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(54) **HOIST OF ELEVATOR**

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Description

Technical Field

[0001] The present invention relates to a hoisting machine for an elevator which is installed within a hoistway.

Background Art

[0002] Conventionally, there has been proposed a hoisting machine having a structure in which in order to reduce a thickness dimension of the hoisting machine, a rotary portion rotated by a motor is integrated with a drive sheave. The rotary portion is disposed inside the motor. A main rope is looped around the drive sheave. The motor and the drive sheave are disposed side by side in a thickness direction of the hoisting machine to prevent the motor and the main rope from interfering with each other (see Patent Document 1).

[0003] Further, patent document 2 discloses a hoist apparatus comprising a shaft, a support member for supporting the shaft, a sheave detachably and rotatably mounted on the shaft, the sheave having walls including one disc side wall defining an inner space with a side opening opposite the side wall, a motor stator mounted to the support member via a support structure which extends into the inner space of the sheave through the side opening and carries the motor stator inside the sheave, a motor rotor core disposed with the inner space in an electromagnetically inductive relationship with the motor stator, and means for detachably mounting the motor rotor core to the disc side wall of the sheave and inside the sheave spaced by an air gap from the motor stator.

Patent Document 1: JP 2000-289954 A
Patent Document 2: US 5,018,603

Disclosure of the Invention

Problem to be solved by the Invention

[0004] In the conventional hoisting machine constructed as described above, however, the motor and the drive sheave are disposed side by side in the thickness direction of the hoisting machine, so the thickness dimension of the hoisting machine cannot be reduced.

[0005] The present invention has been made to solve the problem discussed above, and it is therefore an object of the present invention to obtain a hoisting machine for an elevator, which allows a reduction in thickness dimension.

Means for solving the Problems

[0006] A hoisting machine for an elevator according to the present invention includes the features of claim 1 and in particular: a rotary body having an annular sheave portion provided radially outward of the frame portion so that the annular sheave portion surrounds the frame portion and having a main rope looped around an outer peripheral portion of the annular sheave portion, an annular rotor portion provided radially inward of the frame portion, and a gap bridge portion for fixing the sheave portion and the rotor portion to each other while bypassing the frame portion, the rotary body being supported by the frame portion and being rotatable about a central axis of the frame portion; and a motor disposed radially inward of the sheave portion, for rotating the rotary body with respect to the frame portion.

Brief Description of the Drawings

[0007]

Fig. 1 is a front view showing a hoisting machine for an elevator according to Embodiment 1 of the present invention.
Fig. 2 is a cross-sectional view taken along the line II-II of Fig. 1.
Fig. 3 is a cross-sectional view taken along the line III-III of Fig. 2.
Fig. 4 is a rear view showing the hoisting machine for the elevator of Fig. 1.
Fig. 5 is a cross-sectional view showing the hoisting machine for the elevator at a time when a braking operation of an electromagnetic braking device of Fig. 2 is cancelled.

Best Mode for carrying out the Invention

[0008] A preferred embodiment of the present invention will be described hereinafter with reference to the drawings.

Embodiment 1

[0009] Fig. 1 is a front view showing a hoistingmachine for an elevator according to Embodiment 1 of the present invention. Fig. 2 is a cross-sectional view taken along the line II-II of Fig. 1. Fig. 3 is a cross-sectional view taken along the line III-III of Fig. 2. Further, Fig. 4 is a rear view showing the hoisting machine for the elevator of Fig. 1. The hoisting machine shown in the figures is a low-profile hoisting machine having an axial dimension that is smaller than a radial dimension. Referring to the figures a horizontally extending fixed beam 1 is provided within a hoistway. A support body 2 provided with a circular opening portion 4 is fixed to the fixed beam 1 by using a plurality of bolts 3.

[0010] The support body 2 has an annular support fixation portion 5 surrounding the opening portion 4, an annular frame portion 6 provided radially outward of the support fixation portion 5 so as to surround the support fixation portion 5, and a plate-shaped support plate portion 7 which is provided between the support fixation portion 5 and the frame portion 6, serves to fix the frame

portion 6 to the support fixation portion 5. The support fixation portion 5 is fixed to the fixed beam 1 by using the respective bolts 3.

[0011] The support fixation portion 5 and the frame portion 6 have a common central axis (hereinafter, referred to as "central axis of the frame portion"). The support body 2 is provided with a support body groove portion 8, which is formed of the support fixation portion 5, the frame portion 6, and the support plate portion 7. The support body groove portion 8 extends along a circumferential direction of the support fixation portion 5 and the frame portion 6.

[0012] A rotary body 9, which can rotate about the central axis of the frame portion with respect to the support body 2, is supported by the support body 2. In other words, the rotary body 9 is rotatably supported by the support body 2 coaxially with the support body 2. The rotary body 9 has an annular sheave portion 10 provided radially outward of the frame portion 6 so as to surround the frame portion 6, an annular rotor portion 11 provided radially inward of the frame portion 6 and radially outward of the support fixation portion 5 (i.e. , between the frame portion 6 and the support fixation portion 5), and a rotary plate portion 12. The rotary plate portion 12, which is provided between the sheave portion 10 and the rotor portion 11 while bypassing the frame portion 6, serves as a gap bridge portion for fixing the rotor portion 11 to the sheave portion 10.

[0013] The rotary body 9 is provided with a rotary body groove portion 13, which is formed of the sheave portion 10, the rotor portion 11, and the rotary plate portion 12. The rotary body groove portion 13 extends along a circumferential direction of the sheave portion 10 and the rotor portion 11. A direction in which the rotary body groove portion 13 is opened is opposed to a direction in which the support body groove portion 8 is opened.

[0014] The rotor portion 11 is inserted in the support body groove portion 8, and the frame portion 6 is inserted in the rotary body groove portion 13. In other words, a part of the rotor portion 11, a part of the frame portion 6, and a part of the sheave portion 10 are disposed side by side in a radial direction of the frame portion 6.

[0015] Annular bearings 14 and 15, which extend in the circumferential direction of the sheave portion 10 and the frame portion 6, are disposed between the sheave portion 10 and the frame portion 6. The bearings 14 and 15 are disposed apart from each other in a direction along the central axis of the frame portion. The rotary body 9 is rotatably supported by the frame portion 6 via the bearings 14 and 15. A bearing holding member 60 for preventing one of the bearings 15 from falling is fixed to the sheave portion 10 by means of a bolt 61. A lubricant 16 for lubricating the bearings 14 and 15 is supplied to a space between the bearings 14 and 15. In addition, annular oil seals 17 and 18 for preventing the lubricant 16 from leaking out are provided outside the bearings 14 and 15 so as to sandwich the bearings 14 and 15.

[0016] A plurality of rope grooves 19 extending in the circumferential direction of the sheave portion 10 are provided in an outer peripheral portion of the sheave portion 10. Main ropes (not shown) for suspending a car (not shown) and a counterweight (not shown) within the hoistway are looped around the rope grooves 19, respectively. The car and the counterweight are raised/lowered within the hoistway through rotation of the rotary body 9.

[0017] An annular motor 20 for rotating the rotary body 9 with respect to the support body 2 is provided between the frame portion 6 and the rotor portion 11. The motor 20 has a plurality of permanent magnets 21 for the motor provided in the rotor portion 11 along the circumferential direction of the frame portion 6 and a stator coil 22 provided in the frame portion 6 and opposed to the permanent magnets 21 for the motor.

[0018] The stator coil 22 generates a rotating magnetic field through energization. The permanent magnets 21 for the motor are rotated integrally with the rotary body 9 through energization of the stator coil 22. The stator coil 22 is fixed to the support body 2 by using a plurality of bolts 23.

[0019] An electromagnetic braking device 24 for braking rotation of the rotary body 9 with respect to the support body 2 is supported by the support body 2. The electromagnetic braking device 24 has a pair of movable plates 25 and 26, which are opposed to each other so as to sandwich the rotary body 9, capable of being displaced with respect to the support body 2 in a direction along the central axis of the frame portion, brake linings 27 and 28, which are provided on the movable plates 25 and 26, respectively, and come into contact with and are spaced apart from the rotary body 9 through displacement of the movable plates 25 and 26 with respect to the support body 2, respectively, and an electromagnetic drive body 29 which is provided in the opening portion 4, moving the movable plates 25 and 26 in such directions that the brake linings 27 and 28 come into contact with and are spaced apart from the rotary body 9, respectively.

[0020] The movable plates 25 and 26 are circular plates that are disposed perpendicularly to the direction along the central axis of the frame portion. The movable plates 25 and 26 are substantially equal in outer diameter to the rotary body 9.

[0021] A plurality of first guide pins 30, which are fixed to the support fixation portion 5, slidably pass through one of the movable plates 25. The first guide pins 30 extend in the direction along the central axis of the frame portion. Displacement of one of the movable plates 25 with respect to the support body 2 is guided by the first guide pins 30.

[0022] A plurality of second guide pins 31, which are fixed to the support plate portion 7, slidably pass through the other movable plate 26. The second guide pins 31 extend in the direction along the central axis of the frame portion. Displacement of the other movable plate 26 with respect to the support body 2 is guided by the respective second guide pins 31. The other movable plate 26 is provided with a plurality of through-holes 32 through which

portions of the support fixation portion 5 which are fixed to the fixed beam 1 are passed.

[0023] The brake lining 27 is provided on an outer peripheral portion of the one of the movable plates 25. The brake lining 28 is provided on an outer peripheral portion of the other movable plate 26. The brake linings 27 and 28 are annular members with a high coefficient of friction, which extend in circumferential directions of the movable plates 25 and 26, respectively. The brake linings 27 and 28 move onto and away from the sheave portion 10 through displacement of the pair of movable plates 25 and 26 with respect to the support body 2, respectively. Portions of the sheave portion 10 with and from which the brake linings 27 and 28 come into contact and spaced apart are provided, respectively, with braking surfaces extending in the circumferential direction of the sheave portion 10. Rotation of the rotary body 9 is braked by contact of the brake linings 27 and 28 with the braking surfaces.

[0024] A cylindrical slide member 33 is provided between an inner peripheral surface of the support fixation portion 5 and the electromagnetic drive body 29. The slide member 33 is slidable with respect to the support fixation portion 5 in the direction along the central axis of the frame portion. The electromagnetic drive body 29 is supported by the support fixation portion 5 via the slide member 33. The electromagnetic drive body 29 is disposed between the movable plates 25 and 26.

[0025] The electromagnetic drive body 29 has a first displacement portion 34 displaced integrally with the one of the movable plates 25, and a second displacement portion 35 displaced integrally with the other movable plate 26. The first displacement portion 34 and the second displacement portion 35 are provided side by side as to the direction along the central axis of the frame portion. Displacement of the first displacement portion 34 and the second displacement portion 35 with respect to the support body 2 is guided by the support fixation portion 5.

[0026] The first displacement portion 34 is slidable with respect to the slide member 33. The first displacement portion 34 has an adjustment member 36 provided with the one of the movable plates 25 and a permanent magnet 37 for a brake provided on the portion of the adjustment member 36 located on the other movable plate 26 side.

[0027] The adjustment member 36 has a magnet mounting plate 38 to be slid in contact with the slide member 33, and a screw rod portion 39 protruding from the magnet mounting plate 38 in the direction along the central axis of the frame portion. The permanent magnet 37 for the brake is fixed to the magnet mounting plate 38. The one of the movable plates 25 is provided with a screw hole 40 in which the screw rod portion 39 is screwed. A position of the first displacement portion 34 with respect to the one of the movable plates 25 can be adjusted according to the amount by which the screw rod portion 39 is screwed in the screw hole 40. A check nut 41, for preventing the screw rod portion 39 from being displaced with respect to the one of the movable plates 25, is screwed on the screw rod portion 39. An engagement portion 39a, with which a tool such as a spanner or the like for turning the screw rod portion 39 can be engaged, is provided at a tip of the screw rod portion 39.

[0028] The second displacement portion 35 can be displaced together with the slide member 33 with respect to the support fixation portion 5. The second displacement portion 35 has an electromagnet 43 fixed to the other movable plate 26 by means of a plurality of bolts 42. The electromagnet 43 has a core portion 44 made of a magnetic body such as iron or the like, and an electromagnetic coil portion 45 surrounding the core portion 44. The core portion 44 is opposed to the permanent magnet 37 for the brake.

[0029] The permanent magnet 37 for the brake generates a magnetic force for attracting the core portion 44. The electromagnet 43 generates an electromagnetic force for repelling the magnetic force of the permanent magnet 37 for the brake through energization of the electromagnetic coil portion 45.

[0030] That is, the first displacement portion 34 and the second displacement portion 35 are repelled by each other and displaced away from each other through energization of the electromagnetic coil portion 45, and are attracted to each other and displaced toward each other through stoppage of energization of the electromagnetic coil portion 45. Displacement of each of the first displacement portion 34 and the second displacement portion 35 is guided by the support fixation portion 5.

[0031] A displacement restraining device 46 for restraining the respective movable plates 25 and 26 from being displaced away from the rotary body 9 is supported by the support body 2. The displacement restraining device 46 has a first restraint portion 47 for restraining the movable plate 25 from being displaced away from the support body 2, and a second restraint portion 48 for restraining the respective movable plates 25 and 26 from being displaced away from each other. The support body 2 is provided with the first restraint portion 47. The second restraint portion 48 is provided between the movable plates 25 and 26.

[0032] The first restraint portion 47 has a plurality of fixed rods 49 fixed to the support fixation portion 5, and slidably passed through the one of the movable plates 25, and abutment nuts 50 which are screwed on the fixed rods 49, respectively, and serve as check portions for restraining displacement of the movable plate 25 through abutment on the movable plate 25. The respective fixed rods 49 extend in the direction along the central axis of the frame portion. Check nuts 51 for preventing the abutment nuts 50 from being displaced with respect to the fixed rods 49 are screwed on the fixed rods 49, respectively. The amount of displacement of the movable plate 25 with respect to the support body 2 can be adjusted through adjustment of the amount by which the abutment nuts 50 are screwed on the fixed rods 49, respectively.

[0033] The second restraint portion 48 has a plurality of through-bolts 52 fixed to the other movable plate 26, and slidably passed through the support plate portion 7 and the one of the movable plates 25, and abutment nuts 53 which are screwed on tips of the through-bolts 52, respectively, and prevent an increase in the distance between the respective movable plates 25 and 26 through abutment on the movable plate 25. The respective through-bolts 52 extend in the direction along the central axis of the frame portion. Checknuts 54, for preventing the abutment nuts 53 frombeing displaced with respect to the through-bolts 52, are screwed on the tips of the through-bolts 52, respectively. The amount of displacement of the movable plate 26 with respect to the movable plate 25 can be adjusted through adjustment of the amount by which the abutment nuts 53 are screwed on the through bolts 52, respectively.

[0034] Fig. 5 is a cross-sectional view showing the hoisting machine for the elevator at the time when the braking operation of the electromagnetic braking device 24 of Fig. 2 has been cancelled. Referring to the figure, the brake linings 27 and 28 are separated from the braking surfaces of the sheave portion 10, respectively, when the braking operation of the electromagnetic braking device 24 has been cancelled. The first displacement portion 34 and the second displacement portion 35 are urged away from each other through energization of the electromagnetic coil portion 45. In addition, the movable plate 25 abuts on both the abutment nuts 50 and 53.

[0035] In this example, the amount by which the abutment nuts 50 are screwed on the fixed rods 49, and the amount by which the abutment nuts 50 are screwed on the through-bolts 52 are adjusted such that the distance between the brake lining 27 and the sheave portion 10 and the distance between the brake lining 28 and the sheave portion 10 become equal to each other when the movable plate 25 abuts on both the abutment nuts 50 and 53.

[0036] Next, an operation will be described. When the motor 20 is energized, the rotary body 9 is rotated around the central axis of the frame portion with respect to the support body 2. Thus, the respective main ropes are moved, so the car and the counterweight are raised/lowered within the hoistway.

[0037] During stoppage of energization of the electromagnetic coil portion 45, the first displacement portion 34 and the second displacement portion 35 are attracted to each other owing to a magnetic force of the permanent magnet 37 for the brake. Thus, the first displacement portion 34 and the second displacement portion 35 are displaced toward each other. At this moment, the first displacement portion 34 is allowed to slide on an inner peripheral surface of the slide member 33, and the second displacement portion 35 is allowed to slide together with the slide member 33 on an inner peripheral surface of the support fixation portion 5.

[0038] Thus, the respective movable plates 25 and 26 are displaced toward each other. At this moment, the one of the movable plates 25 is displaced along the respective first guide pins 30, the respective fixed rods 49, and the respective through-bolts 52, and the other movable plate 26 is displaced together with the respective through-bolts 52 along the respective second guide pins 31. Thus, the brake linings 27 and 28 come into contact with the braking surfaces of the sheave portion 10, so rotation of the rotary body 9 is braked.

[0039] When the electromagnetic coil portion 45 is energized, the electromagnet 43 generates an electromagnetic force for repelling the magnetic force of the permanent magnet 37 for the brake. Thus, the first displacement portion 34 and the second displacement portion 35 are displaced away from each other. At this moment as well, the first displacement portion 34 is allowed to slide on the inner peripheral surface of the slide member 33, and the second displacement portion 35 is allowed to slide together with the slide member 33 on the inner peripheral surface of the support fixation portion 5.

[0040] Thus, the one of the movable plates 25 and the other movable plate 26 are displaced away from each other. At this moment, the one of the movable plates 25 is displaced along the respective first guide pins 30, the respective fixed rods 49, and the respective through-bolts 52. The other movable plate 26 is displaced together with the through-bolts 52 along the second guide pins 31. Thus, the brake linings 27 and 28 are separated from the sheave portion 10, so the braking force applied to the rotary body 9 is eliminated.

[0041] After that, the one of the movable plates 25 is brought into abutment on the abutment nuts 50, and the abutment nuts 53 are brought into abutment on the one of the movable plates 25. Thus, the distance between the brake lining 27 and the sheave portion 10 and the distance between the brake lining 28 and the sheave portion 10 become equal to each other, so the respective movable plates 25 and 26 are held through continuation of energization of the electromagnetic coil portion 45.

[0042] The amounts of displacement of the respective movable plates 25 and 26 are adjusted through adjustment of the amount by which the abutment nuts 50 are screwed on the fixed rods 49 and the amount by which the abutment nuts 53 are screwed on the through-bolts 52, respectively. The braking force applied to the rotary body 9 is adjusted through adjustment of the amount by which the screw rod portion 39 is screwed in the screw hole 40.

[0043] In the hoisting machine for the elevator constructed as described above, the sheave portion 10 of the rotary body 9 is provided radially outward of the annular frame portion 6 so as to surround the frame portion 6. The rotor portion 11 is provided radially inward of the frame portion 6, and the motor 20 is provided between the frame portion 6 and the rotor portion 11. Therefore, the sheave portion 10, the rotor portion 11, the frame portion 6, and the motor 20 can be disposed radially side by side. As a result, the thickness dimension of the hoisting machine corresponding to the dimension in the direc-

tion along the central axis of the frame portion 6 can be reduced.

[0044] Since the motor 20 is provided between the frame portion 6 and the rotor portion 11, the space between the frame portion 6 and the rotor portion 11 can be effectively utilized as a space for installing the motor 20.

[0045] The motor 20 has the permanent magnet 21 for the motor provided on the rotor portion 11 along the circumferential direction of the frame portion 6, and the stator coil 22 provided in the frame portion 6 and opposed to the permanent magnet 21 for the motor. Therefore, the stator coil 22 requiring energization is not rotated through rotation of the rotary body 9. As a result, the reliability of the motor 20 can be prevented from deteriorating.

[0046] The pair of themovable plates 25 and 26, which are opposed to each other so as to sandwich the rotary body 9, are provided with the brake linings 27 and 28 that can come into contact with and spaced apart from the rotary body 9. The electromagnetic drive body 29 for displacing the movable plates 25 and 26 is provided in the opening portion 4 of the support body 2. Therefore, the brake linings 27 and 28 can be brought into contact with the outer peripheral portion of the rotary body 9, so the braking torque applied to the rotary body 9 can be increased. Accordingly, the driving force of the electromagnetic drive body 29 for displacing the movable plates 25 and 26 can be reduced, and the electromagnetic drive body 29 can be reduced in size. Thus, the entire hoisting machine can be reduced in size.

[0047] The electromagnetic drive body 29 has the first displacement portion 34 including the permanent magnet 37 for the brake, and the second displacement portion 35 including the electromagnet 43. Therefore, the second displacement portion 35 can be made to repel the permanent magnet 37 for the brake through energization of the electromagnet 43, and the first displacement portion 34 and the second displacement portion 35 can be attracted to each other by a magnetic force of the permanent magnet 37 for the brake through stoppage of energization of the electromagnet 43. Thus, the parts such as the urging spring for urging the first displacement portion 34 and the second displacement portion 35 away from each other can be eliminated, so the electromagnetic drive body 29 can further be reduced in size.

[0048] The first displacement portion 34 has the adjustment member 36 interposed between the permanent magnet 37 for the brake and the movable plate 25, and the adjustment member 36 can be adjusted in position with respect to the movable plate 25. Therefore, even in the case where, for example, the brake linings 27 and 28 have abraded, the permanent magnet 37 for the brake can be adjusted in position with respect to the movable plate 25, so the magnitude of the magnetic force received by the electromagnet 43 from the permanent magnet 37 for the brake. Thus, the braking force applied to the rotary body 9 can be adjusted.

[0049] Displacement of the first displacement portion 34 and the second displacement portion 35 is guided by the support fixation portion 5, so the respective movable plates 25 and 26 can be displaced more reliably.

[0050] The displacement restraining device 46 for restraining the respective movable plates 25 and 26 from being displaced away from the rotary body 9 is supported by the support body 2, so the amounts of displacement of the respective movable plates 25 and 26 can be restrained. As a result, the thickness dimension of the hoisting machine can be prevented from being increased, and the operation of displacing the respective movable plates 25 and 26 can also be performed more reliably.

[0051] The displacement restraining device 46 has the first restraint portion 47 for restraining the movable plate 25 from being displaced away from the support body 2, and the second restraint portion 48 for restraining the respective movable plates 25 and 26 from being displaced away from each other. Therefore, the amounts of displacement of the movable plates 25 and 26 can be restrained with a simple construction.

[0052] In the foregoing example, the motor 20 is provided between the frame portion 6 and the rotor portion 11, and the bearings 14 and 15 are provided between the frame portion 6 and the sheave portion 10. However, it is also appropriate that the bearings 14 and 15 be provided between the frame portion 6 and the rotor portion 11, and that the motor 20 be provided between the frame portion 6 and the sheave portion 10. In this manner as well, the sheave portion 10, the rotor portion 11, the frame portion 6, and the motor 20 can be disposed radially side by side, so the thickness dimension of the hoisting machine can be reduced. In this case, the permanent magnets 21 for the motor are provided on the inner peripheral surface of the sheave portion 10, and the stator coil 22 is provided on the outer peripheral surface of the frame portion 6.

[0053] In the foregoing example, the first displacement portion 34 is displaced integrally with the one of the movable plates 25, and the second displacement portion 35 is displaced integrally with the other movable plate 26. However, it is also appropriate that the first displacement portion 34 and the second displacement portion 35 be replaced with each other, namely, the first displacement portion 34 be displaced integrally with the other movable plate 26 and the second displacement portion 35 be displaced integrally with the one of the movable plates 25. In this manner as well, the movable plates 25 and 26 can be displaced by the electromagnetic drive body 29. In this case, the first displacement portion 34 can be adjusted in position with respect to the other movable plate 26 by the adjustment member 36.

[0054] In the foregoing example, the support fixation portion 5 assumes an annular shape. However, the support fixation portion 5 may assume any shape as long as the support fixation portion 5 can guide the first displacement portion 34 and the second displacement portion 35. For instance, the support fixation portion 5 may assume

a rectangular shape or the like. The support fixation portion 5 may be designed as a pair of rails that are opposed to each other.

[0055] In the foregoing example, the first restraint portion 47 for restraining the movable plate 25 from being displaced away from the support body 2 is supported on the support body 2, and the second restraint portion 48 for restraining the respective movable plates 25 and 26 from being displaced away from each other is provided between the movable plates 25 and 26. However, it is also appropriate that a second restraint portion for exclusively restraining the movable plate 26 from being displaced away from the support body 2 be provided on the support body 2. In other words, it is also appropriate that the first restraint portion exclusively restrain the movable plate 25 from being displaced away from the support body 2, and that the second restraint portion exclusively restrain the movable plate 26 from being displaced away from the support body 2.

[0056] In the foregoing example, the brake linings 27 and 28 assume an annular shape. However, each of the brake linings 27 and 28 may be designed as a plurality of brake lining strips that are disposed apart from one another in the circumferential direction of the movable plates 25 and 26, respectively.

Claims

1. A hoisting machine for an elevator, comprising:

a support body (2) having an annular frame portion (6); a rotary body (9) having an annular sheave portion (10) provided radially outward of the frame portion (6) so that the annular sheave portion (10) surrounds the frame portion (6) and having a main rope looped around an outer peripheral portion of the annular sheave portion (10), an annular rotor portion (11) provided radially inward of the frame portion (6), and a gap bridge portion (12) for fixing the sheave portion (10) and the rotor portion (11) to each other while bypassing the frame portion (6), the rotary body (11) being supported by the frame portion (6) and being rotatable about a central axis of the frame portion (6); and

a motor (20) disposed radially inward of the sheave portion (10), for rotating the rotary body (9) with respect to the frame portion (6),

characterized by further comprising an electromagnetic braking device (24) having: a pair of movable plates (25, 26) displaceable with respect to the support body (2) in a direction along the central axis of the frame portion (6) and opposed to each other so that the pair of movable plates (25, 26) sandwich the rotary body (9); brake linings (27; 28) provided on the respective movable plates (25, 26) to come into contact with and be spaced apart from the rotary body (9) through displacement of the movable plates (25, 26) with respect to the support body (2); and an electromagnetic drive body (29) provided radially inward of the rotor portion (11) to displace the movable plates (25, 26) in a direction in which the brake linings (27; 28) come into contact with and are spaced apart from the rotary body (9).

2. The hoisting machine for the elevator according to Claim 1, **characterized in that** the motor (20) is provided either between the frame portion (6) and the sheave portion (10) or between the frame portion (6) and the rotor portion (11).

3. The hoisting machine for the elevator according to Claim 2, **characterized in that** the motor (20) has a permanent magnet (21) for a motor which is provided on the rotary body (9) along a circumferential direction of the frame portion (6), and a stator coil (22) provided on the frame portion (6) and opposed to the permanent magnet (21) for the motor.

4. The hoisting machine for the elevator according one of to Claims 1 to 3, **characterized in that**:

the electromagnetic drive body (29) has a first displacement portion (34) which includes a permanent magnet (37) for a brake, and which is displaced integrally with one of the pair of the movable plates (25, 26), and a second displacement portion (35) which includes an electromagnet (43) opposed to the permanent magnet (37) for the brake, and which is displaced integrally with another of the movable plates (25,26);

the first displacement portion (34) and the second displacement portion (35) are displaced away from each other by being repelled by each other through energization of the electromagnet (43), and are displaced toward each other by being attracted to each other through stoppage of energization of the electromagnet (43); and

the pair of the movable plates (25, 26) are displaced in a direction in which the brake linings (27; 28) are spaced apart from the rotary body (9) as a result of displacement of the first displacement portion (34) and the second displacement portion (35) in a direction in which the first displacement portion (34) and the second displacement portion (35) are spaced apart from each other, and are displaced in a direction in which the brake linings (27; 28) come into contact with the rotary body (9) as a result of displacement of the first displacement portion (34) and the second displacement portion (35) in a direction in which the first displacement portion (34) and the second displacement portion (35)

move toward each other.

5. The hoisting machine for the elevator according to Claim 4, **characterized in that**:

the first displacement portion (34) further comprises an adjustment member (36) interposed between the permanent magnet (37) for the brake and the movable plate (25),
the adjustment member (36) is provided on the movable plate (25) such that a position of the adjustment member (36) with respect to the movable plate (25) can be adjusted in the direction along the central axis of the frame portion (6); and
a distance between the permanent magnet (37) for the brake and the movable plate (25) can be adjusted through positional adjustment of the adjustment member (36) with respect to the movable plate (25).

6. The hoisting machine for the elevator according to Claim 4 or 5, **characterized in that** the support body (2) further comprises a support fixation portion (5) for guiding the first displacement portion (34) and the second displacement portion (35) in the direction along the central axis of the frame portion (6).

7. The hoisting machine for the elevator according to any one of Claims 1 to 6, **characterized in that** the support body (2) supports a displacement restraining device (46) for restraining the pair of the movable plates (25, 26) from being displaced away from the rotary body (9).

8. The hoisting machine for the elevator according to Claim 7, **characterized in that** the displacement restraining device (46) has a first restraint portion (47) provided on the support body (2), for restraining the one of the pair of the movable plates (25,26) from being displaced away from the support body (2), and a second restraint portion (48) provided between the pair of the movable plates (25,26), for restraining the respective movable plates (25,26) from being displaced away from each other.

Patentansprüche

1. Fördereinrichtung für einen Fahrstuhl mit:

einem Stützkörper (2), der einen ringförmigen Rahmenabschnitt (6) aufweist;
einem Drehkörper (9) mit einem ringförmigen Rollenabschnitt (10), der radial außerhalb des Rahmenabschnitts (6) so vorgesehen ist, dass der ringförmige Rollenabschnitt (10) den Rahmenabschnitt (6) umgibt und ein Hauptseil aufweist, welches um einen äußeren Umfangsabschnitt des ringförmigen Rollenabschnitts (10) geschlungen ist, einem ringförmigen Rotorabschnitt (11), der radial innerhalb des Rahmenabschnitts (6) vorgesehen ist, und einem Spaltverbindungsabschnitt (12) zum Befestigen des Rollenabschnitts (10) und des Rotorabschnitts (11) aneinander, während der Rahmenabschnitt (6) umgangen wird, wobei der Drehkörper (11) durch den Rahmenabschnitt (6) gestützt ist und um eine Mittelachse des Rahmenabschnitts (6) drehbar ist; und
einem Motor (20), der radial innerhalb des Rollenabschnitts (10) angeordnet ist, zum Drehen des Drehkörpers (9) in Bezug auf den Rahmenabschnitt (6),
dadurch gekennzeichnet, dass die Vorrichtung ferner eine elektromagnetische Bremseinrichtung (24) aufweist mit: einem bewegbaren Plattenpaar (25, 26), welches in Bezug auf den Stützkörper (2) in eine Richtung entlang der Mittelachse des Rahmenabschnitts (6) verschiebbar ist und einander so gegenüberliegt, dass das bewegbare Plattenpaar (25, 26) den Drehkörper (9) dazwischen einschließt; Bremsbelägen (27, 28), die an den entsprechenden bewegbaren Platten (25, 26) vorgesehen sind, um in Kontakt mit dem Drehkörper (9) durch Verschiebung der bewegbaren Platten (25, 26) in Bezug auf den Stützkörper (2) zu kommen und von diesem beabstandet zu werden; und einem elektromagnetischen Antriebskörper (29), der radial innerhalb des Rotorabschnitts (11) vorgesehen ist, um die bewegbaren Platten (25, 26) in eine Richtung zu verschieben, in welche die Bremsbeläge (27, 28) in Kontakt mit dem Drehkörper (9) kommen und zu diesem beabstandet werden.

2. Fördereinrichtung für den Fahrstuhl nach Anspruch 1, **dadurch gekennzeichnet, dass** der Motor (20) entweder zwischen dem Rahmenabschnitt (6) und dem Rollenabschnitt (10) oder zwischen dem Rahmenabschnitt (6) und dem Rotorabschnitt (11) vorgesehen ist.

3. Fördereinrichtung für den Fahrstuhl nach Anspruch 2, **dadurch gekennzeichnet, dass** der Motor (20) einen Permanentmagneten (21) für einen Motor, der an dem Drehkörper (9) entlang einer Umfangsrichtung des Rahmenabschnitts (6) vorgesehen ist, und eine Statorspule (22) aufweist, die an dem Rahmenabschnitt (6) und gegenüberliegend zu dem Permanentmagneten (21) für den Motor vorgesehen ist.

4. Fördereinrichtung für den Fahrstuhl nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** der elektromagnetische Antriebskörper (29) einen ersten Verschiebungsabschnitt (34), der einen Per-

manentmagneten (37) für eine Bremse aufweist, und der ganzheitlich mit einer des bewegbaren Plattenpaars (25, 26) verschiebbar ist, und einen zweiten Verschiebungsabschnitt (35) aufweist, der einen Elektromagneten (43) gegenüberliegend zu dem Permanentmagneten (37) für die Bremse aufweist, und der ganzheitlich mit einer anderen der bewegbaren Platten (25, 26) verschiebbar ist;
wobei der erste Verschiebungsabschnitt (34) und der zweite Verschiebungsabschnitt (35) durch Abstoßen voneinander durch Speisung des Elektromagnets (43) voneinander verschoben werden, und durch Anziehung zueinander durch Beenden der Speisung des Elektromagnets (43) zueinander verschoben werden; und
das bewegbare Plattenpaar (25, 26) in eine Richtung verschoben wird, in welche die Bremsbeläge (27, 28) von dem Drehkörper (9) als Ergebnis der Verschiebung des ersten Verschiebungsabschnitts (34) und des zweiten Verschiebungsabschnitts (35) in eine Richtung, in welche der erste Verschiebungsabschnitt (34) und der zweite Verschiebungsabschnitt (35) voneinander beabstandet werden, beabstandet werden, und in eine Richtung verschoben wird, in welche die Bremsbeläge (27, 28) in Kontakt mit dem Drehkörper (9) als Ergebnis der Verschiebung des ersten Verschiebungsabschnitts (34) und des zweiten Verschiebungsabschnitts (35) in eine Richtung, in welche der erste Verschiebungsabschnitt (34) und der zweite Verschiebungsabschnitt (35) sich aufeinander zu bewegen, kommen.

5. Fördereinrichtung für den Fahrstuhl nach Anspruch 4, **dadurch gekennzeichnet, dass**:

der erste Verschiebungsabschnitt (34) ferner ein Anpassungselement (36) aufweist, welches zwischen den Permanentmagneten (37) für die Bremse und der bewegbaren Platte (25) angeordnet ist, wobei
das Anpassungselement (36) an der bewegbaren Platte (25) so vorgesehen ist, das eine Position des Anpassungselements (36) in Bezug auf die bewegbare Platte (25) in die Richtung entlang der Mittelachse des Rahmenabschnitts (6) angepasst werden kann; und
ein Abstand zwischen dem Permanentmagneten (37) für die Bremse und der bewegbaren Platte (25) durch Positionsanpassung des Anpassungselements (36) in Bezug auf die bewegbare Platte (25) angepasst werden kann.

6. Fördereinrichtung für den Fahrstuhl nach Anspruch 4 oder 5, **dadurch gekennzeichnet, dass** der Stützkörper (2) ferner ein Stützbefestigungsabschnitt (5) zum Führen des ersten Verschiebungsabschnitts (34) und des zweiten Verschiebungsabschnitts (35) in die Richtung entlang der Mittelachse des Rahmenabschnitts (6) aufweist.

7. Fördereinrichtung für den Fahrstuhl nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** der Stützkörper (2) eine Verschiebungsrückhalteeinrichtung (46) zum Rückhalten des bewegbaren Plattenpaars (25, 26) weg von dem Drehkörper (9) verschoben zu werden stützt.

8. Fördereinrichtung für den Fahrstuhl nach Anspruch 7, **dadurch gekennzeichnet, dass** die Verschiebungsrückhalteeinrichtung (46) einen ersten Rückhalteabschnitt (47), der an dem Stützkörper (2) vorgesehen ist, zum Rückhalten der einen des bewegbaren Plattenpaars (25, 26) weg von dem Stützkörper (2) verschoben zu werden, und einen zweiten Rückhalteabschnitt (48), der zwischen dem bewegbaren Plattenpaar (25, 26) vorgesehen ist, zum Rückhalten der entsprechenden bewegbaren Platten (25, 26) voneinander verschoben zu werden aufweist.

Revendications

1. Machine de levage pour un ascenseur, comprenant :

un corps de support (2) ayant une partie de châssis annulaire (6) ; un corps rotatif (9) ayant une partie de poulie annulaire (10) prévue radialement vers l'extérieur de la partie de châssis (6) de sorte que la partie de poulie annulaire (10) entoure la partie de châssis (6) et ayant un câble principal formant une boucle autour d'une partie périphérique extérieure de la partie de poulie annulaire (10), une partie de rotor annulaire (11) prévue radialement vers l'intérieur de la partie de châssis (6), et une partie de comblement d'écart (12) destinée à fixer la partie de poulie (10) et la partie de rotor (11) l'une à l'autre tout en contournant la partie de châssis (6), le corps rotatif (11) étant supporté par la partie de châssis (6) et pouvant tourner autour d'un axe central de la partie de châssis (6) ; et
un moteur (20) disposé radialement vers l'intérieur de la partie de poulie (10), pour faire tourner le corps rotatif (9) par rapport à la partie de châssis (6),
caractérisé en ce qu'elle comprend en outre un dispositif de freinage électromagnétique (24) ayant : une paire de plaques mobiles (25, 26) pouvant se déplacer par rapport au corps de support (2) dans une direction le long de l'axe central de la partie de châssis (6) et faisant face l'une à l'autre de sorte que la paire de plaques mobiles (25, 26) prennent en tenaille le corps rotatif (9) ; des garnitures de frein (27, 28) prévues sur les plaques mobiles respectives (25,

26) pour entrer en contact avec et être espacées du corps rotatif (9) par un déplacement des plaques mobiles (25, 26) par rapport au corps de support (2) ; et un corps d'entraînement électromagnétique (29) prévu radialement vers l'intérieur de la partie de rotor (11) pour déplacer les plaques mobiles (25, 26) dans une direction dans laquelle les garnitures de frein (27, 28) entrent en contact avec et sont espacées du corps rotatif (9).

2. Machine de levage pour l'ascenseur selon la revendication 1, **caractérisée en ce que** le moteur (20) est prévu soit entre la partie de châssis (6) et la partie de poulie (10) soit entre la partie de châssis (6) et la partie de rotor (11).

3. Machine de levage pour l'ascenseur selon la revendication 2, **caractérisée en ce que** le moteur (20) a un aimant permanent (21) pour un moteur qui est prévu sur le corps rotatif (9) le long d'une direction circonférentielle de la partie de châssis (6), et une bobine de stator (22) prévue sur la partie de châssis (6) et faisant face à l'aimant permanent (21) pour le moteur.

4. Machine de levage pour l'ascenseur selon l'une des revendications 1 à 3, **caractérisée en ce que** :

le corps d'entraînement électromagnétique (29) a une première partie de déplacement (34) qui comporte un aimant permanent (37) pour un frein, et qui est déplacée d'un seul tenant avec l'une de la paire des plaques mobiles (25, 26), et une deuxième partie de déplacement (35) qui comporte un électro-aimant (43) faisant face à l'aimant permanent (37) pour le frein, et qui est déplacée d'un seul tenant avec l'autre des plaques mobiles (25, 26) ;
la première partie de déplacement (34) et la deuxième partie de déplacement (35) sont écartées l'une de l'autre en étant repoussées l'une de l'autre par une excitation de l'électro-aimant (43), et sont déplacées l'une vers l'autre en étant attirées l'une vers l'autre par l'arrêt d'une excitation de l'électro-aimant (43) ; et
la paire des plaques mobiles (25, 26) sont déplacées dans une direction dans laquelle les garnitures de frein (27, 28) sont espacées du corps rotatif (9) à la suite d'un déplacement de la première partie de déplacement (34) et de la deuxième partie de déplacement (35) dans une direction dans laquelle la première partie de déplacement (34) et la deuxième partie de déplacement (35) sont espacées l'une de l'autre, et sont déplacées dans une direction dans laquelle les garnitures de frein (27, 28) entrent en contact avec le corps rotatif (9) à la suite d'un déplacement de la première partie de déplacement (34) et de la deuxième partie de déplacement (35) dans une direction dans laquelle la première partie de déplacement (34) et la deuxième partie de déplacement (35) se déplacent l'une vers l'autre.

5. Machine de levage pour l'ascenseur selon la revendication 4, **caractérisée en ce que** :

la première partie de déplacement (34) comprend en outre un élément de réglage (36) interposé entre l'aimant permanent (37) pour le frein et la plaque mobile (25),
l'élément de réglage (36) est prévu sur la plaque mobile (25) de sorte qu'une position de l'élément de réglage (36) par rapport à la plaque mobile (25) puisse être réglée dans la direction le long de l'axe central de la partie de châssis (6) ; et
une distance entre l'aimant permanent (37) pour le frein et la plaque mobile (25) peut être réglée par un réglage de position de l'élément de réglage (36) par rapport à la plaque mobile (25).

6. Machine de levage pour l'ascenseur selon la revendication 4 ou 5, **caractérisée en ce que** le corps de support (2) comprend en outre une partie de fixation de support (5) destinée à guider la première partie de déplacement (34) et la deuxième partie de déplacement (35) dans la direction le long de l'axe central de la partie de châssis (6).

7. Machine de levage pour l'ascenseur selon l'une quelconque des revendications 1 à 6, **caractérisée en ce que** le corps de support (2) supporte un dispositif de limitation de déplacement (46) destiné à empêcher la paire des plaques mobiles (25, 26) d'être écartée du corps rotatif (9).

8. Machine de levage pour l'ascenseur selon la revendication 7, **caractérisée en ce que** le dispositif de limitation de déplacement (46) a une première partie de limitation (47) prévue sur le corps de support (2), pour empêcher l'une de la paire des plaques mobiles (25, 26) d'être écartée du corps de support (2), et une deuxième partie de limitation (48) prévue entre la paire des plaques mobiles (25, 26), pour empêcher les plaques mobiles respectives (25, 26) d'être écartées l'une de l'autre.

FIG. 1

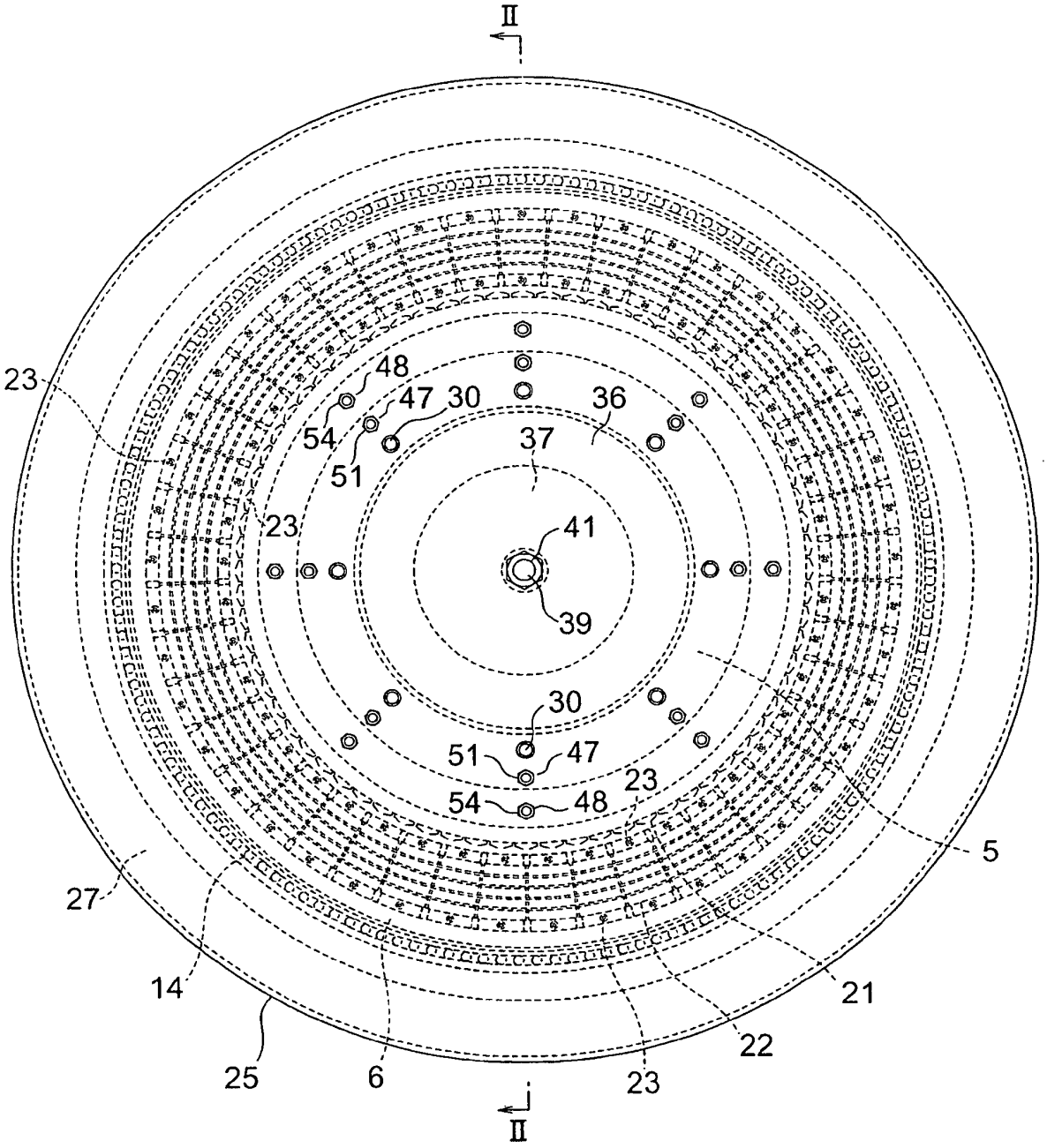
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FIG. 2

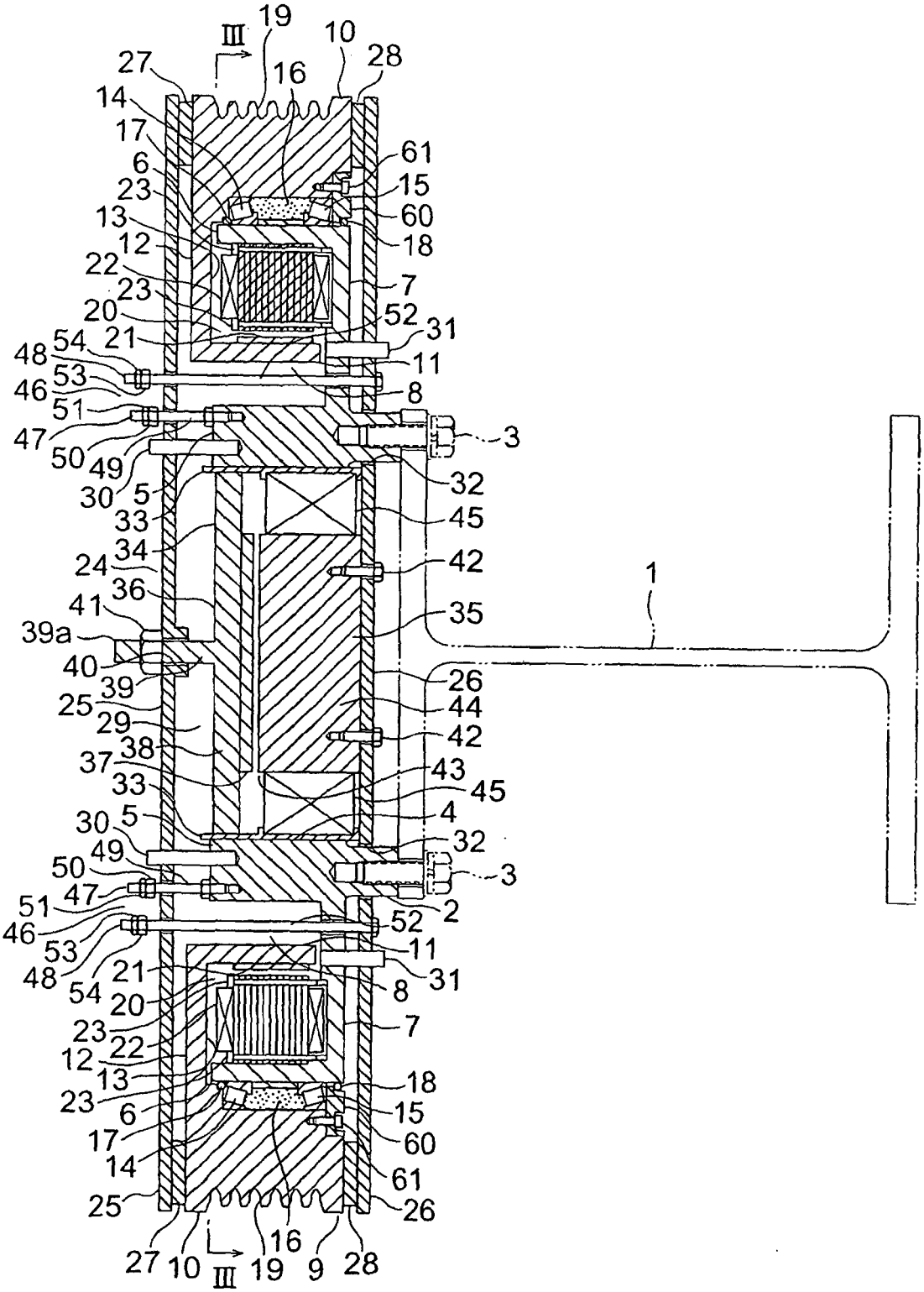
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FIG. 3

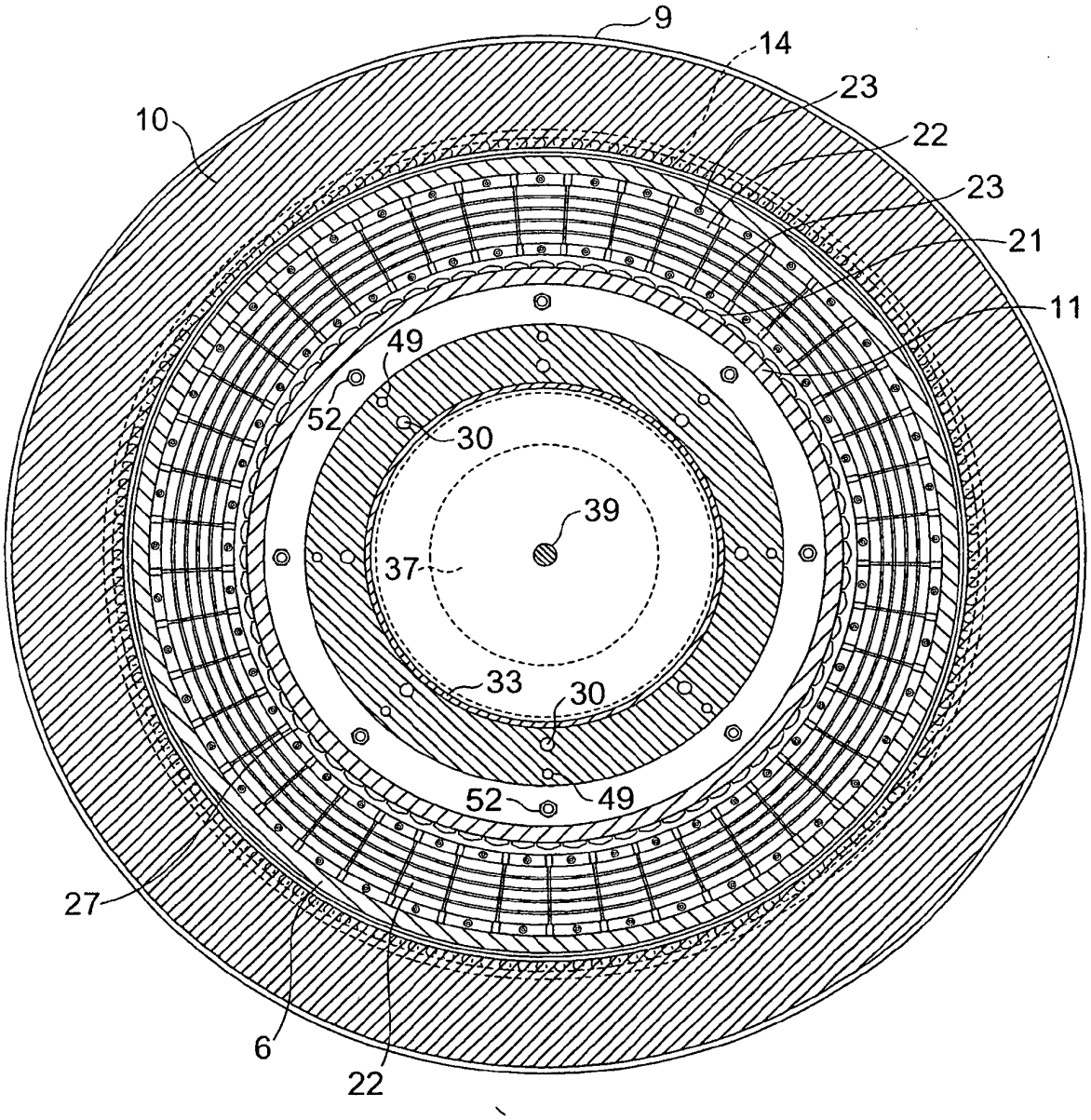


FIG. 4

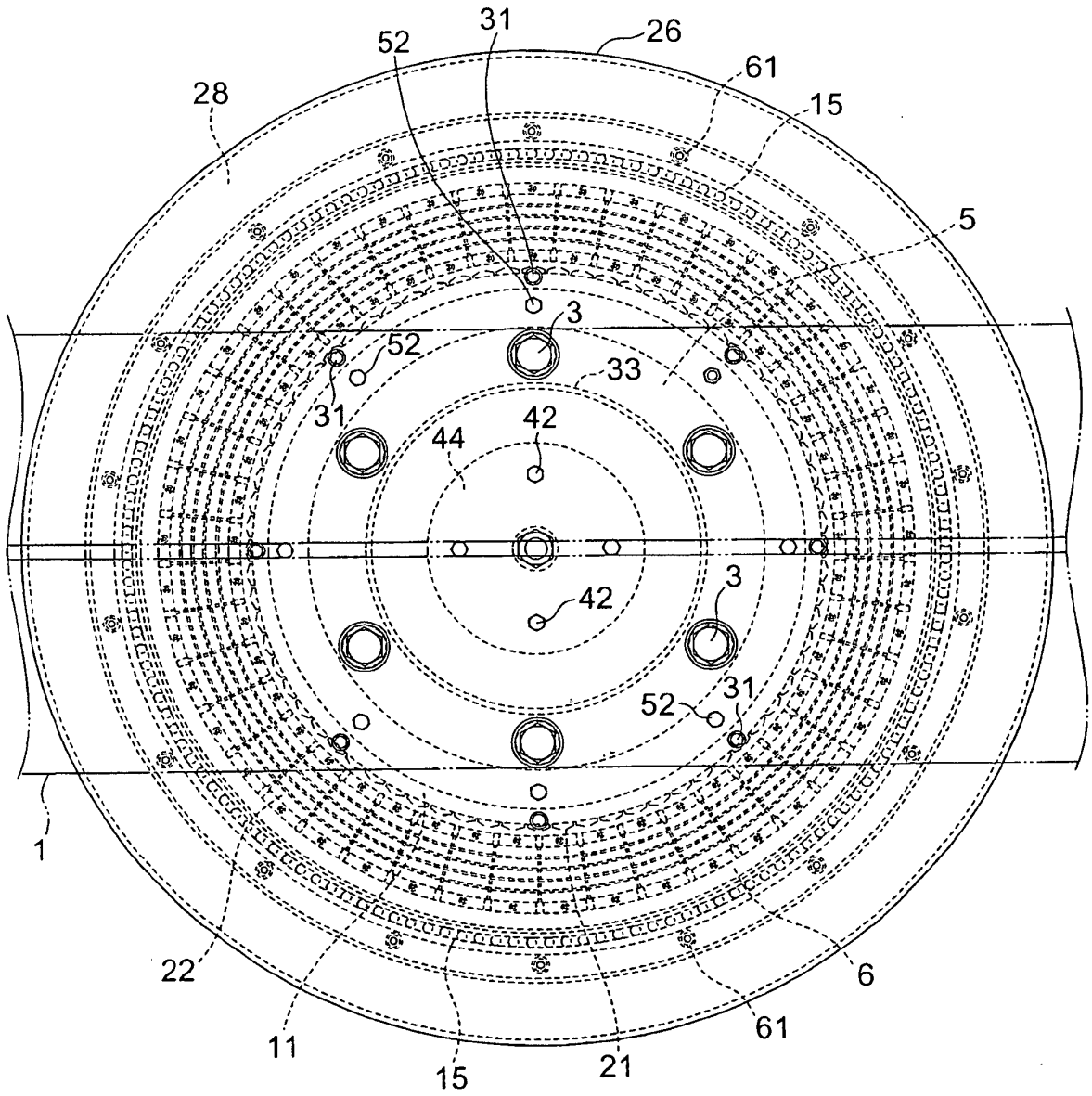
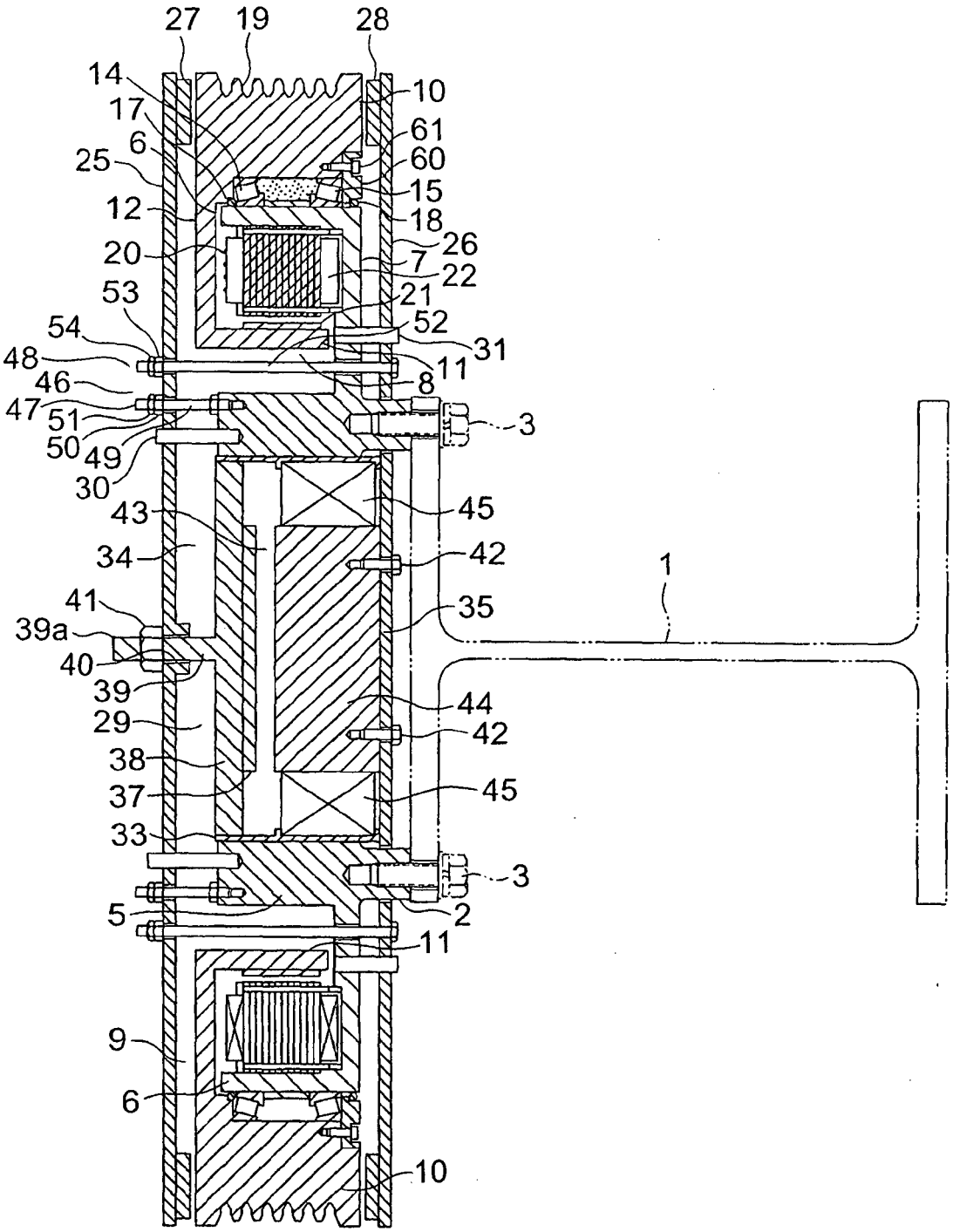


FIG. 5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