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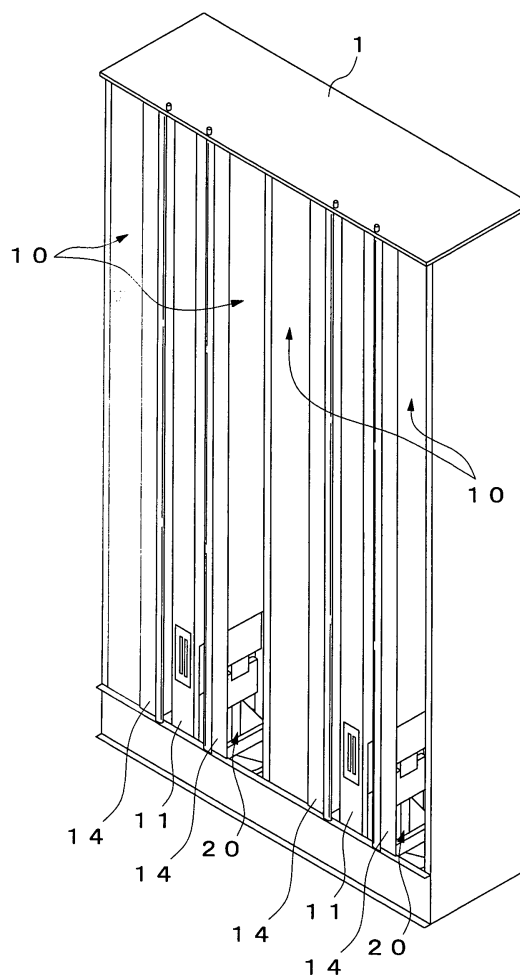
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(54) Article delivery device

(57) The present invention is intended to provide an article delivery device capable of preventing, after an article is delivered, articles remaining in its article storage from being disturbed in alignment. As the article delivery device is provided with a contact plate (15) that can come into contact with the highest-placed one of the articles (A) stored in the article storage (10), delivering operations can be accomplished reliably without allowing, when the lowest-placed article (A) is delivered, the remaining articles (A) from being disturbed in alignment or being stuck by the impact of their drop on the door plates (22). Furthermore, as the contact plate (15) is composed of a contact portion (15a) coming into contact with the upper face of the article (A) and an engaging portion (15b) engaging with a drop preventing plate (14), the contact plate (15) can be moved in the vertical direction in a state of being engaged with the drop preventing plate (14) to prevent the contact plate (15) from being caused to come off the upper face of the article (A) by the delivering operations of the article delivery device.

F i g . 1



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Description

[0001] The present invention relates to an article delivery device for automatic vending machines for vending such articles as cup-contained food, paper-packaged beverages or boxed confectionery.

[0002] Known article delivery devices according to the prior art include what is equipped with a plurality of article storages in which articles are stacked in the vertical direction for storage, partitioning members for partitioning between the article storages in the widthwise direction, and a delivery mechanism disposed toward the lower ends of the partitioning members.

[0003] The delivery mechanism is provided with door members for opening and closing the bottoms of the article storages, and article holding members each disposed on an inside face of one or another article storage to be protrudable into the inside of the article storage. This arrangement enables the lowest-placed article in each article storage to be dropped therefrom by opening its door member or members to open the bottom of the article storage while holding the next lowest article therein with an article holding member protruded into the article storage.

[0004] In this article delivery device, however, the articles stacked in the article storage will drop on the door member when the bottom of the article storage is closed and the articles are released from holding by the article holding member after the lowest-placed one is dropped. Therefore, if the stored articles are light in weight and small in size, their alignment may be disrupted by the impact of the drop and some of them may become stuck in the article storage.

[0005] An object of the present invention is to provide an article delivery device capable of preventing the alignment of remaining articles in the article storage from being disturbed when they are moved downward after the delivery of the lowest-placed article.

[0006] In order to achieve the object stated above, an article delivery device according to the invention comprises: an article storage for storing articles by stacking them in the vertical direction; a door member for enabling the bottom of the article storage to be opened and closed; an article holding member disposed on an inner side of the article storage and protrudable toward the inside of the article storage; and an article contacting member, disposed in the article storage to be movable in the vertical direction, for moving downward together with the highest-placed one of the articles stored in the article storage while remaining in contact with the upper face of the articles, wherein the lowest-placed one of the articles stored in the article storage is delivered by opening the door members to open the bottom of the article storage and dropping that article while holding the next lowest-placed article in the article storage with the article holding member protruding in the article storage.

[0007] In this way, since the article contacting member moves downward, while remaining in contact with

the highest-placed one of the articles stored in the article storage, together with that article, the remaining articles are not disturbed in alignment by the impact of their drop on the door members after the lowest-placed article is delivered. Therefore, as the alignment of the articles is not disturbed by the impact of their drop on the door members after the delivery of the lowest-placed article, the articles are not stuck, and accordingly delivery operations can be accomplished reliably.

[0008] The above-stated and other objects, features and advantages of the invention will become more apparent from the following description when taken in conjunction with the accompanying drawings.

Fig. 1 shows a perspective view of an article delivery device, which is a preferred embodiment of the present invention;

Fig. 2 shows an exploded perspective view of the essential part of the article delivery device;

Fig. 3 shows an exploded perspective view of an article contacting member;

Fig. 4 shows a perspective view of the article contacting member in a state of being fitted to a drop preventing plate;

Fig. 5 shows a planar section of an article storage;

Fig. 6 shows a perspective view of a delivery unit;

Fig. 7 shows a bottom plan view of the delivery unit;

Fig. 8 shows a profile of an article holding plate and a cam member;

Fig. 9 shows a plan of the article holding plate and the cam member;

Fig. 10 illustrates the operation of the article delivery device;

Fig. 11 illustrates the operation of the article delivery device;

Fig. 12 illustrates the operation of the article delivery device;

Fig. 13 illustrates the operation of the article delivery device; and

Fig. 14 shows a perspective view of a state in which a contact plate is engaged with the upper end of the drop preventing plate.

[0009] Fig. 1 through Fig. 14 show a preferred embodiment of the present invention. In the following description, such directional expressions as up, down, left and right or any other expression to similar effects will refer, unless otherwise specified, to respective directional representations in Fig. 10.

[0010] This article delivery device, comprising a plurality of article storages 10 each capable of accommodating a row of articles A stacked in the vertical direction and delivery units 20 capable of delivering articles A in each article storage 10 one by one, is used in automatic vending machines for vending, for instance, cup-shaped articles A, such as cup-contained noodles.

[0011] The article storages 10 are formed by partitioning the inside of a delivery device body 1 in a widthwise

direction with tall hollow partitioning members 11 and U-shaped side plates 12 covering the sides and the rear face. Thus within each side plate 12, there are formed two article storages 10 partitioned by a partitioning member 11, and a plurality of these pairs are arranged side by side. At the lower end of each partitioning member 11, openings 11a and 11b are provided to partially expose the delivery units 20.

[0012] At one end of the inside of each article storage 10 in the widthwise direction, an article spacer 13 capable of moving in the widthwise direction is provided to be moved according to the outer diameter of the articles A to be accommodated.

[0013] The front opening of each article storage 10 is provided with a drop preventing plate 14 to cover one end of the opening in the widthwise direction. The drop preventing plate 14 consists of a plate-shaped member extending in the vertical direction, and a folded portion 14a is formed throughout in the vertical direction by folding the one end of the plate 14 in the widthwise direction in a U shape. The upper and lower ends of one end in the widthwise direction of the drop preventing plate 14 are turnably supported by the delivery device body 1 to open and close one end in the widthwise direction of the front opening of the article storage 10. Further, a contact plate 15 as an article contacting member movable in the vertical direction is detachably fitted to the folded portion 14a of the drop preventing plate 14.

[0014] The contact plate 15, formed of a substantially rectangular plate-shaped member, has a contact portion 15a which can be in contact with the highest-placed one of the articles A stored in the article storages 10 and an engaging portion 15b to be engaged with the folded portion 14a of the drop preventing plate 14 to be movable in the vertical direction. The engaging portion 15b is formed by bending a member extending from one end of the contact portion 15a in an L shape. A first fitting hole 15c and a second fitting hole 15d are formed in the tip and base sides, respectively of the engaging portion 15b, and the contact plate 15 can be detachably fitted to the drop preventing plate 14 by screwing a first fitting screw 15e and a second fitting screw 15f into the first fitting hole 15c and the second fitting hole 15d, respectively. Thus, as shown in Fig. 4, the contact plate 15 is enabled to be fitted movably in the vertical direction without coming off the drop preventing plate 14 as the first fitting screw 15e is positioned toward one end of the folded portion 14a of the drop preventing plate 14 and the second fitting screw 15f is positioned behind the folded portion 14a of the drop preventing plate 14. Further, a holding member 16 capable of holding the contact plate 15 in upper part of the article storage 10 is fitted to the contact plate 15 via the first fitting screw 15e. The holding member 16 consists of a plate-like member, one of which is linked to the contact plate 15. A hooked portion 16a is formed at the other end of the holding member 16 by bending the end in a hook shape.

[0015] The delivery unit 20 comprises a unit body 21

to be inserted into a first partitioning member 11, door plates 22 as a pair of door members that can open the bottom of each article storage 10, article holding plates 23 as a pair of article holding members protrudable into each article storage 10, a pair of slide plates 24 for supporting the article holding plates 23 to be movable in the vertical direction, a turn restricting plate 25 for restricting the downward turns of the door plates 22 to a substantially horizontal position, a motor 26 for driving the door plates 22 and the article holding plates 23, and a cam member 27 for protruding each article holding plate 23 into each article storage 10.

[0016] The unit body 21 is formed of a frame-shaped member covering the front, upper and rear faces of the delivery unit 20, and its two sides in the widthwise direction are open. Reinforcing members 21a and 21b for linking the front and rear end sides of the unit body 21 are fitted to substantially the central part and the lower end, respectively in the vertical direction, of the unit body 21.

[0017] The door plates 22 are positioned at the lower ends of the respective article storages 10, and one end each of them is turnably supported by the unit body 21 via a spindle 22a. A spring 22b is fitted to each of the spindles 22a of the door plates 22, and one end of the spring 22b is engaged with the upper face side of the door plate 22 while the other end is fixed to the unit body 21. Thus, the springs 22b urge the door plates 22 downward.

[0018] The article holding plates 23 are arranged above the door plates 22, and the top end of each article holding plate 23 is turnably fitted to the lower end side of the slide plate 24 via a spindle 23a. A pair of bearing portions 23b which the spindle 23a is to penetrate are disposed on the upper end side of the article holding plates 23, and the bearing portions 23b are arranged with spacing in a widthwise direction between them. A contact portion 23c with which the cam member 27 comes into contact is disposed between the bearing portions 23b, and the contact portion 23c is so formed as to incline downward toward the cam member 27.

[0019] The slide plates 24 are disposed on the unit body 21 to be movable in the vertical direction, and operating pins 24a for moving the slide plates 24 in the vertical direction are fitted toward the top ends of the plates 24. One end each of the operating pins 24a is inserted in a slit 24c of an operating plate 24b fitted to the front face of the unit body 21 to be movable in the vertical direction, and a plurality of grooves 24d that can engage the operating pins 24a are formed in the slits 24c at intervals in the vertical direction. Thus by engaging an operating pin 24a with any desired one of the grooves 24d, the position of the article holding plates 23 in the vertical direction can be altered.

[0020] The turn restricting plate 25, formed in a substantially semicircular shape, turns underneath the door plates 22 in the horizontal direction. Thus, when the turn restricting plate 25 spans the two door plates 22, both

of the door plates 22 are restricted in downward turning and held in a closed state by the turn restricting plate 25 as shown in Fig. 7. When the turn restricting plate 25 turns toward either one of the door plates 22, the other door plate 22 is released from that restriction of turning and turns downward to open the bottom of that article storage 10

[0021] The motor 26, arranged in the upper part of the unit body 21, is configured to be able to revolve both forward and backward. A driving shaft 26a extending to the lower end of the unit body 21 is connected to the motor 26 via a gear unit 26b. The driving shaft 26a is rotatably supported by the reinforcing members 21a and 21b of the unit body 21, and the turn restricting plate 25 is fitted to its lower end. Thus, the motor 26 is connected to the control unit (not shown) of the automatic vending machine, and its revolution is controlled by the control unit.

[0022] The cam member 27, consisting of a tall member whose cross section is shaped in an ellipse, is fitted to the driving shaft 26a to rotate integrally with it. In this case, the cam member 27 is formed to lean toward one end in the lengthwise direction of the cross section of the driving shaft 26a, and part of it in the circumferential direction (toward the other end in the lengthwise direction of the cross section) constitutes a first contact portion 27a to be in contact with the contact portion 23c of the article holding plates 23. A second contact portion 27b which can come into contact with the under face toward the lower ends (tip side) of the article holding plates 23 is so formed as to protrude in the radial direction toward the lower end of the cam member 27. The second contact portion 27b protrudes in the same direction as the first contact portion 27a.

[0023] The delivery units 20 configured as described above are inserted from underneath into the partitioning members 11 with a spacer 21c being arranged on the rear side of the unit body 21, and fixed to the partitioning members 11 by screwing or otherwise. Then, the two sides of the unit body 21 in the widthwise direction are covered by the sides of the first partitioning member 11, and the door plates 22 and the article holding plates 23 of the delivery unit 20 are exposed to outside through the openings 11a in the partitioning members 11. Articles A are stored in this state by stacking them on the door plates 22, and the contact plate 15 is so fitted to the drop preventing plate 14 that the lower face of the contact portion 15a come into contact with the upper face of each article A in the highest position.

[0024] Next, when an article A is to be delivered out of one of the article storages 10 in the article delivery device described above, the turn restricting plate 25 is turned by the revolution of the motor 26 of the delivery unit 20 as shown in Fig. 10. Then, the cam member 27 turns together with the turn restricting plate 25, and the first contact portion 27a of the cam member 27 comes into contact with the contact portion 23c of the article holding plate 23 to cause the article holding plate 23 to

turn toward the article storages 10. At the same time, the second contact portion 27b of the cam member 27 moves toward underneath the lower end of the article holding plate 23. This causes the article holding plate 23 to protrude into the article storage 10, and the engagement of the second article A from the bottom by the article holding plates 23 causes the rest of the articles A to be held in the article storage 10. In this process, the articles A held by the article holding plate 23 are supported not only by the first contact portion 27a of the cam member 27 in contact with the top end of the article holding plates 23 but also by the second contact portion 27b in contact with the lower ends (tip side) of the article holding plates 23. After that, as the turning of the turn restricting plate 25 proceeds, the door plates 22 are released from the restriction of its turning by the turn restricting plate 25, and a spring 22c causes the door plates 22 to turn downward as shown in Fig. 11. The bottom of the article storage 10 is thereby opened to drop and deliver the lowest-placed article A. After the article A is delivered, the revolution of the motor 26 of the delivery unit 20 in the direction reverse to that at the time of delivery causes the turn restricting plate 25 to close the bottom of the article storage 10 as shown in Fig. 12. At the same time, the cam member 27 is released from its contact with the article holding plate 23, and the article A held by the article holding plate 23 and other articles A stacked over it drop onto the door plates 22 as shown in Fig. 13. Then, as the contact plate 15 moves downward in contact with the upper face of article A, the alignment of the highest-placed article A is not disturbed by the impact resulting from the drop of the articles A.

[0025] When articles A are to be stored into an article storage 10 in the article delivery device described above, the drop preventing plate 14 is turned to open the article storage 10, the contact plate 15 is held at the top end of the drop preventing plate 14 by engaging the hooked portion 16a of the holding member 16 linked with the contact plate 15 with the top end of the drop preventing plate 14 as shown in Fig. 14, and articles A can be stored in that state.

[0026] In this way, since the article delivery device embodying the invention in this mode is provided with the contact plate 15 that can come into contact with the highest-placed one of the articles A stored in the article storage 10, delivery operations can be accomplished reliably without allowing, when the lowest-placed article A is delivered, the remaining articles A from being disturbed in alignment or being stuck by the impact of their drop on the door plate 22.

[0027] Furthermore, as the contact plate 15 is composed of the contact portion 15a coming into contact with the upper face of the article A and the engaging portion 15b engaging with the drop preventing plate 14, the contact plate 15 can be moved in the vertical direction in a state of being engaged with the drop preventing plate 14 to prevent the contact plate 15 from being

caused to come off the upper face of the article A by the delivering operations of the article delivery device.

[0028] Also, as the holding member 16 to engage the contact plate 15 is disposed at the top end of the drop preventing plate 14, articles A can be stored into the article storage 10 without having to remove the contact plate 15, resulting in efficient storage of articles A.

[0029] Further, the detachable configuration of the contact plate 15 allows its removal as required. If, for instance, light and thin articles are to be stored, the contact plate 15 can be fitted and when the articles are so thick that their stored conditions are not affected by the impact of their drops, the contact plate 15 can be dispensed with.

[0030] Incidentally, though the embodiment described above has a configuration in which the contact plate 15 is brought into contact by its own weight with the upper face of the highest-placed article A, an article contacting member can as well be brought into contact with the upper face of the article by an urging member, such as a coil spring.

[0031] Also, though the contact plate 15 in the embodiment described above engages with the drop preventing plate 14 to be movable in the vertical direction, an engaging mate extending in the vertical direction, with which the engaging portion 15b of the contact plate 15 is to engage, may as well be disposed on the partitioning member 11 or the side plate 12, so that an article contacting member can movably engage with it.

[0032] Further, though the embodiment described above is so configured that the contact plate 15 is caused to be held in upper part of the article storages 10 by engaging the holding member 16 linked to the contact plate 15 with the upper end of the drop preventing plate 14, the contact plate 15 may as well be held in upper part of the article storages 10 by disposing a magnet at the upper end of the article storage 10 to attract the contact plate 15.

[0033] The preferred embodiment hitherto described in this specification is merely illustrative, but not to be construed in a limiting sense. The scope of the invention is stated in the appended claims, which cover all possible modifications of the invention.

Claims

1. An article delivery device comprising:

an article storage (10) for storing articles (A) by stacking them in the vertical direction;
a door member (22) for enabling the bottom of the article storage (10) to be opened and closed;
an article holding member (23) disposed on an inner side of the article storage (10) and protrudable toward the inside of the article storage (10); and

an article contacting member (15), disposed in the article storage (10) to be movable in the vertical direction, for moving downward together with the highest-placed one of the articles (A) stored in the article storage (10) while remaining in contact with the upper face of the articles (A), wherein:

the lowest-placed one of the articles (A) stored in the article storage (10) is delivered by opening the door member (22) to open the bottom of the article storage (10) and dropping that article (A) while holding the next lowest-placed article (A) in the article storage (10) with the article holding member (23) protruding in the article storage (10).

2. The article delivery device according to Claim 1, further comprising:

a drop preventing plate (14) for opening and closing one end in the widthwise direction of a side of the article storage (10), wherein;
said article contacting member (15) has a contact portion (15a) to come into contact with the upper face of an article (A) and an engaging portion (15b) to be engaged with the drop preventing plate (14) to be movable in the vertical direction.

3. The article delivery device according to Claim 1, further comprising:

a holding member (16) capable of holding said article contacting member (15) in upper part of the article storage (10).

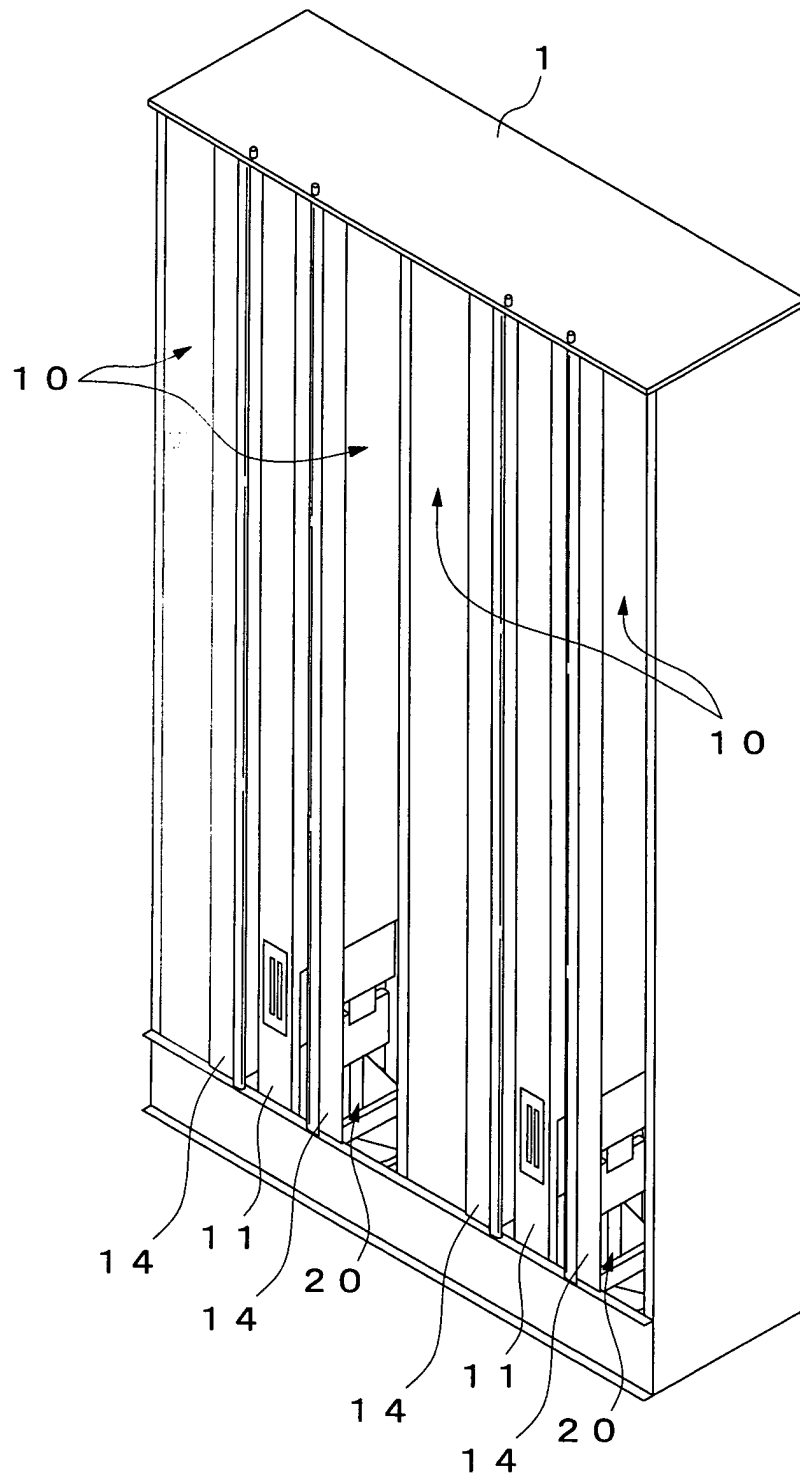
4. The article delivery device according to Claim 2, further comprising:

a holding member (16) capable of holding said article contacting member (15) in upper part of the article storage (10).

5. The article delivery device according to Claim 2, 3 or 4, wherein:

said article contacting member (15) is detachably fitted to the drop preventing plate (14).

F i g . 1



F i g . 2

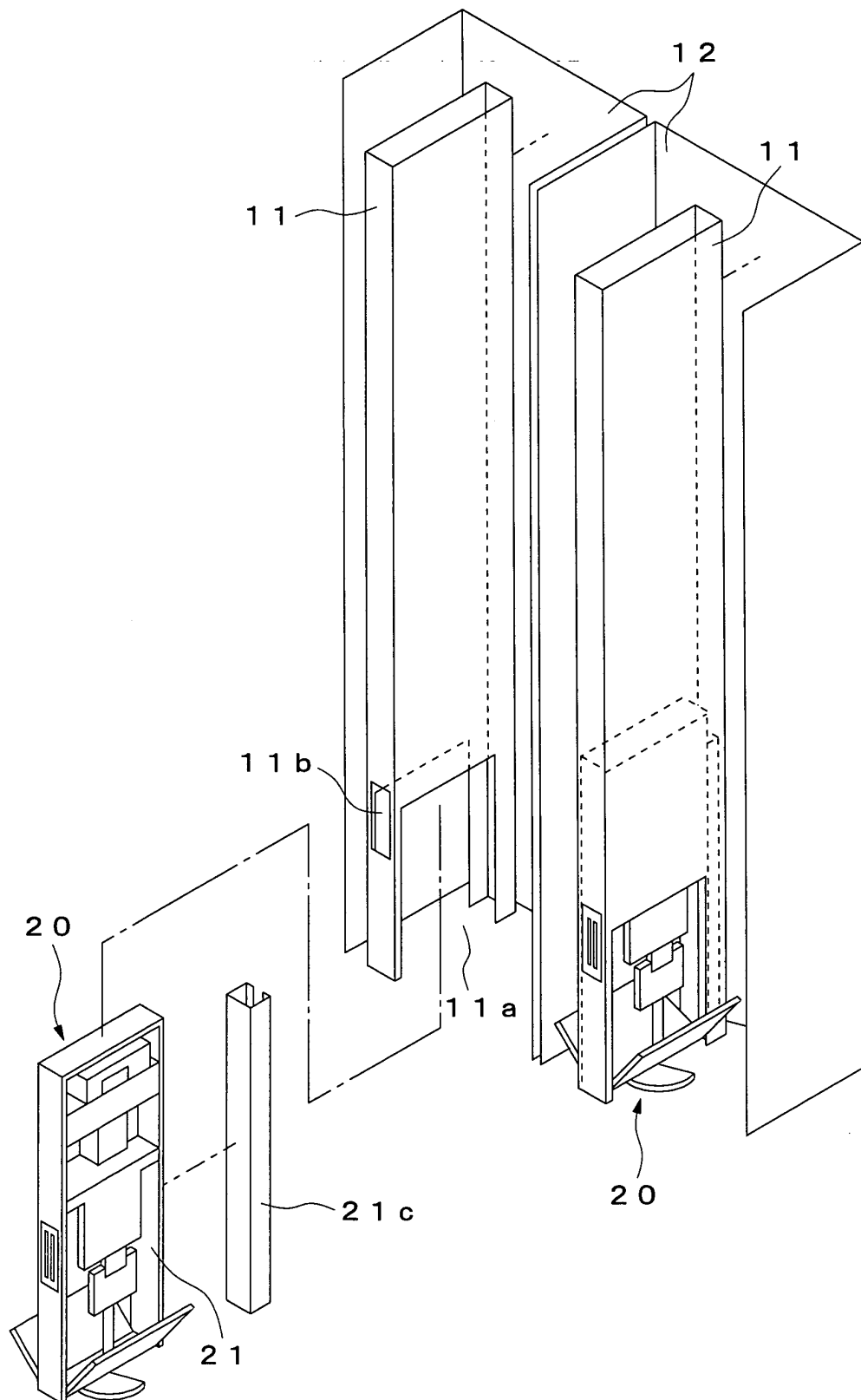


Fig. 3

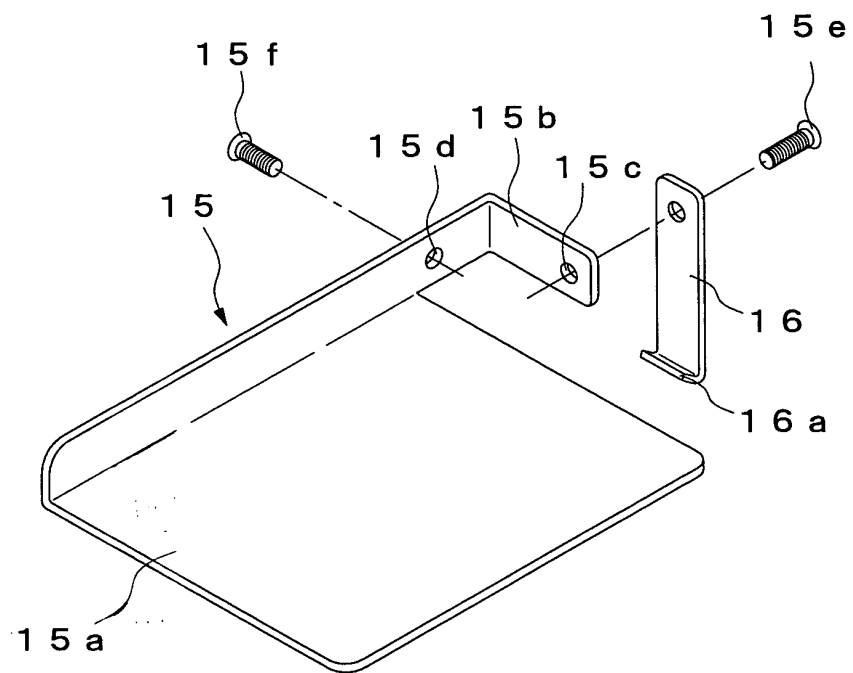
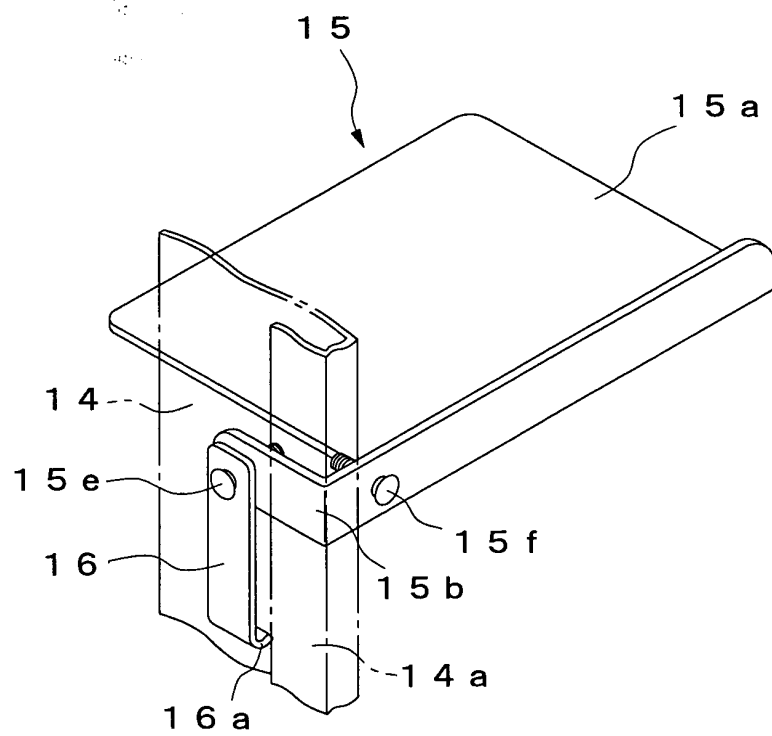


Fig. 4



F i g . 5

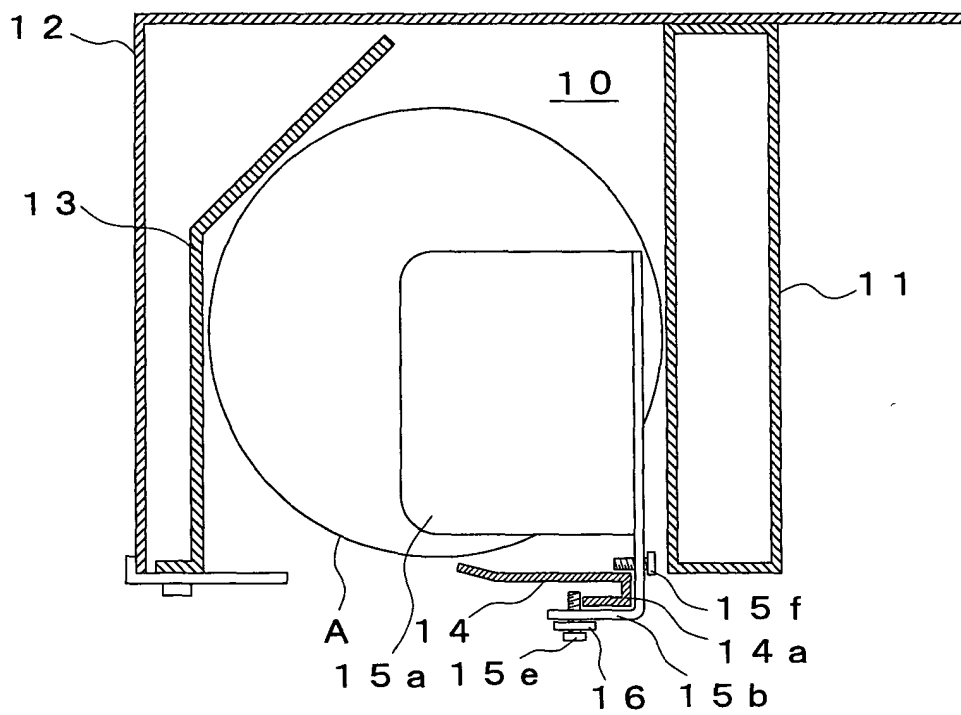
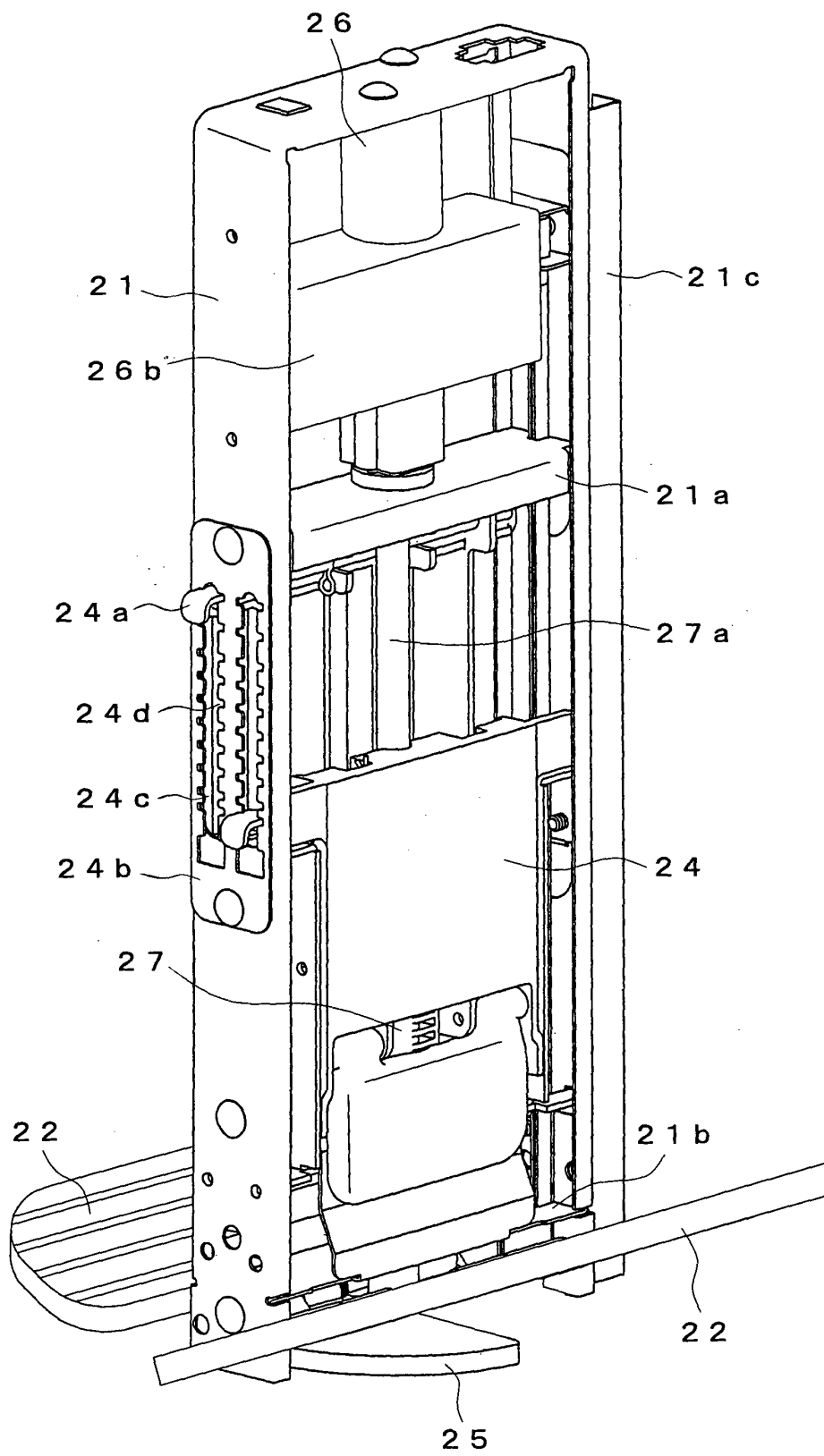


Fig. 6



F i g . 7

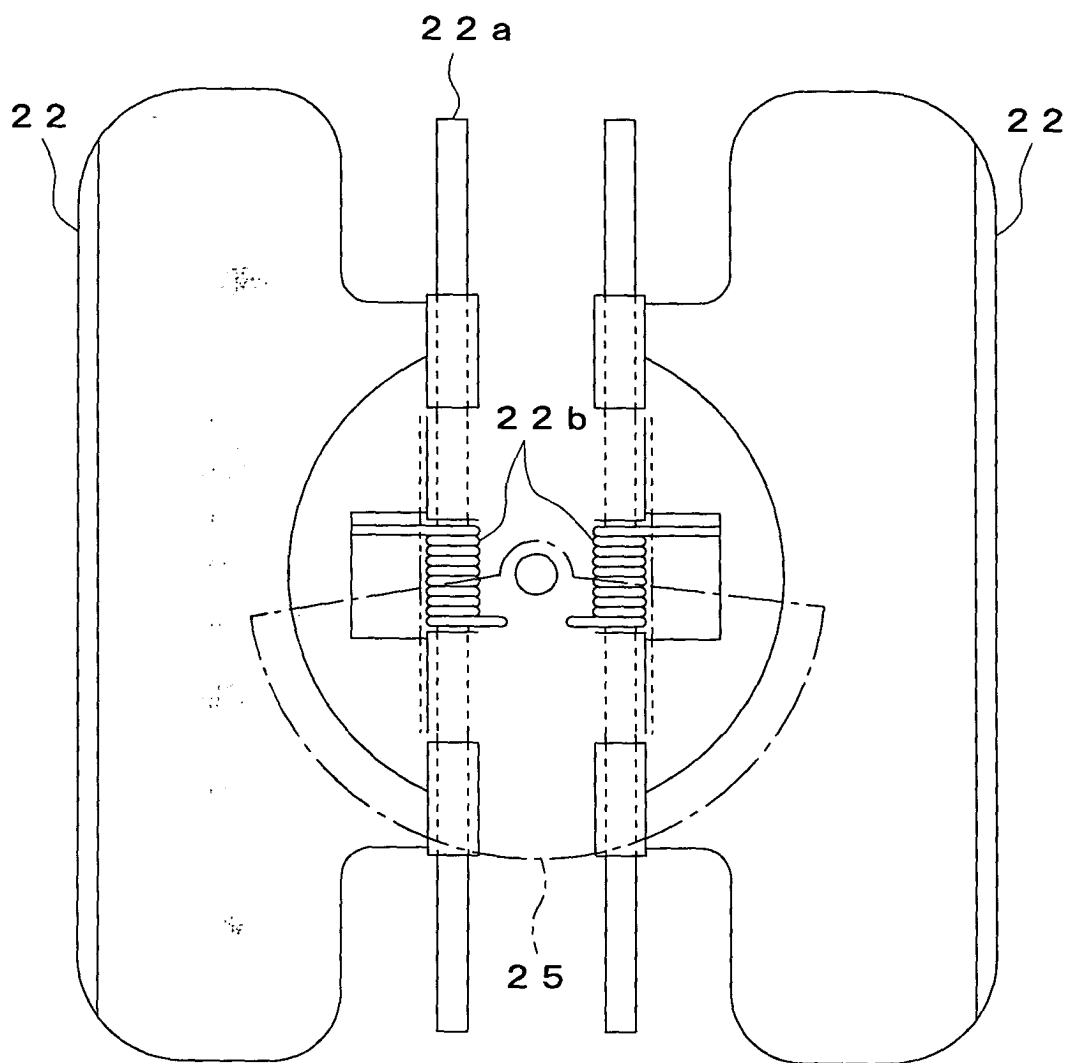


Fig. 8

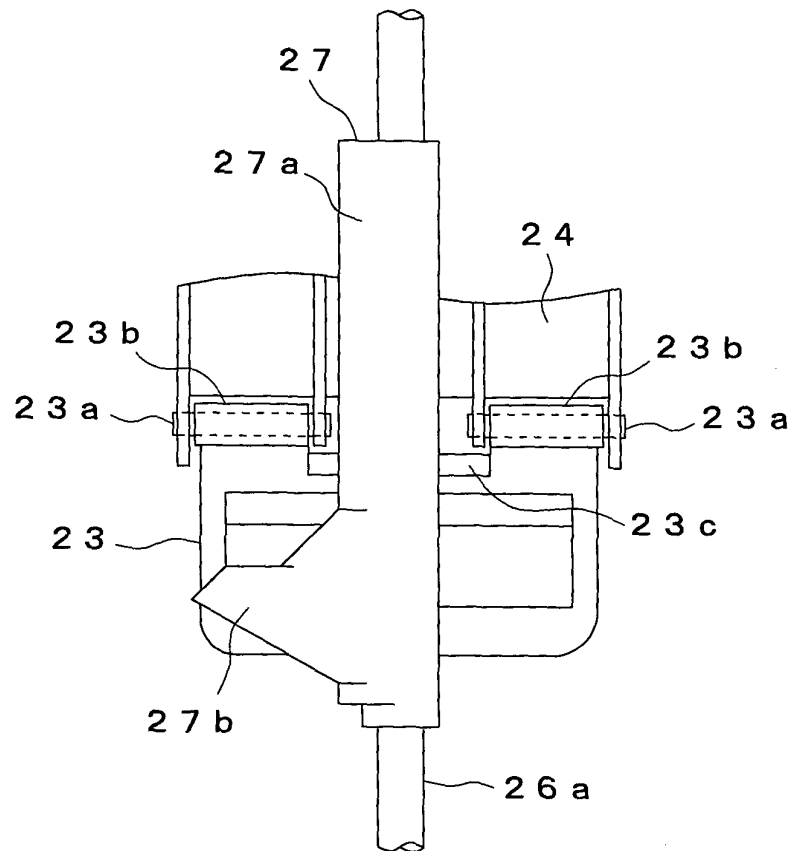


Fig. 9

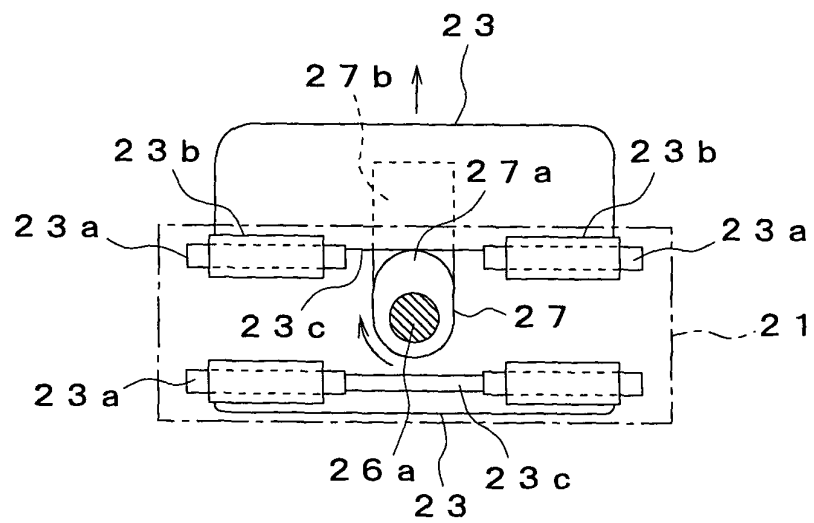
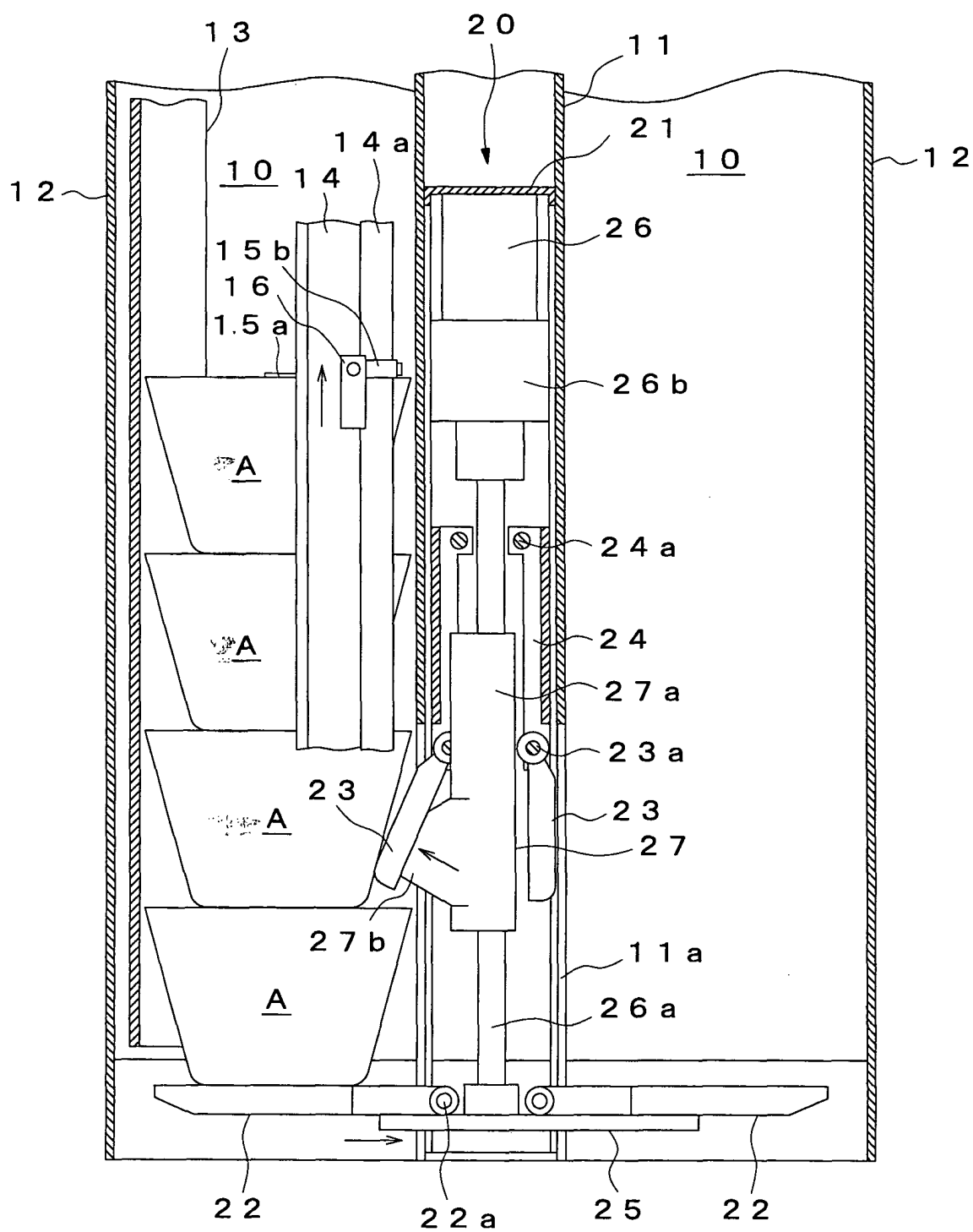
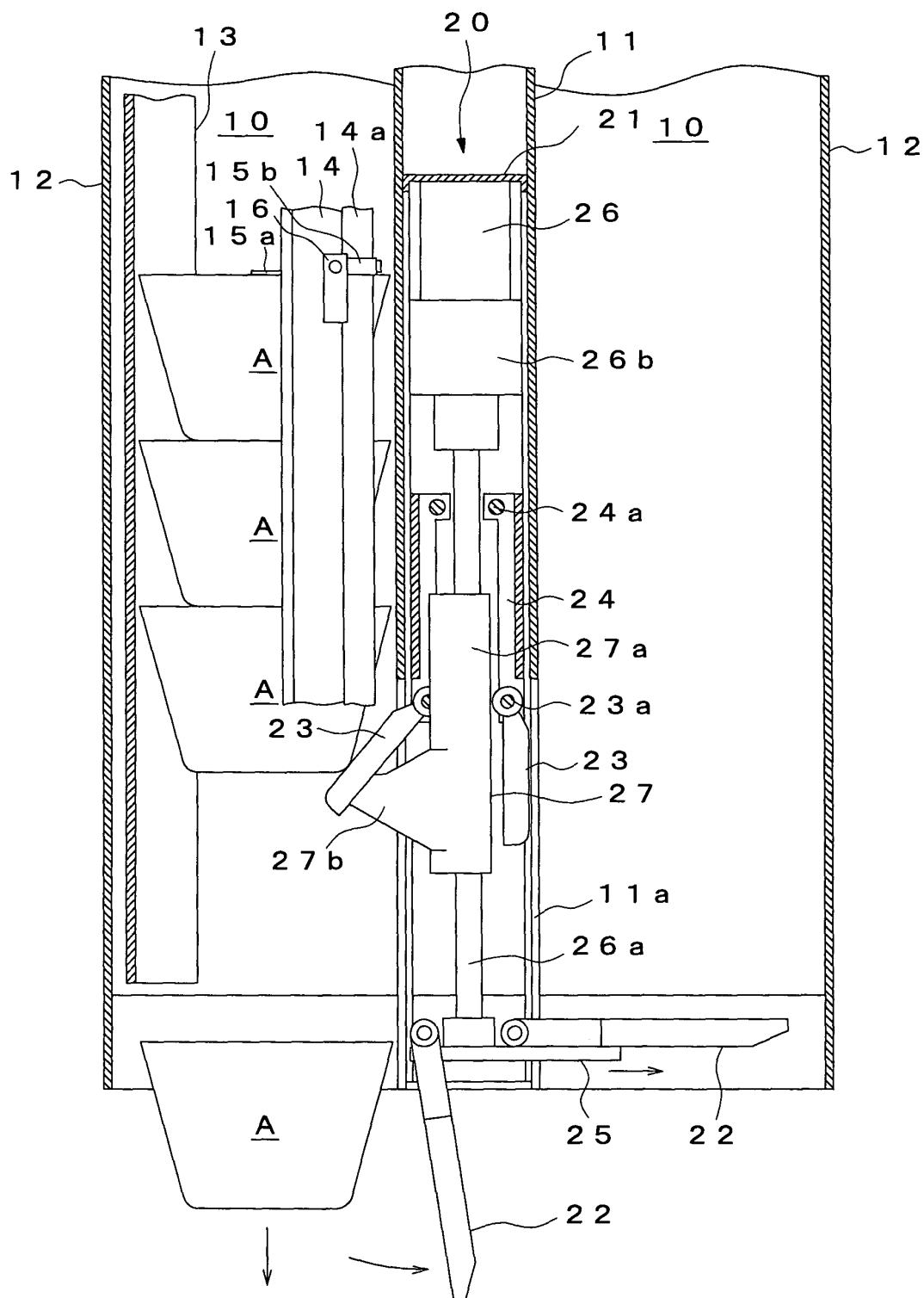


Fig. 10



F i g . 1 1



F i g . 1 2

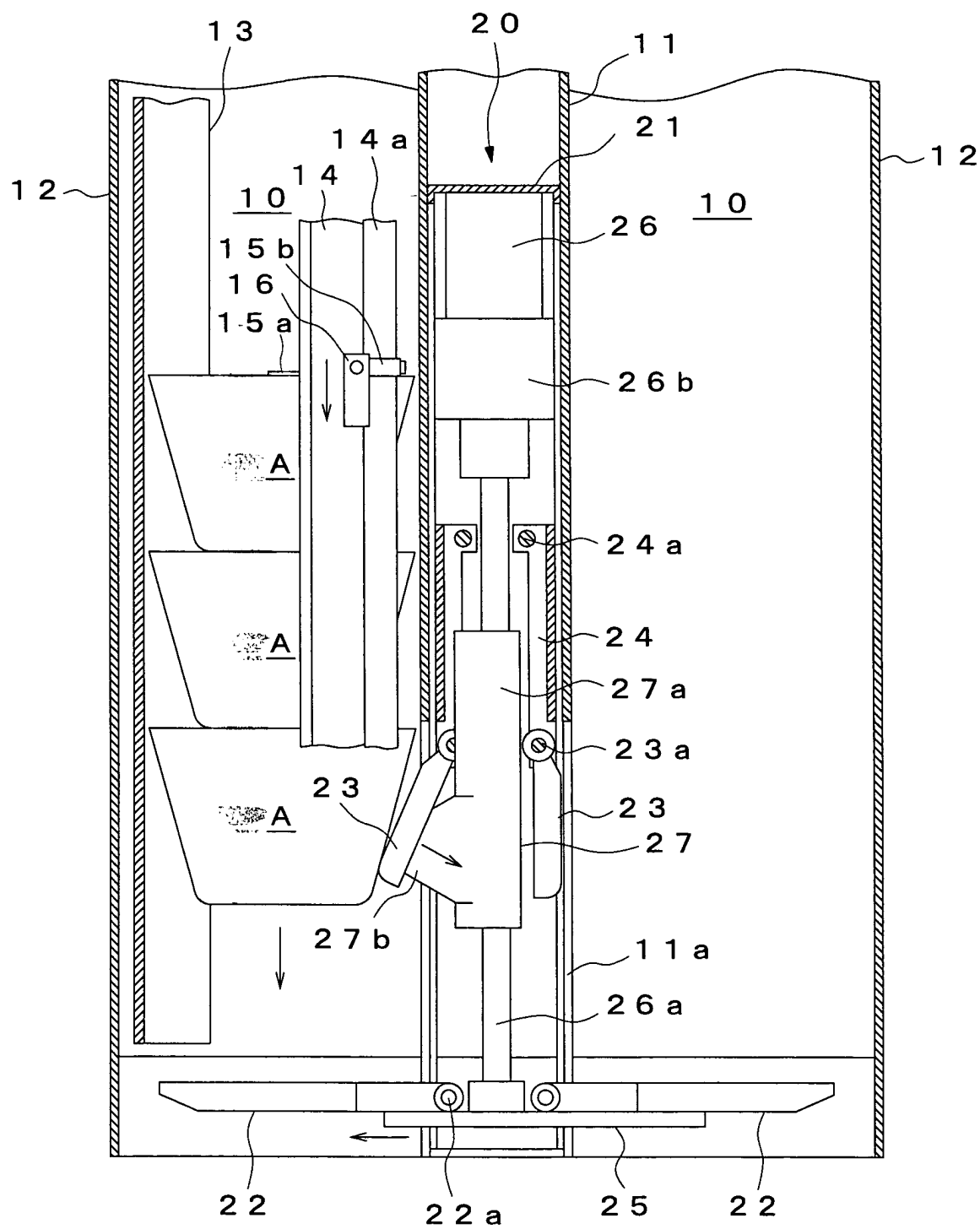
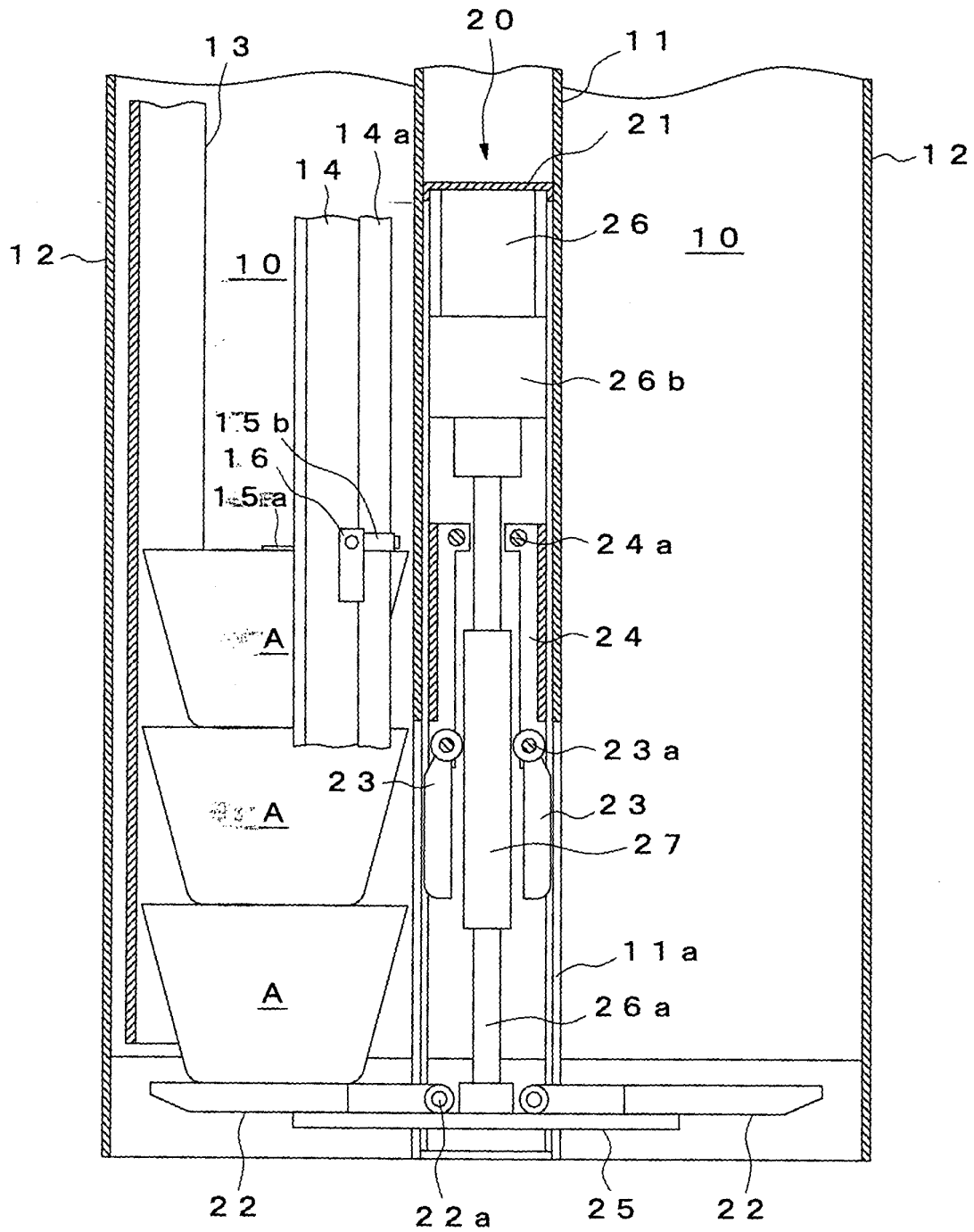


Fig. 13



F i g . 1 4

