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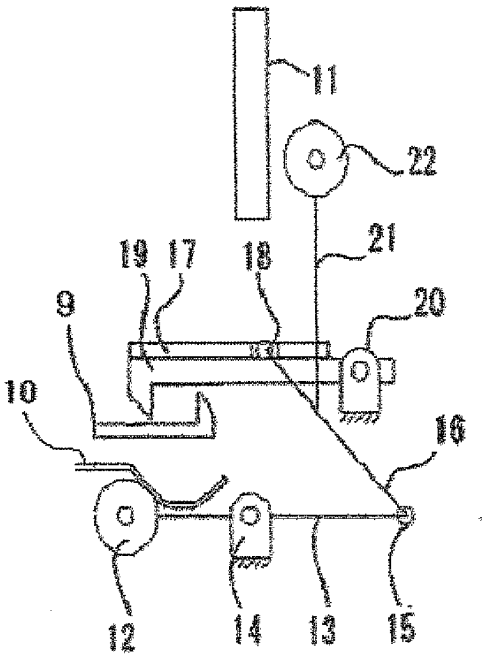
(54) ELEVATOR CAR DOOR LOCK

(57) An elevator car includes: a cam that is fixed to a door hanger that suspends a side opening door of a car; a stationary hook that is fixed to the door hanger; a first roller that is mounted to the car, and that moves downward due to pressure from the cam that accompanies movement of the door hanger; a second roller that is mounted to the car, and that contacts a landing vane that is mounted vertically in a hoistway in a vicinity of a landing closer to a door closing direction side than a path of the first roller due to movement of the car and moves upward based on the downward movement of the first roller; and a movable hook that is mounted to the car, and that faces the stationary hook and releases locking on the stationary hook based on the upward movement of the second roller.

FIG. 4



EP 2 263 963 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to an apparatus that mechanically locks an elevator car door at a position that is outside a landing zone that constitutes a locking release zone. A door on a side near an elevator car is generally opened by a door driving apparatus that is disposed on the elevator car. If the car stops between floors (outside a landing zone) due to a power outage, for example, and a passenger manually opens the car door by force, there is a risk that the passenger may fall into the hoistway. An elevator car door locking apparatus prevents such manual opening of the car door.

BACKGROUND ART

[0002] WO 2006/080094 is an example of a conventional elevator car door locking apparatus. In conventional elevator car door locking apparatuses such as that described in WO 2006/080094:

(i) If a passenger attempts to force open the car door when the car has stopped at a landing position, a first roller is lifted and a second roller moves upward along a landing vane by a cam that is installed on the car door acting in a door opening direction (toward the left), as shown in Figure 1. A movable hook rotates as the second roller moves upward. Then, if an attempt is made to open the car door with the movable hook rotated, the movable hook and a stationary hook do not come into contact, and the car door is not locked.
(ii) If a passenger attempts to force open the car door when the car has stopped away from a landing, because the second roller does not move upward along the landing vane, the movable hook does not rotate, the movable hook 19 comes in contact with the stationary hook, and the car door is locked.

[0003] [Patent Literature 1] WO 2006/080094 A1

DISCLOSURE OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0004] However, in the above conventional elevator car door locking apparatus, since the landing vane is positioned so as to come into contact with the second roller when it moves in the door opening direction (to the left), the landing vane must be placed closer to a door opening side (to the left) than the first roller and the second roller. If the door is centrally opening as shown in Figure 1, the landing vane can be placed outside the doorway, and will not interfere with the boarding and leaving of users. When the conventional elevator car door locking apparatus is applied to side-opening doors, on the other hand, one problem has been that the landing vane may project into the doorway and interfere with the boarding and leaving of users depending on the height of the second roller, as shown in Figure 2. Since passengers can also access the landing vane if the floor alignment position of the car drifts, another problem has been that it may be vandalized and be subjected to damage. An additional problem has been that interference between engaging apparatus and the landing vane may arise between the car and landing doorsills.

[0005] In the present invention, a landing vane does not project into a doorway even if applied to side-opening doors. Passengers cannot gain access to the landing vane even if a floor alignment position of a car drifts. Additionally, interference between engaging apparatus and the landing vane does not arise between the car and a landing doorsill.

MEANS FOR SOLVING THE PROBLEM

[0006] In order to achieve the above object, according to one aspect of the present invention, there is provided an elevator car door locking apparatus constituted by: a cam that is fixed to a door hanger that suspends a side opening door of a car; a stationary hook that is fixed to the door hanger; a first roller that is mounted to the car, and that moves downward due to pressure from the cam that accompanies movement of the door hanger; a second roller that is mounted to the car, and that contacts a landing vane that is mounted vertically in a hoistway in a vicinity of a landing closer to a door closing direction side than a path of the first roller due to movement of the car and moves upward based on the downward movement of the first roller; and a movable hook that is mounted to the car, and that faces the stationary hook and releases locking on the stationary hook based on the upward movement of the second roller.

EFFECTS OF THE INVENTION

[0007] Since the present invention includes: a cam that is fixed to a door hanger that suspends a side opening door of a car; a stationary hook that is fixed to the door hanger; a first roller that is mounted to the car, and that moves downward due to pressure from the cam that accompanies movement of the door hanger; a second roller that is mounted to the car, and that contacts a landing vane that is mounted vertically in a hoistway in a vicinity of a landing closer to a door closing direction side than a path of the first roller due to movement of the car and moves upward based on the downward movement of the first roller; and a movable hook that is mounted to the car, and that faces the stationary hook and releases locking on the stationary hook based on the upward movement of the second roller, the landing vane does not project into a doorway even if applied to a side opening door. Passengers cannot gain access to the landing vane even if a floor alignment position of a car drifts. Addition-

ally, interference between engaging apparatus and the landing vane does not arise between the car and a landing doorsill.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Figure 1 is a diagram that shows an overall view when a conventional car door locking apparatus is used in a centrally opening door;
Figure 2 is a diagram that shows an overall view when the conventional car door locking apparatus is used in a side opening door;
Figure 3 is a diagram that shows an overall view when a door locking apparatus according to the present invention is used in a side opening door;
Figure 4 is a detail of the car door locking apparatus according to the present invention in a landing zone;
Figure 5 is a detail of the car door locking apparatus according to the present invention outside the landing zone;
Figure 6 is a detail of the car door locking apparatus according to the present invention in the landing zone;
Figure 7 is a detail of the car door locking apparatus according to the present invention in the landing zone;
Figure 8 is a detail of a car door locking apparatus according to Embodiment 2 of the present invention;
Figure 9 is a detail of a car door locking apparatus according to Embodiment 3 of the present invention;
Figure 10 is a detail of the car door locking apparatus according to Embodiment 3 of the present invention; and
Figure 11 is a detail of a car door locking apparatus according to Embodiment 4 of the present invention.

REFERENCE SIGNS LIST

[0009] 1: first door, 2: second door, 3: first door hanger, 4: second door hanger, 5: guide rail, 6: parts that are mounted to the first door hanger first roller, 1: parts that are mounted in a stationary state inside the hoistway, 8: parts that are mounted to a car, 9: stationary hook, 10: cam, 10a,10c: inclined portion of cam, 10b: flat portion of cam, 11: landing vane, 12: first roller, 13: first arm, 14: first fixed mediating means, 15: first movable mediating means, 16: second arm, 17: guide, 18: second movable mediating means, 19: movable hook, 20: second fixed mediating means, 21: third arm, 22: second roller, 23: spring, 24: pin, 25: switch, 26: contact

BEST MODE FOR CARRYING OUT THE INVENTION

Embodiment 1

[0010] Figure 3 is a front elevation that shows an overall view of the elevator car door locking apparatus of the present invention. A side opening door is constituted by a first door 1 and a second door 2. When the door opens, first the first door 1 opens to the left, and then the second door 2 opens to the left. A first door hanger 3 suspends the first door 1, and a second door hanger 4 suspends the second door 2. The first door hanger 3 and the second door hanger 4 can move horizontally by means of a guide rail 5. In other words, the first door 1 and the second door 2 can be moved by means of the first door hanger 3 and the second door hanger 4.

[0011] Figure 4 shows a basic concept of the locking apparatus according to the present invention. The car door locking apparatus that constitutes the present invention is divided into three groups: (i) parts 6 that are mounted to the first door hanger 3; (ii) parts 7 that are mounted in a stationary state inside the hoistway; and (iii) parts 8 that are mounted to a car (parts other than parts 6 and parts 7 in Figure 4). Moreover, the parts 8 will be explained as being mounted to the car, but are not limited to this. For example, they may also be mounted to a door driving apparatus that is installed on the car.

[0012] The parts that are mounted to the first door hanger 3 include a stationary hook 9 and a cam 10. The cam 10 has: a pair of inclined portions 10a and 10c; and a flat portion 10b that links the pair of inclined portions 10a and 10c. This cam 10 is mounted to a lower portion of a cam bracket (not shown) such that an inclined portion 10a is oriented toward a door opening direction, and the flat portion 10b is horizontal.

[0013] The parts that are mounted inside the hoistway include landing vanes 11 that are mounted in a stationary state inside the hoistway at respective landings. These landing vanes 11 are mounted vertically in the hoistway in a vicinity of the landings that is closer to a door closing direction side than a path of a first roller (described below) due to movement of the car. By disposing the landing vanes 11 behind jambs of door frames, there is no adverse effect on appearance even in the case of glass doors or glass hoistways.

[0014] The parts that are mounted to the car include the parts described below. There is a first roller 12 that has a bearing and that moves vertically in accordance with movement of the cam 10, a first arm 13 that has a first end that is installed in the first roller 12, a first fixed mediating means 14 that is fixed to the car and that has a bearing, and a first movable mediating means 15 that is constituted by a bearing and that is freely movable. Moreover, when the first end of the first arm 13 is lowered (raised), a second end of the first arm 13 is raised (lowered) by means of the first fixed mediating means 14. There is a second arm 16 that has a first end that is connected by a hinge to the first movable mediating means 15, and a second movable mediating means 18 that is connected by a hinge with a second end of the second arm 16, that is constituted by a bearing, and that moves on a guide 17 that is disposed level with a car floor in a locked state. Moreover, since the first movable

mediating means 15 is constituted by a bearing, an angle that is formed by the first arm 13 and the second arm 16 is not constant. There is a movable hook 19 that is fixed to the guide 17, and a second fixed mediating means 20 that is fixed to the car, that is constituted by a bearing, and that is connected by a hinge to the movable hook 19. Moreover, the movable hook 19 is rotatable around the second fixed mediating means 20. A third arm 21 that has a first end that is fixed to the second arm 16 has a second end that is connected by a hinge to a second roller 22 that has a bearing. The second roller 22 is movable vertically along a landing vane 11 when a landing vane 11 is present. Moreover, the second roller 22 and the landing vanes 11 are arranged so as not to contact each other when the door is fully closed.

[0015] Next, configuration of the present car door locking apparatus if a passenger forces the door open when the car has stopped at a position that is distant from a landing will be explained using Figure 5, and configuration of the present car door locking apparatus if the door is opened when the car has stopped at or in a vicinity of a landing floor will be explained using Figure 6.

[0016] Figure 5 represents a configuration of the present car door locking apparatus if a passenger forces the door open when the car has stopped at a position that is distant from a landing. If the door is opened by manual operation by the passenger, the stationary hook 9 and the cam 10 move to the left interdependently with the door. The first roller 12 moves so as to be pressed downward by the inclined portion 10a of the cam 10 while contacting the cam 10. As the first roller 12 moves downward, the left end of the first arm 13 moves downward, and the right end of the first arm 13 moves upward with the first fixed mediating means 14 as an axis. In other words, the first arm 13 rotates counterclockwise by means of the first fixed mediating means 14. With the upward movement of the right end of the first arm 13, the second movable mediating means 18 that is installed on the first end of the second arm 16 moves along the guide 17 to the left. The reason that the second movable mediating means 18 only moves to the left and the movable hook 19 does not move vertically is because the moment due to the resultant force between the force of the second arm 16 that activates the second movable mediating means 18 and the frictional force of the second movable mediating means 18 is designed so as to be less than the moment that rotates the movable hook 19 around the second fixed mediating means 20. Methods for adjusting the frictional force of the second movable mediating means 18 include methods such as knurling a surface of the second movable mediating means 18, for example. Because of this, when the stationary hook 9 tries to move to the left, the stationary hook 9 and the movable hook 19 come into contact, the stationary hook 9 cannot move any further to the left, and since the stationary hook 9 is fixed to the door, the door cannot move to the left.

[0017] Figure 6 represents a configuration of the present car door locking apparatus if the door is opened when the car has stopped at or in a vicinity of a landing floor. When the door is opened, the second movable mediating means 18 that is installed on the first end of the second arm 16 tries to move left along the guide 17 with the upward movement of the right end of the first arm 13. However, the second roller 22 that is connected by a hinge to the first end of the third arm 21 that is fixed to the second arm 16 contacts a landing vane 11 and moves upward along the landing vane 11. Since the angle that is formed by the second arm 16 and the third arm 21 is always constant, the second movable mediating means 18 cannot move left and only moves upward. The guide 17 and the movable hook 19 also rotate clockwise around the second fixed mediating means 20 due to the upward movement of the second movable mediating means 18. Because of this, when the stationary hook 9 tries to move to the left, the stationary hook 9 and the movable hook 19 do not come into contact, the stationary hook 9 can move left, and the first door 1 can move left.

[0018] Next, operation of the present car door locking apparatus if the door opens when the car has stopped at or in a vicinity of a landing floor (inside a landing zone) will be explained. The door opens partially until the second roller 22 contacts a landing vane 11 as shown in Figure 7. If the door is closed, spacing is left between the second roller 22 and the landing vane 11 that is a distance that is equal to a predetermined standard set gap. Next, as shown in Figure 5, the cam 10 moves to the left together with the door, and the first roller 12 is pressed downward. As a result, the first arm 13 that is coupled by a hinge rotates counterclockwise around the first fixed mediating means 14. This rotation of the first arm 13 moves the first movable mediating means 15 that also serves a role as a hinge point. The second arm 10 shares the first movable mediating means 15 with the first arm 13. Since the second arm 16 has a fixed length, the second movable mediating means 18, which constitutes a hinge point at the second end of the second arm 16, is moved to the left. The second roller 22 moves along the guide 17 toward the landing vane 11 that is to the left until it contacts the landing vane 11. In other words, the movable hook 19 is held in a locked position until the second roller 22 contacts the landing vane 11.

[0019] Next, the gap between the second roller 22 and the landing vane 11 is eliminated by the movement of the second movable mediating means 18. Figure 6 shows the locking apparatus in a state in which the movable hook 19 is released when the door of the car is inside a locking release zone.

[0020] The second roller 22 contacts the landing vane 11, and the second movable mediating means 18 is prevented from further horizontal displacement to the left. During the door opening movement, while the inclined portion 10a of the cam 10 continues pushing the first roller 12, the first arm 13 continues rotating until the first roller 12 rides from the inclined portion of the cam 10 onto the lower flat portion 10b. The first movable mediating means 15, which serves a role as a hinge point,

thereby moves upward. Because of this, the second movable mediating means 18 is also pushed along upward. The movable hook 19 is coupled by a hinge to the second fixed mediating means 20, which plays a role as a hinge point that is disposed in a stationary state on top of the car. Thus, as a result of the upward movement of the second movable mediating means 18, the movable cam 10 rotates clockwise around the second fixed mediating means 20 that also serves the role of a hinge point. The stationary hook 9 can thereby pass through without contacting the movable hook 19.

[0021] The stationary hook 9 passes the movable hook 19, and the first roller 12 remains on the flat portion 10b of the cam 10 until interference between these parts is prevented sufficiently. In other words, the movable hook 19 is held in a locking release position. Then, when the first roller 12 passes the flat portion 10b and moves to the inclined portion 10c, the movable hook 19 is returned from the locking release position to the locked position.

[0022] Operation of the present car door locking apparatus if the door opens when the car has stopped at or in a vicinity of a landing floor (outside a landing zone) will be explained. The door of the car opens partially outside the landing zone. This state, corresponds to when the passenger opens the door manually between floors, for example.

[0023] When the door of the car is inside a locking release zone, as shown in Figure 5, because a landing vane 11 is not present, the second movable mediating means 18, which also serves the role of a hinge point, will not move upward during a continuous door opening movement. In other words, the movable hook 19 is held in the locking position. Because the stationary hook 9 is fixed to the door directly or indirectly, the door will not open any further when the stationary hook 9 is caught behind the movable hook 19. If the door opens without the movable hook 19 moving, the door is locked by the stationary hook 9 engaging with the movable hook 19.

[0024] Thus, effects are achieved such as the landing vanes not projecting into the doorway even if the present invention is applied to a side opening door, passengers being unable to gain access to the landing vane even if the floor alignment position of the car drifts, and interference between the engaging apparatus and the landing vane that arises between the car and the landing doorsills not occurring.

[0025] Moreover, in the present embodiment, the door is explained as moving to the left, but is not limited to this. Right and left may also be reversed.

Embodiment 2

[0026] The present embodiment will be explained using Figure 8. When the first door 1 is opened, a moment is generated in a reverse direction to a direction that a first arm 13 rotates. For example, an elastic body 23 may be included between a car and a right end of the first arm 13. The elastic body 23 may be a spring, or rubber, for example. By forcing a first roller 12 upward using this elastic body 23, a force in a door closing direction can be generated in a first door 1 when the first door 1 is fully closed or in a vicinity of fully closed. Specifically, a clockwise moment is generated in the first arm 13, applying a force to the first door 1 in a fully closing direction by means of a cam 10.

Embodiment 3

[0027] The present embodiment will be explained using Figures 9 and 10. Even if the first door 1 enters the closed state from the open state, the movable hook 19 may remain rotated in the direction of unlocking and not return to its original position due to frictional forces in the second movable mediating means 18, etc. In the present embodiment, an elastic body 24 that is fixed to a first door 1, a first door hanger 3, or a cam 10 moves a first roller upward by coming into contact with the first roller 12 and pressing upward, returning a second movable mediating means to its original position. Thus, the movable hook can be returned to its original position even if the frictional forces in the second movable mediating means are great. The elastic body 24 may be a pin, for example.

Embodiment 4

[0028] The present embodiment will be explained using Figure 11. In the present embodiment, a car stopping means is included that is constituted by a switch 25 and a contact 26. A car is prevented from moving in an unlocked state in which a movable hook 19 is rotated in a direction of unlocking. The contact 26, which is installed on the movable hook 19 or a guide 17, contacts the switch, which is mounted to the car. Electric current passes due to this contact, enabling the car to move. If, on the other hand, the movable hook 19 is rotated, the passage of the electric current is interrupted since contact between the contact 26 and the switch 25 is opened, stopping movement of the car.

INDUSTRIAL APPLICABILITY

[0029] The present invention relates to an apparatus that mechanically locks an elevator car door at a position that is outside a landing zone that constitutes a locking release zone.

Claims

1. An elevator car door locking apparatus comprising:

a cam that is fixed to a door hanger that suspends a side opening door of a car;
a stationary hook that is fixed to said door hanger;
a first roller that is mounted to said car, and that

moves downward due to pressure from said cam that accompanies movement of said door hanger;

a second roller that is mounted to said car, and that contacts a landing vane that is mounted vertically in a hoistway in a vicinity of a landing closer to a door closing direction side than a path of said first roller due to movement of said car and moves upward based on said downward movement of said first roller; and

a movable hook that is mounted to said car, and that faces said stationary hook and releases locking on said stationary hook based on said upward movement of said second roller.

2. An elevator car door locking apparatus according to Claim 1, **characterized in** further comprising an elastic body that is mounted to said car,
said elastic body forcing said first roller upward.

3. An elevator car door locking apparatus according to either of Claims 1 or 2, **characterized in** further comprising a car stopping means that stops movement of said car,
said car stopping means stopping said movement of said car based on unlocking of said movable hook.

FIG. 1

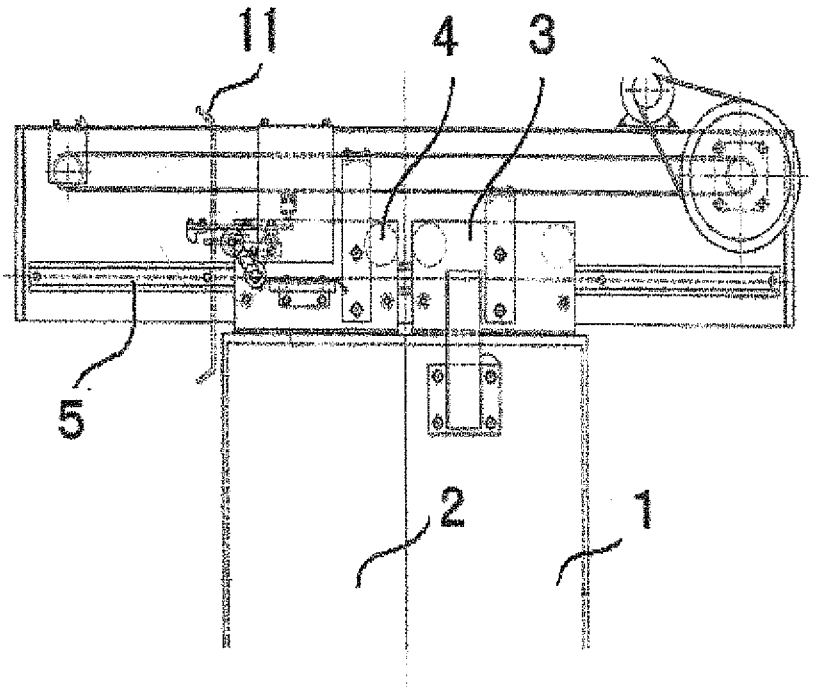


FIG. 2

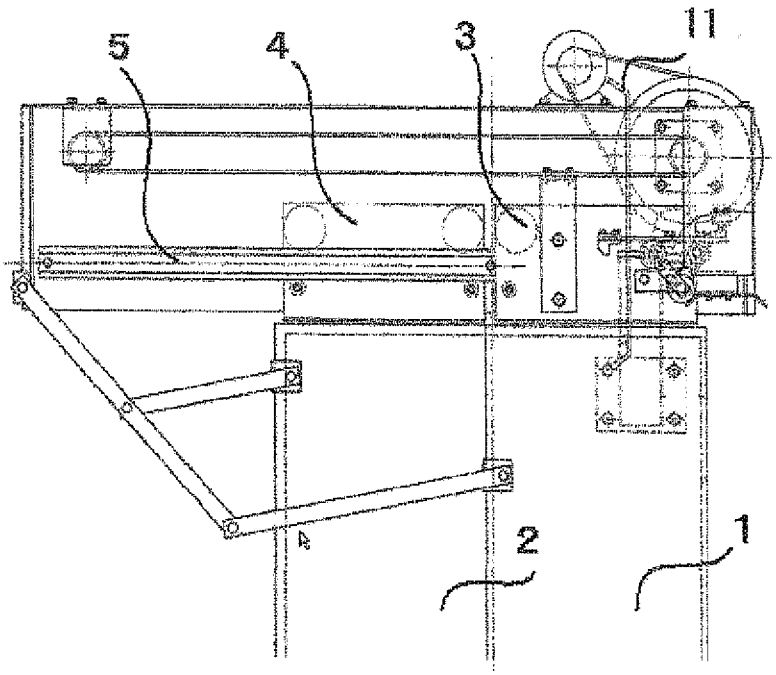


FIG. 3

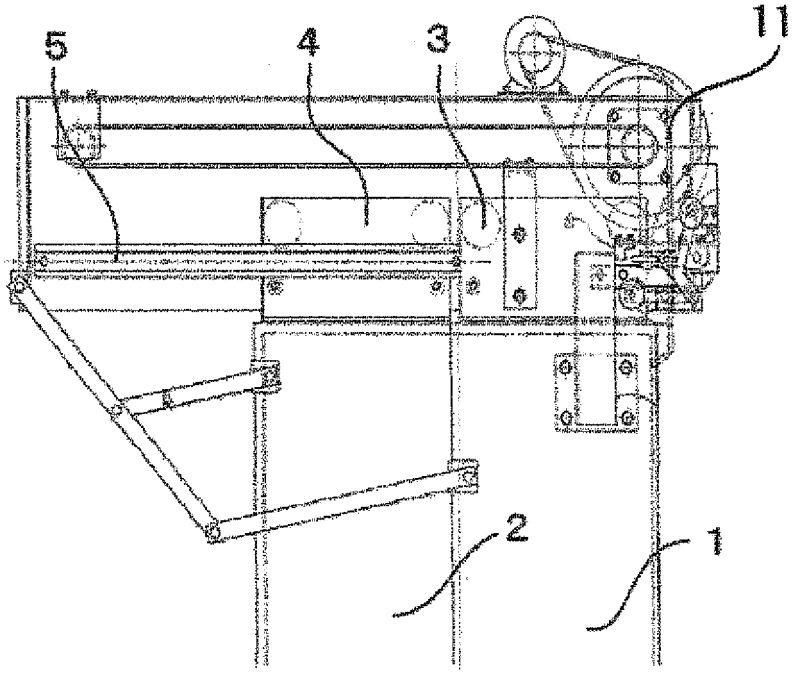


FIG. 4

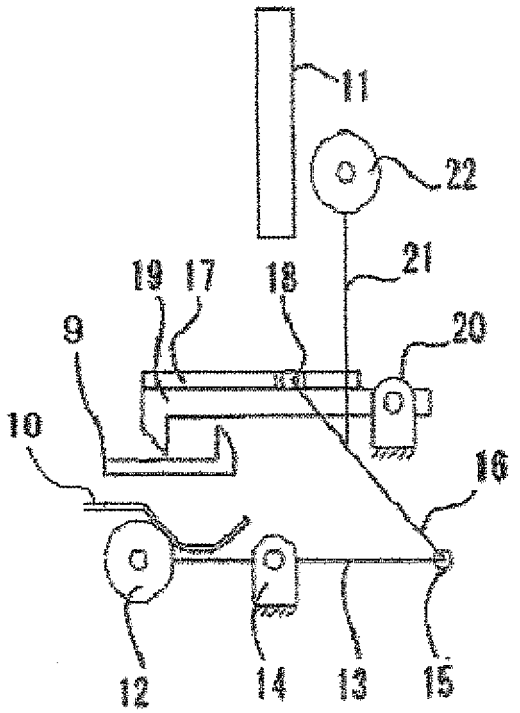


FIG. 5

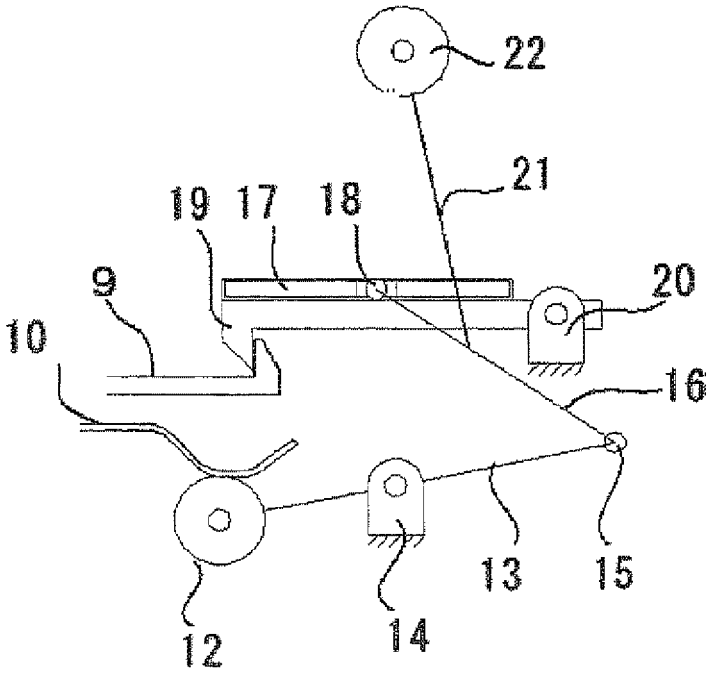

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FIG. 6

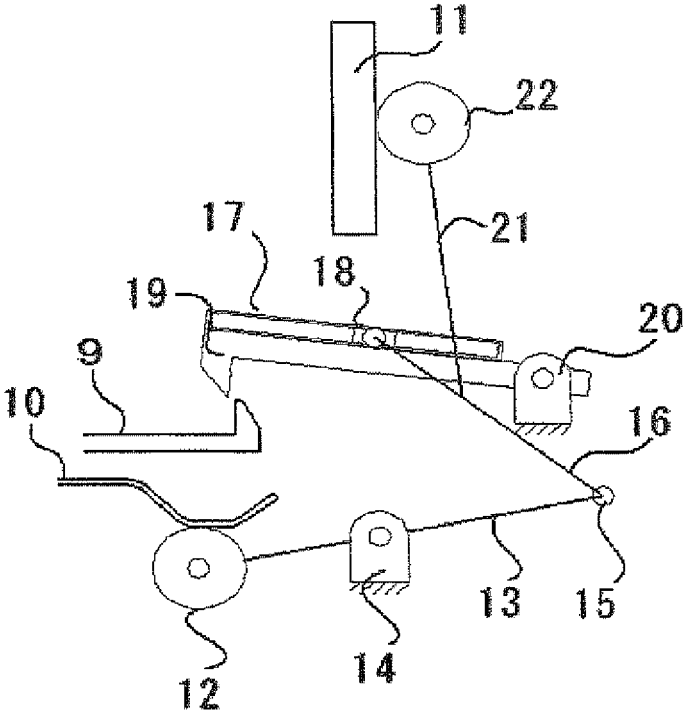
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FIG. 7

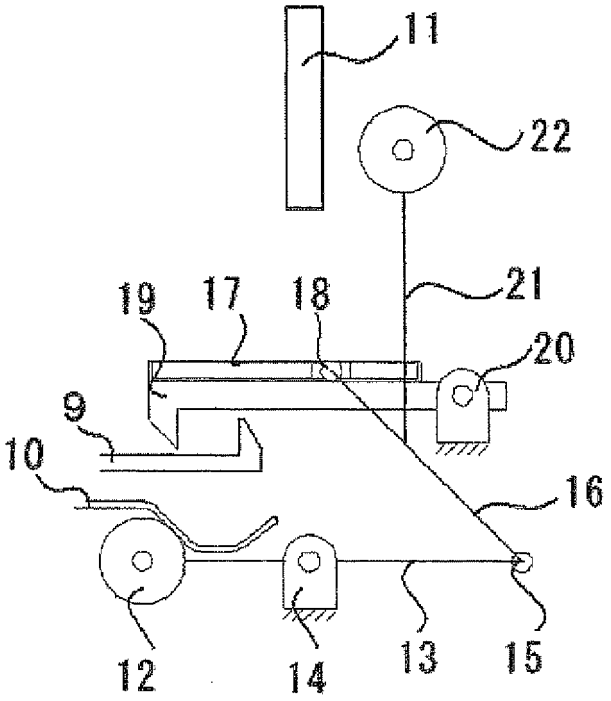
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FIG. 8

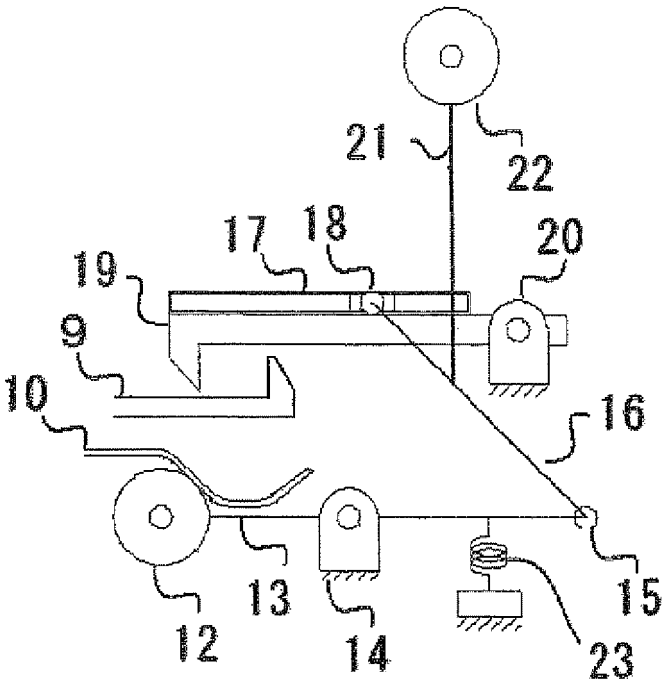
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FIG. 9

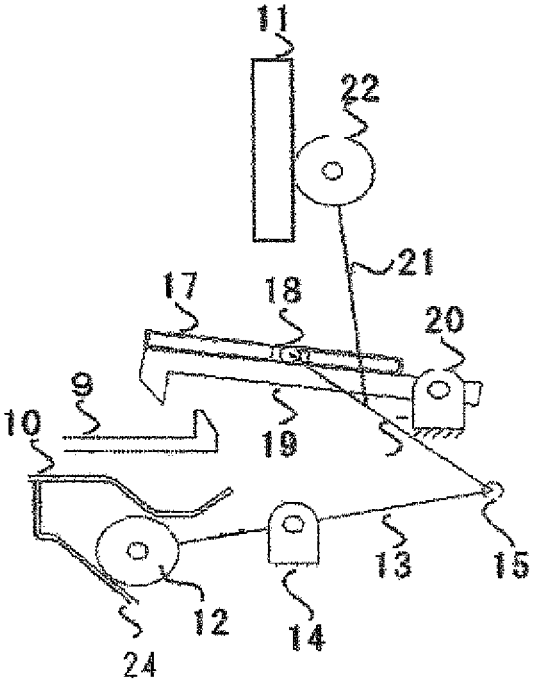
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FIG. 10

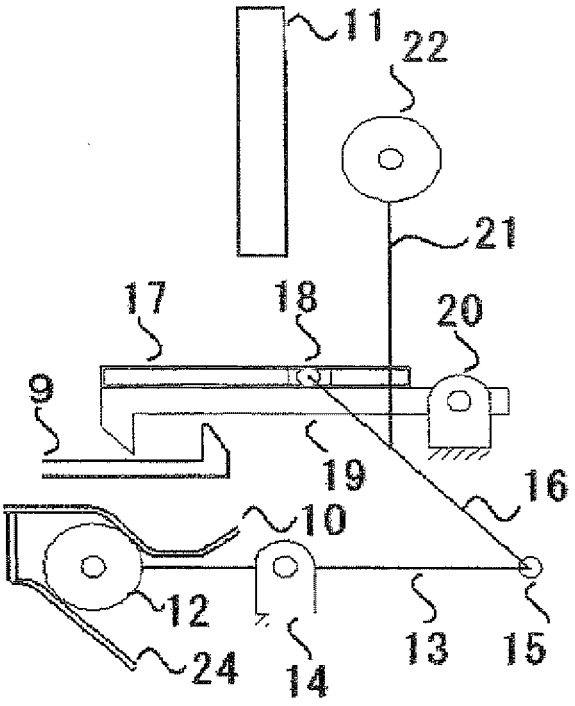
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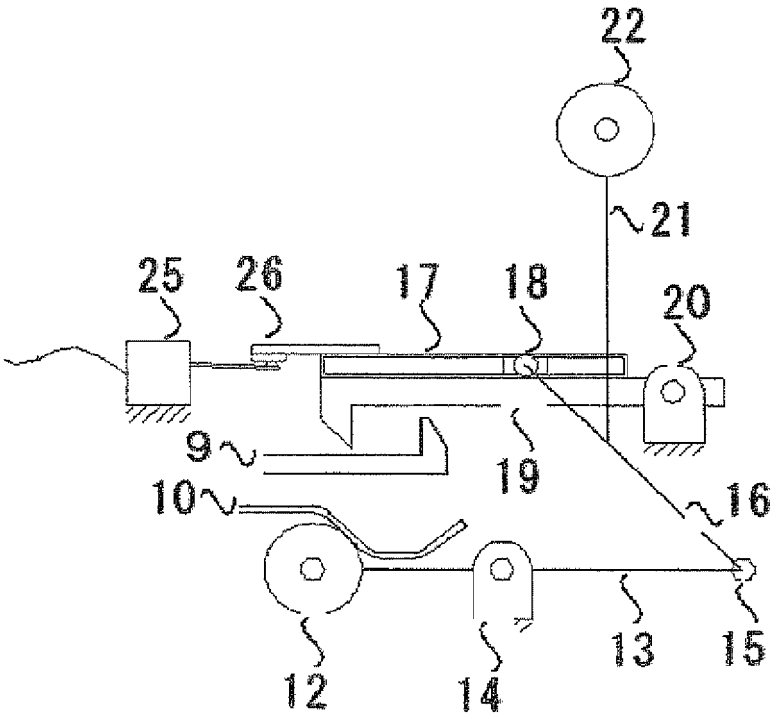
FIG. 11



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2008/057494

A. CLASSIFICATION OF SUBJECT MATTER
B66B13/18(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)
B66B13/18

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 1996-2008
Kokai Jitsuyo Shinan Koho 1971-2008 Toroku Jitsuyo Shinan Koho 1994-2008

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	WO 2006/080094 A1 (MITSUBISHI DENKI KABUSHIKI KAISHA), 03 August, 2006 (03.08.06), & EP 1841682 A & CN 101031497 A & JP 2008-528399 A	1-3
A	JP 08-208161 A (Kone OY), 13 August, 1996 (13.08.96), & US 5690189 A & EP 709334 A1 & FI 945128 A & AU 3456395 A & CA 2161582 A & CN 1129668 A	1-3
A	JP 02-013591 A (Hitachi, Ltd.), 17 January, 1990 (17.01.90), (Family: none)	2

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

* Special categories of cited documents:
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Date of the actual completion of the international search	Date of mailing of the international search report
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International application No.
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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 59-194984 A (MITSUBISHI DENKI KABUSHIKI KAISHA), 05 November, 1984 (05.11.84), (Family: none)	3

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REFERENCES CITED IN THE DESCRIPTION

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