claim 1, wherein the arm has female screw section formed in the arm so as to penetrate through the arm;

the lining has bolt fitted into the female screw section of the arm; and

the bolt is caused to penetrate through the female screw section of the arm, to thereby fit a fixing nut to the bolt at a portion of the arm opposing the armature, thereby supporting the lining on the arm in an adjustable manner.

4. The elevator hoisting machine according to claim 3, wherein the bolt has a hollow section passing through the bolt along the center axis;

the lining further has a compression spring having predetermined spring force, and a support shaft which is supported at one end by the lining and has a seat section at the other end for supporting one end of the compression spring; and

the bolt is supported by the lining by means of causing the support shaft to penetrate through the hollow section of the bolt and a surrounding portion of the hollow section opposing the armatures to support the other ends of the compression springs.

5. An elevator hoisting machine comprising:

a brake drum which rotates around a main shaft upon receipt of thrust;
a lining which brake rotation of the brake drum by coming into contact with the brake drum;
a brake coil which is wound with coils and produce electromagnetic force when energized;
a coil mount section for supporting the brake coil;
an armature which is actuated by means of the electromagnetic force developing in the brake coil; and
an arm which support the lining and the armature and which is supported by the coil mount section in a pivotable manner and bring the lining into and out of contact with the brake drum in association with actuation of the armature by means of the electromagnetic force, wherein
the arm is formed so as to be able to adjust a gap existing between the brake drum and the lining when the lining is detached from the brake drum and parallelism between surface of the armature and surface of the brake coil, both surfaces opposing each other, when the lining is in contact with the brake drum.

6. The elevator hoisting machine according to claim 5, wherein the lining comes into contact with an interior wall of the brake drum.

7. The elevator hoisting machine according to claim 5, wherein

the arm has a plurality of bolts projecting toward the armature;

the armature has a plurality of through holes corresponding to the bolts; and

the bolts of the arm are caused to penetrate through the through holes of the armature, and nuts are fitted to both sides of the armature, to thereby support the armature on the arm in an adjustable manner.

8. The elevator hoisting machine according to claim 5, wherein

the arm has a plurality of bolts projecting toward the armature;

the armature has a plurality of through holes corresponding to the bolts; and

the bolts of the arm are caused to penetrate through the through holes of the armature, and the armature is supported by the arm in an adjustable manner by means of compression springs which are at one end supported by the armature and at the other end by the arm and nuts fitted to portions of the armature opposing the brake coil.

9. An elevator hoisting machine comprising:

a brake drum which rotates around a main shaft upon receipt of thrust;
a lining which brake rotation of the brake drum by coming into contact with the brake drum;
a brake coil which is wound with coils and produce electromagnetic force when energized;
a coil mount section for supporting the brake coil;
an armature which is actuated by means of the electromagnetic force developing in the brake coil; and
an arm which support the lining and the armature and which is supported by the coil mount section in a pivotable manner and bring the lining into and out of contact with the brake drum in association with actuation of the armature by means of the electromagnetic force, wherein
the coil mount section is formed so as to be able to adjust a gap existing between the brake drum and the lining when the lining is detached from the brake drum and parallelism between surface of the armature and surface of the brake coil, both surfaces opposing each other, when the lining is in contact with the brake drum.

10. The elevator hoisting machine according to claim 9,

wherein the linings come into contact with an interior wall of the brake drum.

11. The elevator hoisting machine according to claim 9, wherein

the coil mount section has a plurality of bolts projecting toward the brake coil;

the brake coil has a plurality of through holes corresponding to the bolts; and

the bolts of the coil mount section are caused to penetrate through the through holes of the brake coils, and nuts are fitted to both sides of the brake coil, to thereby support the brake coil on the coil mount section in an adjustable manner.

12. The elevator hoisting machine according to claim 9, wherein

the coil mount section has a plurality of bolts projecting toward the brake coil;

the brake coil has a plurality of through holes corresponding to the bolts; and

the bolts of the coil mount section are caused to penetrate through the through holes of the brake coils, and the brake coil is supported by the coil mount section in an adjustable manner by means of compression springs which are at one end supported by the brake coil and at the other end by the coil mount section andnuts fitted to portions of the brake coil opposing the armature.

13. An elevator system having the elevator hoisting machine defined in any one of claims 1 through 12.

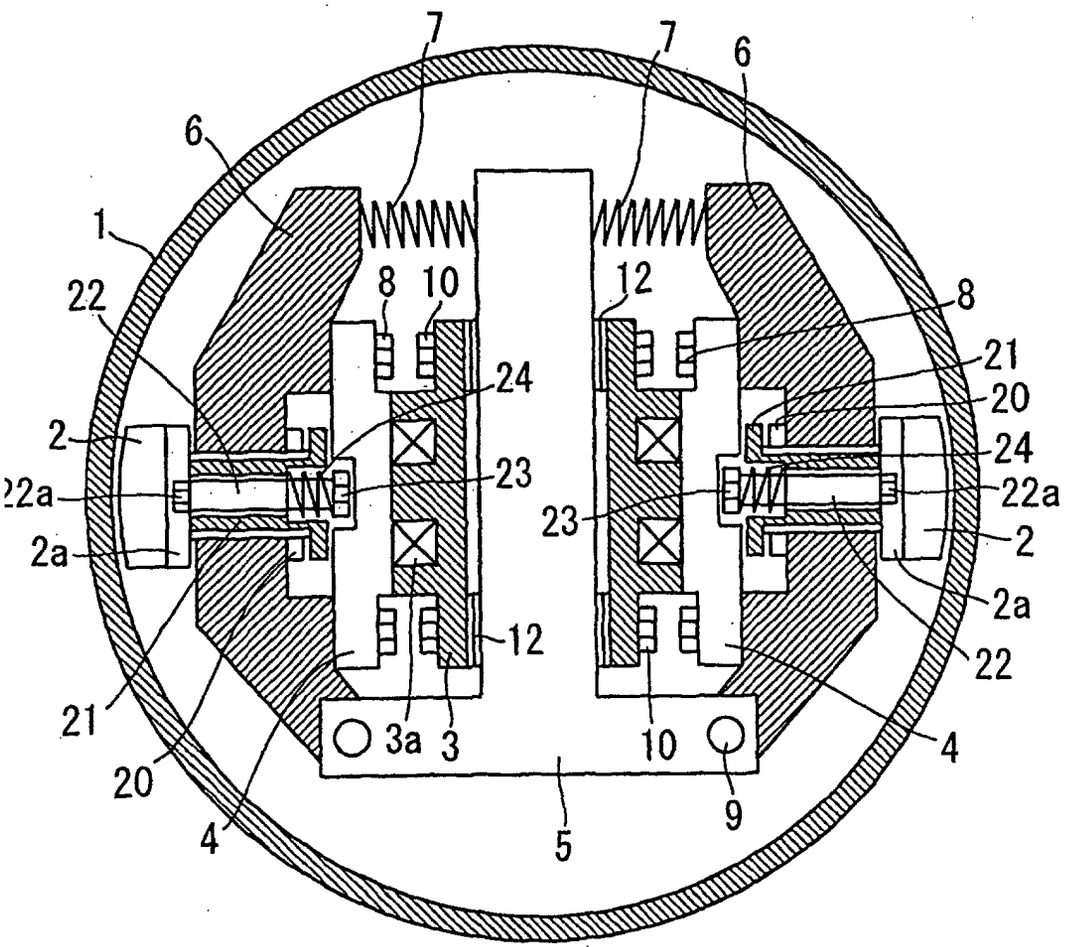
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Fig. 1

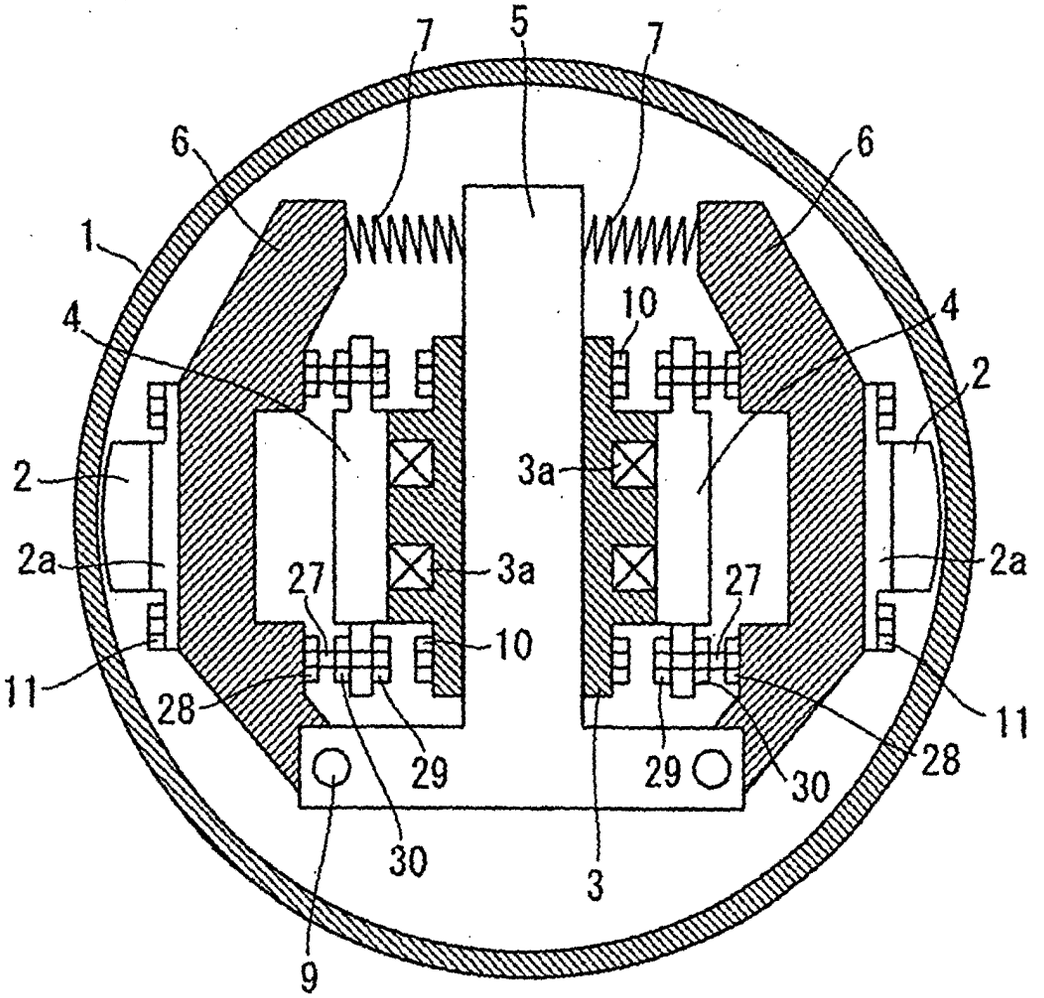

Fig. 2

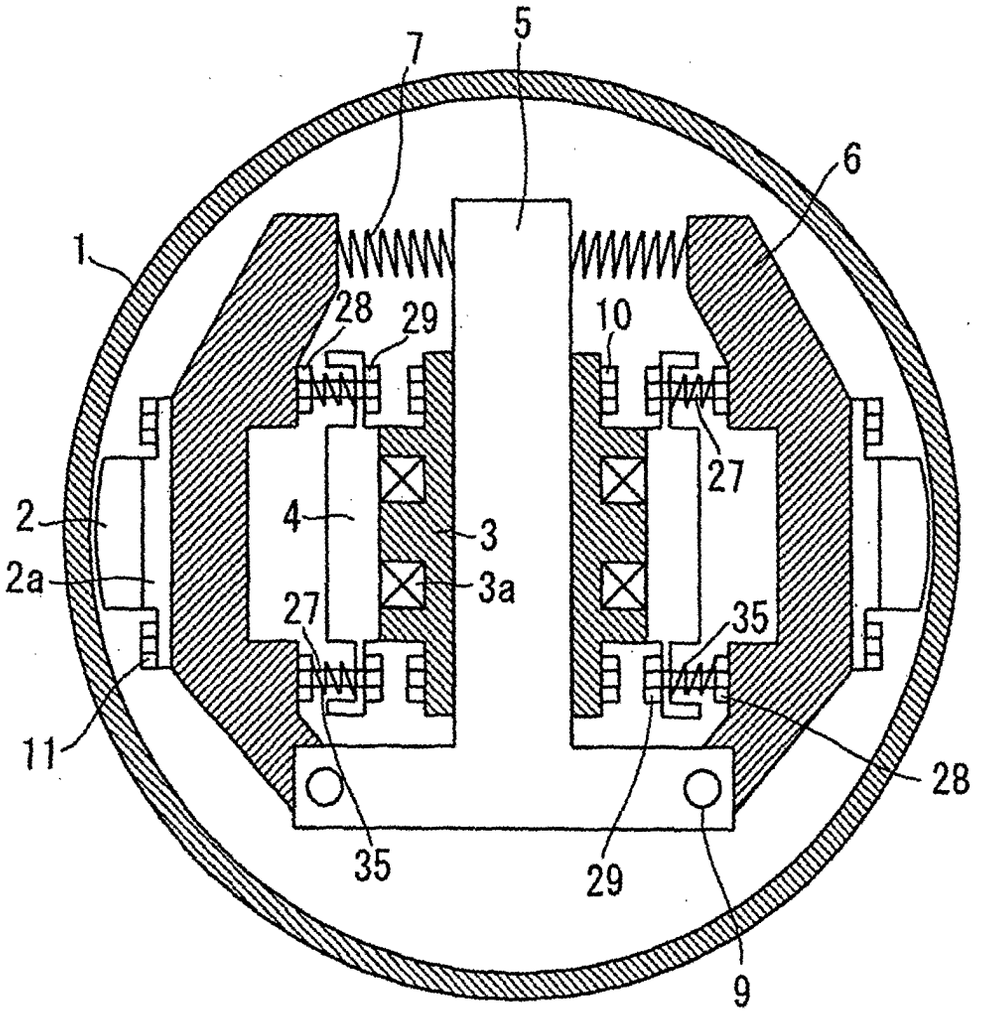

Fig. 3

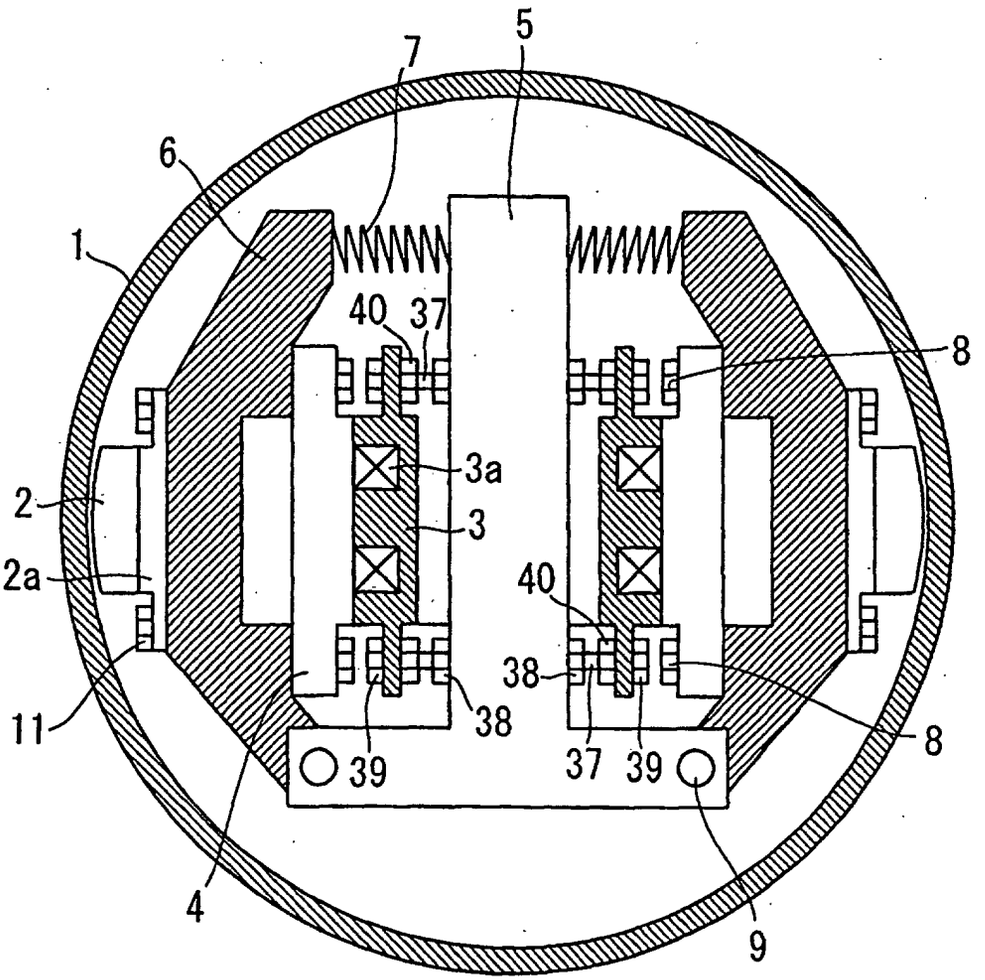

Fig. 4

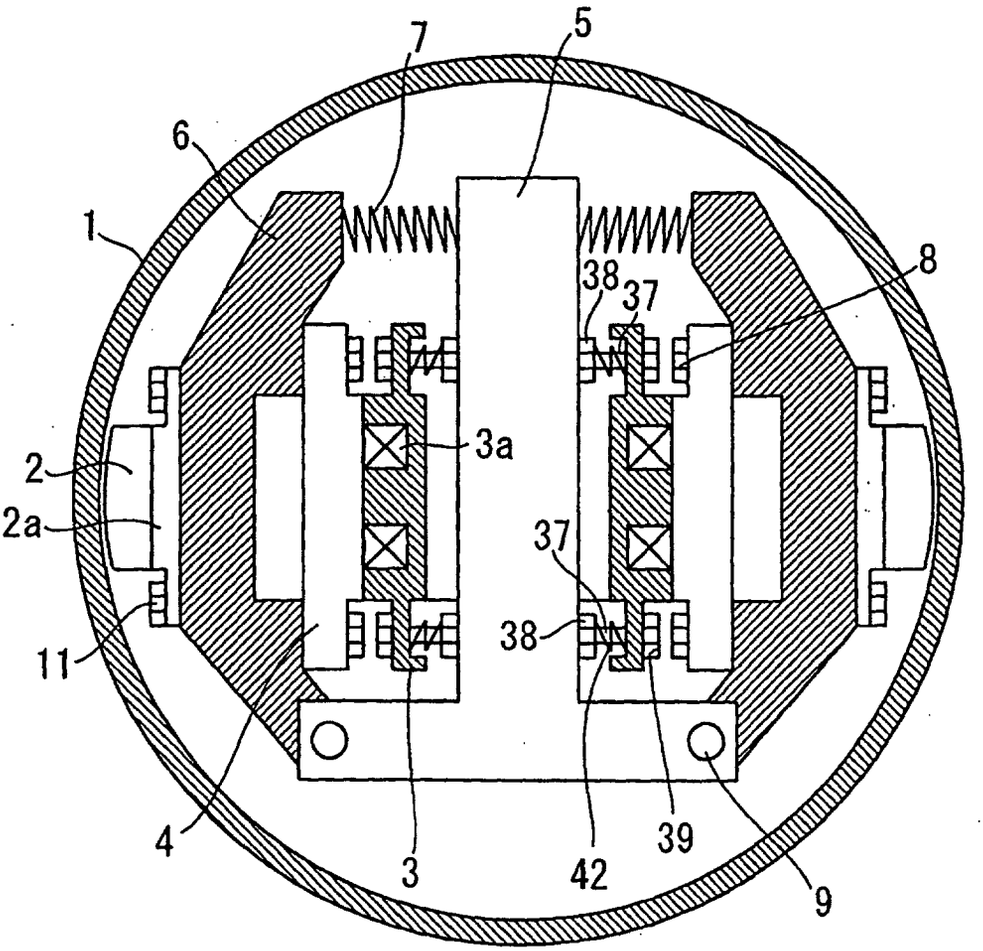

Fig. 5

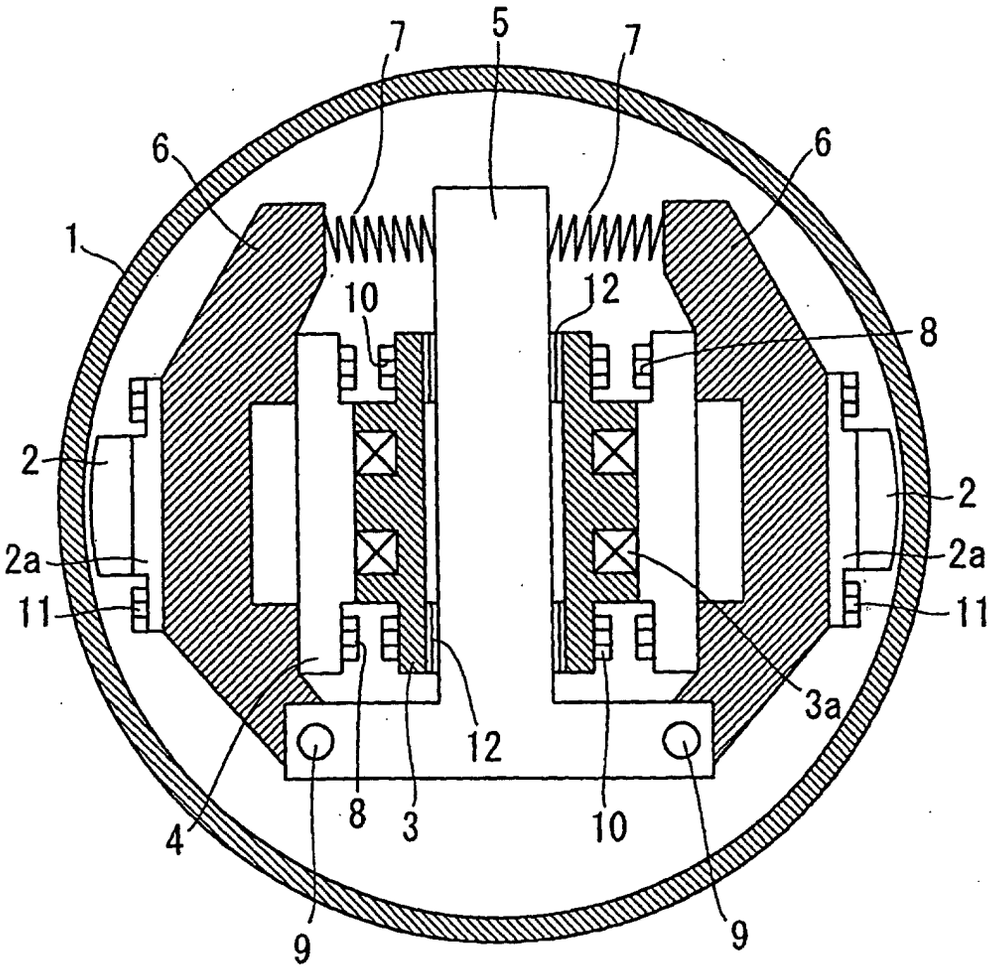

Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP01/05632

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, F16D49/00-71/04

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	1996-2002
Kokai Jitsuyo Shinan Koho	1971-2002	Toroku Jitsuyo Shinan Koho	1994-2002

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, 2001-72358, A (Teijin Seiki Co., Ltd.), 21 March, 2001 (21.03.01), & CN 1279209 A & EP 1074506 A2 & EP 1146005 A2	1-13
Y	JP, 47-2330, B1 (Otis Elevator Co.), 22 January, 1972 (22.01.72), (Family: none)	1-13
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility model Application No. 25615/1987 (Laid-open No. 133650/1988) (Toshiba Corp.), 01 September, 1988 (01.09.88), (Family: none)	1-13
A	JP, 10-203761, A (Mitsubishi Electric Corp.), 04 August, 1998 (04.08.98), (Family: none)	1-13

☐ 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
"B" earlier document but published on or after the international filing date
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"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 12 March, 2002 (12.03.02)	Date of mailing of the international search report 02 April, 2002 (02.04.02)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1998)