(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 997 767 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 158(3) EPC

(43) Date of publication:
03.12.2008 Bulletin 2008/49

(21) Application number: **06715396.5**

(22) Date of filing: **08.03.2006**

(51) Int Cl.:
B66B 5/22 *(2006.01)*

(86) International application number:
PCT/JP2006/304476

(87) International publication number:
WO 2007/102211 (13.09.2007 Gazette 2007/37)

(84) Designated Contracting States:
DE

(71) Applicant: **MITSUBISHI DENKI KABUSHIKI KAISHA**
Chiyoda-ku, Tokyo 100-8310 (JP)

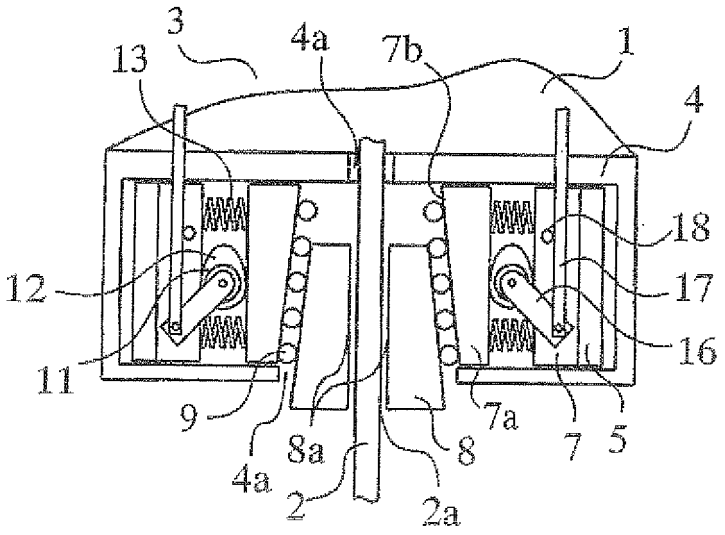
(72) Inventor: **IMURA, Mitsuyoshi**
Chiyoda-ku, Tokyo 1008310 (JP)

(74) Representative: **HOFFMANN EITLE**
Patent- und Rechtsanwälte
Arabellastrasse 4
81925 München (DE)

(54) EMERGENCY STOP DEVICE FOR ELEVATOR

(57) In a safety device 3 of an elevator, there is provided an elevating/lowering body 1; a guide rail 2 erected in an elevator shaft to guide the elevation and lowering of the elevating/lowering body 1; a pressing piece that is provided on the elevating/lowering body 1 and is formed with a pressing surface 7b which faces to the guide rail 2 and the upper side of which tilts to the guide rail 2 side; and a braking wedge piece 8 that is in sliding contact with the pressing surface 7b of the pressing piece and is inserted under pressure between the guide rail and the pressing surface of the pressing piece at the time of emergency stop operation to brake the lowering of the elevating/lowering body 1. The pressing piece 8 includes a movable pressing piece 7a that is formed with the pressing surface 7b and is provided so as to be displaceable to the right and left direction; and a cam 12 that is disposed between the movable pressing piece 7a and a fixed portion 5 on the anti-guide rail side of the movable pressing piece 7a, holds the movable pressing piece 7a so that the braking wedge piece 8 and the guide rail 2 are separate from each other at the normal time, and rotates at the time of emergency stop operation to move the movable pressing piece 7a horizontally to the guide rail 2 side, whereby the braking wedge piece 8 is pressed on the guide rail 2.

Fig. 2



EP 1 997 767 A1

Description

Technical Field

[0001] The present invention relates to a safety device of an elevator, which is provided on an elevating/lowering body to operate when the elevating/lowering body descends at an abnormal speed.

Background Art

[0002] In some conventional safety device of an elevator, a wedge piece is raised by the descending of an elevating/lowering body at an abnormal speed and is forced to be inserted between a guide rail surface and a pressing surface of a pressure element, by which the descending of the elevating/lowering body is braked by the pressing force of the pressure element (for example, refer to Patent Document 1).

[0003] Patent Document 1: Japanese Patent Laid-Open No. 2004-352401

[0004] In the conventional elevator system, the wedge piece is raised by the descending of the elevating/lowering body at an abnormal speed, and the wedge piece comes into contact with the guide rail surface and is inserted with pressure between the guide rail surface and the pressing surface of pressure element. Therefore, a certain period of time is needed from the time when the rise of wedge piece starts to the time when the wedge piece comes into contact with the guide rail surface. This poses a problem in that this certain period of time prolongs operation delay time from the occurrence of descending of the elevating/lowering body to the start of braking of the safety device. Also, there arises a problem in that, if the operation delay time is prolonged, the idle running distance and idle running time of the elevating/lowering body increase, and the distance of abnormal descending of the elevating/lowering body increases. Further, a shock into the elevating/lowering body is increased by the increased operation speed at the time of emergency stop.

Disclosure of the Invention

[0005] The present invention provides a safety device of an elevator comprising: an elevating/lowering body; a guide rail erected in an elevator shaft to guide the elevation/lowering of the elevating/lowering body; a pressing assembly including a pressing piece that is provided on the elevating/lowering body and is formed with a pressing surface which faces to the guide rail and the upper side of which tilts to the guide rail side; and a braking wedge piece that is in sliding contact with the pressing surface of the pressing piece and is inserted under pressure between the guide rail and the pressing surface of the pressing piece at the time of emergency stop operation to brake the lowering of the elevating/lowering body. And said pressing assembly includes said pressing piece that is movable and formed with the pressing surface and is provided so as to be displaceable to the right and left direction; and a cam that is disposed between the movable pressing piece and a fixed portion on the anti-guide rail side of the movable pressing piece, holds the movable pressing piece so that the braking wedge piece and the guide rail are separate from each other at the normal time, and rotates at the time of emergency stop operation to move the movable pressing piece horizontally to the guide rail side, whereby the braking wedge piece is pressed on the guide rail.

[0006] Further, in the safety device of an elevator in accordance with the present invention, the pressing assembly has a fixed pressing piece provided in the fixed portion on the anti-guide rail side of the movable pressing piece, and the cam is provided on a connecting shaft pivotally supported on a bearing bracket provided on the fixed pressing piece, and is disposed between the movable pressing piece and the fixed pressing piece.

[0007] Further, in the elevator system in accordance with the present invention, there is provided an forcing element that pulls the movable pressing piece and the fixed portion on the anti-guide rail side of the movable pressing piece toward each other, and applies a force to the cam in the direction reverse to that at the emergency stop operation time.

[0008] Further, in the elevator system in accordance with the present invention, there is provided a stopper for preventing the rotation of the cam when the cam further rotates a minute amount, after the braking surface comes into contact with the guide rail at the time of emergency stop operation.

[0009] Further, in the elevator system in accordance with the present invention, the upward displacement of a pullup rod pulled up by the operation of a speed governor at the time of emergency stop operation is converted into the turning force of the cam.

[0010] According to the present invention, the operation delay time of the start of braking of the safety device can be shortened, by which a safer elevator system can be provided.

Brief Description of the Drawings

[0011]

Figure 1 is a plan view schematically showing the arrangement of relating members of a safety device of an elevator in a first embodiment of the present invention;

Figure 2 is a front view of Figure 1;

Figure 3 is a front view corresponding to Figure 2, showing a state before the operation of a safety device of an elevator;

Figure 4 is a front view corresponding to Figure 2, showing the initial stage of operation of a safety device of an elevator;

Figure 5 is a front view corresponding to Figure 2,

showing a state during the operation of a safety device of an elevator;

Figure 6 is a front view corresponding to Figure 2, showing the second embodiment of the present invention;

Figure 7 is a plan view corresponding to Figure 1, showing the third embodiment of the present invention;

Figure 8 is a front view corresponding to Figure 2, showing the third embodiment;

Figure 9 is a plan view corresponding to Figure 1, showing the fourth embodiment of the present invention; and

Figure 10 is a front view corresponding to Figure 2, showing the fourth embodiment.

Description of Symbols

[0012]

1	elevator car
2	guide rail
2a	guide rail surface
3	safety device
4	frame
4a	cutout
5	pressure element
5a	U-shaped plate spring
6	vertical shaft
7	first pressing piece
7a	second pressing piece
7b	pressing surface
8	braking wedge piece
8a	braking surface
8b	fixed braking element
9	roller
10	bearing bracket
11	connecting shaft
12	cam
13	first urging element
13a	guide shaft
14	second urging element
14a	coned disc spring
15	holding element
16	pullup lever
17	pullup rod
18	stopper

Best Mode for Carrying Out the Invention

[0013] In the description of the preferred embodiments of the present invention, a safety device of an elevator comprising a pair of pressing pieces and braking wedge pieces is explained as examples. A pair of right and left side pressing pieces is disposed on both sides of a guide rail surface, and each braking wedge piece is inserted with pressure between the pressing piece and the guide rail surface to emergently stop an elevator car.

First Embodiment

[0014] Figure 1 is a plan view schematically showing the arrangement of relating members of the safety device of an elevator in the first embodiment of the present invention. Figure 2 is a front view of Figure 1. Figure 3 is a front view showing a state before the emergency stop operation of the safety device of an elevator. Figure 4 is a front view corresponding to Figure 3, showing the initial state of emergency stop operation of the safety device of an elevator. Figure 5 is a front view corresponding to Figure 3, showing a state during the emergency stop operation of the safety device of an elevator.

In the figures, symbol 1 denotes an elevating/lowering body (not shown in Figure 1) consisting of the elevator car provided in an elevator shaft (not shown), 2 denotes a guide rail having a T-shaped cross section, which is erected in the elevator shaft to guide the rising and lowering of the elevator car 1, 2a denotes a guide rail surface formed on each side of the leg part projecting toward the elevator car 1 of the guide rail 2, and 3 denotes the safety device that is provided on the elevator car 1 to perform emergency stop operation by means of friction with the guide rail 2 when the elevator car 1 descends at an abnormal speed.

Hereunder, the detailed configuration and operation of the safety device 3 are explained.

[0015] Symbol 4 denotes a box-shaped frame for the safety device 3, the top plate of which is provided so as to abut the lower side of the elevator car 1. The frame 4 is formed with an opening on the front surface, and the opening faces to the guide rail 2. Symbol 4a denotes cutouts provided above and below the opening of the frame 4, in which the leg part of the guide rail 2 is disposed. In Figure 1, the illustration of the frame 4 is omitted excluding a part thereof.

Symbol 5 denotes a pair of right and left pressure elements that extend in the front and rear direction in the frame 4 so that the front end inside thereof faces to the guide rail surface 2a. Symbol 6 denotes a pair of right and left vertical shafts that pivotally mount the paired right and left pressure elements 5 at intermediate positions in the lengthwise direction. Symbol 7 denotes a pair of right and left fixed pressing pieces provided on the front end inside of the paired right and left pressure elements 5. Symbol 7a denotes a pair of right and left movable pressing pieces that are arranged apart from the paired right and left fixed pressing pieces 7 toward the guide rail surface 2a. Symbol 7b denotes a pair of right and left pressing surfaces that consist of the side surfaces facing to the guide rail surface 2a of the paired right and left movable pressing pieces 7a, the upper side thereof being inclined toward the guide rail surface 2a. Symbol 8 denotes a pair of right and left braking wedge pieces having a wedge shape, which are in sliding contact with the paired right and left pressing surfaces 7b and the wedge-shaped tip end of which is directed upward. Symbol 8a denotes a pair of right and left braking surfaces formed

on the paired right and left braking wedge pieces 8 so as to face to the guide rail surface 2a. Symbol 9 denotes guide rollers provided between the paired right and left movable pressing pieces 7a and the paired right and left braking wedge pieces 8, which decreases frictional resistance produced by the sliding movement in the up and down direction.

Symbol 10 denotes a pair of right and left bearing brackets convexly provided on the movable pressing piece 7a side of the paired right and left fixed pressing pieces 7. Symbol 11 denotes a pair of right and left connecting shafts pivotally provided on the paired right and left bearing brackets 10 and extending horizontally in the front and rear direction. Symbol 12 denotes a pair of right and left different-diameter cams that are provided on the front end side of the paired right and left connecting shafts 11 and disposed between the paired right and left movable pressing pieces 7 and the paired right and left fixed pressing pieces 7a, two points thereof at the outer periphery being in contact with the inside of the paired right and left movable pressing pieces 7 and the outside of the paired right and left fixed pressing pieces 7a.

[0016] At the normal time, namely, at the time when the safety device 3 is not operated, the paired right and left different-diameter cams 12 stand upright with the vertex portion thereof being directed upward, the small-diameter portions thereof are in contact with the paired right and left fixed pressing pieces 7 and the paired right and left movable pressing pieces 7a. The paired right and left braking wedge pieces 8 are held so as to shift a predetermined amount to the lower side with respect to the frame 4, namely, the paired right and left movable pressing pieces 7a. At this time, a predetermined gap is formed between the braking surfaces 8a of the paired right and left braking wedge pieces 8 and the guide rail surfaces 2a.

When the safety device 3 is operated, the paired right and left different-diameter cams 12 are subjected to a turning force, and thus the vertex portions tilt toward the guide rail surface 2a. Thereby, the large-diameter portions of the paired right and left different-diameter cams 12 are brought into contact with the paired right and left fixed pressing pieces 7 and the paired right and left movable pressing pieces 7a, and thus the paired right and left movable pressing pieces 7a are displaced toward the guide rail 2 as compared with the normal time, by which the braking surfaces 8a of the paired right and left braking wedge pieces 8 are pressed on the guide rail surfaces 2a. Also, the paired right and left braking wedge pieces 8 are raised by the friction with the guide rail 2, and are forced to be inserted with pressure between the pressing surfaces 7b of the paired right and left movable pressing pieces 7a and the guide rail surfaces 2a to brake the lowering of the elevator car 1. The configuration for applying the turning force to the paired right and left different-diameter cams 12 at the time of emergency stop operation is described later.

[0017] Symbol 13 denotes first urging elements that are provided above and below the paired right and left cams 12 to connect and pull the paired right and left fixed pressing pieces 7 and the paired right and left movable pressing pieces 7a each other. The first urging elements 13 always gives a load for bringing the paired right and left fixed pressing pieces 7 and the paired right and left movable pressing pieces 7a into contact with the paired right and left different-diameter cams 12. Further, the first urging elements 13 apply a force to the paired right and left different-diameter cams 12 in the rotation direction reverse to that at the time of emergency stop operation, by which the malfunction of the safety device 3 caused by intentional shaking etc. of passengers is alleviated, and the paired right and left different-diameter cams 12 are returned to the upright normal position when the safety device 3 returns to the normal state.

Symbol 14 denotes a second urging element consisting of a compression spring provided between the far ends of the paired right and left pressure elements 5 (opposite end side of fixed pressing piece 7). The second urging element 14 urges the paired right and left fixed pressing pieces 7 against each other in the direction such that the paired right and left fixed pressing pieces 7 separate from each other. Symbol 15 denotes holding elements consisting of bolts that are screwed in the frame 4 and arranged on the far end outside of the paired right and left pressure elements 5. The holding elements 15 inhibits the rotational displacement of the paired right and left pressure elements 5 urged by the second urging element 14 at a predetermined position at the normal time. Thereby, at the normal time, namely, when the paired right and left different-diameter cams 12 stand upright, the pressing surfaces 7b of the paired right and left movable pressing pieces 7a are held at a predetermined position separate from the guide rail surface 2a, and predetermined gaps are held between the guide rail surfaces 2a and the braking surfaces 8a of the paired right and left braking wedge pieces 8. Also, at the time of emergency stop operation, a force is created by the rise of the braking wedge pieces 8 to widen the space between the front ends of the paired right and left fixed pressing pieces 7 and the paired right and left pressure elements 5. The second urging element 14 resists against the force.

[0018] Next, the rotation mechanism of the paired right and left different-diameter cams 12 at the time of emergency stop operation is explained.

Symbol 16 denotes a pair of right and left pullup levers which are provided at the ends of the paired right and left connecting shafts 11, and the tip end of which extends in the outer peripheral direction of the connecting shaft 11. At the normal time, namely, at the time when the paired right and left different-diameter cams 12 stand upright, the tip ends of the pullup lever 16 are directed slantwise downward toward the fixed pressing piece 7, and the paired right and left different-diameter cams 12 are tilted by the pullup of the paired right and left pullup levers 16. Symbol 17 denotes a pair of right and left pullup rods which extend vertically in the up and down direction and

the lower ends of which are provided at the tip ends of the paired right and left pullup levers 16. Although the explanation of the detailed construction is omitted, a structure that the pullup levers are pulled upward via a speed governor operation when the elevator car 1 descends at an abnormal speed is provided at the upper ends of the paired right and left pullup rods 17. Thereby, at the time of emergency stop operation, the upward displacement of the paired right and left pullup rods 17 is converted into the rotation of the paired right and left pullup levers 16, the paired right and left connecting shafts 11, and the paired right and left different-diameter cams 12.

Symbol 18 denotes a pair of right and left stoppers convexly provided in the front surface upper parts of the paired right and left movable pressing pieces 7. At the time when the emergency stop operation is performed, the paired right and left stoppers 18 come into contact with the upper surfaces of the paired right and left pullup levers 16, by which the rotation of the paired right and left different-diameter cams 12 is restrained. At the time of emergency stop operation, the paired right and left different-diameter cams 12 are rotated by the paired right and left pullup rods 17, and the braking surfaces 8a of the paired right and left braking wedge pieces 8 come into contact with the guide rail surfaces 2a. And when the paired right and left pullup rods 17 rise a minute amount further, then the paired right and left stoppers 18 prevents the paired right and left pullup levers 16 from rising. At this time, the paired right and left different-diameter cams 12 are always subjected to a force in the direction of being compressed via the paired right and left fixed pressing pieces 7 and the paired right and left movable pressing pieces 7a by the compression spring 14. The compressing force acts in the horizontal direction. When the contact points of the paired right and left different-diameter cams 12 contacting with the paired right and left fixed pressing pieces 7 and the paired right and left movable pressing pieces 7a are located at opposed positions on the horizontal line passing through the rotating shaft centers, a turning force acts on the paired right and left different-diameter cams 11. Therefore, both of the contact points are designed so as to be located on the upper or lower side with respect to the horizontal line passing through the rotating shaft centers. Further, the safety device 3 shown in the figure in accordance with the present invention is arranged on both sides of the elevator car 1 so as to correspond to the guide rails 2 arranged on both sides of the elevator car 1. The paired right and left connecting shafts 11 pivotally mounted to the paired right and left different-diameter cams 12 of one safety device 3 is also pivotally mounted to the paired right and left different-diameter cams 11 of the other safety device 3, so that in association with the rotation of the cams 12 of one safety device 3, the paired right and left different-diameter cams 12 of the other safety device also rotate. Therefore, the other safety device 3 also performs the same operation.

[0019] An operation of the safety device 3 of an elevator, configured as described above, is explained with reference to Figures 3 to 5.

As shown in Figure 3, at the normal time such as the time during the elevator operation, the paired right and left different-diameter cams 12 stand upright, and the paired right and left braking wedge pieces 8 are held at the lower positions of the frame 4 or the paired right and left movable pressing pieces 7a, so that the braking surfaces 8a of the paired right and left braking wedge pieces 8 are arranged in a state not being in contact with the guide rail surfaces 2a.

As shown in Figure 4, at the time when the safety device is operated, the paired right and left movable pressing pieces 7a and the braking wedge pieces 8 are moved horizontally toward the guide rail 2 by the operation of the speed governor and via the paired right and left pullup rods 17, the paired right and left pullup levers 16, the paired right and left connecting shafts 11 and the paired right and left different-diameter cams 12. Therefore, the braking surfaces 8a are pressed on the guide rail surfaces 2a.

Next, when the elevator car 1 descends further, the paired right and left movable pressing pieces 7a, the paired right and left different-diameter cams 12, and the paired right and left fixed pressing pieces 7 displace the front ends of the paired right and left pressure elements 5 urged by the second urging element 14 to the outside by means of the inclination of the paired right and left braking wedge pieces 8. Therefore, the braking surfaces 8a of the paired right and left braking wedge pieces 8 are pressed on the guide rail surfaces 2a by the pressing force based on the second urging element 14 of the paired right and left pressure elements 5, and the descending of the elevator car 1 is braked by the friction between the braking surfaces 8a of the paired right and left braking wedge pieces 8 and the guide rail surfaces 2a.

Next, when the elevator car 1 descends further, the upper ends of the paired right and left braking wedge pieces 8 hit the upper plate of the frame 4, so that the upward displacement of the braking wedge pieces 8 stops, and the maximum braking force of the safety device 3 is generated.

[0020] According to the safety device 3 having the construction described above, at the emergency time when the elevator car 1 descends at an abnormal speed, the paired right and left braking wedge pieces 8 can be displaced toward the guide rail 2 by the rotation the paired right and left different-diameter cams 12 driven through the operation of speed governor. Thereby, the movement distance can be made shorter as compared with the conventional example in which the paired right and left braking wedge pieces are displaced toward the guide rail surface 2a while being moved upward along the slope of the pressing surface. Therefore, the paired right and left braking wedge pieces 8 can be brought into contact with the guide rail surfaces 2a in a short period of time.

[0021] Also, similarly, according to this safety device

3, the idle running time of the paired right and left braking wedge pieces 8 becomes short, and early start of braking is achieved. Thereby, the descending speed at the start of the braking is restrained, so that the shock is weak and the influence on the human bodies in the elevator car 1 is on the safety side. Also, the descending distance margin of the elevating/lowering body 1 for the braking operation of the safety device 3 can be shortened. Further the operation reliability of the safety device 3 can be improved.

[0022] Also, similarly, in this safety device 3, the length in the upward direction, which has been needed until the paired right and left braking wedge pieces 8 are brought into contact with the guide rail 2 from the normal positions, is not needed, so that the size in the up and down direction of the safety device can be made small. Thereby, the space can be decreased, so that effects of improved layout ability, reduced building cost induced by shortened pit, and the like can be achieved.

Second Embodiment

[0023] Figure 6 is a front view corresponding to Figure 2, showing a second embodiment of the present invention. In Figure 6, the same symbols are applied to elements equivalent to those in the first embodiment, and the explanation thereof is omitted.

In the first embodiment, the first urging elements 13 consisting of coil springs connecting the paired right and left fixed pressing pieces 7 and the paired right and left movable pressing pieces 7a are disposed above and below the paired right and left different-diameter cams 12.

In the second embodiment, however, guide shafts 13a, which are also used as mounting parts for the first urging elements 13 and are fitted in the paired right and left fixed pressing pieces 7 and the paired right and left movable pressing pieces 7a, are disposed on the inside of the first urging elements 13. Thereby, the same effects as those of the first embodiment can be achieved, and also the paired right and left movable pressing pieces 7a are guided so as to move in the right and left direction without changing the postures thereof. Therefore, an unstable operation can be prevented, which are likely to take place in the configuration of the first embodiment, in that the contact points of the paired right and left different-diameter cams 12 and the midpoints of the coil springs 13 shift, and the paired right and left movable pressing pieces 7a tilt with respect to the paired right and left fixed pressing pieces 7.

Third Embodiment

[0024] Figure 7 is a plan view corresponding to Figure 1, showing a third embodiment of the present invention, and Figure 8 is a front view corresponding to Figure 2, showing the third embodiment.

In the Figures, symbol 5a denotes an urging element consisting of a U-shaped plate spring that integrates the configuration of the paired right and left pressure element 5 and the second urging element 14 in the first embodiment. The urging element 5a resists a force in the outside direction which is applied to the tip end inside of the plate spring 5a at the time of emergency stop operation. Also, the paired right and left movable pressing pieces 7a slide in the right and left direction while the upper and lower ends are held between the upper plate and the lower plate of the frame 4. Thereby, the same effects as those of the first embodiment can be achieved, and also the number of parts and the depth dimension of the safety device 3 can be reduced.

Needless to say, the present invention can be carried out even when the paired right and left pullup levers 16 and the paired right and left stoppers 18 are provided on a side of the movable pressing piece 7a as shown in the Figures.

Fourth Embodiment

[0025] Figure 9 is a plan view corresponding to Figure 1, showing a fourth embodiment of the present invention, and Figure 10 is a front view corresponding to Figure 2, showing the fourth embodiment.

In the safety device 3 in the fourth embodiment, the paired right and left different-diameter cams 12, the paired right and left movable pressing pieces 7a, and the paired right and left braking wedge pieces 8 in the first embodiment are disposed only on one-surface side of the guide rail surface 2a. Also, the paired right and left pressure elements 5, the paired right and left fixed pressing pieces 7, and the second urging element 14 are omitted, and the different-diameter cam 12 is disposed between the movable pressing piece 7a and the side wall of the frame 4. Symbol 8b denotes a fixed braking element disposed so as to be opposed to the anti-braking wedge piece 8 side of the guide rail surface 2a. Symbol 14a denotes a coned disc spring provided between the fixed braking element 8b and the side plate of the frame 4, and the coned disc spring 14a resists a force in the compression direction which is applied to the fixed braking element 8b at the time of emergency stop operation. At the time of emergency stop operation of this safety device 3, the braking surface 8a of the braking wedge piece 8 and the guide rail surface 2a are brought into contact with each other, and the braking wedge piece 8 rises. Then, the overall frame 4 is displaced toward the different-diameter cam 12. Therefore, the braking surface 8b of the braking wedge piece 8 and the fixed braking element 8 hold the guide rail 2 therebetween to brake the elevator car 1.

According to the safety device 3 having the construction described above, the same effects as those of the first through third embodiments can be achieved, and also the number of parts can further be reduced.

Industrial Applicability

[0026] As described above, the safety device of an el-

evator in accordance with the present invention is provided on the moving body the movement of which is guided by the guide rails, and can be used as an emergency stop means that has the pressing surface tilting with respect to the guide rail and the wedge that is inserted with pressure between the pressing surface and the guide rail at the time of emergency stop to brake the moving body.

Claims

1. A safety device of an elevator comprising:

an elevating/lowering body;
a guide rail erected in an elevator shaft to guide the elevation/lowering of the elevating/lowering body;
a pressing assembly including a pressing piece that is provided on the elevating/lowering body and is formed with a pressing surface which faces to the guide rail and the upper side of which tilts to the guide rail side; and
a braking wedge piece that is in sliding contact with the pressing surface of the pressing piece and is inserted under pressure between the guide rail and the pressing surface of the pressing piece at the time of emergency stop operation to brake the lowering of the elevating/lowering body; and
said pressing assembly including:

said pressing piece that is movable and formed with the pressing surface and is provided so as to be displaceable to the right and left direction; and
a cam that is disposed between the movable pressing piece and a fixed portion on the anti-guide rail side of the movable pressing piece, holds the movable pressing piece so that the braking wedge piece and the guide rail are separate from each other at the normal time, and rotates at the time of emergency stop operation to move the movable pressing piece horizontally to the guide rail side, whereby the braking wedge piece is pressed on the guide rail.

2. The safety device of an elevator according to claim 1, **characterized in that** the pressing assembly has a fixed pressing piece provided in the fixed portion on the anti-guide rail side of the movable pressing piece, and the cam is provided on a connecting shaft pivotally supported on a bearing bracket provided on the fixed pressing piece, and is disposed between the movable pressing piece and the fixed pressing piece.

3. The safety device of an elevator according to claim 1 or 2, **characterized in that** there is provided an urging element that pulls the movable pressing piece and the fixed portion on the anti-guide rail side of the movable pressing piece toward each other, and applies a force to the cam in the direction reverse to that at the emergency stop operation time.

4. The safety device of an elevator according to any one of claims 1 to 3, **characterized in that** there is provided a stopper for preventing the rotation of the cam when the cam further rotates a minute amount, after the braking surface comes into contact with the guide rail at the time of emergency stop operation.

5. The safety device of an elevator according to any one of claims 1 to 4, **characterized in that** the upward displacement of a pullup rod pulled up by the operation of a speed governor at the time of emergency stop operation is converted into the turning force of the cam.

Fig. 1

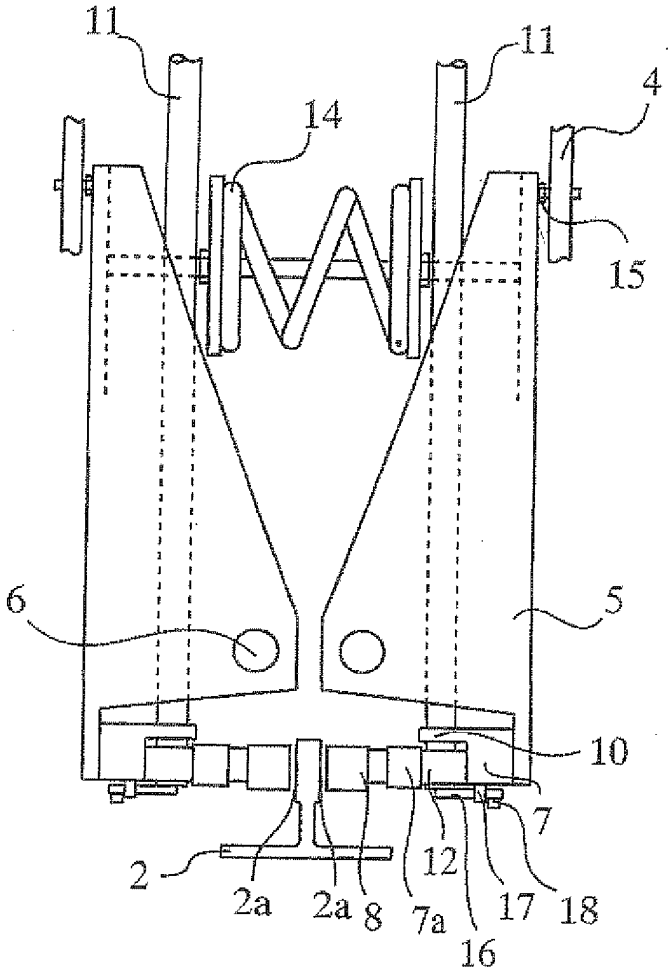

11
11
4
14
15
6
5
10
7
12
2
2a
2a
8
7a
17
18
16

Fig. 2

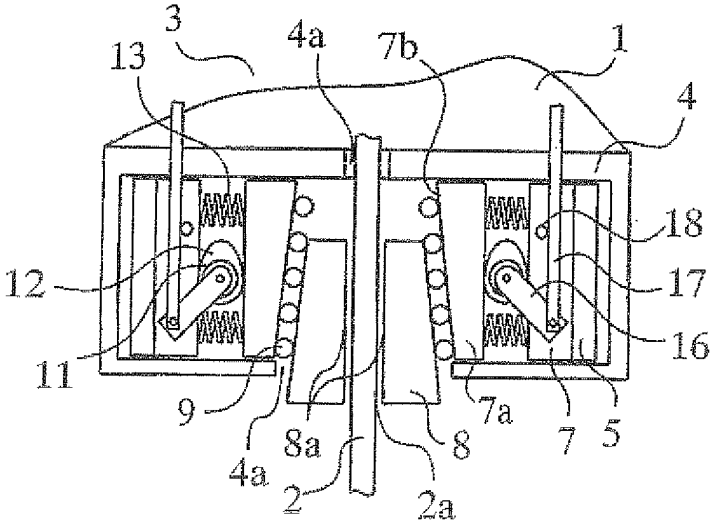

3
4a
7b
1
13
4
18
12
17
16
11
9
7a
8a
8
7
5
4a
2
2a

Fig. 3

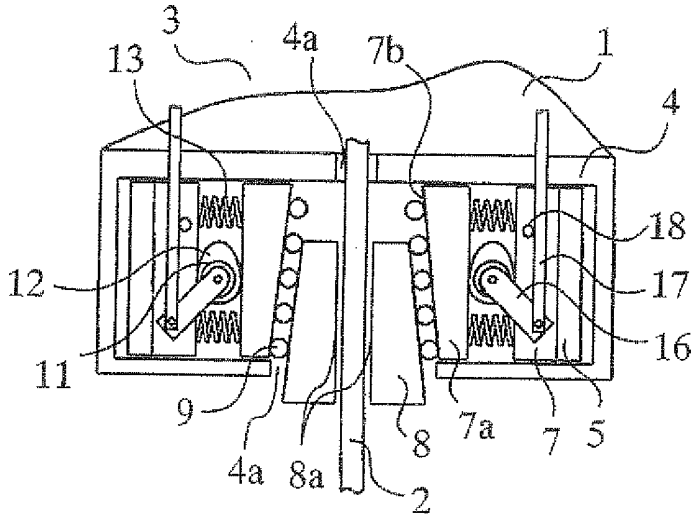


Fig. 4

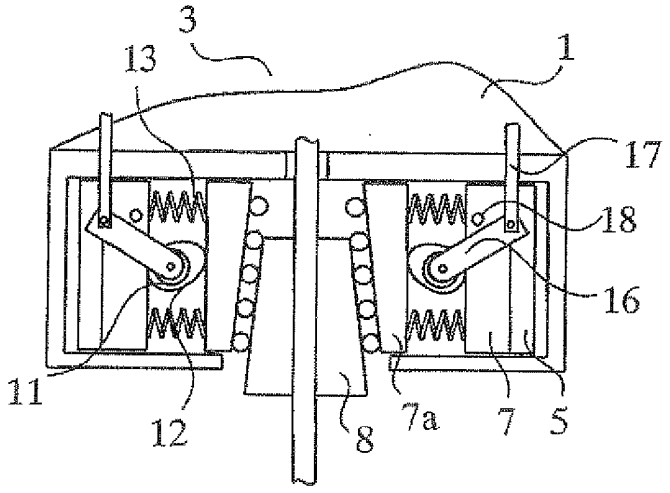


Fig. 5

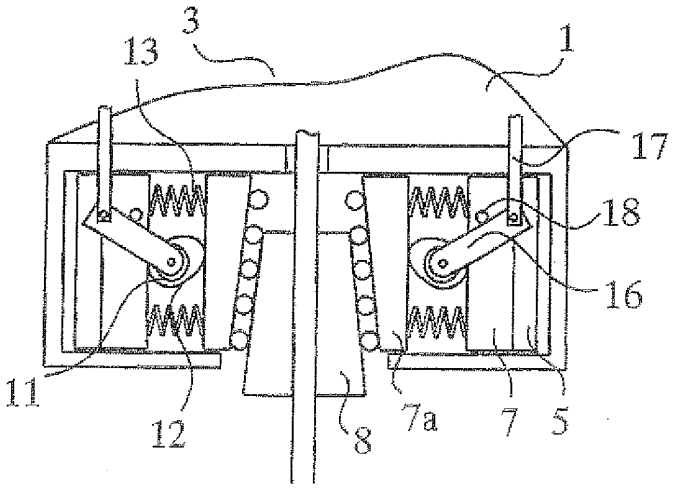


Fig. 6

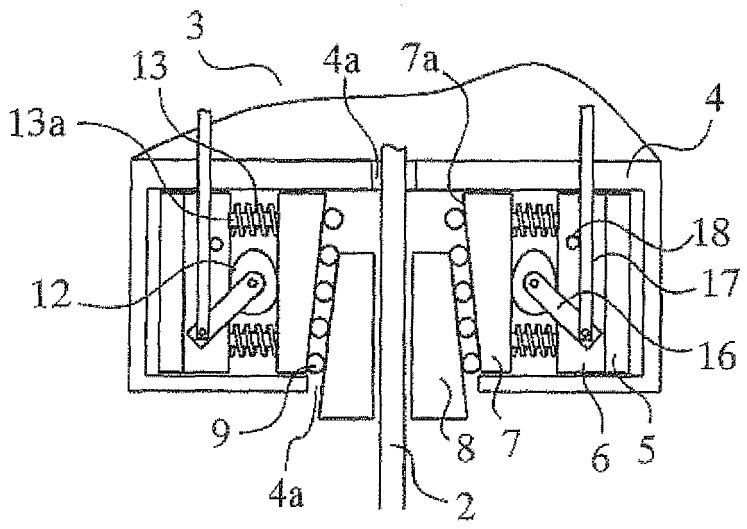


Fig. 7

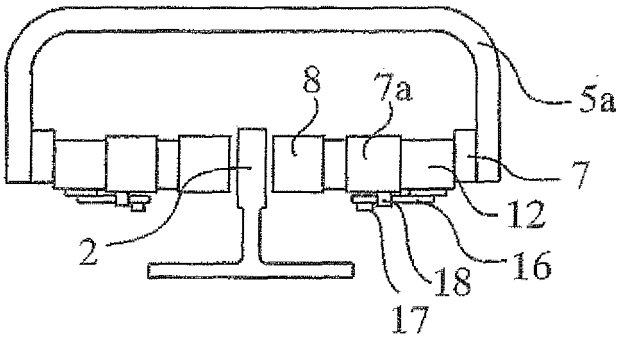


Fig. 8

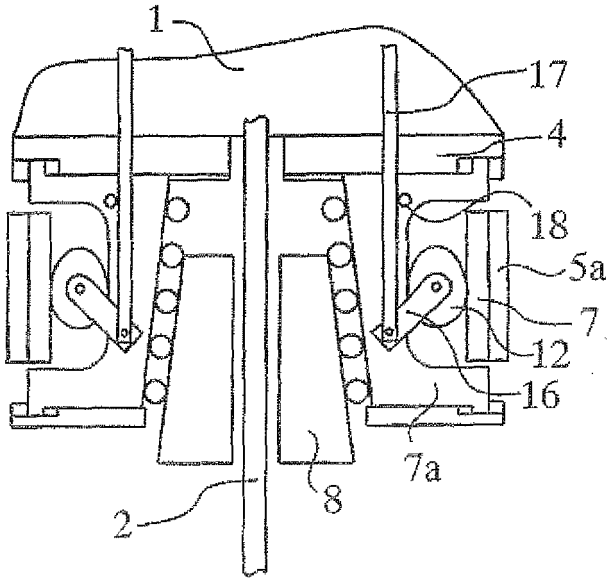


Fig. 9

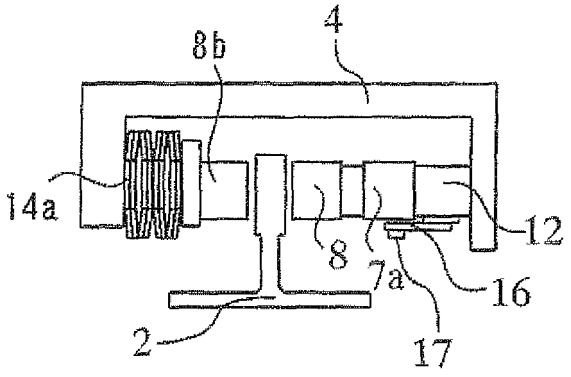
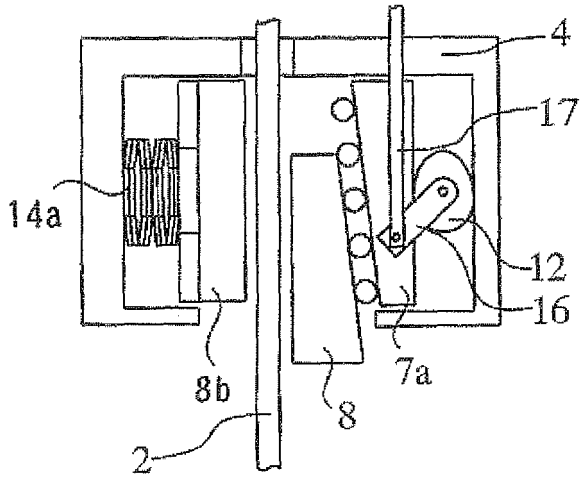


Fig. 10



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2006/304476

A. CLASSIFICATION OF SUBJECT MATTER
B66B5/22(2006.01)i

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)
B66B1/00-B66B20/00

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 1996-2006
Kokai Jitsuyo Shinan Koho 1971-2006 Toroku Jitsuyo Shinan Koho 1994-2006

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2002-226151 A (Inventio AG.), 14 August, 2002 (14.08.02), & US 2002/0070082 A1 & EP 1213247 A1 & NO 20016002 A & CN 1357487 A & AU 9711001 A & BR 0105908 A & NZ 515769 A & CA 2364336 A1	1-5
A	JP 55-037578 Y2 (Kabushiki Kaisha Tomoegumi Tekkosho), 03 September, 1980 (03.09.80), & JP 53-145669 U	1
A	JP 2004-352401 A (Mitsubishi Electric Corp.), 16 December, 2004 (16.12.04), (Family: none)	1

☐ 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
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"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	Date of mailing of the international search report
28 November, 2006 (28.11.06)	12 December, 2006 (12.12.06)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2005)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2004352401 A **[0003]**