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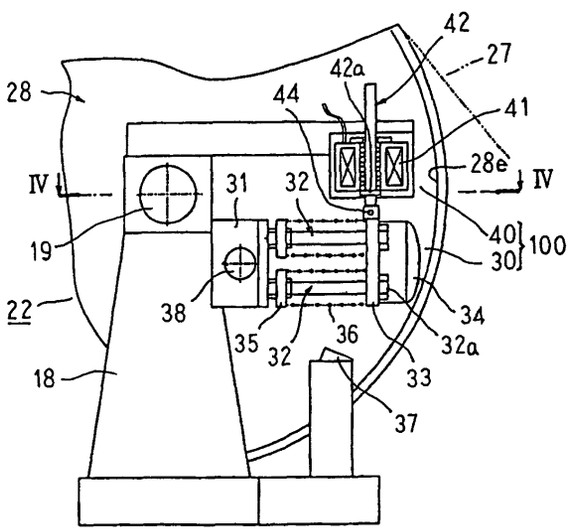
(54) EMERGENCY BRAKE DEVICE FOR ELEVATOR

(57) The present invention provides an inexpensive elevator emergency braking apparatus operating to swiftly decelerate or stop a car when the car ascends at greater than or equal to a rated velocity, and not requiring special installation space.

The elevator emergency braking apparatus includes a braking mechanism portion mounted inside a sheave so as to be pivotable around a first shaft parallel to an axle of the sheave and so as to be positioned on a like side as a counterweight relative to a vertical line passing through the axle, and being provided with a brake shoe at an opposite end from the first shaft, the braking mechanism portion adopting a standby position in which the brake shoe is separated from an inner circumferential wall surface of an outer ring of the sheave and a braking position in which the brake shoe contacts the inner circumferential wall surface of the outer ring; and

an activating mechanism portion for maintaining the braking mechanism portion in the standby position when not braking and maintaining the braking mechanism portion in the braking position when braking.

FIG. 2



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Description

TECHNICAL FIELD

[0001] The present invention relates to an emergency braking apparatus applied to an elevator in which a car and a counterweight are suspended at a first end and a second end, respectively, of a main rope wound around a sheave, and functions such that ascent of the car is stopped when the car ascends at greater than or equal to a rated velocity, for example.

BACKGROUND ART

[0002] Generally, elevators are constructed such that a car and a counterweight are suspended at a first end and a second end, respectively, of main ropes wound around a drive sheave of a hoisting machine. A brake designed to apply a braking force as input to an electric motor is simultaneously interrupted is mounted to the hoisting machine in order to control inertial rotation of the hoisting machine automatically. In addition, irrespective of the type of hoisting machine, or how the ropes are hung, etc, there is a risk that an elevator will exceed the capacity of normal safety apparatus if the ropes snap, or if the descent velocity of the car increases significantly for some other unforeseeable reason. For that reason, if the descent velocity of the car reaches a constant ratio of overspeed, it is necessary to stop the descent thereof completely. Thus, an emergency stopping apparatus for gripping opposite sides of a guide rail with strong force is disposed on a side of the car, and the emergency stopping apparatus operates to stop the descent of the car if the speed governor detects an overspeed in the descent velocity.

[0003] In addition, a supplementary emergency braking apparatus that functions independently from the brake and starts prior to the emergency stopping apparatus is required to further increase the safety level of the elevator. This supplementary emergency braking apparatus must generate a controlled reproducible braking effect, particularly when the elevator is moving in an upward direction. More specifically, in elevators of this kind, there is a danger that the car may suddenly ascend at greater than or equal to the rated velocity due to failure of the brake or due to the hoisting machine running out of control, etc. If the car ascends at greater than or equal to the rated velocity, there is a risk that the counterweight may collide with buffers at greater than or equal to design velocity, injuring passengers inside the car.

[0004] Thus, conventionally, a supplementary emergency braking apparatus provided with a mechanism for seizing a guide rail or a main rope directly has been installed on the same side as the counterweight, and if the car ascends at greater than or equal to a rated velocity, the supplementary emergency braking apparatus operates to seize the guide rail or the main rope directly and stop the ascent of the car. However, some disadvantages with this conventional countermeasure are that installation space is required for the supplementary emergency braking apparatus, that it may lead to damage to the guide rail or the main rope and to accidents, and also that the construction is complicated, giving rise to increases in equipment costs.

[0005] In Japanese Patent Laid-Open No. HEI 6-199483 (Gazette), as shown in Figure 6, an emergency braking apparatus is proposed in which a pressing body 3 is disposed facing a drive sheave 1 on an opposite side of a main rope 2 wound over the drive sheave 1 and a wedge-shaped braking member 4 between the drive sheave 1 and the pressing body 3. In this conventional emergency braking apparatus, it is claimed that during braking the braking member 4 is pushed in between the drive sheave 1 and the pressing body 3 and the main rope 2 is grasped between the drive sheave 1 and the braking member 4, thus achieving an appropriate braking effect. However, some disadvantages with this conventional emergency braking apparatus are that installation space is required for the apparatus and that it may lead to damage to the main rope and to accidents. Another disadvantage is that after activation this conventional emergency braking apparatus must be reset to its standby state manually.

[0006] In addition, in Japanese Patent Laid-Open No. HEI 5-193860 (Gazette), as shown in Figures 7 to 9, an emergency braking apparatus is proposed that is provided with: a drive sheave 6 fixed to a shaft 5; a star-shaped brake wheel 7 rotatably mounted to the shaft 5 so as to place a brake shoe 8 in contact with an annular end surface 6a of the drive sheave 6; a spring member 9 for pressing the star-shaped brake element 7 against the drive sheave 6; and an activating mechanism 12 constructed such that a braking bolt 11 is inserted and removed from between spokes 7a of the star-shaped brake wheel 7 by electromagnetic force from a solenoid 10. In this conventional emergency braking apparatus, during normal operation, the star-shaped brake wheel 7, which is pressed against the drive sheave 6 by the spring member 9, rotates together with the drive sheave 6, and during braking, the braking bolt 11 is inserted between the spokes 7a of the star-shaped brake wheel 7, preventing the star-shaped brake wheel 7 from rotating. Thus, it is claimed that rotation of the drive sheave 6 is stopped by friction between the brake shoe 8 of the star-shaped brake wheel 7 and the end surface 6a of the drive sheave 6 to achieve an appropriate braking effect. However, one disadvantage with this conventional emergency braking apparatus is that installation space is required for the apparatus. Another disadvantage with this conventional emergency braking apparatus is that because braking of the drive sheave 6 commences after the braking bolt 11 has been inserted between the spokes 7a and comes into contact with a spoke 7a, a time lag between activation and the commencement of braking arises due to the construction, and the car will

increase velocity during this temporal delay.

[0007] The present invention aims to solve the above problems and an object of the present invention is to provide an inexpensive elevator emergency braking apparatus operating to swiftly decelerate or stop a car when the car ascends at greater than or equal to a rated velocity, and not requiring special installation space.

[0008] According to one aspect of the present invention, an elevator emergency braking apparatus for performing braking of an elevator in which a car is suspended at a first end of a main rope wound around an outer ring of a sheave and a counterweight is suspended at a second end of the main rope includes:

a first braking mechanism portion mounted inside the above sheave so as to be pivotable around a first shaft parallel to an axle of the sheave and so as to be positioned on a like side as the above counterweight relative to a vertical line passing through the axle, and being provided with a first brake shoe at an opposite end from the first shaft, the first braking mechanism portion adopting a first standby position in which the first brake shoe is separated from an inner circumferential wall surface of the outer ring of the above sheave and a first braking position in which the first brake shoe contacts the inner circumferential wall surface of the outer ring; and
a first activating mechanism portion for maintaining the above first braking mechanism portion in the above first standby position when not braking and maintaining the above first braking mechanism portion in the above first braking position when braking.

[0009] According to another aspect of the present invention, an elevator emergency braking apparatus for performing braking of an elevator in which a car is suspended at a first end of a main rope wound around an outer ring of a sheave and a counterweight is suspended at a second end of the main rope includes:

a braking mechanism portion mounted inside the above sheave so as to be pivotable around a second shaft parallel to an axle of the sheave and so as to be positioned on a like side as the above car relative to a vertical line passing through the axle, and being provided with a brake shoe at an opposite end from the second shaft, the braking mechanism portion adopting a standby position in which the brake shoe is separated from an inner circumferential wall surface of the outer ring of the above sheave and a braking position in which the brake shoe contacts the inner circumferential wall surface of the outer ring; and
an activating mechanism portion for maintaining the above braking mechanism portion in the above standby position when not braking and maintaining the above braking mechanism portion in the above braking position when braking.

Brief Description of the Drawings

[0010]

Figure 1 is a schematic diagram showing an elevator mounted with an emergency braking apparatus according to Embodiment 1 of the present invention;
Figure 2 is an enlarged partial side elevation showing a standby state of the emergency braking apparatus according to Embodiment 1 of the present invention;
Figure 3 is an enlarged partial side elevation showing an activated state of the emergency braking apparatus according to Embodiment 1 of the present invention;
Figure 4 is a cross section taken along line IV - IV in Figure 2 viewed from the direction of the arrows;
Figure 5 is an enlarged partial side elevation showing a standby state of an emergency braking apparatus according to Embodiment 2 of the present invention;
Figure 6 is an enlarged partial side elevation explaining a construction of a conventional emergency braking apparatus;
Figure 7 is a cross section explaining a construction of a second conventional emergency braking apparatus;
Figure 8 is a side elevation explaining the construction of the second emergency braking apparatus; and
Figure 9 is an enlarged partial cross section explaining the construction of the second conventional emergency braking apparatus.

BEST MODE FOR CARRYING OUT THE INVENTION

[0011] Preferred embodiments of the present invention will now be explained with reference to the drawings.

Embodiment 1

[0012] Figure 1 is a schematic diagram showing an elevator mounted with an emergency braking apparatus according to Embodiment 1 of the present invention, Figure 2 is an enlarged partial side elevation showing a standby state of the emergency braking apparatus according to Embodiment 1 of the present invention, Figure 3 is an enlarged partial side elevation showing an activated state of the emergency braking apparatus according to Embodiment 1 of the present invention, and Figure 4 is a cross section taken along line IV - IV in Figure 2 viewed from the direction of the arrows.

[0013] In Figure 1, a hoisting machine 22 is installed in a machine room 21 in an upper portion of a hoistway 20, a car 23 is disposed so as to be guided by car guide rails 24 and be able to ascend and descend inside the

hoistway 20, and a counterweight 25 is disposed so as to be guided by counterweight guide rails 26 and be able to ascend and descend inside the hoistway 20. A main rope 27 is wound around a drive sheave 28 of the hoisting machine 22 and a deflector sheave 29 installed inside the machine room 21. The car 23 is suspended at a first end of the main rope 27, and the counterweight 25 at a second end of the main rope 27. In addition, an emergency braking apparatus 100 is mounted to the drive sheave 28.

[0014] Moreover, the hoisting machine 22, as shown in Figure 2, is disposed inside the machine room 21 such that a frame 18 thereof is fixed to a floor surface of the machine room 21. The drive sheave 28 (a sheave) of the hoisting machine 21, as shown in Figure 4, is constituted by: a hub 28a; spokes 28b extending radially from the hub 28a; and an annular outer ring 28c linked to the hub 28a by means of the spokes 28b, the hub 28a being rotatably mounted to the frame 18 around an axle 19. Rope grooves 28d are formed on an outer peripheral wall surface of the outer ring 28c. The deflector sheave 29 (a sheave) is also constructed in a similar manner to the drive sheave 28. In addition, although not shown, a brake and emergency stopping apparatus are provided.

[0015] Next, construction and operation of the emergency braking apparatus 100 will be explained with reference to Figures 2 to 4.

[0016] The emergency braking apparatus 100 is constituted by: a braking mechanism portion 30 for braking the drive sheave 28; and an activating mechanism portion 40 for activating the braking mechanism portion 30.

[0017] The braking mechanism portion 30 is constituted by: a base portion 31; a pair of bolts 32 functioning as a guide member disposed so as to stand parallel to each other on this base portion 31; a movable portion 33 mounted to the pair of bolts 32 so as to be reciprocally movable in an axial direction; a brake shoe 34 mounted to a tip of this movable portion 33; adjusting nuts 35 respectively screwed onto a root portion of each of the bolts 32; and springs 36 respectively disposed in a compressed state between each of the adjusting nuts 35 and the movable portion 33. The brake shoe 34 is formed integrally with the movable portion 33 so as to cover head portions 32a of the bolts 32. The movable portion 33 is placed in a state of contact with the head portions 32a of the bolts 32 by the force of the springs 36.

[0018] The base portion 31 of this braking mechanism portion 30 is mounted to the frame 18 so as to be pivotable about a shaft 38 parallel to the axle 19, the braking mechanism portion 30 adopting: a standby position in which the brake shoe 34 is separated from an inner circumferential wall surface 28e of the outer ring 28c of the drive sheave 28; and a braking position in which the braking mechanism portion 30 is placed in contact with a stopper 37 disposed so as to stand upright on the frame 18 and the brake shoe 34 is placed in contact with the inner circumferential wall surface 28e of the outer ring 28c of the drive sheave 28. Here, the shaft 38 (a first shaft) is disposed inside the drive sheave 28 on a like side as the deflector sheave 29 relative to an up-down line (a vertical line) passing through a central axis of the axle 19 in Figure 2 and in a region between a left-right line (a horizontal line) passing through the central axis of the axle 19 and the perpendicular line so as to enable the standby position and the braking position to be adopted.

[0019] The activating mechanism portion 40 is constituted by: a solenoid coil 41; and a plunger 42 composed of a magnetic material. This activating mechanism portion 40 is mounted to the frame 18 such that the direction of movement of the plunger 42 is vertical, a projecting end of the plunger 42 being linked to the movable portion 33 so as to be pivotable around a shaft 44 parallel to the shaft 38.

[0020] In an emergency braking apparatus 100 constructed in this manner, when an electric current is passed through the solenoid coil 41, the plunger 42 is magnetically attracted and retracts (moves upward in Figure 2), stopping when a stopper 42a comes into contact with a main body portion of the solenoid coil 41. The retracting force of this plunger 42 is transmitted to the braking member 30 by means of the movable portion 33, and the braking member 30 pivots around the shaft 38 counterclockwise in Figure 2. This braking member 30, as shown in Figure 2, is maintained in the standby position by the stopper 42a being placed in contact with the main body portion of the solenoid coil 41.

[0021] Next, when a state in which the ascent velocity of the car 23 exceeds a rated velocity is detected by a speed governor, etc., the passage of electric current to the solenoid coil 41 is stopped. Thus, the magnetic attraction that was acting on the plunger 42 is removed, and the braking mechanism portion 30 pivots around the shaft 38 clockwise in Figure 2 under its own weight. The braking mechanism portion 30 pivots until the brake shoe 34 comes into contact with' the inner circumferential wall surface 28e of the outer ring 28c of the drive sheave 28. Thereafter, the braking mechanism portion 30 moves toward the base portion 31 together with the rotation of the drive sheave 28 (clockwise in Figure 2) such that the movable portion 33 is guided by the bolts 32, pivots further while compressing the springs 36, and stops when placed in contact with the stopper 37, assuming the braking position shown in Figure 3. Then, a pressing force resulting from the compression of the springs 36 acts on the inner circumferential wall surface 28e by means of the brake shoe 34, generating a braking force between the brake shoe 34 and the inner circumferential wall surface 28e, and the car 23 is decelerated or stopped.

[0022] If the elevator is restored to a normal state, an electric current is passed through the solenoid coil 41. Thus, the plunger 42 is magnetically attracted and the braking mechanism portion 30 pivots around the shaft 38 counterclockwise in Figure 3, returning the braking mechanism portion 30 to the standby position.

[0023] Thus, an emergency braking apparatus 100 according to Embodiment 1 functions as an ascent safety apparatus capable of operating swiftly to perform deceleration or stopping of the car 23 when the ascent velocity of the car 23 exceeds a rated velocity. Thus, the occurrence of accidents in which passengers may be injured due to the counterweight 25 colliding with the buffers at greater than or equal to the design velocity as a result of the ascent being greater than or equal to the rated velocity of the car 23 can be prevented in advance.

[0024] In this emergency braking apparatus 100, because the braking mechanism portion 30 and the activating mechanism portion 40 are disposed inside the drive sheave 28, installation space for the apparatus can be conserved. Because the braking force is generated by pushing the brake shoe 34 against the inner circumferential wall surface 28e of the outer ring 28c of the drive sheave 28, there is no damage to the guide rails 24 and 25 or the main rope 27, making it extremely economical.

[0025] In this emergency braking apparatus 100, because the amount of pivoting from the standby position of the braking mechanism portion 30 to the braking position is constant, the amount of compression in the springs 36 is also constant, enabling the ascending car 23 to be decelerated or stopped by a constant braking force irrespective of velocity. Because adjusting nuts 35 are provided, if the adjusting nuts 35 are adjusted so that the amount of compression in the springs 36 is increased at the standby position, the pressing force of the brake shoe 34 on the inner circumferential wall surface 28e during braking can be increased. In other words, the braking force can be adjusted arbitrarily. In addition, because the direction of rotation during activation of the braking mechanism portion 30 matches the direction of rotation of the drive sheave 28, the braking function is reliably exhibited by the brake shoe 34 cutting into the inner circumferential wall surface 28e in a wedging effect, thereby improving the safety level.

[0026] In this emergency braking apparatus 100, because the braking mechanism portion 30 adopts the braking position swiftly under its own weight by stopping the passage of electric current to the solenoid coil 41, time lag from activation to the commencement of braking can be shortened, enabling increases in the velocity of the car 23 resulting from the time lag from activation to the commencement of braking also to be suppressed.

[0027] In this emergency braking apparatus 100, because the braking mechanism portion 30 can be returned from the braking position to the standby position by passing an electric current to the solenoid coil 41, a manual operation for resetting the emergency braking apparatus is also no longer necessary. Thus, because the emergency braking apparatus 100 can be activated repeatedly, the emergency braking apparatus 100 can also be activated when the car 23 is at a floor to stop rotation of the drive sheave 28. Thus, sudden abnormal ascent of the car 23 while passengers are boarding and leaving is reliably prevented, further increasing the safety level.

[0028] Because the emergency braking apparatus 100 is constituted by a braking mechanism portion 30 including a base portion 31, a pair of bolts 32 disposed so as to stand on the base portion 31, a movable portion 33 movably disposed along shafts of the bolts 32 so as to be guided by the bolts 32, and having a brake shoe 34 mounted integrally to a tip, and springs 36 for forcing the movable portion 33 toward head portions 32a of the bolts 32; and an activating mechanism portion 40 including a solenoid coil 41 and a plunger 42, the construction of the apparatus is simplified, enabling cost reductions.

[0029] In Embodiment 1 above, the emergency braking apparatus 100 is disposed on a like side of a vertical line passing through the axle 19 as a deflector sheave 29, but the emergency braking apparatus 100 may also be disposed on an opposite side of the vertical line passing through the axle 19 from the deflector sheave 29. In that case, the emergency braking apparatus 100 functions as a descent safety apparatus and the emergency braking apparatus 100 operates swiftly to decelerate or stop the car 23 if abnormal velocity of the car 23 in a downward direction is detected. In addition, when the car 23 is at a floor, sudden dropping of the car while passengers are boarding and leaving can be prevented by operating the emergency braking apparatus 100 to prevent rotation of the drive sheave 23 that gives rise to the dropping of the car 23.

Embodiment 2

[0030] Figure 5 is an enlarged partial side elevation showing a standby state of an emergency braking apparatus according to Embodiment 2 of the present invention.

[0031] In Embodiment 2, as shown in Figure 5, in a first emergency braking apparatus 100, a braking mechanism portion 30 mounted so as to be pivotable around a shaft 38 (a first shaft) is disposed inside a drive sheave 28 and a braking position on a like side of a vertical line passing through a central axis of an axle 19 as a deflector sheave 29 and in a region between a horizontal line and the vertical line passing through the central axis of the axle 19 so as to adopt a standby position, and in a second emergency braking apparatus 100, a braking mechanism portion 30 mounted so as to be pivotable around a shaft 38 (a second shaft) is disposed inside the drive sheave 28 on an opposite side of the vertical line passing through the central axis of the axle 19 from the deflector sheave 29 and in a region between a horizontal line and the vertical line passing through the central axis of the axle 19 so as to adopt a standby position and a braking position. The two emergency braking apparatuses 100 are disposed symmetrically relative to the vertical line passing through the axle 19.

[0032] According to Embodiment 2, during normal operation of the car 23, an electric current is passed

through the solenoid coils 41 of both of the emergency braking apparatuses 100 to maintain them in the standby position.

[0033] When a state in which the ascent velocity of the car exceeds a rated velocity is detected by a speed governor, etc., the passage of electric current to the solenoid coil 41 of the first emergency braking apparatus 100 is stopped, the braking mechanism portion 30 assumes the braking position, generating a braking force between the brake shoe 34 and the inner circumferential wall surface 28e, and the car 23 is decelerated or stopped. If the elevator is restored to a normal state, an electric current is passed through the solenoid coil 41, returning the braking mechanism portion 30 to the standby position.

[0034] Similarly, when a state in which the descent velocity of the car exceeds a rated velocity is detected by a speed governor, etc., the passage of electric current to the solenoid coil 41 of the second emergency braking apparatus 100 is stopped, the braking mechanism portion 30 assumes the braking position, generating a braking force between the brake shoe 34 and the inner circumferential wall surface 28e, and the car 23 is decelerated or stopped. If the elevator is restored to a normal state, an electric current is passed through the solenoid coil 41, returning the braking mechanism portion 30 to the standby position.

[0035] When the car 23 arrives at a floor, the passage of electric current to the solenoid coils 41 of both of the emergency braking apparatuses 100 is stopped, and the braking mechanism portions 30 of both of the emergency braking apparatuses 100 assume the braking position. Then, when passengers have finished boarding and leaving and a destination button is pressed, an electric current is passed through the solenoid coils 41 of both of the emergency braking apparatuses 100, and the braking mechanism portions 30 of both of the emergency braking apparatuses 100 assume the standby position. Thereafter, raising or lowering of the car 23 is performed.

[0036] Consequently, in Embodiment 2, because two emergency braking apparatuses 100 are deployed, and the first emergency braking apparatus 100 functions as an ascent safety apparatus, and the second emergency braking apparatus 100 functions as a descent safety apparatus, if abnormal upward or downward velocity of the car 23 is detected, the emergency braking apparatus 100 operates swiftly to decelerate or stop the car 23, improving the safety level.

[0037] Because the two emergency braking apparatuses 100 are operated when the car 23 is at a floor in order to prevent rotation of the drive sheave 23 that gives rise to rising and dropping of the car 23, sudden rising and dropping of the car can be prevented while passengers are boarding and leaving, raising the safety level.

[0038] In an unbalanced state at an intermediate floor with no load, dismantling and maintenance of the brake of the hoisting machine 22 are possible if the two emergency braking apparatuses 100 are operated to prevent rotation of the drive sheave 23 that gives rise to rising and dropping of the car 23.

[0039] Now, in Embodiment 2, the two emergency braking apparatuses 100 are disposed symmetrically relative to a vertical line passing through the axle 19, but it is not absolutely necessary for the two emergency braking apparatuses 100 to be disposed symmetrically relative to the vertical line passing through the axle 19; it is only necessary for the braking mechanism portion 30 of each of the emergency braking apparatuses 100 to be disposed so as to be able to adopt the standby position and the braking position.

[0040] Moreover, in each of the above Embodiments, when the passage of electric current to the solenoid coil 41 of an emergency braking apparatus 100 is stopped, the braking mechanism portion 30 is set to the braking position by pivoting around the shaft 38 under its own weight, but the activating mechanism portion 40 may also be equipped with a spring for forcing the plunger 42 toward the braking mechanism portion 30, and when the passage of electric current to the solenoid coil 41 is stopped, the plunger 42 is moved by the force of the spring, the braking mechanism portion 30 thereby being set to the braking position by pivoting around the shaft 38. In that case, the amount of time from activation to the commencement of braking is shortened, enabling increases in the velocity of the car 23 resulting from the time lag from activation to the commencement of braking to be further suppressed.

[0041] In each of the above Embodiments, the plunger 42 and the movable portion 33 are linked so as to be pivotable about the shaft 44, but the plunger 42 and the movable portion 33 may also be linked by a universal joint. In that case, the transmission of force between the plunger 42 and the movable portion 33 is smooth, and it is no longer necessary to ensure the installation position of the activating mechanism portion 40 with high precision, facilitating assembly of the emergency braking apparatus 100.

[0042] In each of the above Embodiments, the emergency braking apparatus 100 is installed in the drive sheave 28, but similar effects can also be achieved if the emergency braking apparatus 100 is installed in the deflector sheave 29.

Claims

1. An elevator emergency braking apparatus for performing braking of an elevator in which a car is suspended at a first end of a main rope wound around an outer ring of a sheave and a counterweight is suspended at a second end of said main rope, said elevator emergency braking apparatus comprising:

   a first braking mechanism portion mounted in-

side said sheave so as to be pivotable around a first shaft parallel to an axle of said sheave and so as to be positioned on a like side as said counterweight relative to a vertical line passing through said axle, and being provided with a first brake shoe at an opposite end from said first shaft, said first braking mechanism portion adopting a first standby position in which said first brake shoe is separated from an inner circumferential wall surface of said outer ring of said sheave and a first braking position in which said first brake shoe contacts said inner circumferential wall surface of said outer ring; and

a first activating mechanism portion for maintaining said first braking mechanism portion in said first standby position when not braking and maintaining said first braking mechanism portion in said first braking position when braking.

2. The elevator emergency braking apparatus according to Claim 1, wherein:

said first braking mechanism portion comprises:

a first base portion pivotally supported by said first shaft;

a first guide member disposed so as to extend from said first base portion on an opposite side from said first shaft;

a first movable portion movably disposed so as to be guided by said first guide member, said first movable portion having said first brake shoe mounted to an opposite end from said first shaft; and

a first spring for forcing said first movable portion away from said first shaft.

3. The elevator emergency braking apparatus according to Claim 1, further comprising:

a second braking mechanism portion mounted inside said sheave so as to be pivotable around a second shaft parallel to said axle of said sheave and so as to be positioned on a like side as said car relative to a vertical line passing through said axle, and being provided with a second brake shoe at an opposite end from said second shaft, said second braking mechanism portion adopting a second standby position in which said second brake shoe is separated from said inner circumferential wall surface of said outer ring of said sheave and a second braking position in which said second brake shoe contacts said inner circumferential wall surface of said outer ring; and

a second activating mechanism portion for maintaining said second braking mechanism portion in said second standby position when not braking and maintaining said second braking mechanism portion in said second braking position when braking.

4. The elevator emergency braking apparatus according to Claim 3, wherein:

said second braking mechanism portion comprises:

a second base portion pivotally supported by said second shaft;

a second guide member disposed so as to extend from said second base portion on an opposite side from said second shaft;

a second movable portion movably disposed so as to be guided by said second guide member, said second movable portion having said second brake shoe mounted to an opposite end from said second shaft; and

a second spring for forcing said second movable portion away from said second shaft.

5. An elevator emergency braking apparatus for performing braking of an elevator in which a car is suspended at a first end of a main rope wound around an outer ring of a sheave and a counterweight is suspended at a second end of said main rope, said elevator emergency braking apparatus comprising:

a braking mechanism portion mounted inside said sheave so as to be pivotable around a second shaft parallel to an axle of said sheave and so as to be positioned on a like side as said car relative to a vertical line passing through said axle, and being provided with a brake shoe at an opposite end from said second shaft, said braking mechanism portion adopting a standby position in which said brake shoe is separated from an inner circumferential wall surface of said outer ring of said sheave and a braking position in which said brake shoe contacts said inner circumferential wall surface of said outer ring; and

an activating mechanism portion for maintaining said braking mechanism portion in said standby position when not braking and maintaining said braking mechanism portion in said braking position when braking.

6. The elevator emergency braking apparatus according to Claim 5, wherein:

said braking mechanism portion comprises:

a base portion pivotally supported by said second shaft;
a guide member disposed so as to extend from said base portion on an opposite side from said second shaft;
a movable portion movably disposed so as to be guided by said guide member, said movable portion having said brake shoe mounted to an opposite end from said second shaft; and
a spring for forcing said movable portion away from said second shaft.

7. The elevator emergency braking apparatus according to any of Claims 1 to 6, wherein:

said sheave is a drive sheave of a hoisting machine.

8. The elevator emergency braking apparatus according to any of Claims 1 to 6, wherein:

said sheave is a deflector sheave.

FIG. 1

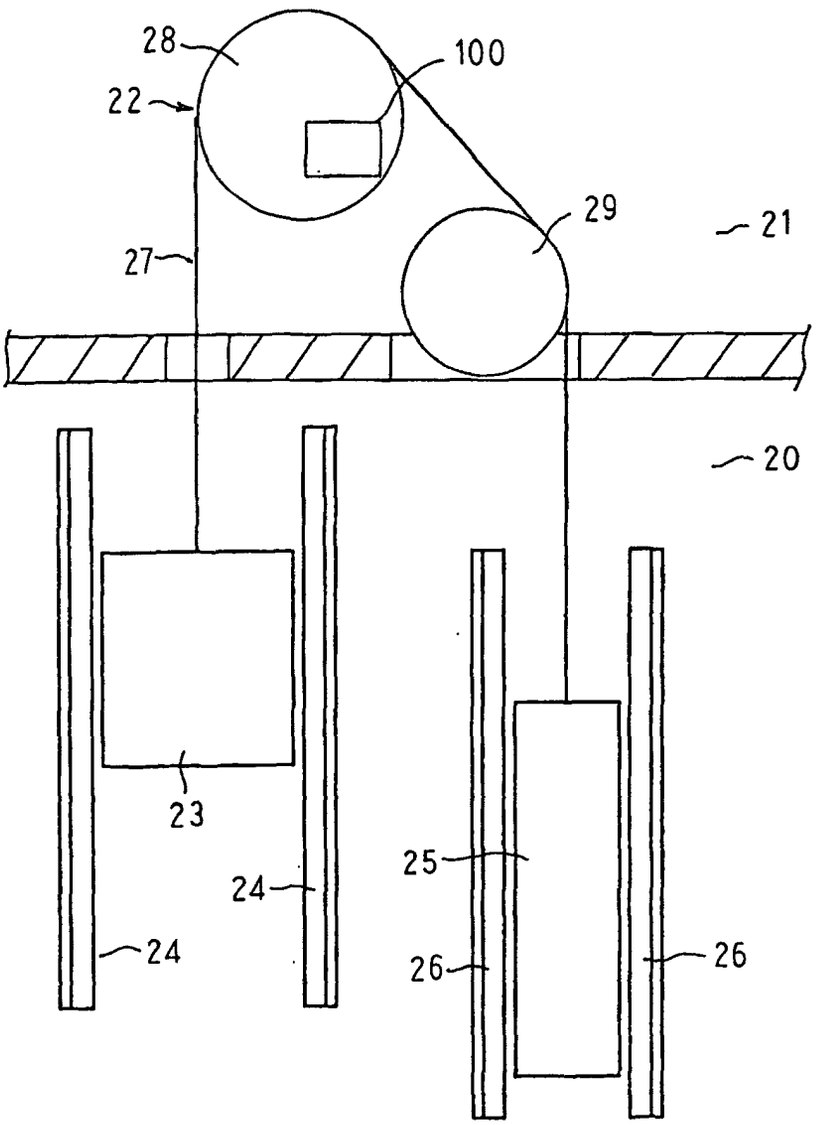


FIG. 2

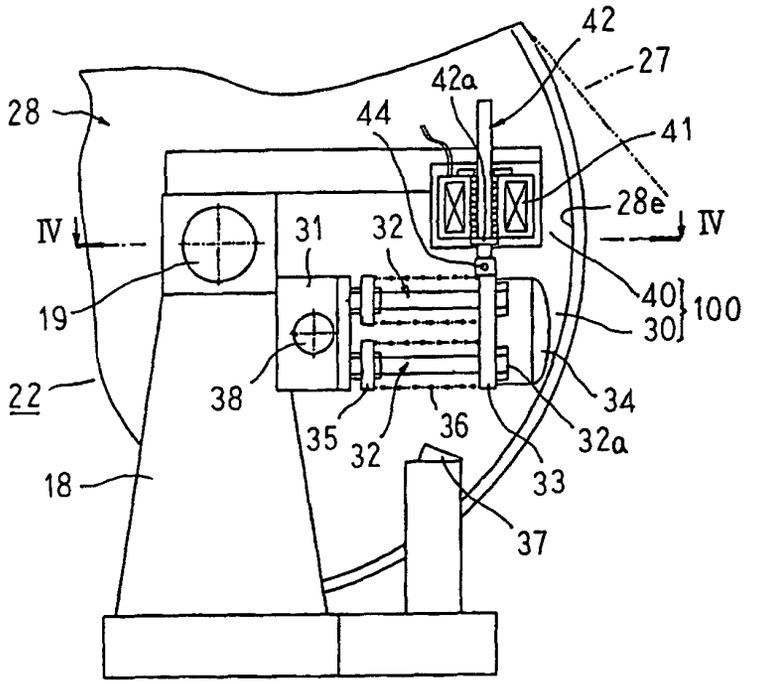

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FIG. 3

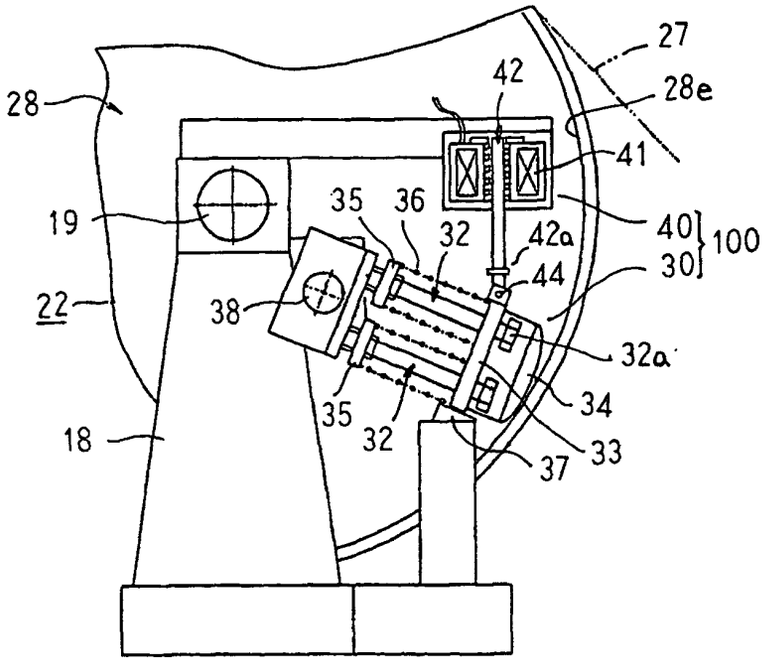

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FIG. 4

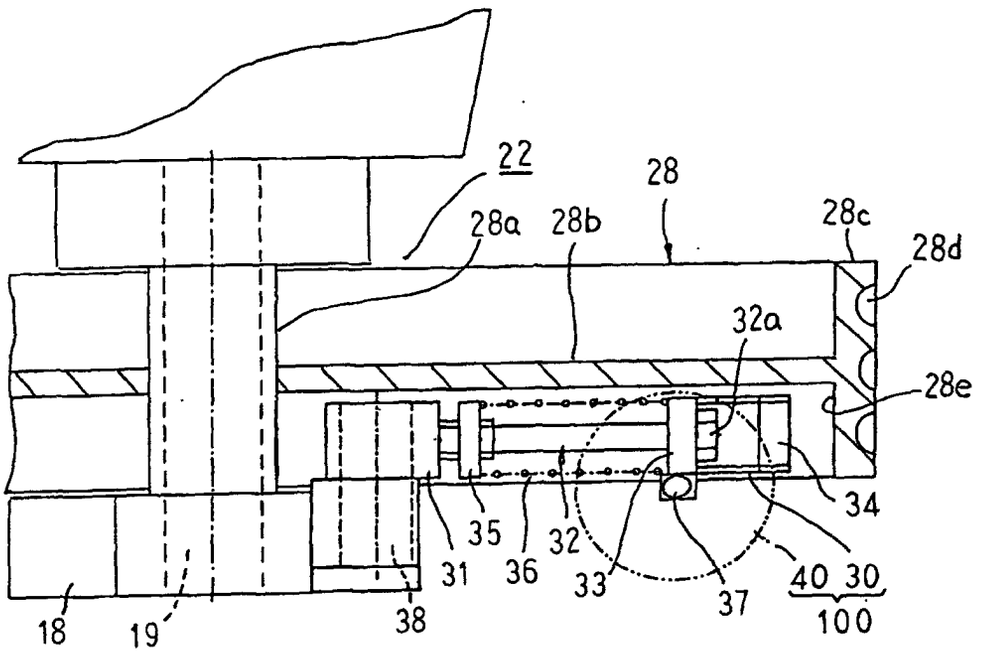

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28a
28b
28c
28d
32a
28e
34
35
32
31
36
33
37
40 30
100
18
19
38

FIG. 5

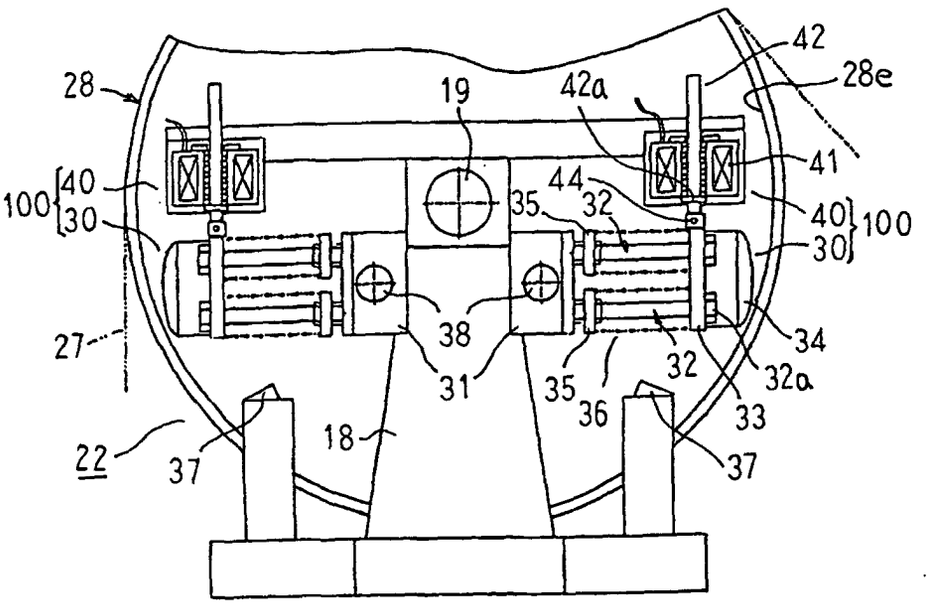

42
28e
28
19
42a
41
100
40
30
44
35
32
40
30
100
27
38
34
31
35
36
32
32a
33
22
37
18
37

FIG. 6

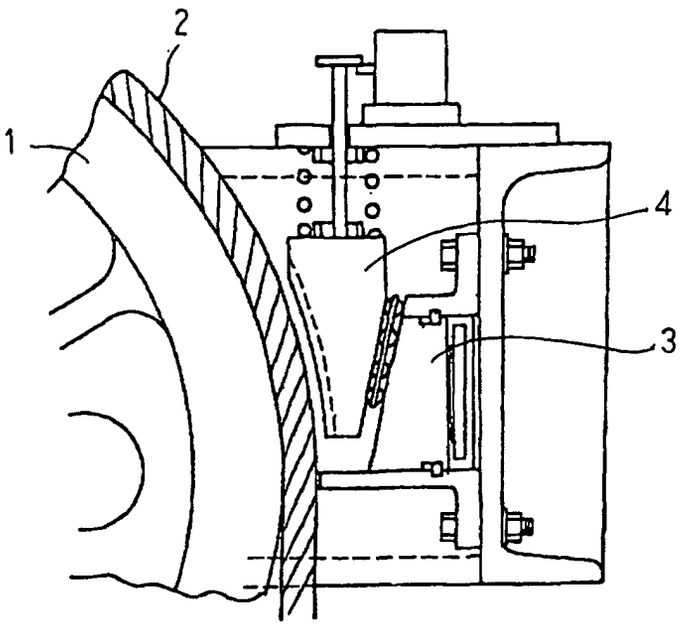


FIG. 7

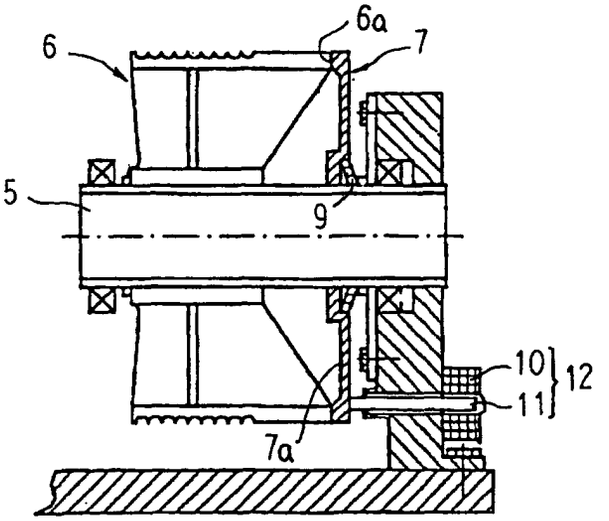


FIG. 8

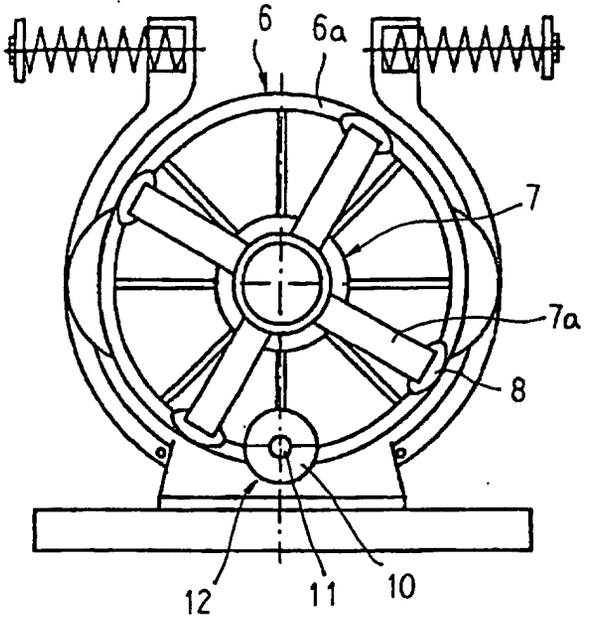
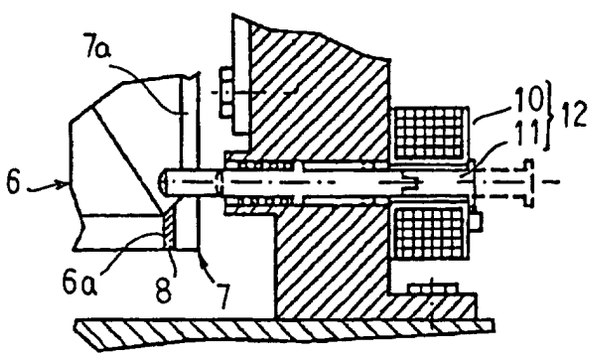


FIG. 9



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP02/03935

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] B66B5/02

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] B66B5/00-5/28

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.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 78375/1983 (Laid-open No. 183469/1984) (Mitsubishi Electric Corp.), 06 December, 1984 (06.12.84), (Family: none)	1-8
A	JP 8-2848 A (Shimizu Corp.), 09 January, 1996 (09.01.96), (Family: none)	1-8

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"E" earlier document but published on or after the international filing date
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"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
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 July, 2002 (15.07.02)	06 August, 2002 (06.08.02)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

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