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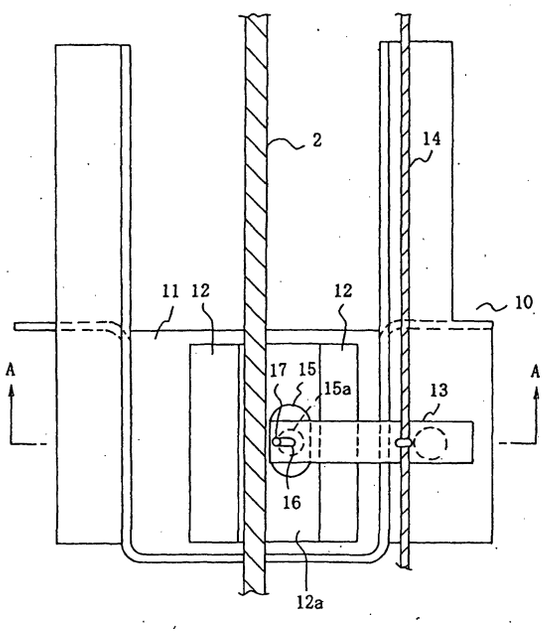
(54) EMERGENCY STOPPER OF ELEVATOR

(57) An emergency elevator stopping apparatus provided on an elevator car 1 and adapted to stop the elevator car 1 by pressing a guide rail 2 along which the elevator car 1 is guided, including:

an elliptic roller 15 disposed rotatably in the vicinity of the guide rail 2, and having a smaller diameter shorter than a distance between the guide rail 2 and a rotary shaft 15a and a larger diameter longer than the same distance, and
a lever 13 adapted to set the direction in which the guide rail 2 extends and that in which the larger diameter of the roller 15 extends, substantially parallel to each other while the elevator car 1 moves at a speed not higher than a predetermined level, and turn the roller 15 when the elevator car 1 moves at a speed in excess of a predetermined level, and thereby cause the roller 15 to press the guide rail 2.

FIG.2



EP 1 449 800 A1

Description

TECHNICAL FIELD

[0001] This invention relates to an emergency elevator stopping apparatus (elevator safety device) capable of stopping an elevator car easily when a speed thereof increases even while the elevator car moves up, and having an excellent durability.

BACKGROUND ART

[0002] The emergency elevator stopping apparatus disclosed in JP-B-52-18973 is known as an example of a related art general emergency elevator stopping apparatus. This related art example will now be described.

[0003] As shown in Fig. 9, a related art emergency elevator stopping apparatus 20 is fixed to a lower portion of an elevator car guided along a guide rail 21 provided in an elevator shaft. A speed of the elevator car is detected by a governor via a governor rope 22 provided in the elevator shaft, and the speed data are transmitted to an emergency stopper 23 joined to the governor rope 22. The emergency stopper 23 lifts a lever 24 when the speed constituting these speed data exceeds a predetermined level. In accordance with this lever lifting action, a roller 25 provided in a front end portion of the lever 24 is lifted, and held between a metal holder 26 provided so as to extend to both sides of the guide rail 21 and the same guide rail 21. As shown in Fig. 10, the roller 25 thrusts into a space between the metal holder 26 and guide rail 21 to cause the elevator car to stop emergently.

[0004] However, since the related art emergency elevator stopping apparatus 20 functions only when the speed of the elevator car increases during a downward movement thereof, the elevator car could not be stopped emergently when a speed thereof increased during an upward movement thereof.

[0005] An emergency elevator stopping apparatus disclosed in Japanese Patent No. 2698765 has been proposed as an emergency elevator stopping apparatus effectively used when the speed of an elevator car increases during both an upward movement thereof and a downward movement thereof. As shown in Fig. 11, an emergency elevator stopping apparatus 30 disclosed in the mentioned Japanese Patent No. 2698765 is provided with a pair of elevator car stopping wedges 31, 32. When a speed of the elevator car increases during a downward movement thereof, the wedge 31 moves up slidingly, and thrusts into a space between a guide rail 33 and a frame 34 to cause the elevator car to stop emergently. Similarly, when the speed of the elevator car increases during an upward movement thereof, the wedge 32 moves down slidingly, and thrusts into a space between the guide rail 33 and a frame 35 to cause the elevator car to stop emergently.

[0006] However, the related art emergency elevator stopping apparatus 30 has a complicated construction, so that the apparatus has a durability problem. Especially, since the emergency elevator stopping apparatus is not used during a normal operation of an elevator, there is the possibility that a driving portion of the emergency elevator stopping apparatus be rusted or covered with dust to cause a movement of the driving portion thereof to be deteriorated. Under the circumstances, the development of an emergency elevator stopping apparatus of a simple construction capable of being operated reliably in an emergency has been demanded.

[0007] The present invention has been made in view of the problems as described above, and provides an emergency elevator stopping apparatus of a high durability.

DISCLOSURE OF THE INVENTION

[0008] The present invention also provides an emergency elevator stopping apparatus provided on an elevator car and adapted to press a guide rail, which guides the elevator car, and thereby stop the elevator car, including a roller rolling mechanism adapted to press the guide rail when the elevator car moves at a speed in excess of a predetermined level in either upward or downward direction.

[0009] The invention further provides an emergency elevator stopping apparatus, provided on an elevator car and adapted to press a guide rail, which guides the elevator car, and thereby stop the elevator car, including an elliptic roller which is disposed rotatably in the vicinity of the guide rail, and which has a smaller diameter shorter than a distance between the guide rail and an axis of a rotary shaft of the elliptic roller and a larger diameter longer than the same distance; and a lever adapted to set the direction in which the guide rail extends and that in which the larger diameter of the roller extends, substantially parallel to each other while the elevator car moves at a speed not higher than a predetermined level, and turn the roller when the elevator car moves at a speed in excess of a predetermined level, and thereby cause the roller to press the guide rail.

[0010] The invention further provides an emergency elevator stopping apparatus further including an elongated hole formed in a front end portion of the lever and extending in the lengthwise direction of the lever, a pin inserted slidably in the elongated hole, and a lever driving member adapted to press down the front end portion of the lever when the elevator car moves up at a speed in excess of a predetermined level, and lift the front end portion of the lever when the elevator car moves down at a speed in excess of a predetermined level.

[0011] The invention further provides an emergency elevator stopping apparatus further including a metal holder provided with a recess for holding a part of the guide rail and the roller, the width of the recess being larger than the sum of the width of the guide rail and the length of the shorter diameter of the roller and smaller

than the sum of the width of the guide rail and the length of the longer diameter of the roller.

[0012] The invention further provides an emergency elevator stopping apparatus, in which a side wall of the recess is inclined in the vertical direction.

[0013] The invention further provides an emergency elevator stopping apparatus, in which an inclined plate diagonal in the vertical direction is fixed replaceably to a side wall of the recess.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Fig. 1 is a front view showing an elevator car on which the emergency elevator stopping apparatus in a mode of embodiment of the present invention is provided;

Fig. 2 is a front view showing the emergency elevator stopping apparatus in the mode of embodiment;

Fig. 3 is a sectional view of the emergency elevator stopping apparatus in the mode of embodiment taken along the line A-A;

Fig. 4 illustrates an action of the emergency elevator stopping apparatus made when the speed of an elevator car increases during a downward movement thereof;

Fig. 5 illustrates an action of the emergency elevator stopping apparatus made when the speed of an elevator car increases during an upward movement thereof;

Fig. 6 is a partial enlarged view showing a modified example in which a right side wall of a recess provided in a metal holder is inclined in the vertical direction;

Fig. 7 is a partial enlarged view showing a modified example in which the shape of a roller is partially changed;

Fig. 8 is a partial enlarged view showing a modified example in which a vertically inclined plate is replaceably fixed to a right side wall of the metal holder;

Fig. 9 is a front view showing a related art emergency elevator stopping apparatus;

Fig. 10 is a front view showing the related art emergency elevator stopping apparatus; and

Fig. 11 is a front view showing a related art emergency elevator stopping apparatus.

BEST MODE FOR CARRYING OUT THE INVENTION

[0015] Fig. 1 is a front view showing an elevator car I on which an emergency elevator stopping apparatus 10 in a mode of embodiment of the present invention is provided. As shown in the same drawing, the emergency elevator stopping apparatus 10 is fixed to a lower portion of an elevator car 1 guided along a guide rail 2 provided in a elevator shaft. The apparatus 10 functions so as to stop the elevator car 1 by pressing the guide rail 2 when a speed of the elevator car 1 abnormally increases.

[0016] The emergency elevator stopping apparatus 10 in this mode of embodiment will now be described in detail.

[0017] Fig. 2 is a front view showing the emergency stopping apparatus 10 in this mode of embodiment, and Fig. 3 is a sectional view of the emergency stopping apparatus in this mode of embodiment taken along the line A-A. As shown in these drawings, a reference numeral 11 denotes a frame fixed to a lower portion of the elevator car 1. A reference numeral 12 denotes a recessed metal holder fixed to a central portion of the frame 11 and adapted to hold a part of the guide rail 2 in a recess 12a. A reference numeral 13 denotes a lever fixed rotatably to a side portion of the frame 11. A reference numeral 14 denotes a governor rope fixed to the lever 13 and adapted to vertically swing a front-end portion of the lever 13. A reference numeral 15 denotes an elliptic roller fixed rotatably to the metal holder 12 by a rotary shaft 15a and held with the guide rail 2 in the recessed wall 12a of the metal holder 12. A reference numeral 16 denotes an elongated hole formed in a front-end portion of the lever 13 and extending in the lengthwise direction of the lever 13. A reference numeral 17 denotes a pin provided in a projecting state on a circumferential portion of a smaller-diameter section of the roller 15, and inserted slidably into the elongated hole 16.

[0018] The roller 15 has an elliptic shape the smaller diameter of which is shorter than a distance between the guide rail 2 and rotary shaft 15a, and the larger diameter of which is longer than the same distance. Therefore, when the roller 15 is disposed so that the direction in which the guide rail 2 extends and that of the larger diameter of the roll 15 become parallel to each other, a space of a predetermined width is formed between the roller 15 and guide rail 2. When the roller 15 is brought close to the guide rail 2 so that the direction in which the guide rail 2 extends and that in which the shorter diameter of the roll 15 extends become parallel to each other, the roller 15 contacts the guide rail 2.

[0019] The width of the recess 12a is regulated so that this width is larger than the sum of the width of the guide rail 2 and the length of the smaller diameter of the roller 15, and smaller than the sum of the width of the guide rail 2 and the length of the larger diameter of the roller 15.

[0020] The operation of the emergency elevator stopping apparatus 10 in this mode of embodiment will now be described. First, while the elevator car 1 moves at a speed of within a predetermined level, the governor rope 14 also moves at the same speed, so that the governor rope 14 does not draw the lever 13. Therefore, the lever 13 always maintains in a horizontal condition with the elongated hole 16 formed therein also becoming horizontal as shown in Fig. 2. Accordingly, the pin 17 inserted into the elongated hole 16 is positioned in a left end thereof. Since the pin 17 is formed on a surface of a

smaller-diameter portion of the roller 15, the smaller diameter of the roller 15 becomes horizontal. As a result, a space of a predetermined width is formed between the roller 15 and guide rail 2, so that the roller 15 does not press the guide rail 2.

[0021] Next, when the speed of the elevator car 1 increases to a level in excess of a predetermined level while the elevator car 1 moves down, the governor (not shown) detects the increase in speed of the elevator car 1, and grips the governor rope 14 payed out downward at a speed equal to that of the elevator car 1. The lever 13 fixed to the governor rope 14 owing to the gripping action of the governor with respect to the governor rope 14 is lifted, and the pin 17 inserted into the elongated hole 16 in the front end portion of the lever 13 is lifted as shown in Fig. 4. Since the pin 17 is fixed to the roller 15, the roller 15 turns clockwise in the drawing around the rotary shaft 15a. The roller 15 has not a circular shape but a vertically elongated shape. Therefore, the roller 15 is held between the metal holder 12 and guide rail 2, and thrusts (makes an inroad) into a space therebetween to stop the elevator car emergently.

[0022] When the speed of the elevator car 1 increases to a level in excess of a predetermined level while the elevator car 1 moves up, the governor (not shown) detects the increase in speed of the elevator car 1, and grips the governor rope 14 payed out upward at a speed equal to that of the elevator car 1. The lever 13 fixed to the governor rope 14 owing to the gripping action of the governor with respect to the governor rope 14 is drawn downward, and the pin 17 inserted into the elongated hole 16 in the front end portion of the lever 13 is drawn downward as shown in Fig. 5. Since the pin 17 is fixed to the roller 15, the roller 15 turns counter-clockwise around the rotary shaft 15a. Therefore, the roller 15 is held between the metal holder 12 and guide rail 2, and thrusts (makes an inroad) into a space therebetween to stop the elevator car 1 emergently.

[0023] As described above, the emergency elevator stopping apparatus 10 in this mode of embodiment having a very simple construction in which the elliptic roller 15 is turned in accordance with a vertical movement of the lever 13 to cause the roller 15 to thrust (make an inroad) into the space between the guide rail 2 and metal holder enables the elevator car 1 to stop emergently with a reliability with respect to an increase in speed of the elevator car both in the upward and downward directions. Therefore, the durability and reliability of this emergency elevator stopping apparatus are improved greatly as compared with those of a related art emergency elevator stopping apparatus.

[0024] A first modified example of the emergency elevator stopping apparatus 10 in this mode of embodiment will now be described. Fig. 6 is a partial enlarged view showing an example in which a right side wall 40 of a recess 12a provided in a metal holder 12 is inclined in the vertical direction. As shown in this drawing, a lower half portion of the right side wall 40 is inclined so that the width of the recess 12a increases gradually. Therefore, the quantity of a thrust of the roller 15 into a lower half of the right side wall 40 during a turn of the roller 15 in the counter-clockwise direction in the drawing in accordance with an increase in speed of the elevator car 1 moving up is smaller than that of a thrust of the roller 15 into an upper half of the right side wall 40 during a turn of the roller 15 in the clockwise direction in the drawing in accordance with an increase in speed of the elevator car 1 moving down. As a result, an elevator car stopping force occurring when the speed of the elevator car 1 increases during an upward movement thereof becomes smaller than that occurring when the speed of the elevator car 1 increases during a downward movement thereof.

[0025] The reasons for setting the elevator car stopping force different in the upward and downward directions reside in the following. First, when the speed of the elevator car 1 increases during a downward movement thereof, the force of gravity also works downward, so that a large stopping force is needed to stop the elevator car 1. On the other hand, when the speed of the elevator car 1 increases during an upward movement thereof, the force of gravity works in the contrary direction, so that the elevator car 1 stops by a stopping force smaller than that needed in the above case. Therefore, when the elevator car stopping force is set equal in the upward and downward directions, a reaction force occurring when the elevator car 1 moves up at an increased speed and stops suddenly is large as compared with that occurring in a case where the elevator car 1 moves down at an increased speed and stops suddenly. When this reaction force gives rise to trouble, a large reaction force occurring due to a sudden stoppage of the elevator car 1 can be reduced by inclining the right side wall 40 of the metal holder 12 just as in this modified example.

[0026] In the first modified example, the lower half portion of the right side wall 40 of the metal holder 12 is inclined so that the width of the recess 12a increases gradually. The upper half portion of the right side wall 40 of the metal holder 12 may be inclined instead so that the width of the recess 12a decreases gradually. In this case, the same effect as in the modified example is obtained.

[0027] A second modified example of the emergency elevator stopping apparatus 10 in the mode of embodiment will now be described. Fig. 7 is a partial enlarged view showing an example in which the shape of a roller 41 is partially changed. As shown in the drawing, a right upper side surface portion 41a of the roller 41 is cut off. Therefore, the quantity of a thrust of the right upper side surface portion 41a of the roller 41 into a right side wall 40 during a turn of the roller 41 in the counter-clockwise direction in the drawing in accordance with an increase in speed of the elevator car 1 moving up is smaller than that of a thrust of a right lower side surface portion 41b of the roller 41 into the right side wall 40 during a turn of the roller 41 in the clockwise direction in the drawing

in accordance with an increase in speed of the car elevator 1 moving down. Accordingly, the elevator car stopping force occurring when the speed of the elevator car 1 increases during an upward movement thereof becomes smaller as compared with that occurring when the speed of the elevator car 1 increases during a downward movement thereof. This enables a large reaction force occurring when the elevator car 1 moves up at an increased speed and stops suddenly to decrease effectively.

[0028] A third modified embodiment of the emergency elevator stopping apparatus 10 in the mode of embodiment will now be described. Fig. 8 is a partial enlarged view of an example in which a vertically inclined plate 42 is replaceably fixed to a right side wall 40 of a metal holder 12. As shown in the drawing, the inclined plate 42 is formed so that the width of a lower half portion thereof gradually increases. Therefore, the quantity of a thrust of a roller 15 into the lower half portion of the inclined plate 42 during a turn of the roller 15 in the counter-clockwise direction in the drawing in accordance with an increase in speed of an elevator car 1 moving up is smaller than that of a thrust of the roller 15 into an upper half portion of the inclined plate 42 during a turn of the roller 15 in the clockwise direction in the drawing in accordance with an increase in speed of the elevator car 1 moving down. Accordingly, the elevator stopping force occurring when the speed of the elevator car 1 increases during an upward movement thereof becomes smaller as compared with that occurring when the speed of the elevator car 1 increases during a downward movement thereof. This enables a large reaction force occurring when the elevator car 1 moves up at an increased speed and stops suddenly to decrease effectively. Since the inclined plate 42 is replaceable, the elevator stopping force can be changed as occasion calls, by fixing an inclined plate 42 of a different angle of inclination to the right side wall of a metal holder.

[0029] Although the lower half portion of the inclined plate 42 in the third modified example is formed so that the width of the recess of the metal holder increases gradually, the upper half portion thereof may be inclined so that the width of the recess decreases gradually. In this case, the same effect as in the third modified example is obtained.

INDUSTRIAL APPLICABILITY

[0030] The present invention can provide an emergency elevator stopping apparatus, capable of stopping an elevator car easily when the speed of the elevator car increases even during an upward movement thereof, and having a simple construction. Accordingly, this apparatus is suitably utilized, for example, as a household elevator in a low price zone, and as an elevator demanding a high durability.

Claims

1. An emergency elevator stopping apparatus provided on an elevator car and adapted to stop the elevator car by pressing a guide rail along which the elevator car is guided, **characterized in that**:

   the apparatus is provided with a roller rolling mechanism adapted to press the guide rail when the elevator car moves at a speed in excess of a predetermined level in either the upward or downward direction.

2. An emergency elevator stopping apparatus provided on an elevator car and adapted to stop the elevator car by pressing a guide rail along which the elevator car is guided, **characterized in that**:

   the apparatus is provided with an elliptic roller disposed rotatably in the vicinity of the guide rail, and having a smaller diameter shorter than a distance between the guide rail and a rotary shaft and a larger diameter longer than the same distance, and
   a lever adapted to set the direction in which the guide rail extends and that in which the larger diameter of the roller extends, substantially parallel to each other while the elevator car moves at a speed not higher than a predetermined level, and turn the roller when the elevator car moves at a speed in excess of a predetermined level, and thereby cause the roller to press the guide rail.

3. An emergency elevator stopping apparatus according to Claim 2, wherein the apparatus is further provided with:

   an elongated hole formed in a front end portion of the lever and extending in the lengthwise direction of the lever,
   a pin provided on a circumferential portion of a smaller-diameter section of the roller and slidably inserted into the elongated hole, and
   a lever driving member adapted to press down a front end portion of the lever when the elevator car moves up at a speed in excess of a predetermined level, and lift the front end portion of the lever when the elevator car moves down at a speed in excess of a predetermined level.

4. An emergency elevator stopping apparatus according to Claim 2 or 3, wherein the apparatus is further provided with:

   a metal holder having a recess for holding a part of the guide rail and the roller therein,
   the width of the recess being larger than the

sum of the width of the guide rail and the smaller diameter of the roller, and smaller than the sum of the width of the guide rail and the larger diameter of the roller.

5. An emergency elevator stopping apparatus according to Claim 4, wherein a side wall of the recess is inclined in the vertical direction.

6. An emergency elevator stopping apparatus according to Claim 4, wherein the apparatus is further provided with an inclined plate fixed replaceably to a side wall of the recess and extending diagonally in the vertical direction.

FIG.1

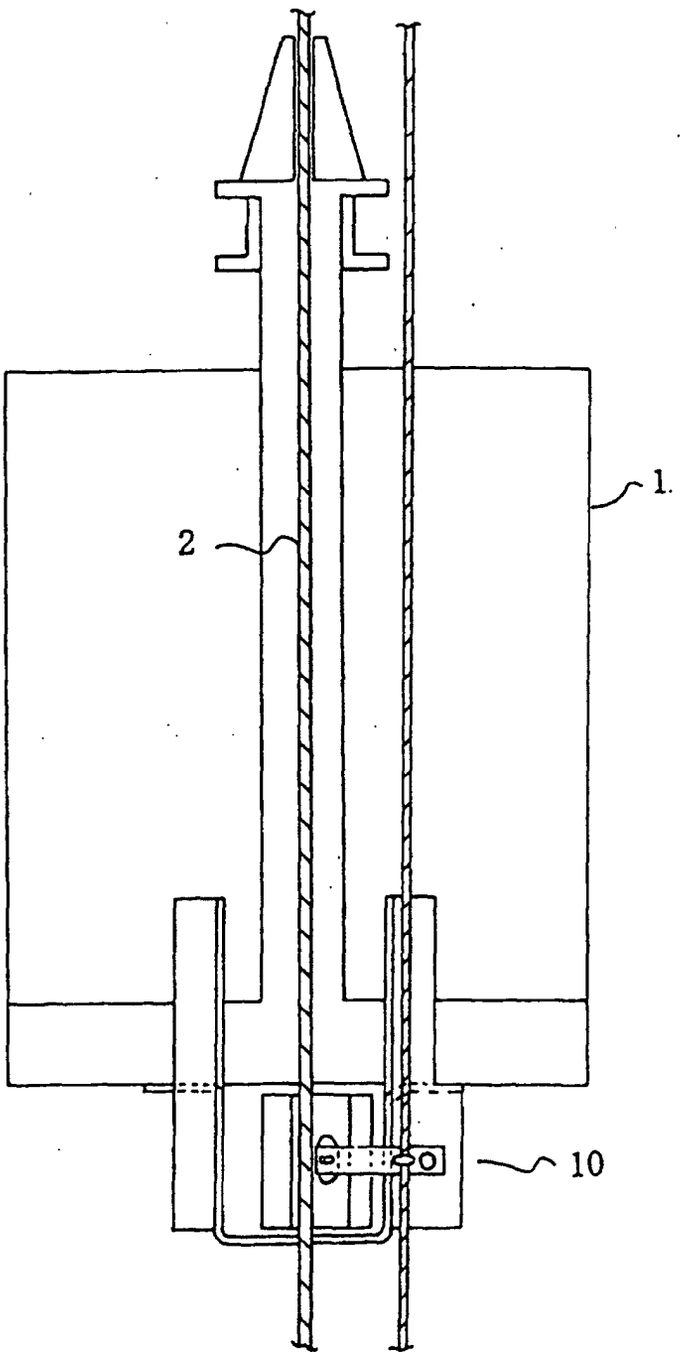


FIG.2

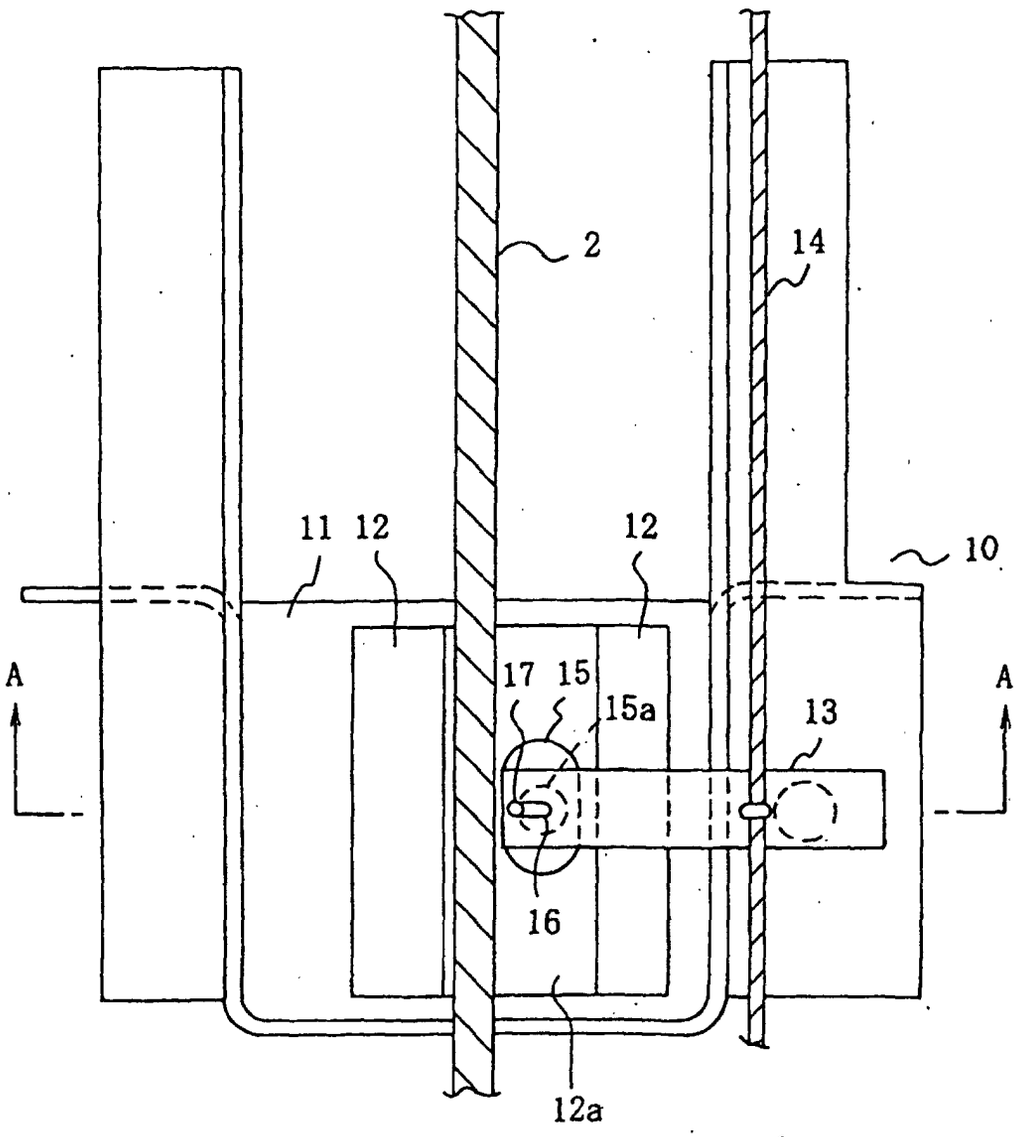


FIG.3

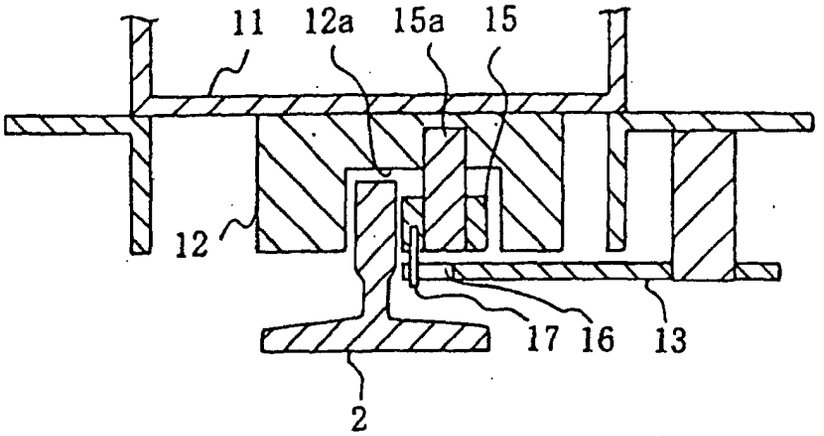


FIG.4

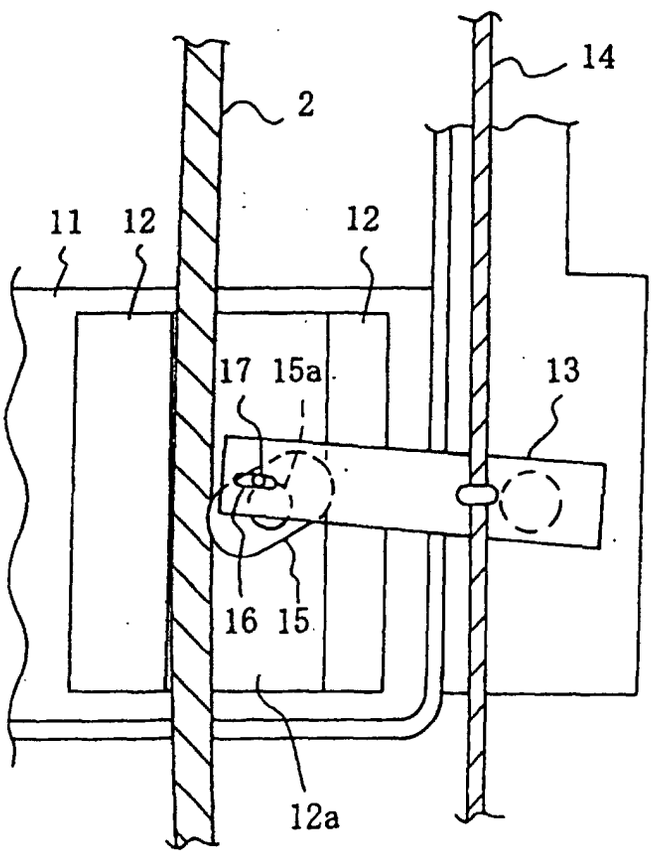


FIG.5

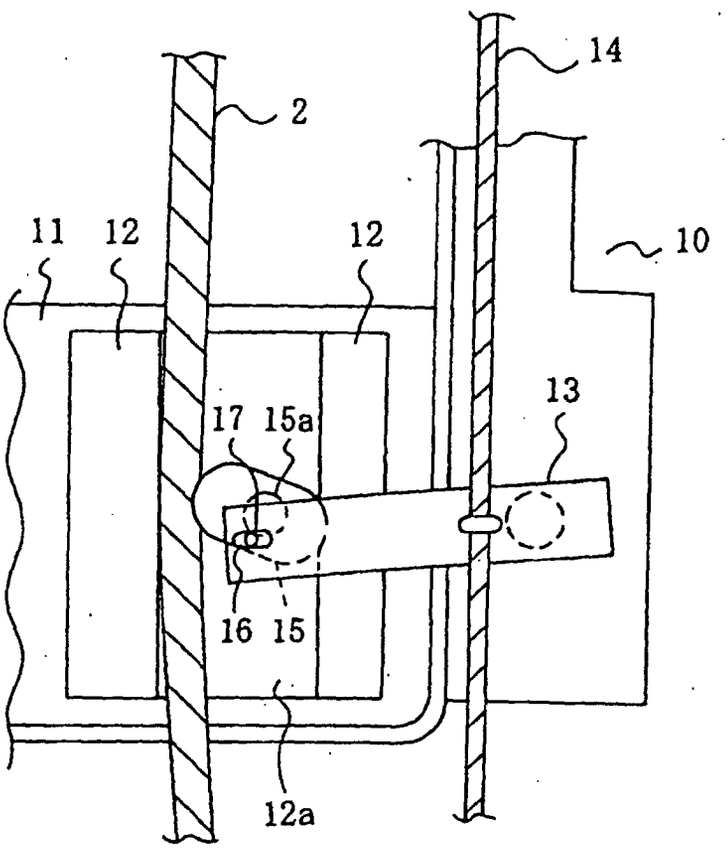


FIG.6

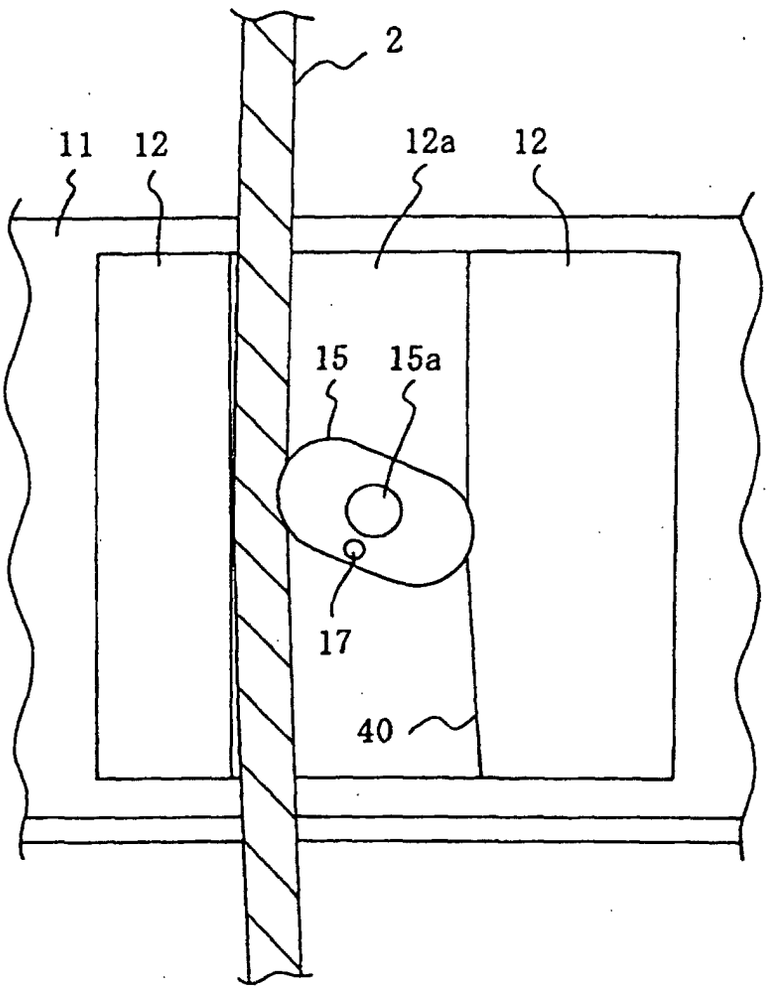


FIG.7

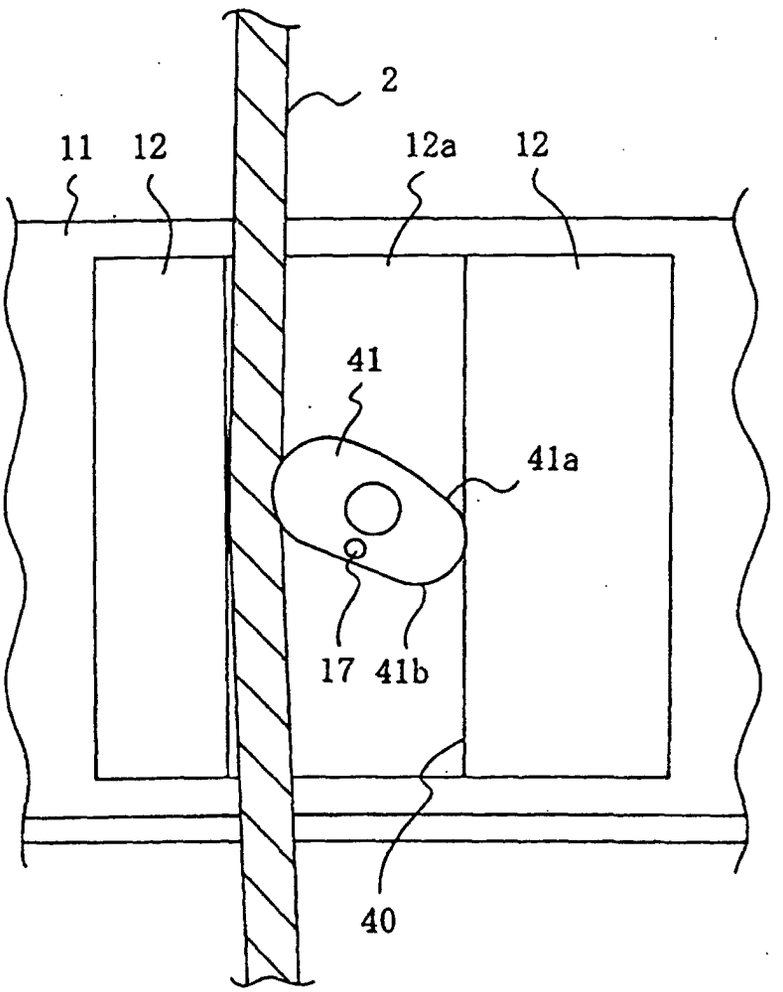


FIG.8

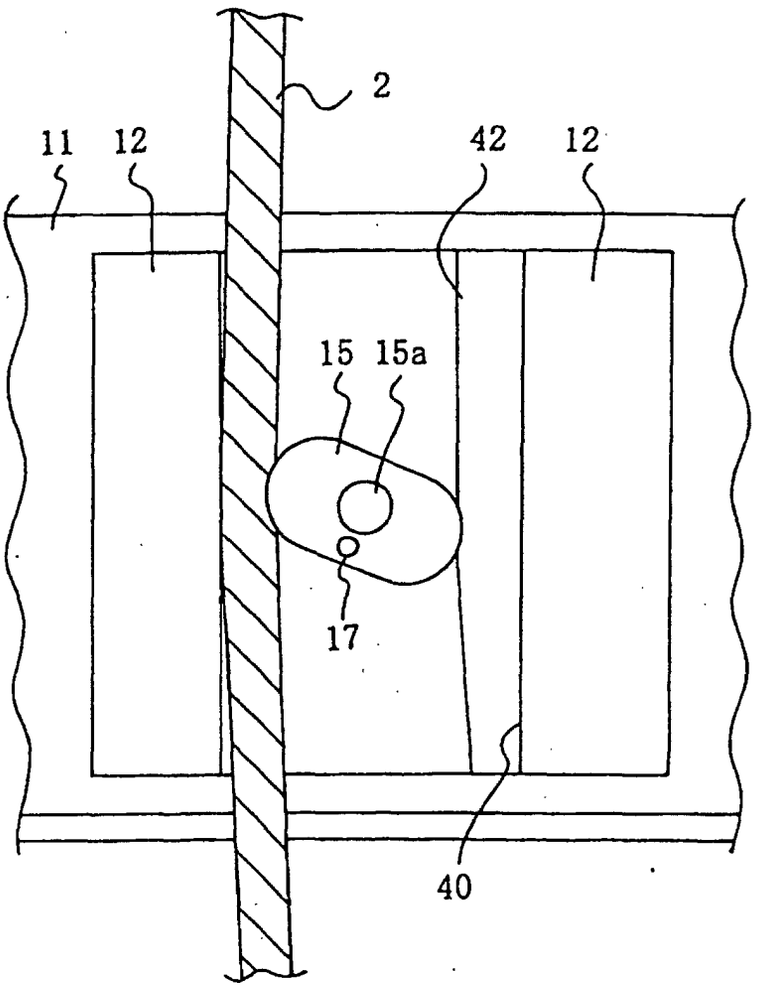


FIG.9

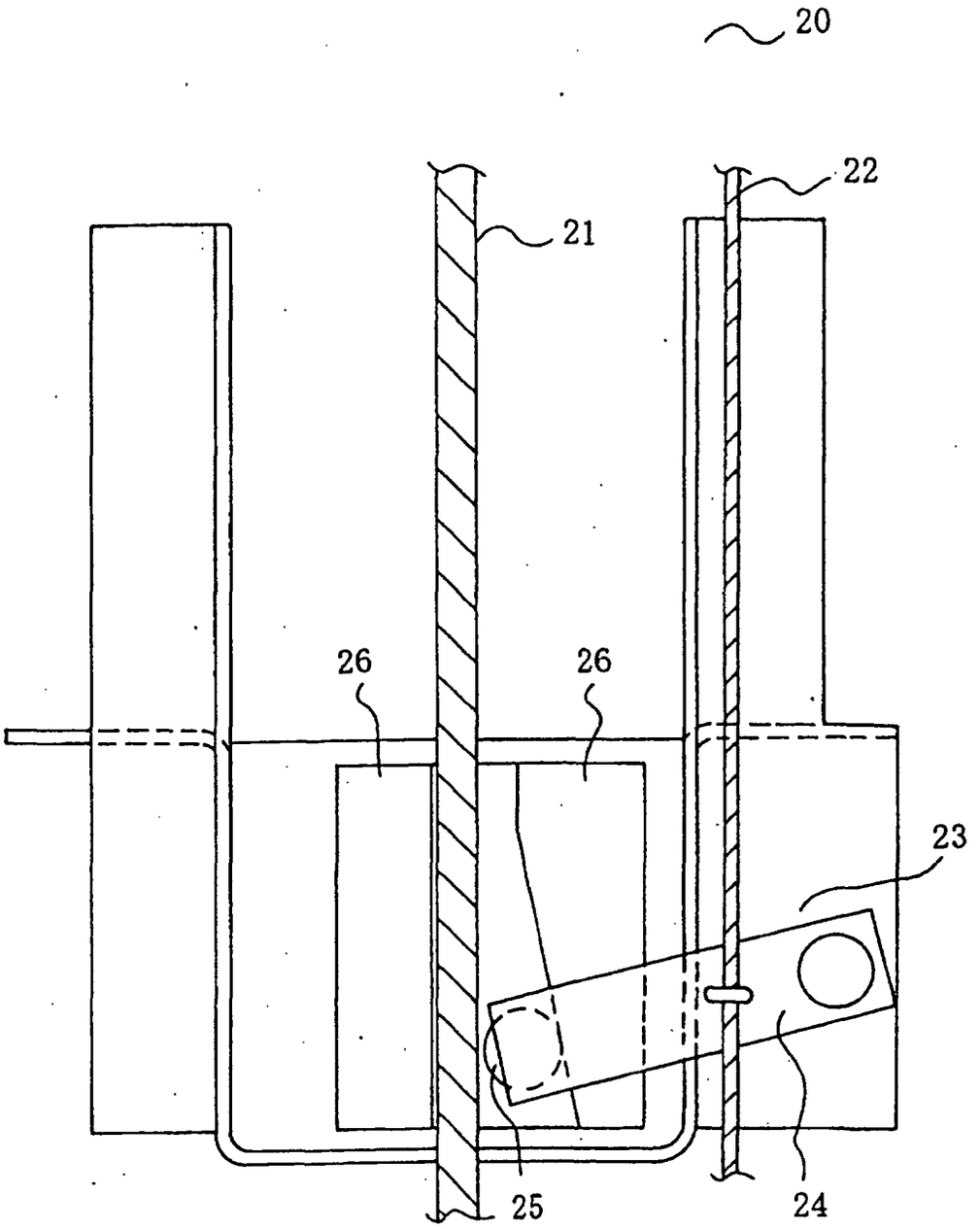


FIG.10

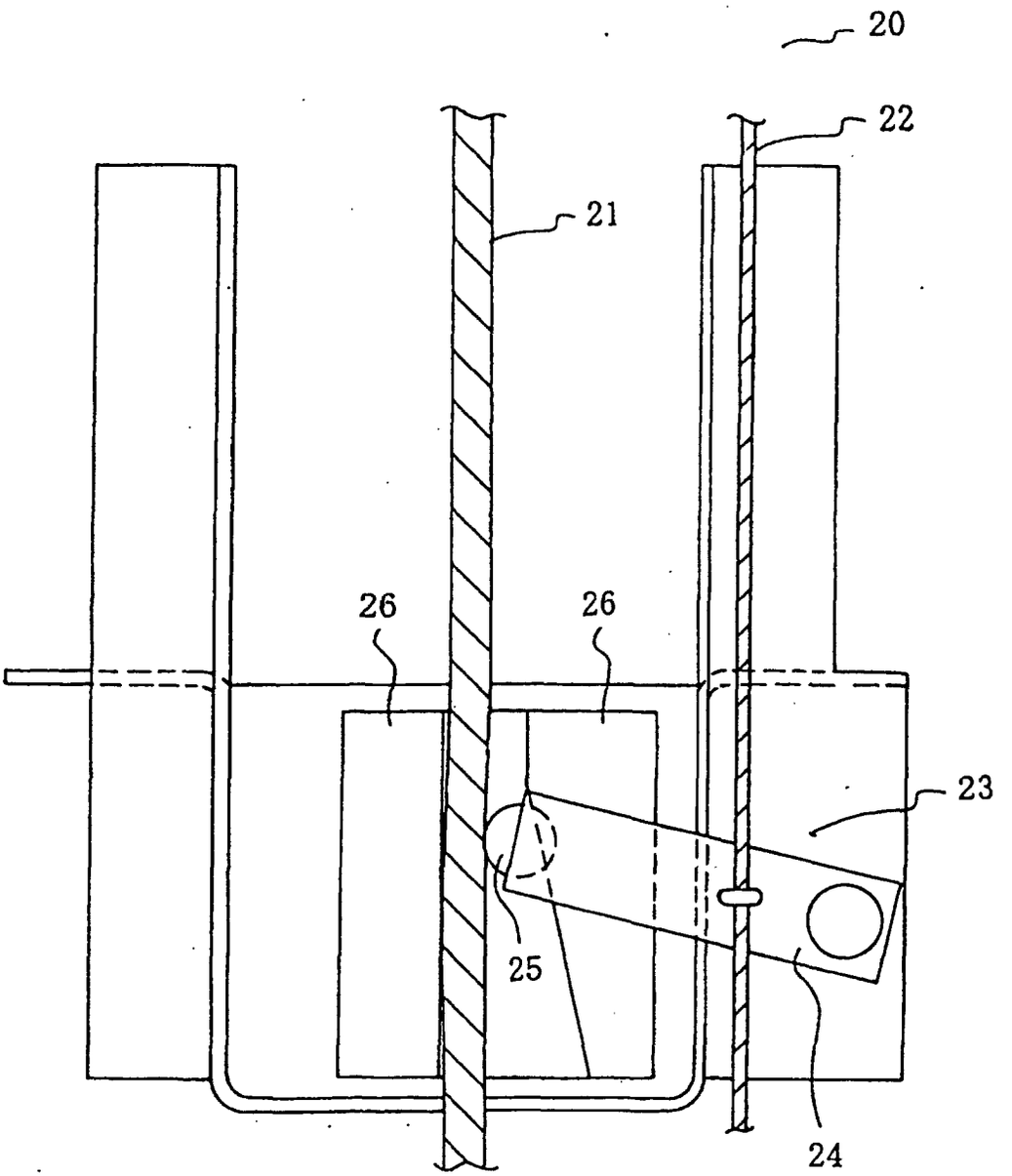
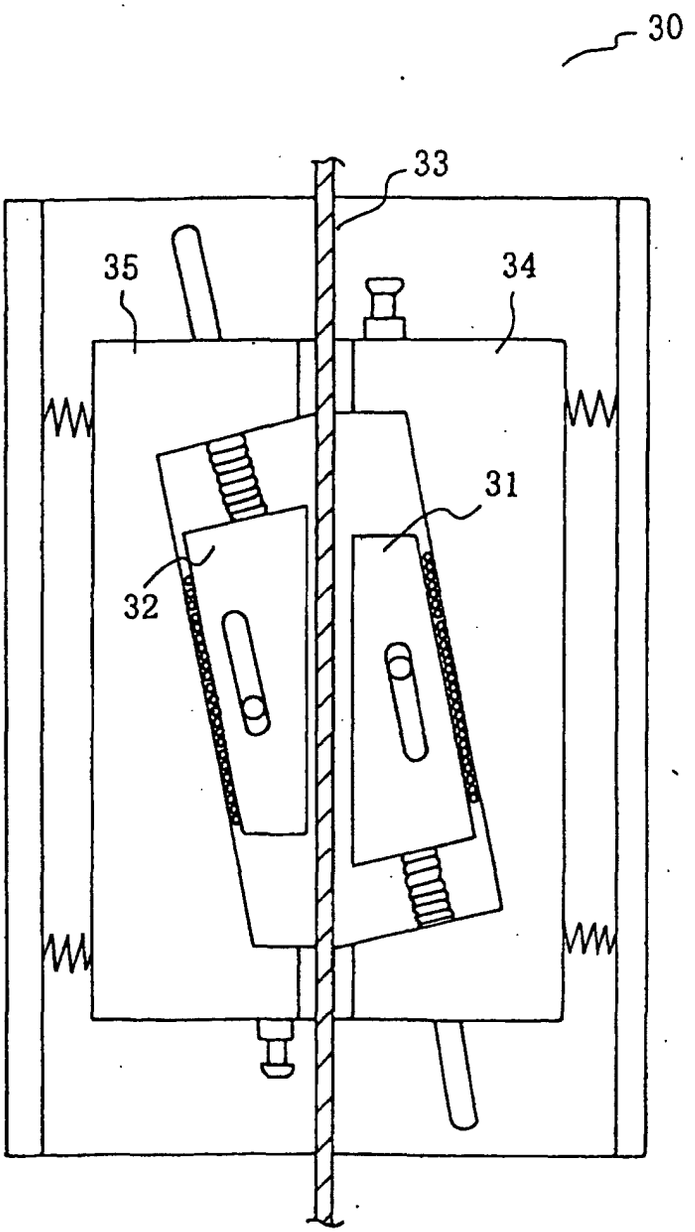


FIG.11



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP01/10325

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] B66B5/18

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] B66B5/16-5/20

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1926-1996 Toroku Jitsuyo Shinan Koho 1994-2002
Kokai Jitsuyo Shinan Koho 1971-2002 Jitsuyo Shinan Toroku Koho 1996-2002

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 64-22788 A (Mitsubishi Electric Corporation), 25 January, 1989 (25.01.1989), page 2, lower left column, line 15 to lower right column, line 10; Figs. 1 to 4 (Family: none)	1-2 3-6
Y A	US 6176350 B1 (AUTZUGSTECHNOLOGIE SCHLOSSER GMBH), 23 January, 2001 (23.01.2001), Column 4, lines 14 to 62; Column 5, lines 8 to 41; Figs. 2 to 7 & EP 899231 A1	1-2 3-6
Y A	GB 1368974 A (A.C.E MACHINERY LIMITED), 02 October, 1974 (02.10.1974), page 1, lines 69 to 80; page 2, lines 33 to 45; Fig. 1 (Family: none)	1-2 3-6

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

* Special categories of cited documents:
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"&" 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 February, 2002 (15.02.02)	26 February, 2002 (26.02.02)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)