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(71) Applicant:
SANYO ELECTRIC Co., Ltd.
Moriguchi-shi, Osaka (JP)

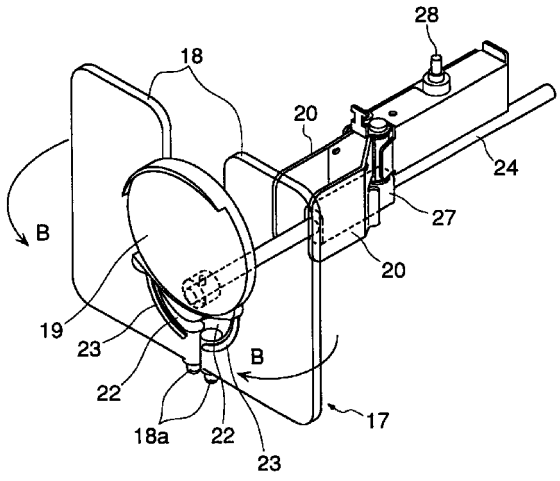
(72) Inventor: **Yasaka, Yoshio**
Gunma-ken (JP)

(74) Representative:
Glawe, Delfs, Moll & Partner
Patentanwälte
Postfach 26 01 62
80058 München (DE)

(54) Article storage device for vending machine

(57) There is provided an article storage device for a vending machine (2). The article storage device is characterized by an opening/closing device which has the following characterizing features: Left and right transparent opening/closing plates (18) have respective inner end portions mounted in a central portion of an article rack (10) in parallel with each other in a manner such that each of the opening/closing plates (18) can rotate about a vertical axis between a closed position for closing a dispensing opening of a corresponding one of article passages formed in the article rack (10) and an open position for opening the dispensing opening of the corresponding article passage. Each opening/closing plate (18) has a cut-away portion (22) formed at an inner end side thereof. A spring urges the each opening/closing plate (18) toward the open position. A stopper plate (19) is arranged at a central location of the article rack (10) which is close to a front side of the each opening/closing plate (18) in a manner such that the stopper plate (19) extends vertically and is capable of rotating about a horizontal axis extending in a front-rear direction between a holding position for abutting on the opening/closing plates (18) to thereby hold the each opening/closing plate (18) in the closed position and a release position for selectively releasing one of the opening/closing plates (18). A stopper plate-driving mechanism (21) causes the stopper plate (19) to rotate between the holding position and the release position.

FIG. 8



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] This invention relates to an article storage device for a vending machine, and more particularly to an article storage device of this kind which stores a large number of articles one behind another in a front-rear direction, and dispenses the articles from a front side for vending.

Prior Art

[0002] The present applicant proposed this kind of article storage device for a vending machine e.g. in Japanese Patent Application No. 8-355374. As shown in FIGS. 15 and 16, the article storage device 50 includes a plurality of article racks 51 arranged one above another. Each article rack 51 is mounted in a body of the vending machine, not shown, such that it can be moved in a front-rear direction by means of rollers 53, etc. and that it can be drawn out of the machine body.

[0003] Each article rack 51 is made of bent steel sheet and separated into a pair of left and right article passages 52 by a partition wall 54 arranged in the center thereof. The partition wall 54 has an opening/closing plate 55 arranged at a front end thereof, which is commonly used for opening and closing the two article passages 52. A pair of pushers 56 are arranged in the respective article passages 52 behind the opening/closing plate 55 such that the pushers 56 are capable of moving in a front-rear direction and urged toward the front of the vending machine. Further, block plates 57 are arranged behind the opening/closing plate 55 and a flapper 58 is provided at a front end of each article passage 52.

[0004] The opening/closing plate 55 is fixed to the front end of a drive shaft 59 which extends in a front-rear direction through the partition wall 54, and the drive shaft 59 is connected to a drive mechanism, not shown, having a motor, not shown, arranged at a read end of the article rack 51. The blocking plates 57 can be moved in the front-rear direction for adjustment, and is capable of projecting into the article passages 52 with rotation of the drive shaft 59. Further, the flapper 58 is connected via a link mechanism, not shown, to the drive shaft 59, and held in a horizontal position except during a vending operation of the machine. When an article S is dispensed for vending, the drive shaft 59 rotates to change the flapper 58 from the held state to a released state for free downward rotation in the forward direction.

[0005] The articles S are stored in each article passage 52 such that they are arranged one behind another in the front-rear direction in a state sandwiched between the opening/closing plate 55 and the pusher 56. During a vending operation, the drive mechanism operates to cause the drive shaft 59 to rotate the plate 55 through a predetermined angle to open one of the two article passages 52, whereby the foremost article (vend product) S is delivered from the article passage 52. Further, upon rotation of the drive shaft 59, the flapper 58 freely rotates downward in the forward direction to effect smooth delivery of the article S, and at the same time, the blocking plates 57 project into the article passages 52 to hold second articles S positioned next to the foremost ones between themselves and the respective opposed side walls 52a of the article passages 52.

[0006] However, this article storage device 50 has room for improvement in the following points: During a vending operation, the opening/closing plate 55 rotates by sliding on articles S. This brings about the following problems: (1) Articles S in an article passage 52 can be lifted when the plate 55 returns to its original position. In this case, a horizontal misalignment of articles S in the two passages 52, 52 can occur, resulting in a degraded display effect of the stored articles S. (2) The opening/closing plate 55 is easy to be marred or stained, and hence the transparency of the plate 55 is lowered, resulting in the degraded display effect. (3) If the article S is box-shaped, and deformed, or if it is soft, the plate 55 may bite into the article S to spoil the commodity value of the article S.

[0007] Further, since the plate 55 rotates about the drive shaft 59 which extends horizontally, it is required to rotate the plate 55 through a relatively large angle so as to completely open the article passage 52. To permit this rotation of the plate 55, it is necessary to secure a sufficient space between the racks 51, 51 positioned vertically adjacent to each other so as to prevent the plate 55 from rotating beyond the rack 51 associated therewith into an area before the rack 51 positioned below. This degrades the commodity storage efficiency of the vending machine. For the same reason, if the articles S are cylinder-shaped ones, such as canned beverages, the plate 55 cannot hold the articles S unless it rotates backward through a fairly large angle. This makes it very difficult to adjust the timing of retracting the blocking plates 57 to release the blocked second articles S so as to permit the same to advance. Further, the plate 55 has a fairly large size since it is commonly used for opening and closing the two article passages, and at the same time it is directly connected to the drive shaft 59. Therefore, if the rotational stop position of the drive shaft 59 is varied, this variation directly causes an inclination of the opening/closing plate 55, which also causes the degraded display effect.

SUMMARY OF THE INVENTION

[0008] It is an object of the invention to provide an article storage device for a vending machine, which is capable of storing vendible articles therein without an opening/closing plate biting into any of the articles even

when they are soft, easily dispensing even cylinder-shaped articles in a properly timed manner, and enhancing the display effect and the article storage efficiency of the machine.

[0009] To attain the above object, the present invention provides an article storage device for a vending machine, including an article rack formed with a pair of left and right article passages for receiving a large number of articles one behind another in a front-rear direction, each of the article passages having a dispensing opening formed at a front end thereof, an opening/closing device for opening and closing the dispensing opening of the each of the article passages, and pushers arranged in the respective article passages in a manner such that each of the pushers is capable of moving in a front-rear direction within a corresponding one of the article passages to urge forward the articles received in the corresponding one of the article passages.

[0010] The article storage device according to the invention is characterized in that the opening/closing device comprises left and right transparent opening/closing plates having respective inner end portions mounted in a central portion of the article rack in parallel with each other in a manner such that each of the opening/closing plates can rotate about a vertical axis between a closed position for closing the dispensing opening of the corresponding one of the article passages and an open position for opening the dispensing opening of the corresponding one of the article passages, the opening/closing plates having cut-away portions formed at respective inner end sides thereof, a spring for urging the each of the opening/closing plates toward the open position, a stopper plate arranged at a central location of the article rack which is close to a front side of the opening/closing plates in a manner such that the stopper plate extends vertically and is capable of rotating about a horizontal axis extending in a front-rear direction between a holding position for abutting on the each of the opening/closing plates to thereby hold the each of the opening/closing plates in the closed position and a release position for selectively releasing one of the opening/closing plates, and a stopper plate-driving mechanism for causing the stopper plate to rotate between the holding position and the release position.

[0011] According to this article storage device, when the vending machine is not performing a vending operation, the stopper plate is held in the holding position by the stopper plate-driving mechanism to abut on the left and right opening/closing plates to thereby hold these plates in the respective closed positions. In this state of the article storage device, a large number of articles are received or stored in the corresponding one of the article passages formed in the article rack in a manner such that they are arranged one behind another in a front-rear direction, and sandwiched between the opening/closing plates in the closed positions and pushers associated therewith. During the vending operation of the vending machine, the stopper plate rotates about the horizontal axis toward one of the opening/closing plates to its release position whereby the other of the opening/closing plates is disengaged from the stopper plate to be released therefrom. During this process, the cut-away portion formed in the released opening/closing plate functions as a clearance recess for avoiding the interference with the stopper plate. The released opening/closing plate is rotated to its open position by the urging force of the spring associated therewith to open the dispensing opening of the corresponding article passage, whereby the foremost article in the passage is dispensed or delivered therefrom. Subsequently, the stopper plate rotates in a reverse direction to return to its original position in a predetermined timing. The stopper plate returning to its original position presses the released opening/closing plate to move the same backward into the closed position against the urging force of the spring whereby the vending machine is placed into the state ready for vending, again.

[0012] Thus, the article storage device of the present invention includes the left and right opening/closing plates separately provided for opening and closing the respective article passages, with these plates being constantly urged by the springs associated therewith toward their open positions. The opening/closing plates are held or selectively released by the stopper plate for closing and opening operations thereof. Therefore, differently from the case of an opening/closing plate rotating by sliding on vendible articles, no articles are lifted by the opening/closing plate returning to the original closed position, and the opening/closing plates become hard to be stained or marred, which contributes to maintaining an excellent display effect of the machine. For the same reason, even when an article is deformed or a soft one, the opening/closing plate does not bite therein.

[0013] Further, since each opening/closing plate rotates about the vertical axis, it is no longer required to secure extra space between article racks located vertically adjacent to each other, whereby the article storage efficiency of the article storage device can be enhanced. Moreover, each opening/closing plate is rotatably supported at supporting points of the inner end portion thereof, and the stopper plate abuts a portion of the opening/closing plate in the vicinity of the supporting points, so that the holding and releasing of the opening/closing plate by the stopper plate i.e. opening and closing of the opening/closing plate can be effected by rotation of the stopper plate through a relatively small angle. As a result, in the case where the articles next to the foremost ones are blocked by blocking plates projected into the respective article passages, it is easy to cause the blocking plates to be retracted after the vending operation, in a properly timed manner to thereby cause the blocking plates to allow the blocked articles to

advance, even when the articles stored are cylinder-shaped ones. For the same reason, the stopper plate can be constructed to have a relatively small size, and hence even if the rotational stop position of the motor of the stopper plate-driving mechanism is varied to cause an inclination of the stopper plate, the inclined state of the plate is not very conspicuous, so that the display effect is hardly affected thereby.

[0014] Preferably, one of a contacting surface of the opening/closing plates and a contacting surface of the stopper plate is formed with a protrusion in the form of a band.

[0015] According to this preferred embodiment, the stopper plate rotates on the opening/closing plates by sliding on the protrusion in the form of a band. This reduces the frictional resistance to the movement of the stopper plate, and hence it is possible to reduce the required driving force of the stopper plate-driving mechanism, and at the same time prevent a mar or scratch from being produced on the plates.

[0016] More preferably, the protrusion is arranged in the form of an arc extending about the horizontal axis of the stopper plate.

[0017] According to this preferred embodiment, the center of rotation of the stopper plate and the center of protrusion in the arcuate form is coincident with each other. Therefore, the stopper plate rotates while receiving reaction forces from the opening/closing plates in a well balanced manner, which enables the stopper plate to smoothly carry out its holding/releasing operation.

[0018] Preferably, the stopper plate has attaching means for attaching a display label to a front surface of the stopper plate.

[0019] According to this preferred embodiment, the display label can be attached to the front surface of the stopper plate by using the attaching means. This makes it possible to make use of the stopper plate as display means. Contents to be displayed by the display label are e.g. a price of an article (commodity), a rack number when a selection button for selecting an article is provided at a location remote from an article rack storing the article, and so forth.

[0020] The above and other objects, features, and advantages of the invention will become more apparent from the following detailed description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

FIG. 1 is a front view of a vending machine incorporating an article storage device according to an embodiment of the invention;

FIG. 2 is a front view of the FIG. 1 vending machine in a door-opened state;

FIG. 3 is a sectional side elevation of the FIG. 1 vending machine;

FIG. 4 is a perspective view showing an article rack drawn out of a body of the FIG. 1 vending machine;

FIG. 5 is an enlarged partial front view showing a portion encircled by a broken line indicated by an arrow A in FIG. 2;

FIG. 6 is a partially exploded perspective view of a rack and a dispensing mechanism associated therewith;

FIG. 7 is a partially exploded perspective view of the rack, a shelf, and the dispensing mechanism;

FIG. 8 is a perspective view of the dispensing mechanism in a state ready for vending;

FIG. 9 is a perspective view of the dispensing mechanism which is useful in explaining the operation thereof when an article is dispensed from one article passage;

FIG. 10 is a perspective view of the dispensing mechanism which is useful in explaining the operation thereof when an article is dispensed from an article passage opposite to the FIG. 9 article passage;

FIG. 11 is a perspective view showing a display label, and a stopper plate before having the display label attached thereto;

FIG. 12 is a front view of the display label;

FIG. 13 is a side sectional view of the stopper plate to which the display label is attached;

FIG. 14 is a perspective view similar to FIG. 8, which shows a dispensing mechanism of an article storage device according to a second embodiment of the invention;

FIG. 15 is a perspective view showing a pusher and a guide mechanism for the pusher used in a conventional article storage device proposed by the present applicant; and

FIG. 16 is an enlarged partial front view of the article storage device including the FIG. 15 components.

DETAILED DESCRIPTION

[0022] The invention will now be described in detail with reference to drawings showing embodiments thereof.

[0023] Referring first to FIGS. 1 to 3, a vending machine 2 to which the present invention is applied is a so-called see-through vending machine which allows vendible articles actually contained therein, such as canned or packed beverages, to be viewed from outside. The vending machine 2 is comprised of a machine body 3 having an article storage device 1 of the invention arranged therein, a main door 4 mounted on the front of the machine body 3, and a transparent heat insulating door 5 interposed between the machine body 3 and the main door 4.

[0024] As shown in FIGS. 2 and 3, the machine body 3 contains a plurality of article racks 10, each forming a component element of the article storage

device 1 of the invention. In the present embodiment, twenty-four article racks 10 are arranged in eight vertical layers and three horizontal rows. Each of the article racks 10 stores articles S of the same kind.

[0025] On the front of the main door 4, there are arranged a plurality of money insertion slots 4a, a plurality of article selection buttons 4b, a product outlet 4c, and a front window 4d for allowing vendible articles to be viewed from outside to serve as an article display. The selection buttons 4b each having a number identical to one assigned to a corresponding one of the article racks 10 are arranged in the form of a matrix corresponding to the array of the article racks 10. A user can select and buy a desired article S by putting money into one of the slots 4a and then pushing a selection button 4b corresponding to an article rack 10 storing the desired article. Further, an elevator 6 is arranged in a space in front of the array of article racks 10 within the machine body 3. The elevator 6 carries an article S dispensed from the rack 10 on a carrier plate 6a down to the vicinity of a shutter 3b arranged on the bottom of the machine body 3 and delivers the article S via the shutter 3b to the product outlet 4c.

[0026] Referring next to FIGS. 6 and 7, each of the article racks 10 has a rack body 11 and an adapter attached to a front end of the rack body 11. The rack body 11 is made of bent steel sheet, and has a pair of left and right article passages 14, 14 formed therein. Each article passage 14 has a dispensing opening 14a formed at a front end thereof.

[0027] The adapter 12 is a component in the form of a frame molded of a synthetic resin (e.g. polypropylene), which is fitted into the front end of the rack body 11 and fixed thereto by screws. At a front side of the adapter 12, there are formed a central horizontal portion 12a and inclined portions 12b descending forward on opposite sides of the horizontal potion 12a. Each inclined portion 12b has a bottom formed with a plurality of elongate grooves each extending in a front-rear direction. The inclined portions 12b are protruded to form a jaw-shaped front end portion which serves as a handle 12d of the article rack 10. Further, the horizontal portion 12a is formed with mounting holes 12e, 12e for mounting respective left and right opening/closing plates 18, 18, referred to hereinafter, therein.

[0028] Each article rack 10 constructed as above is mounted on a shelf 15 (see FIG. 5) provided within the machine body 3 such that it can be moved in a front-rear direction by means of rollers 53. Normally, the article rack 10 is received within the machine body 3 as shown e.g. in FIG. 5, whereas when it is required to be replenished with articles S, it is drawn forward out of the machine body 3, as shown in FIG. 4.

[0029] The article storage device 1 further includes a dispensing mechanism 17 for dispensing an article S during a vending operation of the vending machine 2. The dispensing mechanism 17 is comprised of the left and right opening/closing plates 18, 18, springs, not shown, for urging the respective plates 18, a stopper plate 19 for holding/releasing the plates 18, 18, left and right blocking plates 20, 20 for holding second articles S (articles positioned next to the foremost ones), a stopper plate-driving mechanism 21 for driving the stopper plate 19, and so forth.

[0030] Each of the opening/closing plates 18, which is made of a transparent synthetic resin (e.g. polycarbonate), has a concentric semicircular cut-away portion 22 formed by cutting away a lower inner end portion thereof, and a semi-arcuate protrusion 23 formed on a front surface thereof along the corresponding cut-away portion 22. Further, each plate 18 has an inner end portion formed with upper and lower pivot shafts 18a, 18a protruding from the respective upper and lower end faces of the inner end portion (best shown in FIG. 10). The upper pivot shaft 18a is mounted in a mounting hole, not shown, formed in the partition wall 13, and the lower pivot shaft 18a is mounted in the mounting hole 12e formed in the adapter 12 of the article rack 10. This construction enables the opening/closing plates 18 to supported at a central location of the article rack via the pivot shafts 18a, 18a thereof such that it can pivot about a vertical axis extending through the pivot shafts 18a. The opening/closing plate 18 can pivotally move between a closed position thereof for closing the dispensing opening 4a of a corresponding one of the article passages 14 and an open position thereof for opening the same. The opening/closing plates 18 are always urged by the springs in a rack opening direction (indicated by an arrow B in FIG. 8).

[0031] The stopper plate 19 formed by a circular plate of an opaque synthetic resin (e.g. polyacetal) has an lower end thereof fixed to an end of a drive shaft 24. The drive shaft 24 extends in a manner concentric with a circle formed by the semi-arcuate protrusions 12a of the opening/closing plates 18 through the partition wall 13 and the cut-away potions 22 of the plates 18 (see FIG. 8). The drive shaft 24 forms part of the stopper plate-driving mechanism 21, and has a rear end thereof connected to a reduction gear mechanism 25 of the stopper plate-driving mechanism 21. The drive shaft 24 is driven for rotation by a motor 26 which operates during a vending operation of the vending machine.

[0032] The left and right blocking plates 20, 20 are rotatably mounted on the partition wall 13 at a location behind the respective opening/closing plates 18. The blocking plates 20, 20 simultaneously pivotally moved by a cam 27 (see FIG. 9) integrally formed with the drive shaft 24 to protrude into the respective article passages 14, whereby the articles S positioned next to the foremost ones are held between themselves and the respective opposed side walls 14b, 14b. The position of the blocking plates 20, 20 can be moved in a front-rear direction for adjustment by operating a lever 28.

[0033] As shown in FIG. 5, the article storage device 1 further includes a pair of left and right pushers 29, 29 for each pushing forward the articles S in a cor-

responding one of the article passages 14 to dispense the same for vending, and a guide rail 30 for guiding the pushers 29, 29 along opposite side faces thereof, respectively. The pushers 15 are each comprised of a pusher body 29a in the form of a block, a pair of front and rear rollers 15b, 15b (only front one is shown) mounted on an upper side face of the pusher body 29a, and an auxiliary roller 15c mounted on a lower side face of the same. The rollers 15b, 15b each have a U-shaped groove formed therearound. Each pusher 29 is constantly urged forward by a helical tension spring, not shown.

[0034] The guide rail 30 is formed e.g. by an extrusion molded component of aluminum, and mounted at a central portion of the underside of a corresponding upper shelf 15 on which the article rack 10 immediately above the present rack 10 is placed, in a manner extending in a front-rear direction and at the same time protruding downward. The guide rail 30 includes a pair of upper and lower guide protrusions 30a, 30a formed on opposite sides thereof and extending vertically in an opposed direction. The rollers 29b of the pusher 29 are fitted on the guide protrusions 30a whereby the pusher 29 can be moved smoothly in the front-rear direction along the guide rail 30.

[0035] Next, the operation of the article storage device 1 constructed as above will be described with reference to FIGS. 8 to 10, etc. FIG. 8 shows the article storage device 1 when the vending machine is in a state ready for vending. More specifically, in this state, the stopper plate 19 is held in a holding position by the stopper plate-driving mechanism 21, and abuts on the opening/closing plates 18, 18 from the front side to hold them in their closed positions. In this state of the plates 18, a large number of articles S are stored within each article passage 14 one behind another in the front-rear direction and held between the plate 18 in the closed position and the pusher 29.

[0036] When an article S is dispensed from the left article passage 14, the motor 26 of the stopper plate-driving mechanism 21 operates to cause the drive shaft 24 to rotate in a direction indicated by an arrow C in FIG. 9 through a predetermined angle. With this rotation of the drive shaft 24, the stopper plate 29 is rotated toward the right one of the opening/closing plates 18 through the same predetermined angle to its open position, whereby the left one 18 is disengaged from the stopper plate 19 to be released therefrom. In this case, the cutaway portion 22 of the left plate 18 serves as "a clearance recess" for avoiding or escaping from interference with the stopper plate 19. When the opening/closing plate 18 is released, it is caused to rotate toward the open position by the urging force of the spring, not shown, to open the dispensing opening 14a of the left article passage 14, whereby the foremost article S is dispensed or delivered from this article passage 14.

[0037] The article S is fallen forward and guided by the corresponding inclined portion 12b of the adapter 12 of the article rack 10, with reduced frictional resistance to the movement thereof by virtue of provision of the elongate grooves 12c in the surface of the inclined portion 12b, whereby the article S is delivered smoothly. At the same time, as the drive shaft 24 rotates, the cam 27 simultaneously actuates both of the blocking plates 20, 20 whereby the blocking plates 20, 20 are projected into the respective article passages 14 to block the articles S next to the foremost ones from advancing.

[0038] Subsequently, when the motor 26 starts to operate in properly timed manner to rotate through the same predetermined angle in a reverse direction, the stopper plate 19 rotates and returns toward its holding position shown in FIG. 8. Accordingly, the left opening/closing plate 18 is pressed by the stopper plate 19 returning to its stop position, whereby the plate 18 also returns to its closed position against the urging force of the spring. At the same time, the blocking plates 20 are retraced from the article passages 14 to place the vending machine 2 into the state ready for vending. Further, as shown in FIG. 10, by rotating the drive shaft 24 in a direction (indicated by an arrow D) opposite to the FIG. 9 direction, an article S can be dispensed from the right article passage 14.

[0039] As described above, in the article storage device 1 according to the present embodiment, the opening/closing plates 18, 18 are separately provided for the left and right article passages 14, 14 and constantly urged toward their open positions by the respective springs, and these plates 18, 18 are held and released by the stopper plate 19 to thereby open and close the corresponding article passages 14, 14. Therefore, differently from the case of an opening/closing plate rotating by sliding on articles S, no articles S are lifted by the opening/closing plate returning to its original position, and the plate 18 is hard to be stained and marred, whereby the excellent display effect can be preserved. For the same reason, even when the article is deformed or soft, it is possible to prevent the plate 18 from biting into an article S.

[0040] Furthermore, since each plate 18 rotates about the vertical axis, it is no longer required to secure extra space between article racks 10 located vertically adjacent to each other, whereby the efficiency of storage of articles S can be enhanced. Moreover, each plate 18 is rotatably supported at supporting points of the inner end portion thereof, and the stopper plate 19 abuts a portion of the plate 18 in the vicinity of the supporting points, so that the holding and releasing of the plate 18 by the stopper plate 19 i.e. opening and closing of the plate 18 can be effected by rotation of the stopper plate 19 through a relatively small angle. As a result, it is easy to cause the blocking plates 20 to be retracted after the vending operation in a properly timed manner to stop blocking of the blocked article S, even when the articles S are cylinder-shaped. For the same reason, the stopper plate 19 can be constructed to have a relatively small size, and hence even if the rotational stop

position of the motor 26 of the stopper plate-driving mechanism 21 may be varied to cause inclination of the stopper plate 19, the inclination of the plate 19 is not very conspicuous, so that the display effect is hardly affected thereby.

[0041] Further, the stopper plate 19 rotates by sliding on the protrusions 23 of the plates 18, which reduces the frictional resistance to the movement of the stopper plate 19. Therefore, it is possible to employ a motor 26 smaller in size for the stopper plate-driving mechanism 21, and at the same time, prevent the plates from being marred. Further, the protrusions 23 are each in a semi-arcuate form, and the center of the protrusions 23 is coincident with the axis of the drive shaft 14, i.e. the center of rotation of the stopper plate 19. This causes the stopper plate 19 to perform rotation while receiving reaction forces from the plates 18 in a well-balanced manner, and hence the holding and releasing of the opening/closing plates 19 can be smoothly carried out.

[0042] Next, a display label 31 to be attached to the stopper plate 19 will be described with reference to FIGS. 11 to 13. The display label 31 is made of a soft plastic, for instance. The display label 31 has a lower end thereof formed with a protruding portion 31a, and a surface thereof printed with a numeral indicative of a rack number selected from 1 to 24 which is assigned to the article rack 10 (in the illustrated example, the rack number is 1) and a price of the article S. As shown in FIG. 13, the stopper plate 19 has a lower end thereof formed with a recess 19a (attaching means) corresponding to the protruding potion 31a and an upper end thereof formed with an engaging portion 19b (attaching means) which is undercut. The display label 31 is mounted in the stopper plate 19 by fitting lower and upper ends thereof into the recess 19a and the engaging portion 19b, respectively. As described hereinbefore, the selecting buttons 4b are provided in the same number as the number of article racks 10 and arranged in the form of a matrix corresponding to the array of the article racks 10. Each button 4b also has a number selected from 1 to 24 which is identical to one assigned to a corresponding one of the article racks 10, though not shown specifically.

[0043] Therefore, the user can view an article S stored in an article rack 10 via the main door 4 to select a desired article S and confirm the rack number and the price from the display label 31 attached to the stopper plate 31 associated with the article rack 10. Then, he can buy the desired article S by putting money into one of the slots 4a and then pushing a selection button 4b having the same number as the number of the article rack 10 storing the desired article.

[0044] FIG. 14 shows an article storage device according to a second embodiment of the invention. This embodiment is distinguished from the first embodiment in which the stopper plate 19 has a circular shape, in that a stopper plate 39 employed in this embodiment is crescent-shaped, and considerably smaller than the stopper plate 19. The other component elements and devices are identical to those of the first embodiment. Therefore, it is possible to obtain the same advantageous effects as obtained by the first embodiment, and in particular, since the stopper plate 39 has a smaller size, part of the articles which can be viewed through the transparent opening/closing plates 18 is increased in size, which contributes to enhancement of the display effect.

[0045] The present invention is not limited to the above embodiments, but it can be practices in various forms. For instance, although in the above embodiments, the semi-arcuate protrusions are formed on the front side of the left and right opening/closing plates, this is not limitative, but these protrusions may be formed on the rear side of the stopper plate. Further, they may be differently shaped.

[0046] It is further understood by those skilled in the art that the foregoing is a preferred embodiment of the invention, and that various changes and modifications may be made without departing from the spirit and scope thereof.

Claims

1. An article storage device for a vending machine, including an article rack formed with a pair of left and right article passages for receiving a large number of articles one behind another in a front-rear direction, each of said article passages having a dispensing opening formed at a front end thereof, an opening/closing device for opening and closing said dispensing opening of said each of said article passages, and pushers arranged in said respective article passages in a manner such that each of said pushers is capable of moving in a front-rear direction within a corresponding one of said article passages to urge forward said articles received in said corresponding one of said article passages,
the article storage device being characterized in that: said opening/closing device comprises:

left and right transparent opening/closing plates having respective inner end portions mounted in a central portion of said article rack in parallel with each other in a manner such that each of said opening/closing plates can rotate about a vertical axis between a closed position for closing said dispensing opening of said corresponding one of said article passages and an open position for opening said dispensing opening of said corresponding one of said article passages, said opening/closing plates having cut-away portions formed at respective inner end sides thereof;
a spring for urging said each of said open-

ing/closing plates toward said open position;

a stopper plate arranged at a central location of said article rack which is close to a front side of said each of said opening/closing plates in a manner such that said stopper plate extends vertically and is capable of rotating about a horizontal axis extending in a front-rear direction between a holding position for abutting on said each of said opening/closing plates to thereby hold said each of said opening/closing plates in said closed position and a release position for selectively releasing one of said opening/closing plates; and

a stopper plate-driving mechanism for causing said stopper plate to rotate between said holding position and said release position.

2. An article storage device according to claim 1, wherein one of a contacting surface of said opening/closing plates and a contacting surface of said stopper plate is formed with a protrusion in the form of a band.

3. An article storage device according to claim 2, wherein said protrusion is arranged in form of an arc extending about said horizontal axis of said stopper plate.

4. An article storage device according to any one of claims 1, 2 or 3, wherein said stopper plate has attaching means for attaching a display label to a front surface of said stopper plate.

FIG. 1

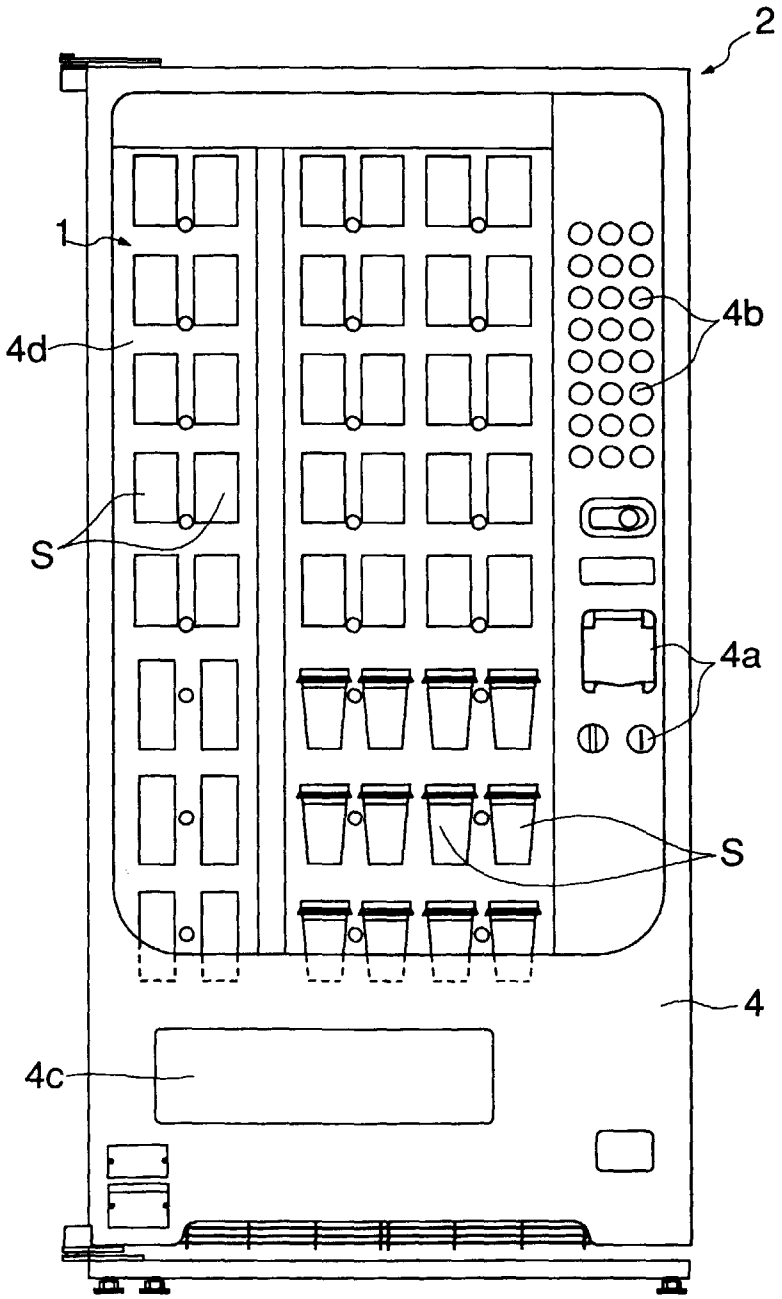


FIG. 2

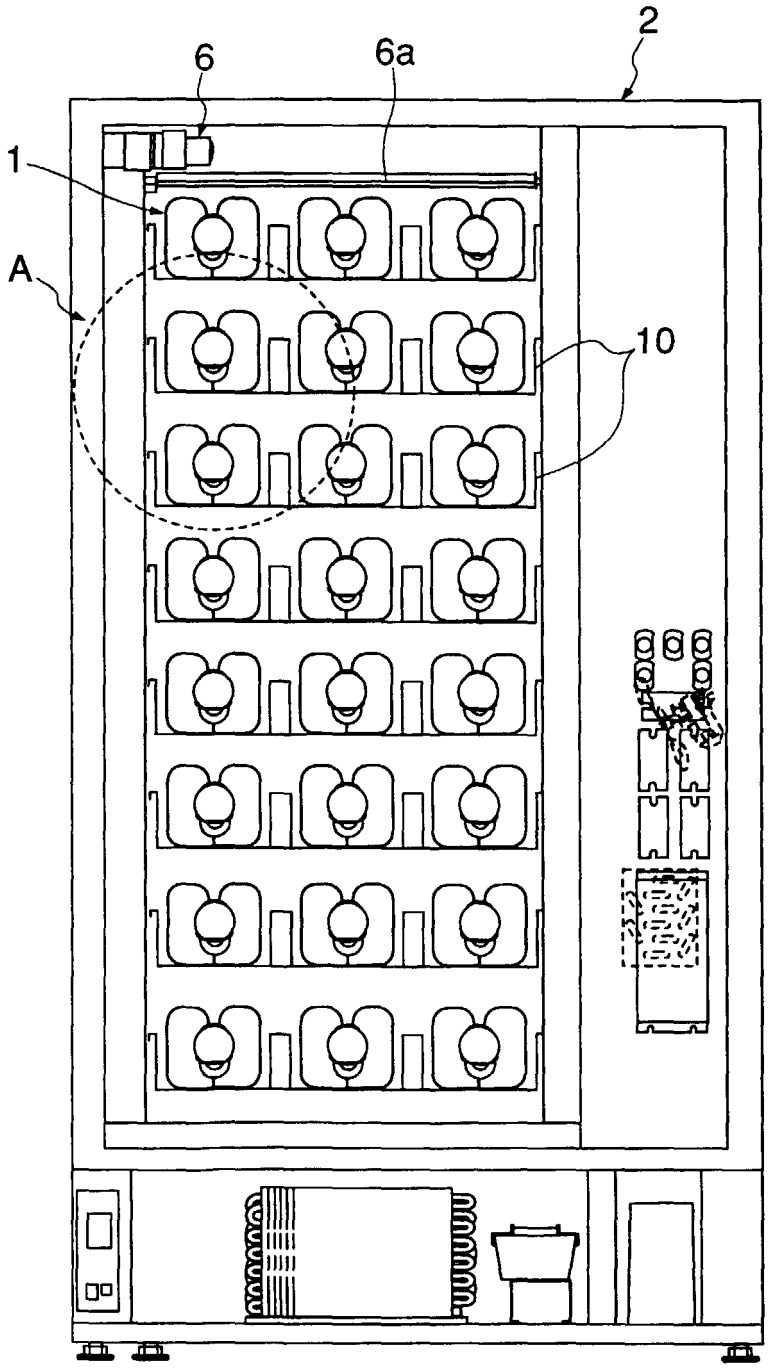


FIG. 3

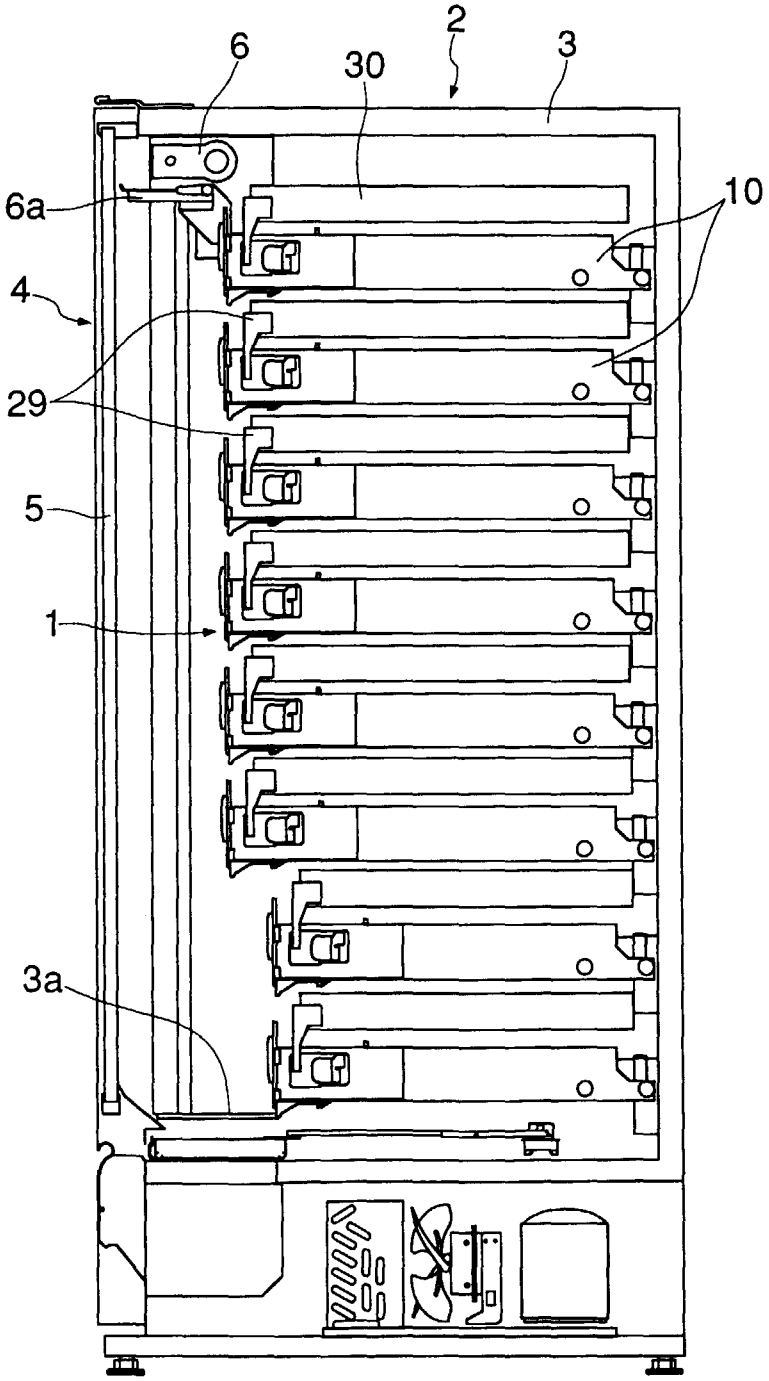


FIG. 4

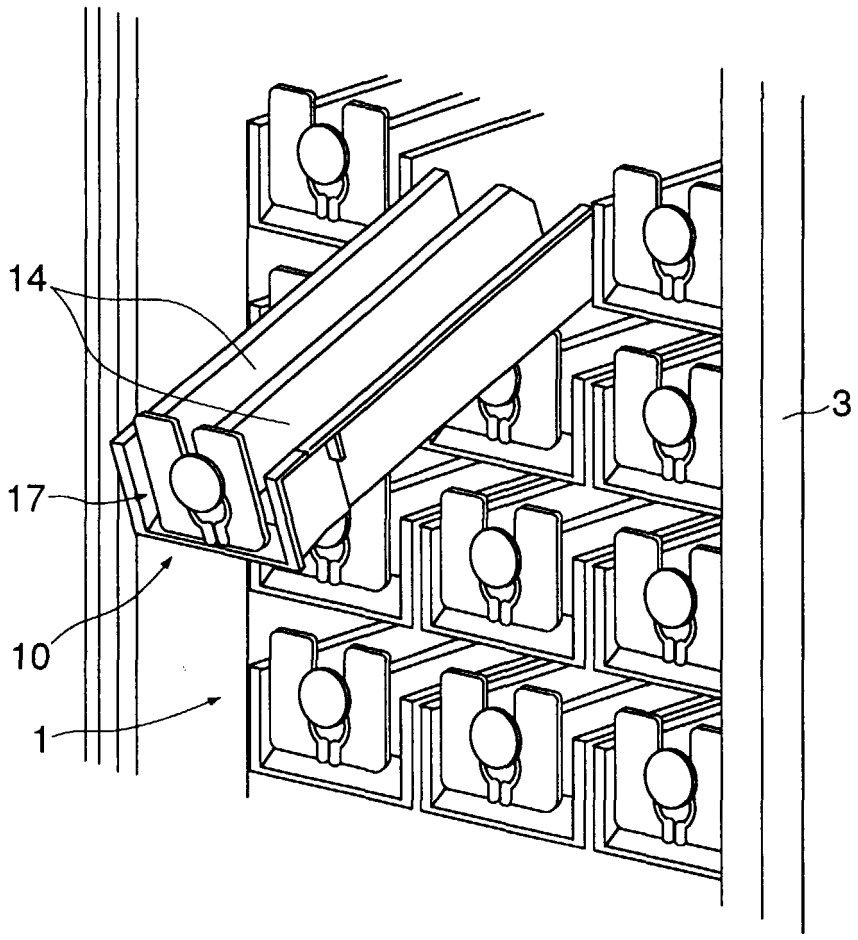
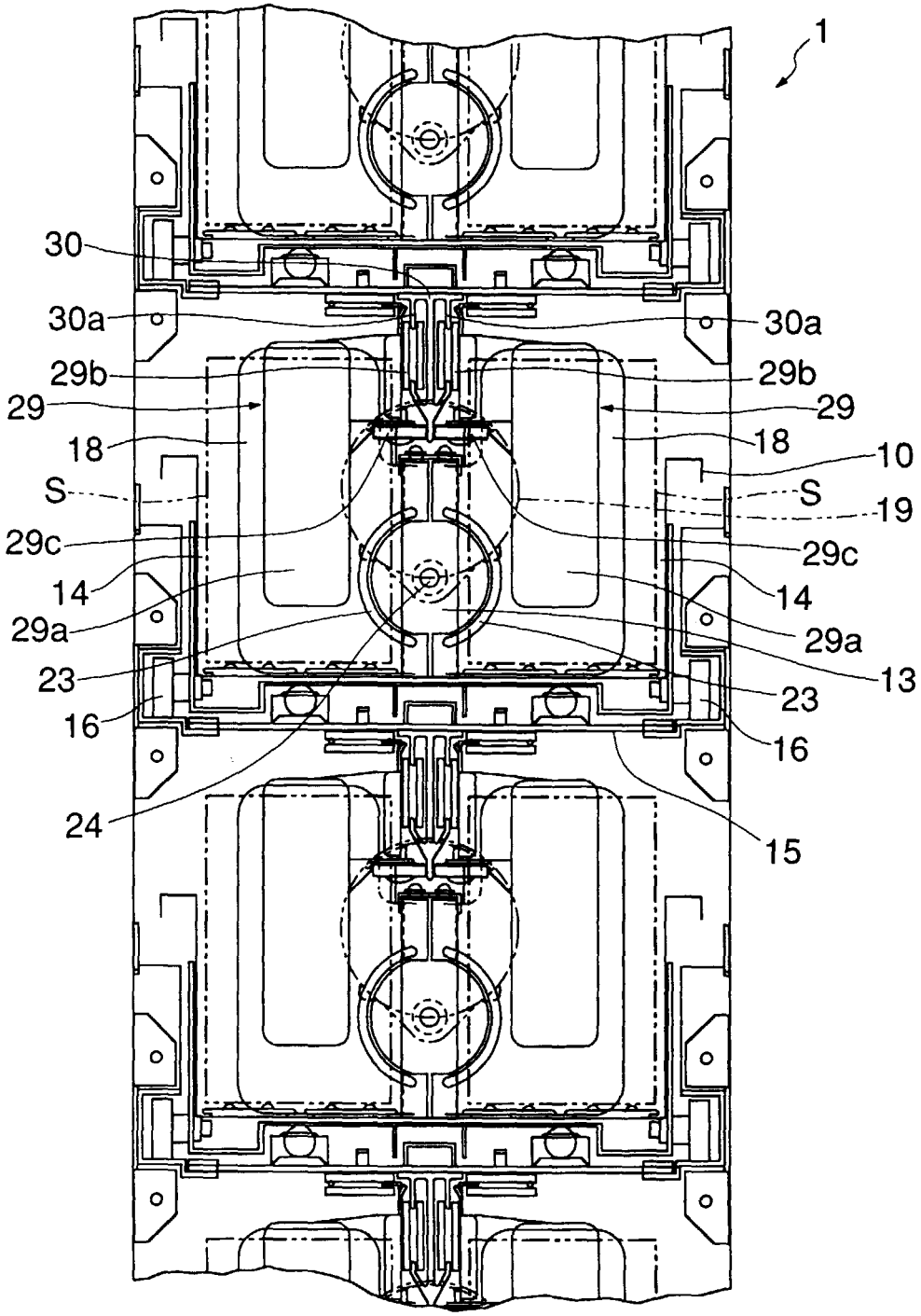


FIG. 5


1
30
30a
29b
29
18
S
29c
14
29a
23
16
24
30a
29b
29
18
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19
29c
14
29a
13
23
16
15

FIG. 6

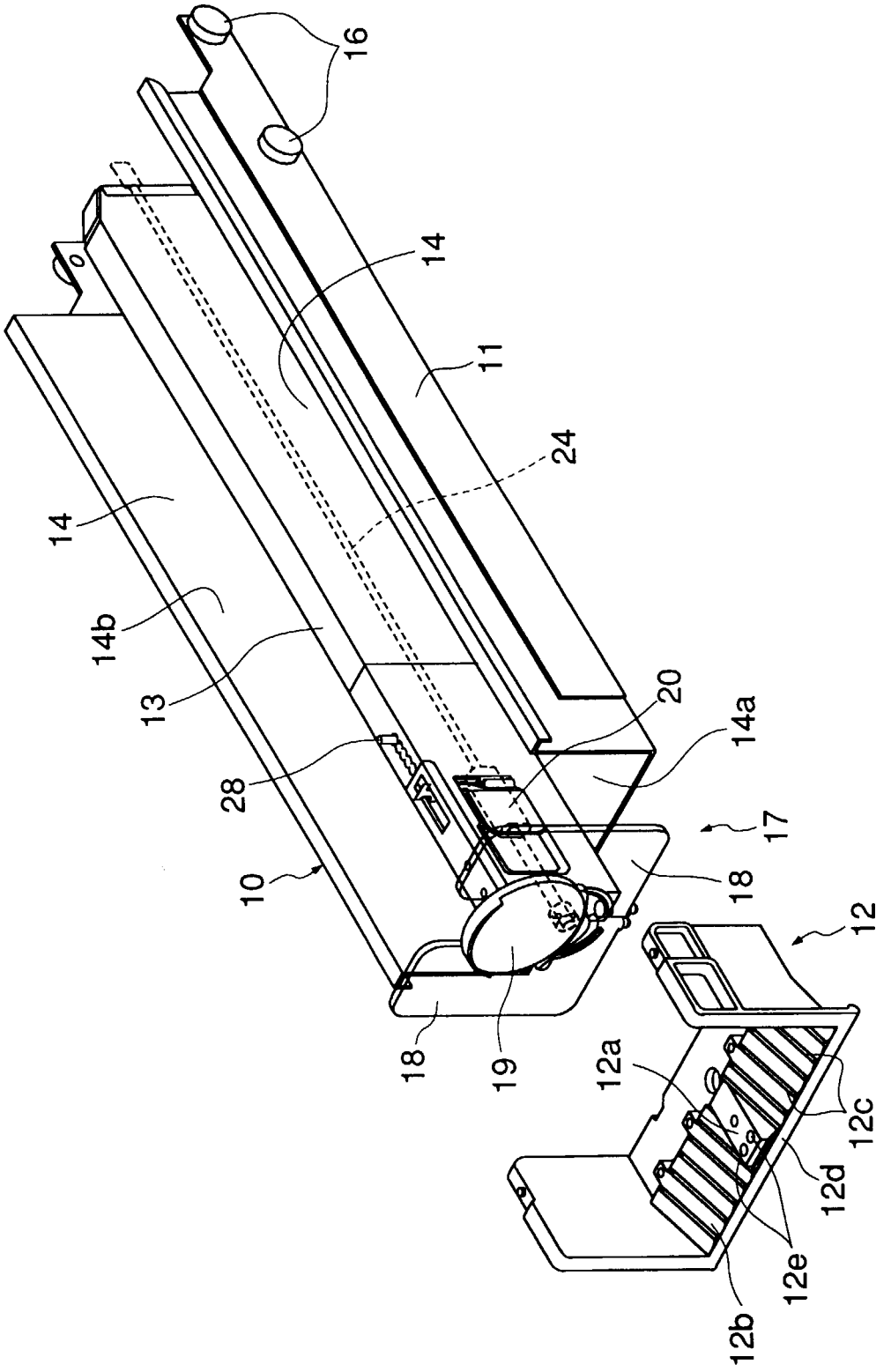


FIG. 7

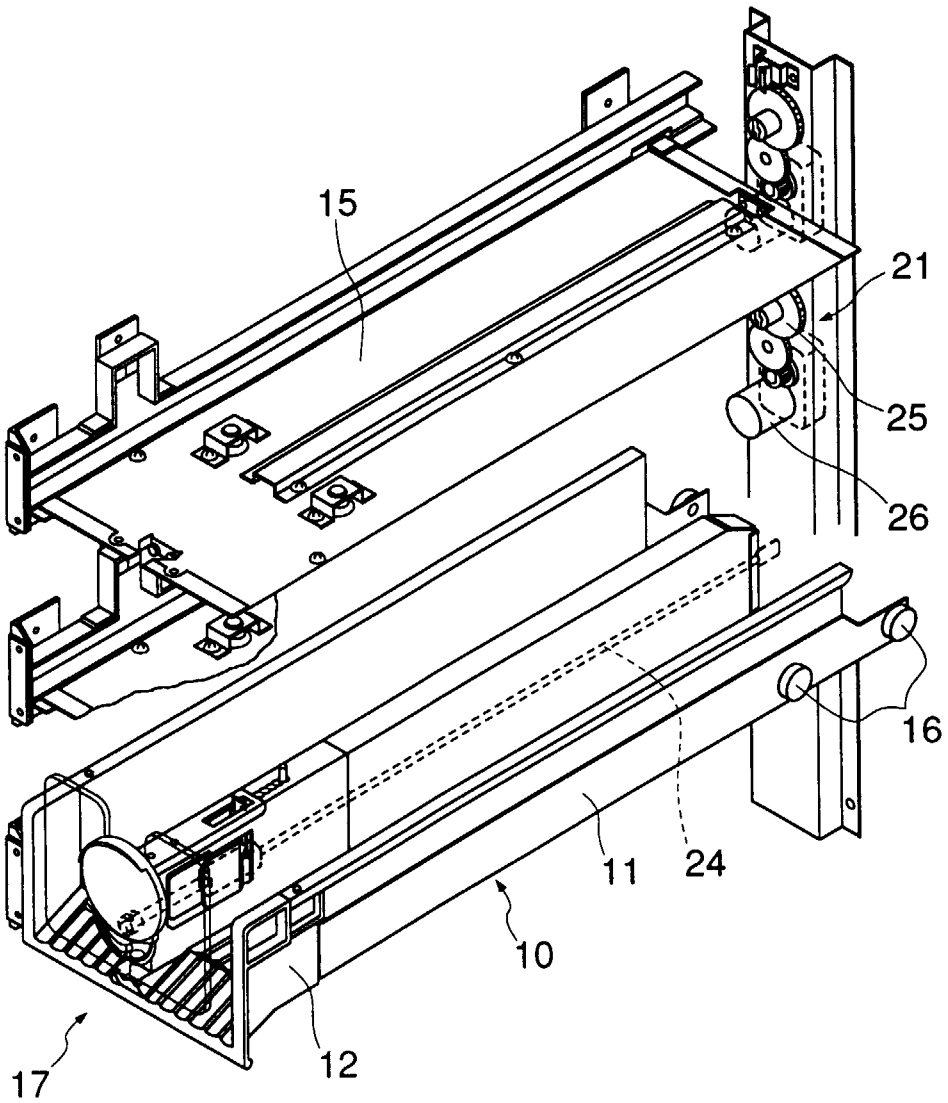


FIG. 8

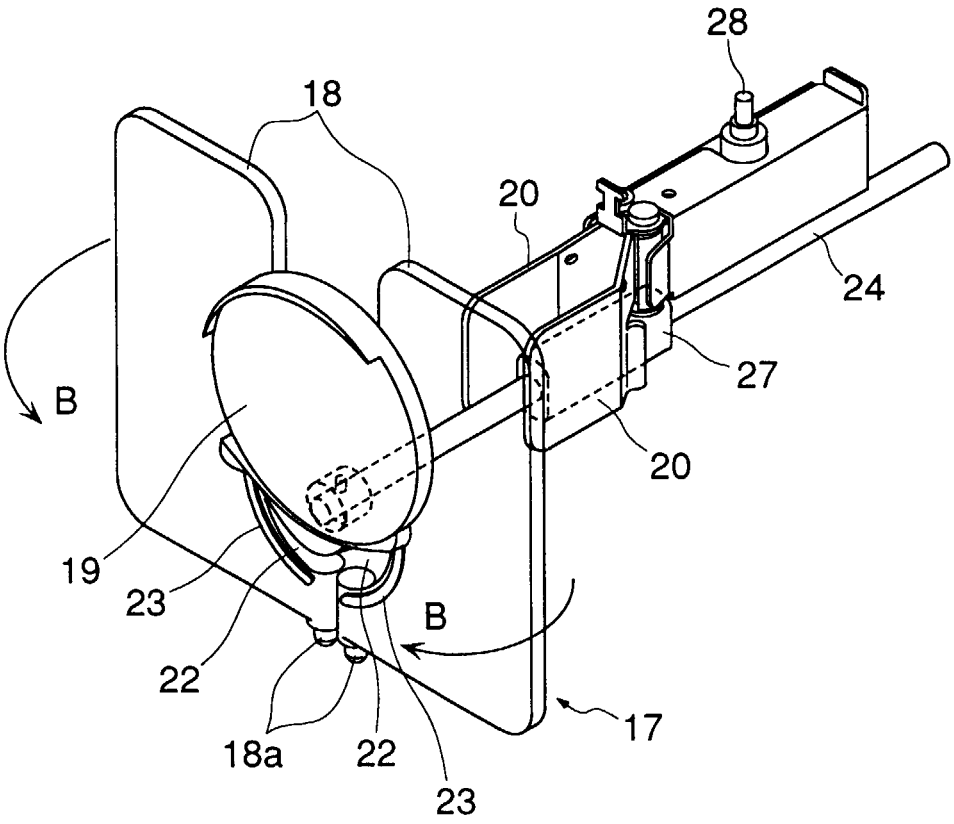


FIG. 9

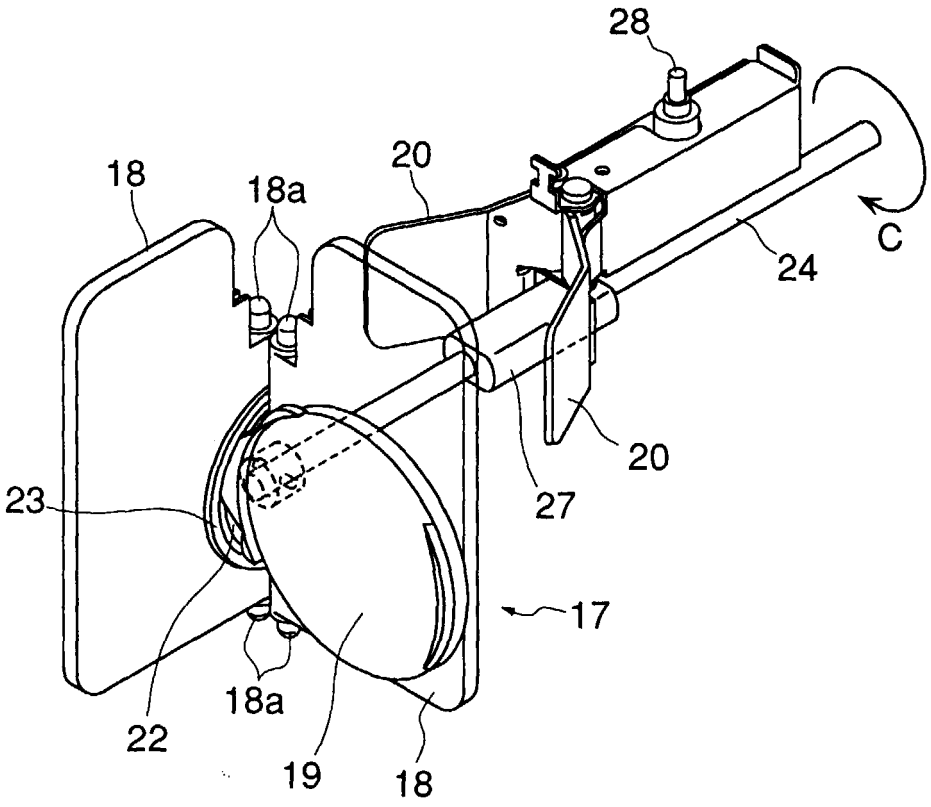


FIG. 10

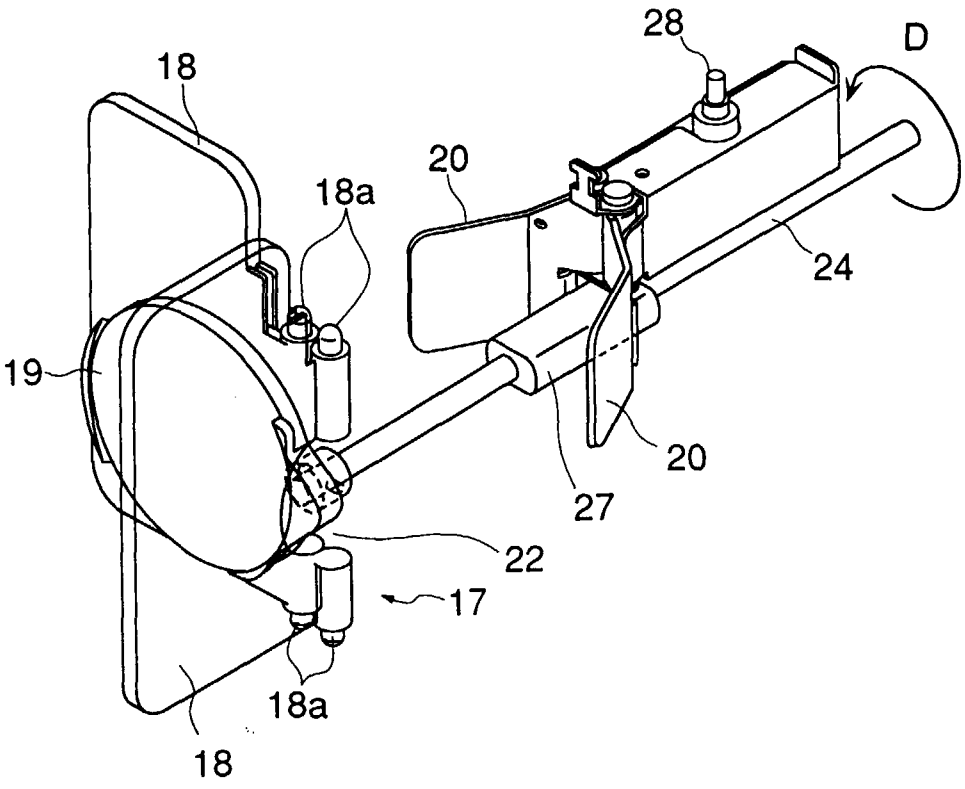


FIG. 11

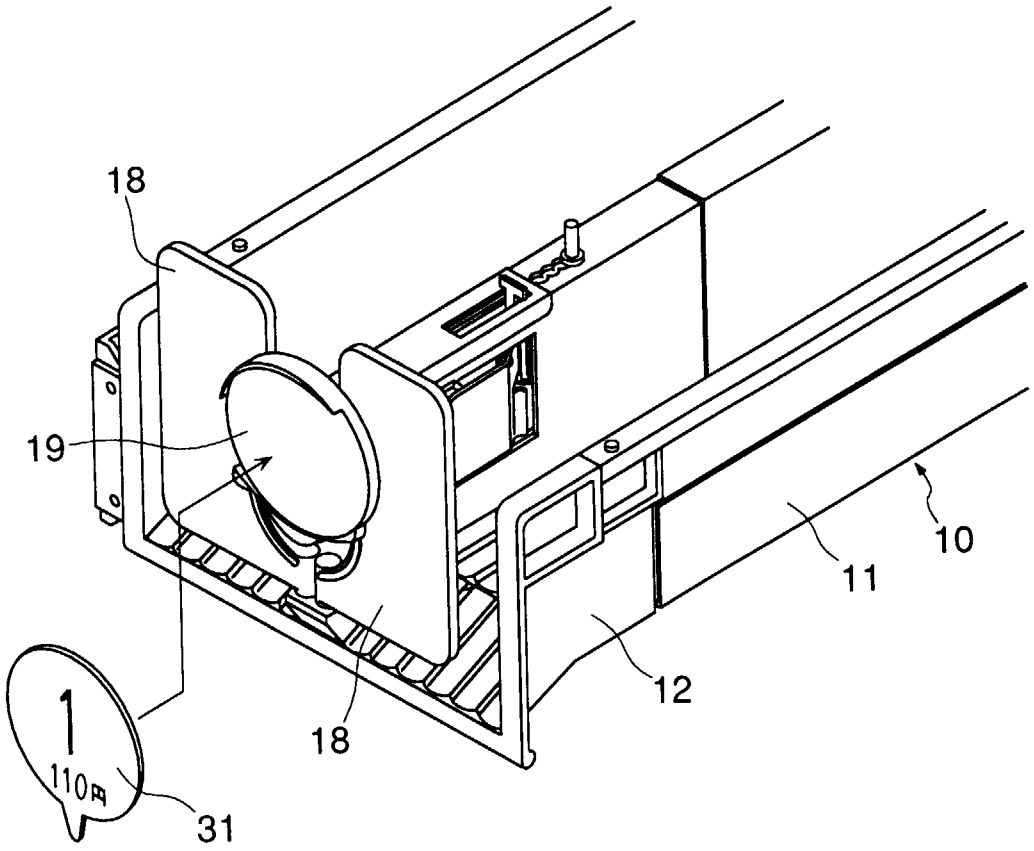


FIG. 12

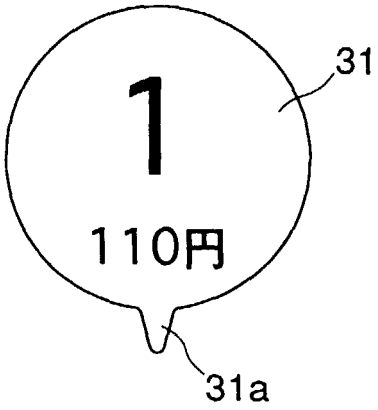


FIG. 13

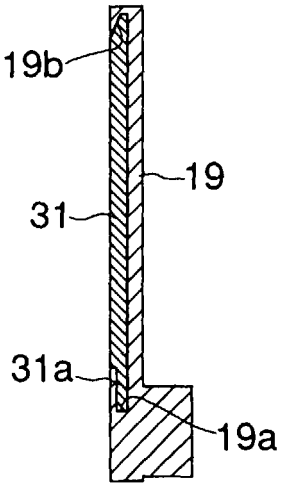


FIG. 14

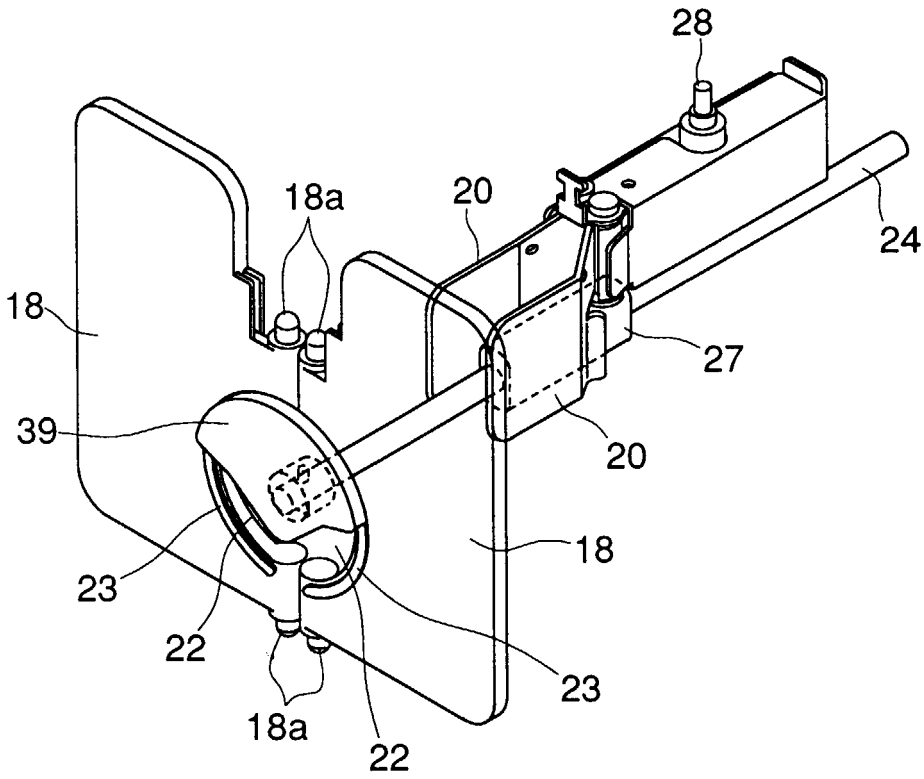


FIG. 15

PRIOR ART

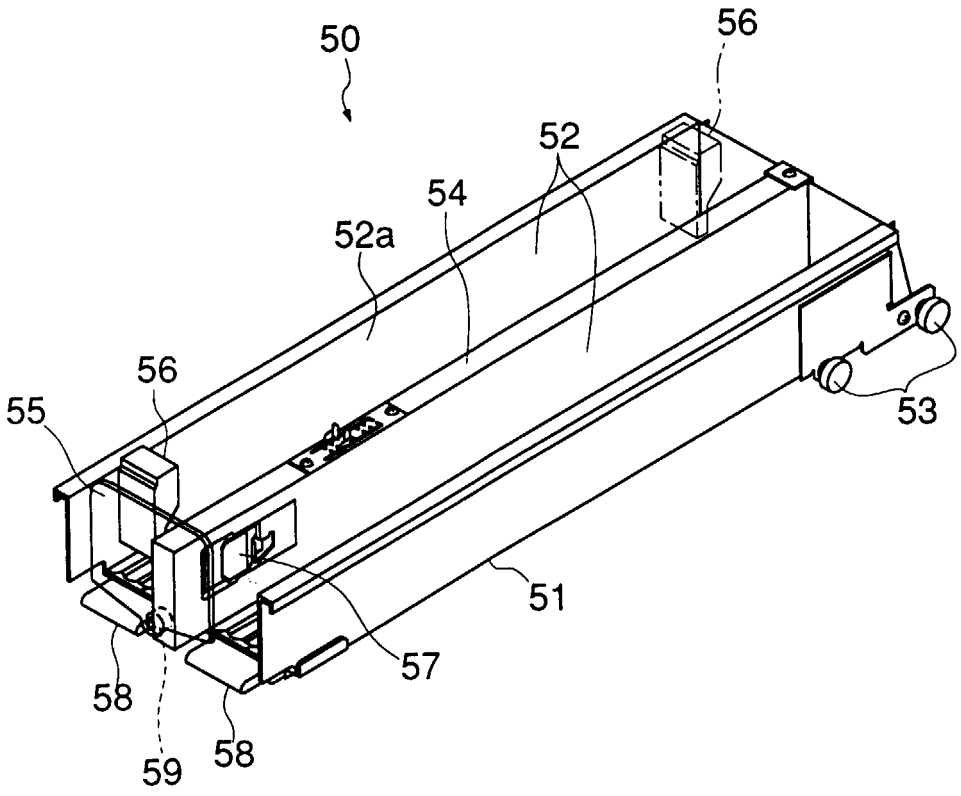
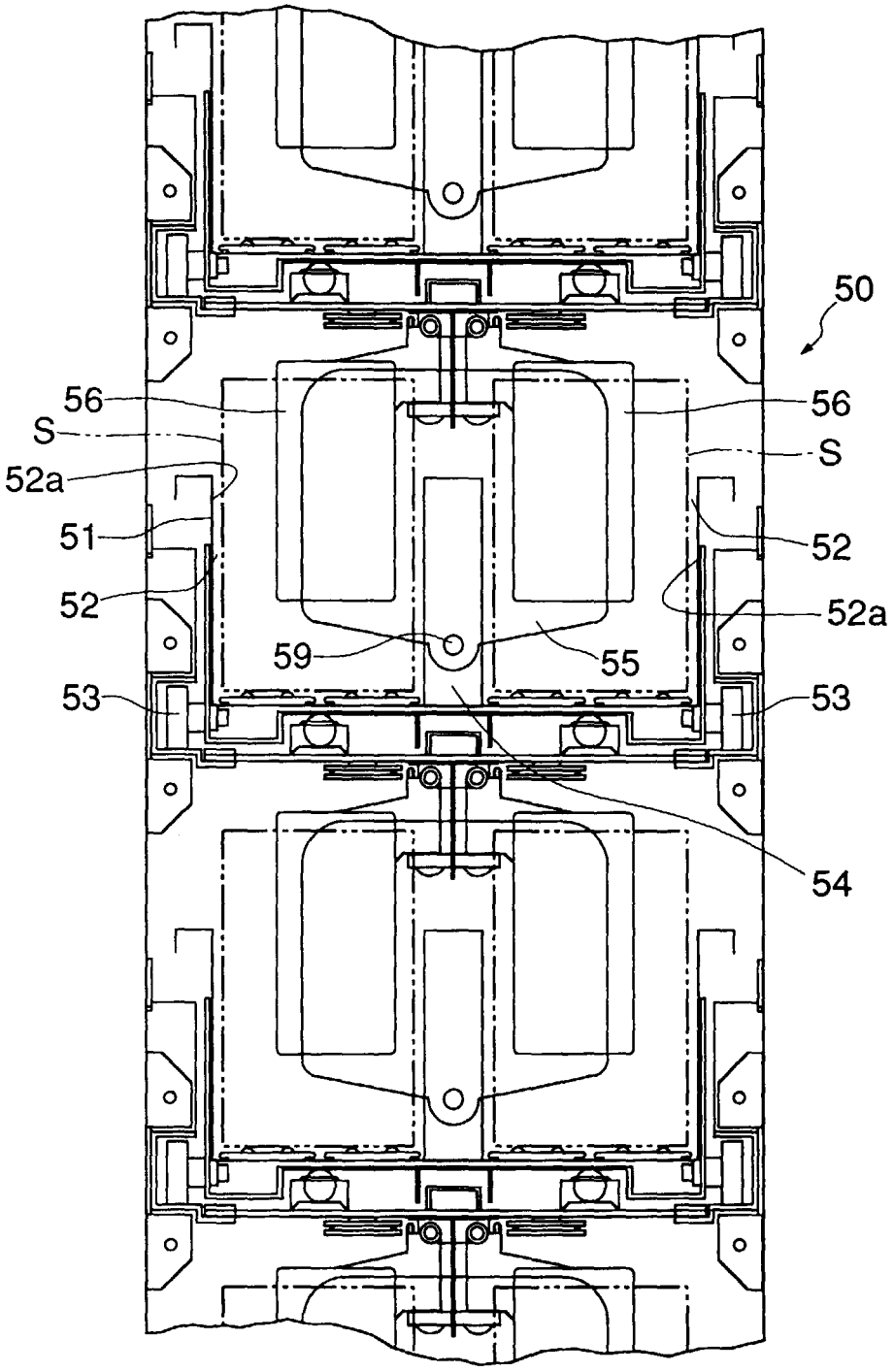


FIG. 16
PRIOR ART



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Application Number
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Y	PATENT ABSTRACTS OF JAPAN vol. 17, no. 161 (P-1512), 29 March 1993 & JP 04 323797 A (SANYO ELECTRIC CO LTD), 12 November 1992 * abstract *	1	
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A	GB 2 134 091 A (SANDEN CORPORATION) 8 August 1984 * page 2, line 54 - page 3, line 128; figures 3-12 *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.6) G07F
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	22 March 1999	Rivero, C

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