

DESCRIPTION

TITLE OF INVENTION:

MEDICINE DISPENSING DEVICE, MEDICINE DISPENSING METHOD,
5 AND
MEDICINE STORAGE CASSETTE

TECHNICAL FIELD

[0001]

10 The present invention relates to medicine dispensing apparatuses which dispense medicine sheets such as PTP (Press Through Package) sheets, blister package sheets, etc. The invention also relates to medicine dispensing methods and medicine storage cassettes.

15 BACKGROUND ART

[0002]

Medicine dispensing apparatuses have a large number of medicine storage cassettes each storing PTP sheets of a specific medicine. Based on inputted prescription data, a necessary quantity of PTP sheets is dispensed from a selected one of
20 the medicine storage cassettes. Examples of such a medicine dispensing apparatus are disclosed in Patent Literature 1 and Patent Literature 2.

[0003]

In the medicine dispensing apparatus disclosed in Patent Literature 1, a medicine storage cassette stores a plurality of PTP sheets in an upright state in a horizontal line so
25 that pocket-side surfaces face the same direction. On a back side in the medicine storage cassette, there is provided a pressing device which presses the PTP sheets toward a front side of the medicine storage cassette. The medicine storage cassette has a front wall, which has a bottom formed with a dispensing slit. As the forwardmost one of the PTP sheets is pushed downward by a pushing member, that PTP sheet is pushed out of
30 the slit.

[0004]

Likewise, in the medicine dispensing apparatus disclosed in Patent Literature 2, a medicine storage cassette stores a plurality of PTP sheets in an upright state in a horizontal line so that pocket-side surfaces face the same direction. However, the PTP sheets are dispensed by way of vibration generated by a vibration discharge mechanism. A medicine sheet such as a PTP sheet generally has flat edges (sheet margins) at its two ends, with one of the edges being wider than the other. The wider edge is generally called tab. Some medicine dispensing apparatus are capable of cutting fraction packs out of the medicine sheet, but there can be cases where the apparatus cannot make a fraction cut appropriately if all of the medicine sheets coming out of the medicine storage cassettes do not have their pockets or the wider edges on a predetermined side.

CITATION LIST

PATENT LITERATURE

[0005]

Patent Literature 1: JP-A 2011-41789 Gazette

Patent Literature 2: JP-B 4347183 Gazette

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0006]

Generally, PTP sheets come as a bundle in a pack, and usually, in order to save height, two mutually adjacent PTP sheets are fitted face-to-face so that one of the PTP sheets has its pockets (bulges) placed into non-pockets (recesses) in the other of the PTP sheets. If two PTP sheets which are fitted together as described above are stored in a medicine storage cassette and then pushing operation is applied so as to push the forwardmost PTP sheet as in Patent Literature 1, it is impossible to dispense only the forwardmost one PTP sheet. The same applies to Patent Literature 2: Even if vibration is applied to the PTP sheets, the two PTP sheets may be fitted so strongly that it is impossible to separate them. Even if they are separated, the two PTP sheets are

opposed to each other, which makes it impossible to make appropriate dispensing. For these reasons, when loading the medicine storage cassettes with PTP sheets in medicine dispensing apparatuses according to the Patent Literature 1 and Patent Literature 2, a time consuming step must be spent after the bundles are taken out of the packs, because
5 the PTP sheets must be separated into individual sheets and then rearranged so that all of the sheets face a predetermined direction.

[0007]

In consideration of the above-described circumstances, the present invention provides a medicine dispensing method, a medicine storage cassette and a medicine
10 dispensing apparatus which ensure that medicine sheets are dispensed one by one even in cases where stored medicine sheets includes pairs of sheets with their pocket-formed surfaces fitted to each other, or in cases where a plurality of medicine sheets are stored in such a fashion that their pocket-formed surfaces do not face a predetermined direction.

15 SOLUTION TO PROBLEM

[0008]

The present invention provides a medicine dispensing apparatus which includes: a medicine storage cassette for storage of a plurality of medicine sheets in a line along a normal-line direction of a surface of the medicine sheet; and a dispensing operation
20 section for dispensing the medicine sheets from the medicine storage cassette.

In this apparatus, the medicine storage cassette includes: a storage section for storage of the medicine sheets; a dispensing section for dispensing the medicine sheets inside the storage section; a moving operation section which moves the medicine sheets inside the storage section toward the dispensing section; and a limiter section which
25 limits a forwardmost one of the medicine sheets stored in the storage section from being dispensed from the dispensing section.

Further, the dispensing operation section includes: a take-out section which holds and takes out the forwardmost medicine sheet; and a movement controller which dispenses the forwardmost medicine sheet by moving the take-out section which holds
30 the forwardmost medicine sheet in a direction in which the medicine sheets are moved

by the moving operation section and at a faster speed than a speed at which the medicine sheets are moved by the moving operation section.

[0009]

According to the above-described arrangement, the take-out section which holds
5 the forwardmost medicine sheet moves in the direction in which the moving operation section moves the medicine sheets, at a faster speed than a speed at which the moving operation section moves the medicine sheets. As the forwardmost medicine sheet moves fast, a gap between the forwardmost and the second forwardmost medicine sheets increases, and this helps the limiter section to come between the forwardmost medicine
10 sheet and the second forwardmost medicine sheet. In other words, at the time of dispensing the medicine sheets, the limiter section is positioned appropriately between the forwardmost medicine sheet and the second forwardmost medicine sheet, enabling the dispensing of the forwardmost medicine sheet while reliably stopping the second forwardmost medicine sheet from moving. This also makes it possible to dispense the
15 medicine sheets one by one even in cases where two medicine sheets are joined together in the storage, with their pocket-formed surfaces fitted to each other, or in cases where a plurality of medicine sheets are stored in such a fashion that their pocket-formed surfaces do not face a predetermined direction. The direction in which the medicine sheets are moved is a direction in which the pockets protrude. Therefore, the pockets
20 do not constitute an impediment in the move of the medicine sheets.

[0010]

The medicine storage cassette may further include adjustment means for adjusting the speed at which the moving operation section moves the medicine sheets.

[0011]

25 The movement controller may move the take-out section which holds the forwardmost medicine sheet, in a direction in which the moving operation section moves the medicine sheets, at a faster speed than a speed at which the moving operation section moves the medicine sheets, after moving the take-out section in an opposite direction from the direction in which the moving operation section moves the medicine sheets.
30 By moving the take-out section in the opposite direction from the direction in which the

moving operation section moves the medicine sheets as described above, it becomes possible to increase a distance between the forwardmost medicine sheet and the limiter section. This increases a time span from a time point when the take-out section starts to move the forwardmost medicine sheet to a time point when the forwardmost medicine sheet rides over the limiter section. Therefore, even if there is only a small difference between the speed (V1) at which the take-out section moves the medicine sheet and the speed (V2) at which the moving operation section moves the medicine sheets, it is possible to have an increased distance between the forwardmost medicine sheet and the second forwardmost medicine sheet upon a time point when the forwardmost medicine sheet passes over the limiter section, and this helps the limiter section to come between the forwardmost medicine sheet and the second forwardmost medicine sheet.

[0012]

The limiter section may be provided by a first limiter section which includes: a contact member which makes contact with an edge of the forwardmost medicine sheet; a support section which movably supports the contact member so that the contact member can ride over the edge of the medicine sheet; and an urge member which urges the contact member for stopping the medicine sheets from a move caused by the moving operation section while allowing the ride-over by the contact member at a time of dispensing.

[0013]

Aside from the first limiter section, a second limiter section may be provided for contact with an edge of the forwardmost medicine sheet.

[0014]

The second limiter section may be provided by a rotatable roller which makes contact with the edge of the forwardmost medicine sheet.

[0015]

The first limiter section may be disposed at a position to make contact with an edge of a longer side of the medicine sheet, whereas the second limiter section is disposed at a position to make contact with an edge of a shorter side of the medicine sheet.

[0016]

The take-out section may hold the forwardmost medicine sheet by suction.

[0017]

In the storage section, the medicine sheets may be stored in a line in a horizontal
5 direction.

[0018]

A plurality of the medicine storage cassettes may be provided, with an arrangement
that the dispensing operation section moves in up-down and left-right directions in a
range where the plurality of medicine storage cassettes are disposed, for dispensing
10 medicine sheets from a specified one of the medicine storage cassettes.

[0019]

A medicine storage cassette according to the present invention includes: a storage
section for storage of medicine sheets; a dispensing section for dispensing the medicine
sheets from the storage section; and a moving operation section for moving the medicine
15 sheets inside the storage section toward the dispensing section. In this cassette, the
dispensing section includes a first limiter section which has: a contact member which
makes contact with an edge of the forwardmost medicine sheet; a support section which
movably supports the contact member so that the contact member can ride over the edge
of the medicine sheet; and an urge member which urges the contact member for stopping
20 the medicine sheets from a move caused by the moving operation section while allowing
the ride-over by the contact member at a time of dispensing.

[0020]

According to the above-described arrangement, when dispensing the medicine
sheet, the contact member is able to rider over the medicine sheet against the urge
25 member. Once the riding-over is achieved, the contact member is returned by the urge
member to a position between the forwardmost medicine sheet and the subsequent
medicine sheet, allowing the forwardmost medicine sheet to be dispensed whereas the
urge member prevents the subsequent medicine sheet from moving. This makes it
possible to dispense the medicine sheets one by one even in cases where two medicine
30 sheets are fitted together by mating their pocket-formed surfaces to each other, or in

cases where a plurality of medicine sheets are stored in such a fashion that their pocket-formed surfaces do not face a predetermined direction.

[0021]

In the medicine storage cassette, a second limiter section may be provided for
5 contact with an edge of the forwardmost medicine sheet aside from the first limiter section.

[0022]

Also, in the medicine storage cassette, the second limiter section may be provided
10 by a rotatable roller which makes contact with the edge of the forwardmost medicine sheet.

[0023]

Also, in the medicine storage cassette, the first limiter section may be disposed at
a position to make contact with an edge of a longer side of the medicine sheet, whereas
the second limiter section is disposed at a position to make contact with an edge of a
15 shorter side of the medicine sheet.

[0024]

A medicine dispensing method according to the present invention uses the
medicine storage cassette described above. The method includes a step of holding a
forwardmost medicine sheet in the storage section and pushing the medicine sheet in an
20 opposite moving direction from a direction in which the moving operation section moves
the medicine sheets; then pulling the medicine sheet in the same moving direction but at
a faster speed than a speed at which the moving operation section moves the medicine
sheets, thereby positioning the contact member of the first limiter section between the
forwardmost medicine sheet and a second forwardmost medicine sheet.

25 [0025]

The present invention also provides a medicine dispensing apparatus which
includes: a medicine storage cassette for storage of a plurality of medicine sheets in a
line along a normal-line direction of a surface of the medicine sheet; and a dispensing
operation section for dispensing the medicine sheets from the medicine storage cassette.

30 In this apparatus, the medicine storage cassette includes: a storage section for

storage of the medicine sheets; a dispensing section for dispensing the medicine sheets inside the storage section; a moving operation section which moves the medicine sheets inside the storage section toward the dispensing section; and a limiter section which limits a forwardmost one of the medicine sheets stored in the storage section from being
5 dispensed from the dispensing section.

Further, the dispensing operation section includes: a take-out section which holds and takes out the forwardmost medicine sheet; and a movement controller which moves the take-out section that holds the forwardmost medicine sheet so as to increase a gap between the forwardmost medicine sheet and a second forwardmost medicine sheet, for
10 dispensing of the forwardmost medicine sheet.

[0026]

According to the above-described arrangement, the take-out section which holds the forwardmost medicine sheet moves and increases a gap between the forwardmost medicine sheet and the second forwardmost medicine sheet. Thus, at the time of
15 dispensing the medicine sheet, the limiter section is positioned between the forwardmost medicine sheet and the second forwardmost medicine sheet, enabling the dispensing of the forwardmost medicine sheet while stopping the second forwardmost medicine sheet from moving. This makes it possible to dispense the medicine sheets one by one even in cases where two medicine sheets are fitted together by mating their pocket-formed
20 surfaces to each other, or in cases where a plurality of medicine sheets are stored in such a fashion that their pocket-formed surfaces do not face a predetermined direction.

[0027]

The present invention also provides a medicine dispensing apparatus which includes: a medicine storage cassette for storage of a plurality of medicine sheets in a
25 line along a normal-line direction of a surface of the medicine sheet; and a dispensing operation section for dispensing the medicine sheets from the medicine storage cassette.

In this apparatus, the medicine storage cassette includes: a storage section for storage of the medicine sheets; a dispensing section for dispensing the medicine sheets inside the storage section; a moving operation section which moves the medicine sheets
30 inside the storage section toward the dispensing section; and a limiter section which

limits a forwardmost one of the medicine sheets stored in the storage section from being dispensed from the dispensing section.

The limiter section includes a first limiter section which makes contact with a longer side of the forwardmost medicine sheet; and a second limiter section which makes
5 contact with a shorter side of the forwardmost medicine sheet.

The dispensing operation section includes: a take-out section that holds and takes out the forwardmost medicine sheet; and a movement controller which moves the take-out section that holds the medicine sheets, in a direction in which the moving operation section moves the medicine sheets, for dispensing the forwardmost medicine sheet.

10 With this arrangement, the first limiter section is positionally displaceable.

[0028]

According to the above-described arrangement, the limiter section has the first limiter section which makes contact with a longer side of the forwardmost medicine sheet, and the second limiter section which makes contact with a shorter side of the
15 forwardmost medicine sheet. Further, the first limiter section is positionally displaceable. Therefore, at the time of dispensing the medicine sheet, the first limiter section is between the forwardmost medicine sheet and the second forwardmost medicine sheet, allowing the forwardmost medicine sheet to be dispensed while stopping the second forwardmost medicine sheet from moving. This makes it possible to
20 dispense the medicine sheets one by one even in cases where two medicine sheets are fitted together by mating their pocket-formed surfaces to each other, or in cases where a plurality of medicine sheets are stored in such a fashion that their pocket-formed surfaces do not face a predetermined direction.

[0029]

25 The first limiter section may include: a contact member which makes contact with an edge of the forwardmost medicine sheet; a support section which movably supports the contact member so that the contact member can ride over the edge of the medicine sheet; and an urge member which urges the contact member for stopping the medicine sheets from a move caused by the moving operation section while allowing the ride-over
30 by the contact member at a time of dispensing.

[0030]

The second limiter section may be provided by a rotatable roller which makes contact with the edge of the forwardmost medicine sheet.

[0031]

5 The take-out section may hold the forwardmost medicine sheet by suction.

[0032]

In the storage section, the medicine sheets may be stored in a line in a horizontal direction.

[0033]

10 A plurality of the medicine storage cassettes may be provided, with an arrangement that the dispensing operation section moves in up-down and left-right directions in a range where the plurality of medicine storage cassettes are disposed, for dispensing medicine sheets from a specified one of the medicine storage cassettes.

[0034]

15 A medicine dispensing method according to the present invention uses the medicine storage cassette described above, and includes a step of: sucking on a center region of the forwardmost medicine sheet in the storage section; pulling the medicine sheet in the same direction in which the medicine sheets are moved thereby deflecting the center region of the medicine sheet, to allow the contact member of the first limiter
20 section to come between the forwardmost medicine sheet and the second forwardmost medicine sheet.

[0035]

The present invention also provides a medicine dispensing apparatus which includes: a medicine storage cassette for storage of a plurality of medicine sheets in a
25 line along a normal-line direction of a surface of the medicine sheet; and a dispensing operation section for dispensing the medicine sheets from the medicine storage cassette.

In this apparatus, the medicine storage cassette includes: a storage section for storage of the medicine sheets; a dispensing section for dispensing the medicine sheets inside the storage section; a moving operation section which moves the medicine sheets
30 inside the storage section toward the dispensing section; and a limiter section which

limits a forwardmost one of the medicine sheets stored in the storage section from being dispensed from the dispensing section.

The limiter section has a first limiter section which makes contact with a longer side of the forwardmost medicine sheet.

5 The dispensing operation section includes a take-out section which holds and takes out the forwardmost medicine sheet; and a movement controller which dispenses the forwardmost medicine sheet by moving the take-out section that holds the medicine sheets so that a distance between a center region of the forwardmost medicine sheet along a direction of the longer side of the sheet and a center region of the second
10 forwardmost medicine sheet along the direction of the longer side of the sheet becomes greater than a distance between an end region of the forwardmost medicine sheet in the direction of the longer side of the sheet and an end region of the second forwardmost medicine sheet in the direction of the longer side of the sheet thereby causing the first limiter section to position between the forwardmost medicine sheet and the second
15 forwardmost medicine sheet.

[0036]

According to the above-described arrangement, at the time of dispensing the medicine sheet, the first limiter section is positioned between the forwardmost medicine sheet and the second forwardmost medicine sheet, enabling the dispensing of the
20 forwardmost medicine sheet while stopping the second forwardmost medicine sheet from moving. This makes it possible to dispense the medicine sheets one by one even in cases where two medicine sheets are fitted together by mating their pocket-formed surfaces to each other, or in cases where a plurality of medicine sheets are stored in such a fashion that their pocket-formed surfaces do not face a predetermined direction.

25 [0037]

The present invention also provides a medicine dispensing apparatus which includes: a take-out section which takes out a medicine sheet from inside a medicine storage cassette; a wide edge detector which detects a wide edge of the medicine sheet; and a pivotal operation section which pivots the medicine sheet based on a result of
30 detection made by the wide edge detector, so that the medicine sheet faces a

predetermined direction.

[0038]

According to the arrangement as described above, the medicine sheet is pivoted so that the medicine sheet faces a predetermined direction, based on a result of detection
5 made by the wide edge detector. Therefore, it is possible to bring the wide edge of the medicine sheet onto a predetermined side even in cases where the wide edge is not originally on the predetermined side.

[0039]

A pocket detector which detects pockets of the medicine sheets may be included.
10 With this arrangement, the pivotal operation section pivots the medicine sheet so that the pockets of the medicine sheet face a predetermined direction and the wide edge of the medicine sheet is located on a predetermined side, based on a result of detection by the pocket detector and a result of detection by the wide edge detector.

[0040]

15 According to the arrangement as described above, the medicine sheet is pivoted so that pockets face a predetermined direction and the wide edge of the medicine sheet is located on a predetermined side, based on a result of detection by the pocket detector and a result of detection by the wide edge detector. Therefore, even if a medicine sheet has its pockets not facing a predetermined direction and the wide edge not on a
20 predetermined side, it is possible to make the pockets face the predetermined direction and turn the wide edge onto the predetermined side.

[0041]

The pivotal operation section may include a double-axis pivoting section which pivots the medicine sheet around a first axis and a second axis which are perpendicular
25 to each other within a plane of the sheet. Or, the pivotal operation section may include a normal-line-centered pivoting section which pivots the medicine sheet around its normal line, and an axial pivoting section which pivots the medicine sheet around a first axis or a second axis which are perpendicular to each other within a plane of the medical sheet.

30 [0042]

The pocket detector may include: a movable member disposed in the take-out section; and a move-amount detection section which detects an amount of move of this movable member. With this arrangement, the pockets are detected based on the amount of move of the movable member being in contact with the medicine sheet when the take-out section takes out the medicine sheet inside the medicine storage cassette.

[0043]

Alternatively, the pocket detector may include a pressure detector which detects a pressure of a suction-adhesion section disposed in the take-out section. With this arrangement, the pockets are detected based on the pressure of the suction-adhesion section at a time of sucking the medicine sheet.

[0044]

The wide edge detector may detect the wide edge based on a distance between grip nails at a time when it grips the medicine sheet. The wide edge detector may be disposed in the pivotal operation section.

[0045]

The present invention also provides a medicine dispensing apparatus which includes: a take-out section which takes out a medicine sheet from inside a medicine storage cassette; a wide edge detector which detects a wide edge of the medicine sheet; and a pivotal operation section which pivots the medicine sheet based on a result of detection made by the wide edge detector, so that the medicine sheet faces a predetermined direction.

The pivotal operation section has a normal-line-centered pivoting section which makes contact with a sheet surface of the medicine sheet and pivots the medicine sheet around the normal line of the sheet surface.

In the above arrangement, the medicine sheet is handed over, between the take-out section and the normal-line-centered pivoting section.

[0046]

According to the arrangement as described above, it is possible to make the medicine sheet face a predetermined direction by means of the normal-line-centered pivoting section.

[0047]

The present invention also provides a medicine dispensing apparatus which includes: a take-out section which takes out a medicine sheet from inside a medicine storage cassette; a wide edge detector which detects a wide edge of the medicine sheet;
5 and a pivotal operation section which pivots the medicine sheet based on a result of detection made by the wide edge detector, so that the medicine sheet faces a predetermined direction.

The pivotal operation section has a normal-line-centered pivoting section which makes contact with a sheet surface of the medicine sheet and pivots the medicine sheet
10 around the normal line of the sheet surface.

In the above arrangement, the take-out section has a plurality of holding-contacting sections each making contact with the medicine sheet, whereas the normal-line-centered pivoting section has one or more number of pivot contactors but fewer than pivot contactors than the holding-contacting sections, each contacting the medicine sheet.

15 [0048]

According to the arrangement as described above, the medicine sheet is held reliably since the take-out section has a plurality of holding-contacting sections which make contact with the medicine sheet. Also, since the normal-line-centered pivoting section has one or more number of pivot contactors but fewer than the holding-
20 contacting sections, each contacting the medicine sheet, it is possible to make the normal-line-centered pivoting section compactly.

[0049]

A pocket detector which detects pockets of the medicine sheets may be included. With this arrangement, the pivotal operation section pivots the medicine sheet so that the
25 pockets of the medicine sheet face a predetermined direction and the wide edge of the medicine sheet is located on a predetermined side, based on a result of detection by the pocket detector and a result of detection by the wide edge detector.

[0050]

The take-out section may be movable in the normal-line direction of the surface of
30 the sheet.

[0051]

The take-out section may perform an operation of storing the medicine sheet into a fraction supply sheet storage section in the medicine storage cassette.

[0052]

5 In cases where the take-out section has a plurality of sucking discs for holding the medicine sheet, suction by these sucking discs maybe stopped sequentially at a time when storing the medicine sheet in the fraction supply sheet storage section.

[0053]

10 There may be an arrangement including: a feeder screw laid across the normal-line direction of the surface of the medicine sheet; a moving member which moves on the feeder screw; a swing arm having one end connected to the moving member and another end connected to the take-out section; and a guide which guides the take-out section to the normal-line direction of the surface of the medicine sheet.

[0054]

15 A speed at which the take-out section is guided to the normal-line direction of the surface of the medicine sheet may become slower as the take-out section comes closer to the medicine sheet.

[0055]

20 The take-out section may have a movable plate moving therewith, making engagement with the medicine storage cassette so that the movable plate moves the medicine storage cassette as the take-out section moves.

[0056]

The movable plate may be a constituent member of the pocket detector.

[0057]

25 A device which draws the medicine storage cassette for enabling the medicine sheet to be taken out may be integrally provided with the take-out section. The device may have an engagement part for engagement with part of the medicine storage cassette as it is drawn, for preventing the medicine storage cassette from becoming out of position.

[0058]

30 The apparatus may include a transport section which receives a medicine sheet

that is taken out from the take-out section. In this arrangement, the transport section has a contact member which makes contact with a rear end portion of the medicine sheet as the sheet drops from a downstream end of a transportation path, thereby supporting the medicine sheet in a generally horizontal state.

5 [0059]

The apparatus may include a transport section which receives medicine sheets that are taken by the take-out section; an intermediate stocker with a shutter for receiving fraction packs of the medicine that are cut off; and a mix stocker which stocks the medicine sheets transported by the transport section and the fraction packs of the
10 medicine. In this arrangement, the shutter opens after the medicine sheets are transported from the transport section to the mix stocker to drop the fraction packs of the medicine into the mix stocker.

[0060]

The apparatus may include a stocker for temporary storage of the medicine sheets.
15 In this arrangement, the stocker has two pivotable shutters in its bottom. The shutters open/close asymmetrically with each other so that the medicine sheets will lose their horizontal attitude.

[0061]

A medicine dispensing method according to the present invention uses a medicine
20 dispensing apparatus which includes the pivotal operation section that pivots the medicine sheets. The method is performed when it is necessary to store a medicine sheet to face a predetermined direction in a fraction supply sheet storage section which is provided in the medicine storage cassette. The method includes a step of selecting a medicine sheet facing the predetermined direction from a plurality of medicine sheets
25 taken out of the medicine storage cassette and storing the selected medicine sheet in the sheet storage section. The above-described method makes it possible to minimize the number of pivoting operations of the medicine sheet performed by the pivotal operation section.

[0062]

30 In the above-described medicine dispensing method, there may be an arrangement

that the last medicine sheet is pivoted by the pivotal operation section if none of the medicine sheets which are taken out is faced in the predetermined direction.

ADVANTAGEOUS EFFECTS OF INVENTION

5 [0063]

The present invention makes it possible to dispense the medicine sheets one by one even in cases where two medicine sheets are joined together in the storage, with their pocket-formed surfaces mated to each other, or in cases where a plurality of medicine sheets are stored in such a fashion that their pocket-formed surfaces do not
10 face a predetermined direction. Therefore, the invention allows that a plurality of medicine sheets in a bundled state may simply be taken out of a package and stored in the medicine storage cassette as they are, without any rearranging step of making all of the sheets face a predetermined direction. Hence, the invention dramatically decrease a medicine loading time for the medicine storage cassette.

15

BRIEF DESCRIPTION OF DRAWINGS

[0064]

Fig. 1 is an explanatory view which shows a medicine dispensing apparatus according to an embodiment of the present invention.

20 Fig. 2 is a block diagram which shows an outline of a control system of the medicine dispensing apparatus in Fig. 1.

Fig. 3A is a perspective view which shows a dispensing operation section and a medicine storage cassette included in the medicine dispensing apparatus shown in Fig. 1; Fig. 3B is a perspective view which shows a sucking operation section in the
25 dispensing operation section in an enlarged state; Fig. 3C is a perspective view of a sucking disc in the sucking operation section.

Fig. 4A is a perspective view which shows the dispensing operation section and the medicine storage cassette in the medicine dispensing apparatus in Fig. 1; Fig. 4B is an explanatory view which shows a relationship between sucking tips of the sucking
30 operation section in the dispensing operation section and a medicine sheet.

Fig. 5 is a perspective view which shows the dispensing operation section and the medicine storage cassette in the medicine dispensing apparatus in Fig. 1.

Fig. 6 is a perspective view which shows the dispensing operation section in the medicine dispensing apparatus in Fig. 1.

5 Fig. 7 is a perspective view which shows the dispensing operation section in the medicine dispensing apparatus in Fig. 1.

Fig. 8 is a perspective view which shows the medicine storage cassette in the medicine dispensing apparatus in Fig. 1.

10 Fig. 9 is a perspective view of the medicine storage cassette in Fig. 8 taken from another direction.

Fig. 10A is a perspective view which shows an internal structure of the medicine storage cassette in Fig. 8; Fig. 10B is a perspective view of a constant-load spring.

Fig. 11 is a perspective view which shows an internal structure of the medicine storage cassette in Fig. 8.

15 Fig. 12A and Fig. 12B are front views which show an internal structure of the medicine storage cassette in Fig. 8.

Fig. 13A and Fig. 13B are explanatory views which show a positional relationship between a PTP sheet which is deflected by suction and limiter sections.

20 Fig. 14A and Fig. 14B are explanatory views which show a positional relationship between a PTP sheet which is deflected by suction and the limiter sections.

Fig. 15 is an explanatory view which shows another configuration example of a first limiter section usable in a medicine storage cassette according to an embodiment of the present invention.

25 Fig. 16 is an explanatory view of an embodiment of the present invention, showing a shaft for pivoting a medicine sheet.

Fig. 17 are explanatory charts of an embodiment of the present invention, showing a relationship between axes for pivoting a medicine sheet, pocket direction in the medicine sheet and a position of the wide edge in the medicine sheet.

30 Fig. 18 is an explanatory view of an embodiment of the present invention, showing an example of pivoting operation of a medicine sheet.

Fig. 19 is an explanatory view of an embodiment of the present invention, showing an example of pivoting operation of a medicine sheet.

Fig. 20 is an explanatory view of an embodiment of the present invention, showing an example of pivoting operation of a medicine sheet.

5 Fig. 21 is an explanatory view of an embodiment of the present invention, showing an example of pivoting operation of a medicine sheet.

Fig. 22 is a perspective view of another embodiment of the present invention, which shows a dispensing operation section in a medicine dispensing apparatus.

10 Fig. 23 is a perspective view which shows the dispensing operation section in Fig. 22.

Fig. 24 is a perspective view which shows a suction main body in the dispensing operation section in Fig. 22.

Fig. 25A is a perspective view which shows a suction main body and a normal-line-centered pivoting section in Fig. 23; Fig. 25B is a perspective view which shows the normal-line-centered pivoting section.

Fig. 26 is a flow chart which shows sucking and other operations when a medicine sheet is handed over between the suction main body and the normal-line-centered pivoting section.

20 Fig. 27 is a perspective view which shows a fore-aft mover of the dispensing operation section in Fig. 22.

Fig. 28 is a perspective view which shows the fore-aft mover of the dispensing operation section in Fig. 22.

Fig. 29 is a perspective view which shows a second grasping section and a lid opener/closer section 5 of the dispensing operation section in Fig. 22.

25 Fig. 30 is a perspective view which shows a sheet gripping section in the dispensing operation section in Fig. 22.

Fig. 31 is a perspective view which shows a cutter section, transport section, etc. in the dispensing operation section in Fig. 22.

30 Fig. 32 is a perspective view which shows the cutter section, the transport section, etc. in the dispensing operation section in Fig. 22.

Fig. 33 is a perspective view which shows a sheet transport section in Fig. 31 in an enlarged view.

Fig. 34 is an explanatory view which shows an operation of the sheet transport section in Fig. 33.

5 Fig. 35A is a perspective view of an intermediate stocker in Fig. 31 in an enlarged view; Fig. 35B is an explanatory view which shows a state where medicine sheets are stuck in a shutter of the intermediate stocker.

Fig. 36 is an explanatory view which shows an operation of the sheet transport section in Fig. 33.

10 Fig. 37 is a perspective view which shows the suction main body and a weight measurement section in the dispensing operation section in Fig. 22.

Fig. 38A and Fig. 38B are perspective views which show the weight measurement section in Fig. 37 in enlarged views.

Fig. 39 is an explanatory view which shows a general configuration of the weight measurement section in Fig. 38.

Fig. 40 is an explanatory view which shows a relationship between the weight measurement section in Fig. 37 and a ramp of the transport section.

Fig. 41 is an explanatory view of an embodiment of the present invention, showing a relationship between gripping nails in the sheet gripping section, a PTP sheet and the cutter section.

Fig. 42 is an explanatory view of an embodiment of the present invention, showing a relationship between gripping nails in the sheet gripping section, a PTP sheet and the cutter section.

Fig. 43 is an explanatory view of an embodiment of the present invention, showing a relationship between gripping nails in the sheet gripping section, a PTP sheet and the cutter section.

Fig. 44 is an explanatory view of an embodiment of the present invention, showing a relationship between gripping nails in the sheet gripping section, a PTP sheet and the cutter section.

30 Fig. 45 is an explanatory view of an embodiment of the present invention, showing

a relationship between a grasping main body, a PTP sheet and sucking discs.

Fig. 46A and Fig. 46B are perspective views of the sucking disc in Fig. 3C.

Fig. 47 includes six views (front, rear, plan, bottom, right-side, and left-side) of the sucking disc in Fig. 46.

5

DESCRIPTION OF EMBODIMENTS

[0065]

Hereinafter, embodiments of the present invention will be described with reference to the attached drawings.

10 As shown in Fig. 1, a medicine dispensing apparatus 101 according to the present embodiment has, inside thereof, a plurality of loading spaces 101a in an up-down and a left-right directions. In each of the loading space 101a, there is provided a medicine storage cassette 1 removably/replaceably in a fore-aft direction (depth direction). The medicine dispensing apparatus 101 has a dispensing operation section 110, which is
15 movable in the up-down direction and the left-right direction in a range where the medicine storage cassettes 1 are disposed. Also, the medicine dispensing apparatus 101 has a display 102 and an input section 103. It should be noted here that Fig. 1 shows direction indications, for a front side and a rear side of the medicine dispensing apparatus 101.

20 [0066]

As shown in Fig. 2, the medicine dispensing apparatus 101 has a controller 105, which performs various processes such as processing information inputted from the input section 103 and displaying processed information in the display 102. For example, a human operator can use the input section 103 to perform such operations as:
25 initial input which relates each of the medicine storage cassettes 1 with a specific kind of PTP sheets 100 stored therein and the like; replenishing-quantity input which is performed when replenishing the medicine storage cassette 1 with PTP sheets 100; and prescription information input for dispensing operations. The controller 105 can process and store various information in a memory section 104. Also, the controller
30 105 performs a dispensing operation of PTP sheets 100 by moving the dispensing

operation section 110 to a selected one of the medicine storage cassettes 1 based on the prescription information.

[0067]

The medicine storage cassette 1 is formed with a storage section 11 for storage of the PTP sheets 100. The storage section 11 can store a plurality of PTP sheets 100 in an upright state in a horizontal line. In other words, a plurality of PTP sheets 100 are arranged in a line in a normal-line direction of the sheet surface. In the present embodiment, the normal line of the sheet surface is defined as a normal line at a center of the sheet surface of the PTP sheet 100. The normal line at the center of the sheet surface is parallel with a perpendicular line (drawn at a right angle) to the sheet surface when the PTP sheet 100 is assumed to lie in a flat plane rather than a curved plane. Also, in the present embodiment, the normal line of the sheet surface runs in the same direction as the above-described fore-aft direction and the direction in which the medicine storage cassette 1 is moved.

15 [0068]

Fig. 3 through Fig. 5 show a state where the dispensing operation section 110 comes close to a dispensing section 2 of a selected one of the medicine storage cassettes 1. Under the state shown in these Figures the medicine storage cassette 1 has its lid 4 open.

20 [0069]

The dispensing operation section 110 includes: a lid opener/closer section 5 for opening, closing or otherwise operating the lid 4; a sucking operation section (take-out section) 6 for sucking thereby pulling a forwardmost PTP sheet 100 out of the medicine storage cassette 1; a first grasping section 7 for grasping the PTP sheet 100 which is pulled out; and a second grasping section 8 which receives the PTP sheet 100 from the first grasping section 7 and performs necessary operations.

[0070]

The lid opener/closer section 5 has, for example, a shaft which engages with an engagement part formed in the lid 4. With the engagement part engaged with the shaft, the shaft is moved along an arc track to open/close the lid 4. The lid 4 has a pivotable,

sheet storage section 41 for storing a fraction supply PTP sheet 100. The lid opener/closer section 5 has, for example, a shaft which engages with an engagement part formed in the sheet storage section 41. With the engagement part engaged with the shaft, the shaft is moved along an arc track to pivot the sheet storage section 41.

5 [0071]

As shown enlarged in Fig. 3B, the sucking operation section 6 has a suction main body 61. The suction main body 61 has laterally arranged four sucking discs 61a. Also, as shown enlarged in Fig. 3C, Fig. 46A, Fig. 46B and Fig. 47, each sucking disc 61a is formed with a constriction(narrow part), which allows a sucking surface of the sucking disc 61a to deform easily in an Arrow A direction in Fig. 3C. Therefore, it is possible to suck even a deflected surface of the PTP sheet 100. Also, as shown enlarged in Fig. 4B, each sucking disc 61a is laterally long and flat so that it can be inserted between pockets, and long in a fore-aft direction so that it can clear a height of the pockets, of the PTP sheets 100. Each sucking disc 61a is connected to a tube, and the tube is connected to an air sucking device.

15 [0072]

The sucking operation section 6 has a pocket detector 62 for determining whether or not a pocket-formed surface of the PTP sheet faces in a dispensing side. The pocket detector 62 includes, for example: a movable plate 62a movable in the fore-aft direction; a rack fixed onto an inner-facing surface of the movable plate 62a; a pinion for engagement with the rack; and a rotary type potentiometer having a shaft to which the pinion is fixed. An amount of rotation of the potentiometer when the movable plate 62a makes contact with a pocket of the PTP sheet 100 differs from an amount of rotation of the potentiometer when the movable plate 62a does not make contact with a pocket of the PTP sheet 100, so it is possible to detect whether or not the pocket-formed surface of the PTP sheet 100 faces the dispensing side. The movable plate 62a is formed with two contactor tips, and these two contactor tips make contact with the PTP sheet 100.

25 [0073]

As shown in Fig. 3B, the movable plate 62a has an upper surface, on which a salient 62b is fixed. Further, the sucking operation section 6 has an electromagnetic

solenoid 62c and an actuation lever 62d pivoted by the electromagnetic solenoid 62c. When the PTP sheet 100 is dispensed, the electromagnetic solenoid 62c turns ON to pivot the actuation lever 62d. The pivotal action of the actuation lever 62d pushes the salient 62b to move the movable plate 62a toward the medicine storage cassette 1. This makes it possible for the movable plate 62a to make contact with the pocket of the PTP sheet 100. Before the next dispensing, the electromagnetic solenoid 62c turns OFF and the actuation lever 62d returns to an initial position.

[0074]

The suction main body 61 of the sucking operation section 6 is movable in an up-down direction by a lift 64. As shown also in Fig. 6 and Fig. 7, the lift 64 includes, for example: a mover nut 64a fixed to a base of the suction main body 61; a feeder screw 64b threaded into the mover nut 64a; a motor 64c which rotates the feeder screw 64b; a belt transmission mechanism 64d which transmits a driving force of the motor 64c to the feeder screw 64b; and a guide 64e which stabilizes lifting/lowering movement of a fore-aft mover 63. By using the lift 64, it is possible to adjust an up-down position of the sucking operation section 6.

[0075]

The lift 64 is movable in the fore-aft direction (closer to and away from the dispensing section 2 of the medicine storage cassette 1) by the fore-aft mover 65. The fore-aft mover 65 includes, for example: a mover nut 65a fixed to a base of the lift 64; a feeder screw 65b threaded into the mover nut 65a; a motor 65c which rotates the feeder screw 65b; a belt transmission mechanism 65d which transmits a driving force of the motor 65c to the feeder screw 65b; and a guide 65e which stabilizes the lifting/lowering movement of the fore-aft mover 64.

[0076]

The fore-aft mover 65 in the sucking operation section 6 is capable of sucking the forwardmost PTP sheet 100 and moving the suction main body 61 in a direction in which the PTP sheets 100 are moved by a moving operation section 3, which is in the medicine storage cassette 1 and will be described later, and at a faster speed than a speed at which the moving operation section 3 moves the PTP sheets 100.

[0077]

When the sucking operation section 6 is moved by the fore-aft mover 65 toward the medicine storage cassette 1, the suction main body 61 sucks on a sheet region of the forwardmost PTP sheet 100. If pockets of the forwardmost PTP sheet 100 face the
 5 dispensing operation section 110, the movable plate 62a of the pocket detector 62 undergoes a positional displacement in accordance with a height of bulges of the pockets. This positional displacement can be detected in the form of a resistance value (voltage value) of the potentiometer.

[0078]

10 The first grasping section 7 includes: a grasping main body 71 which is rotatable around a vertical shaft; a rotator 72 which rotates the grasping main body 71; a fore-aft mover 73 which moves the rotator 72 in the fore-aft direction; and a lift 74 which raises/lowers the fore-aft mover 73.

[0079]

15 The grasping main body 71 has a long nail 71a and a short nail 71b. The long nail 71a or the short nail 71b is fixed to a rack for example. The rack is engaged with a pinion which is rotated by a motor, so it is possible by driving the motor to decrease/increase a distance between the long nail 71a and the short nail 71b. Thus, it is possible to grasp the PTP sheet 100. The long nail 71a and the short nail 71b are
 20 provided with a thru-beam type optical sensor pair, so it is possible with the optical sensor pair to detect presence of the PTP sheet 100 between the long nail 71a and the short nail 71b.

[0080]

The rotator 72 has: a belt 72a which is wound around a pulley 71c in the grasping
 25 main body 71, and a motor 72b which rotatably drives the belt 72a. As the motor 72b rotates, the grasping main body 71 rotates to change a positional relationship between the long nail 71a and the short nail 71b. The rotator 72 is fixed to a fore-aft moving plate 72c.

[0081]

30 The fore-aft mover 73 includes: a mover nut fixed to a base of the fore-aft moving

plate 72c; a feeder screw 73a threaded into this mover nut; a screw-side pulley fixed to the feeder screw 73a; a drive-side pulley 73b; a belt wound around these two pulleys; a motor 73c which drives the drive-side pulley 73b; and a guide which guides the fore-aft moving plate 72c. By means of the fore-aft mover 73, the grasping main body 71 can
 5 move in the fore-aft direction from a vicinity of the lid 4 of the medicine storage cassette 1 to a vicinity of the second grasping section 8.

[0082]

The lift 74 includes: a mover nut 74a fixed to the fore-aft mover 73; a feeder screw threaded into the mover nut 74a; a screw-side pulley 74b fixed to this feeder screw; a
 10 drive-side pulley 74c; a belt wound around these pulleys; a motor 74d which drives the drive-side pulley 74c; and a guide for the fore-aft mover 73. The lift 74 provides access to the second grasping section 8 side from above, an upward movement from the position of the lid 4, etc.

[0083]

15 The second grasping section 8 includes: a grasping main body 81 which is rotatable around a horizontal shaft; a rotator 82 which rotates the grasping main body 81; and a left-right mover 83 which moves the rotator 82 in a left-right direction.

[0084]

The grasping main body 81 has a first nail 81a and a second nail 81b. The first
 20 nail 81a or the second nail 81b is fixed to a rack for example. The rack is engaged with a pinion which is rotated by a motor, so it is possible, by driving the motor, to decrease/increase a distance between the first nail 81a and the second nail 81b. Thus, it is possible to grasp the PTP sheet 100. The first nail 81a and the second nail 81b are provided with a thru-beam type optical sensor pair, so it is possible with the optical
 25 sensor pair to detect presence of the PTP sheet 100 between the first nail 81a and the second nail 81b. It is also possible to determine whether the grasp by the grasping main body 81 is on the wide edge 100a of the PTP sheet 100 which is commonly called the tab, or on the pockets, from a relative position between the first nail 81a and the second nail 81b upon completion of the grasping action. The completion of the grasping action
 30 can be determined from torque control on the motor. Of course other means may be

used, such as a contact sensor and an image sensor, for determining whether the grasp was made on the wide edge 100a or on the pockets.

[0085]

The rotator 82 has: a belt 82a which is wound around a pulley 81c in the grasping
5 main body 81, and a motor 82b which rotatably drives the belt 82a. As the motor 82b rotates, the grasping main body 81 rotates to change positional relationship between the first nail 81a and the second nail 81b. The rotator 82 is fixed to a left-right moving plate 82c.

[0086]

10 The left-right mover 83 includes: a mover nut 83a fixed to the left-right moving plate 82c; a feeder screw 83b threaded into the mover nut 83a; a screw-side pulley 83c fixed to the feeder screw 83b; a drive-side pulley 83d; a belt wound around these two pulleys 83c, 83d; and a motor 83e which drives the drive-side pulley 83d. By means of the left-right mover 83, the grasping main body 81 can evacuate to a side when the
15 first grasping section 7 descends.

[0087]

When dispensing the PTP sheet 100, the first grasping section 7 grasps the PTP sheet 100 which is suction-dispensed by the sucking operation section 6. In this process, the long nail 71a of the first grasping section 7 is on the cassette side. Under
20 this state, the first grasping section 7 moves the rotator 72, the fore-aft mover 73 and the lift 74 to hand the PTP sheet 100 to the grasping main body 81 of the second grasping section 8. At this stage, the pocket detector 62 of the sucking operation section 6 already reveals whether or not the pocket-formed surface of the PTP sheet 100 faces the dispensing side, so it is possible to hand the PTP sheet 100 to the grasping main body 81
25 of the second grasping section 8 with the pocket-formed surface facing a predetermined direction. Since it is possible with the grasping main body 81 to detect whether the grasping was made on the wide edge 100a or on the pocketed area, it is possible to use a result of this detection as a basis of rotating operation of the PTP sheet 100 by the second grasping section 8 and rotating operation of the PTP sheet 100 by the first
30 grasping section 7, so that the PTP sheet 100 faces a predetermined direction when the

first grasping section 7 places the PTP sheet 100 into the sheet storage section 41 of the lid 4. Detailed operation for making the PTP sheet 100 face a predetermined direction will be described later.

[0088]

5 As shown in Fig. 8, Fig. 9, Fig. 10A, Fig. 10B and Fig. 11, the dispensing section 2 from which the PTP sheet 100 is dispensed, and the lid 4 are at a front-side position in the medicine storage cassette 1. The lid 4 opens upward. The lid 4 is formed with a cutout 4a which is shaped to allow access by the long nail 71a and the short nail 71b of the grasping main body 71 in the first grasping section 7. When setting the dispensed
10 PTP sheet 100 in the sheet storage section 41, the grasping main body 71 moves horizontally to enter the cutout 4a of the opened lid 4. At this point, the sheet storage section 41 is in an opened state by the lid opener/closer section 5.

[0089]

As shown also in Fig. 12A and Fig. 12B, the dispensing section 2 is formed with
15 first limiter sections 21 at two locations, i.e., at an upper location and at a lower location. The first limiter section 21 has: a contact member 21a which makes contact with an upper edge or a lower edge of the forwardmost PTP sheet 100; a support section 21b which movably supports the contact member 21a so that the contact member 21a can ride over the upper edge or the lower edge of the PTP sheet 100; and a spring (urge
20 member) 21c which urges the contact member 21a in a direction to stop the PTP sheet 100. The contact member 21a located at the upper position and the contact member 21a located at the lower position are disposed at respective heights making them contactable by the upper and the lower edges of both of two PTP sheets 100 that are fitted to each by placing their pocket-formed surfaces face to face and have different
25 heights.

[0090]

The support section 21b is a horizontal shaft. The contact member 21a is supported pivotably around this horizontal shaft. The spring 21c is wound around the support section 21b on its both sides, and has its two ends fixed. The spring 21c has
30 its center portion engaged with the contact member 21a. It should be noted here that

the upper one of the first limiter sections 21 may be made adjustable in its height by screwing a support section 21d which supports the upper first limiter sections 21 to vertically elongated long hole 21e.

[0091]

5 Aside from the first limiter sections 21, a second limiter sections 22 are provided at two, left and right locations for contact with a left and a right edges of the forwardmost PTP sheet 100. The second limiter sections 22 are provided by rotatable rollers, and surfaces of the rollers are contacted by the left and the right edges of the forwardmost PTP sheet 100. In Fig. 12B, two PTP sheets 100 which are fitted to each by placing
10 their pocket-formed surfaces face to face have their respective left and right edges in alignment with each other. Shafts of the rollers are across the support section 21b. The second limiter sections 22 are disposed on side plates of the storage section 11. The side plates may be made adjustable in a width direction, so that widthwise position of the second limiter sections 22 can be adjusted in accordance with different sizes of
15 PTP sheets 100.

[0092]

The PTP sheets 100 are stored with their longer sides setting in a lateral direction and their shorter sides setting in an upright direction in the storage section 11 of the medicine storage cassette 1. Therefore, the first limiter sections 21 make contact with
20 edges of the longer sides of the PTP sheets 100, whereas the second limiter sections 22 make contact with edges of the shorter sides of the PTP sheets 100. Movement limitation on shorter sides of the PTP sheet 100 may be increased to cause increased deflection at a center region of the longer-side edge.

[0093]

25 Inside the storage section 11, the moving operation section 3 moves the PTP sheets 100 toward the dispensing section 2. The moving operation section 3 is constituted by, for example, a hold-on member 31 which makes contact with the PTP sheets 100, and a constant-load spring (provided by a product called CONSTON SPRING, for example)
32. The constant-load spring 32 provides a pressing force which will not push the PTP
30 sheets 100 strongly enough to pass over neither the first nor the second limiter sections

21, 22. The constant-load spring 32 is provided with a lock 32a, and it is possible to move the moving operation section 3 to a rear position and lock there at times when the PTP sheets 100 are set. Once the PTP sheets 100 are placed, the lock is disengaged and then the PTP sheets 100 come under a pushing operation. The constant-load spring 32 also has a coil spring. The coil spring has its tips fixed to locations near the dispensing section 2. As shown in Fig. 10B, the lock 32a has a gear 32b. The gear 32b engages with teeth which are formed on a bottom surface of the storage section 11. As the gear 32b is limited in its pivotal movement, the moving operation section 3 is locked. The gear 32b may be provided with a damper (oil damper, for example) 32c. Then it becomes possible to adjust operation speed of the moving operation section 3. In this case, the damper 32c serves as adjustment means for adjusting a speed at which the moving operation section 3 moves the PTP sheets 100.

[0094]

The arrangement described as the above makes it possible to allow the contact member 21a to overcome the urge from the spring 21c and ride over the edge of the PTP sheet 100 at the time of operation when a forwardmost PTP sheet 100 is sucked and pulled by the sucking operation section 6 out of the dispensing section 2 in the same direction in which the PTP sheets 100 are moved by the moving operation section 3. Once the riding-over is achieved, the contact member 21a is returned by the spring 21c and comes to a position between the forwardmost PTP sheet 100 and a second forwardmost PTP sheet 100, allowing the forwardmost PTP sheets 100 to be dispensed. Simultaneously, the urge from the spring 21c prevents the second forwardmost PTP sheet 100 from moving.

[0095]

Thus, it is possible to dispense PTP sheets 100 one by one even in cases where two PTP sheets 100 in storage are fitted to each other with their pocket-formed surfaces opposed to each other, or in cases where a plurality of PTP sheets 100 are in storage in such a fashion that their pocket-formed surfaces do not face the same direction as shown in Fig. 12B.

[0096]

There can be the following two possible methods for dispensing PTP sheets 100 one by one as the above:

[0097]

In the first method, the sucking operation section 6 sucks the forwardmost PTP sheet 100 in the storage section 11 while at the same time the PTP sheet 100 is pushed in the opposite direction from the direction in which the moving operation section 3 moves the PTP sheets 100, then the PTP sheet 100 is pulled in the same direction but at a faster speed than a speed at which the moving operation section 3 moves the PTP sheet 100, so that the contact members 21a of the first limiter sections 21 come between the forwardmost PTP sheet 100 and the second forwardmost PTP sheet 100, thereby letting only the forwardmost PTP sheet 100 to be dispensed. The first method is implementable even if the second limiter sections 22 are replaced by the first limiter sections 21 disposed at left and right locations. The first method is also implementable even if the first limiter sections 21 and the second limiter sections 22 are disposed in an inversed locational relationship in terms of left-right and up-down directions. Further, it is not essential that the first limiter sections 21 are disposed at a center region of the edge of the PTP sheet 100.

[0098]

In this arrangement, preferably, once the fore-aft mover (movement controller) 65 has moved the sucking operation section (take-out section) 6 in the opposite direction from the direction in which the moving operation section 3 moves the PTP sheets 100, it should move the sucking operation section 6, which holds the forwardmost PTP sheets 100, in the direction in which the moving operation section 3 moves the PTP sheets 100, at a faster speed than the speed at which the moving operation section 3 moves the PTP sheets 100. By moving the sucking operation section 6 in the opposite direction from the direction in which the moving operation section 3 moves the PTP sheets 100 as described above, it becomes possible to have an increased distance between the forwardmost PTP sheet 100 and the first limiter sections 21 at the time of dispensing. This increases a time span from the time point when the sucking operation section 6 starts to move the forwardmost PTP sheet 100 to a time point when the forwardmost PTP

sheet 100 rides over the first limiter sections 21. Hence, even if there is only a small difference between the speed at which the sucking operation section 6 moves a PTP sheet 100 and the speed at which the moving operation section 3 moves PTP sheets 100, it is possible to have a long distance between the forwardmost PTP sheet 100 and the second forwardmost PTP sheet 100 upon a time point when the forwardmost PTP sheet 100 passes over the first limiter sections 21, and this helps the first limiter sections 21 to come between the forwardmost PTP sheet 100 and the second forwardmost PTP sheet 100.

[0099]

In other words, this means that the fore-aft mover (movement controller) 65 moves the sucking operation section 6 which holds the forwardmost PTP sheet 100 in such a way to increase a distance between the forwardmost PTP sheet 100 and the second forwardmost PTP sheet 100.

[0100]

In the second method, the sucking operation section 6 sucks at a center area of the forwardmost PTP sheet 100 in the storage section 11, and then as shown in Fig. 13A and Fig. 13B, the forwardmost PTP sheet 100 is pulled in the same direction in which this PTP sheet 100 is moved, to deflect the forwardmost PTP sheet 100. Then, as shown in Fig. 14A and Fig. 14B, the contact member 21a of the first limiter sections 21 come at the place of deflection in the PTP sheets 100, i.e., between the forwardmost PTP sheet 100 and the second forwardmost PTP sheet 100, allowing only the forwardmost PTP sheet 100 to be dispensed. In this embodiment, the second limiter sections 22 allow a center portion of the forwardmost PTP sheet 100 to bulge forward but prevent both ends from moving forward, whereas the second forwardmost PTP sheet 100 is prevented from moving forward by the ends of the forwardmost PTP sheet 100. As a result, there is an increased distance between the center portion of the forwardmost PTP sheet 100 and a center portion of the second medicine sheet.

[0101]

The second method is implementable even if the second limiter sections 22 are replaced by the first limiter sections 21 disposed at left and right locations. In this case,

a possible modification may be that the first limiter sections 21 which are disposed in the left and right positions are given a greater spring force, with decreased protrusion of the nails than when the first limiter sections 21 are disposed in up-down locations.

[0102]

5 In the dispensing of a PTP sheet 100 as performed by the second method, the apparatus has the first limiter sections 21, and with this arrangement, the fore-aft mover (movement controller) 65 moves the sucking operation section 6 which holds the PTP sheet 100 so that the distance between a longitudinal center portion of the forwardmost PTP sheet 100 and a longitudinal center portion of the second forwardmost PTP sheet
10 100 becomes greater than a distance between longitudinal end sections of the forwardmost PTP sheet 100 and longitudinal end sections of the second forwardmost PTP sheet 100, and the first limiter sections 21 come between the forwardmost PTP sheet 100 and the second forwardmost PTP sheet 100.

[0103]

15 As shown in Fig. 15, the first limiter sections 21 may be replaced by the first limiter sections 21A. The first limiter section 21A has: a contact member 21a which makes contact with an edge of the forwardmost PTP sheet 100; a support section 21b which movably supports the contact member 21a so that the contact member 21a can ride over the edge of the PTP sheet 100; and a spring (urge member) 21c which urges the contact
20 member 21a in a direction to stop the PTP sheets 100. The support section 21b is a cylindrical member for example, and inside this cylindrical member, the contact member 21a, which is provided by a plunger-like body, is supported for linear movement. The spring 21c is provided by a coil spring for example, and is placed inside the cylindrical member.

25 [0104]

Thus far, the sucking operation section 6 is shown as the take-out section which holds the PTP sheet 100; however, the invention is not limited to suction as described. For example, the forwardmost PTP sheet 100 inside the medicine storage cassette 1 may be dispensed by way of adhesion or grasping.

30 [0105]

Fig. 16 is an explanatory view which shows three axes for pivoting the PTP sheet 100. The three axes are: the normal line of the sheet surface, a short axis and a long axis, of the PTP sheets 100. The short axis and the long axis represent a first axis and a second axis which are perpendicular to each other within a plane of the PTP sheet 100.

5 An example of a pivotal center around the long axis is an axis which passes a center of the shorter side of the PTP sheets 100. An example of a pivotal center around the short axis is an axis which passes a center of the longer side of the PTP sheets 100. An example of a pivotal center around the normal line is an intersection made by a center of rotation around the long axis and a center of rotation around the short axis. With the
10 above, the PTP sheet 100 is symmetrical with respect to the second axis (the long axis). The pivotal center around the normal line may be made closely to the intersection between the center of rotation around the long axis and the center of rotation around the short axis. This makes it possible to decrease a space required for the pivoting operation around the normal line, making it possible to decrease the size of the apparatus.

15 [0106]

Fig. 17 is an explanatory chart which shows state changes of the PTP sheet 100. The PTP sheet 100 can take: a first state in which the pockets face forward and the wide edge 100a is on a left side; a second state (shown in Fig. 16) in which the pockets face backward and the wide edge 100a is on a right side; a third state in which the pockets
20 face backward and the wide edge 100a is on the left side; and a fourth state in which the pickets face backward and wide edge 100a is on the right side. In whichever state the forwardmost PTP sheet 100 is at the time it is dispensed, it is possible to bring the sheet into any one of the states by using two of the following state change operations of: a state change by pivoting around the long axis; a state change by pivoting around the
25 short axis; and a state change by pivoting around the normal line. In other words, it is possible to turn the PTP sheet 100 so that its pockets face a predetermined direction and the wide edge 100a is on a predetermined side.

[0107]

As shown in Fig. 18A, if the forwardmost PTP sheet 100 is in the first state where
30 the pockets face forward (facing a dispensing side) and the wide edge 100a is on the left

side, then the PTP sheet 100 is grasped as shown in Fig. 18B by the long nail 71a and the short nail 71b of the grasping main body 71. At this stage the short nail 71b is on the pocket side. The pocket orientation is already recognized by the controller 105 when the forwardmost PTP sheet 100 is taken from the medicine storage cassette 1.

5 Therefore, as shown in Fig. 18C for example, the grasping main body 71 is pivoted so that the pockets will face frontward as in the drawing, and the first and the second nails 81a, 81b of the second grasping section 8 are caused to grasp a left edge margin of the PTP sheet 100 at a shallow position (not as deep as the width of the wide edge 100a and not as deep as to the pockets). From the distance between the first nail 81a and the
10 second nail 81b on grasping, it is possible to determine if the grasp was made on the wide edge 100a or not. Under the state shown in Fig. 18C the controller 105 determines that the grasp was made on the wide edge 100a; then un-grasps temporarily; operates the fore-aft mover 73 to re-grasp at a deeper position as shown in Fig. 18D; and then operates the second grasping section 8 to turn the pockets backward as viewed in the drawing,
15 using a pivotal movement around the horizontal shaft (around the long axis of the sheet). In other words, the long nail 71a is positioned on the pocket side of the PTP sheets 100. Thereafter, as shown in Fig. 18E, the long nail 71a and the short nail 71b of the grasping main body 71 are used to grasp the PTP sheet 100, and the fore-aft mover 73, etc. are used to cause the sheet storage section 41 of the lid 4 to hold the PTP sheet 100 as shown
20 in Fig. 18F. In this process, the long nail 71a of the grasping main body 71 moves sideways to enter the cutout 4a of the lid 4. Thus, a state where the pockets of the PTP sheet 100 face the lid 4 and the wide edge 100a is on the left side is achieved.

[0108]

As shown in Fig. 19A, if the forwardmost PTP sheet 100 is in the second state
25 where the pockets face forward (facing a dispensing side) and the wide edge 100a is on the right side, then the PTP sheet 100 is grasped as shown in Fig. 19B by the long nail 71a and the short nail 71b of the grasping main body 71. At this stage the short nail 71b is on the pocket side. The pocket orientation is already recognized by the controller 105 when the forwardmost PTP sheet 100 was taken from the medicine storage
30 cassette 1. Therefore, as shown in Fig. 19C for example, the grasping main body 71 is

pivoted so that the pockets will face frontward as in the drawing, and the first and the second nails 81a, 81b of the second grasping section 8 are caused to grasp a left edge margin of the PTP sheet 100 at a shallow position. From the distance between the first nail 81a and the second nail 81b on grasping, it is possible to determine if the grasp was made on the wide edge 100a or not. In the state shown in Fig. 19C, the controller 105 determines that the grasping is made on the side which is not the wide edge 100a. Next, the grasping main body 71 is moved up, and the long nail 71a and the short nail 71b are turned around the vertical axis (the short axis of the sheet) by 180° so that the long nail 71a is positioned on the pocket side of the PTP sheets 100 as shown in Figs. 19D and 19E. Thereafter, as shown in Fig. 19F, the sheet storage section 41 of the lid 4 is caused to hold the PTP sheet 100. In this process, the long nail 71a of the grasping main body 71 moves into the cutout 4a of the lid 4. Thus, a state where the pockets of the PTP sheets 100 face the lid 4 and the wide edge 100a is on the left side is achieved.

[0109]

As shown in Fig. 20A, if the forwardmost PTP sheet 100 is in the third state where the pockets face backward (facing a cassette side) and the wide edge 100a is on the left side, then the PTP sheet 100 is grasped as shown in Fig. 20B by the long nail 71a and the short nail 71b of the grasping main body 71. At this stage the long nail 71a is on the pocket side. The pocket orientation is already recognized by the controller 105 when the forwardmost PTP sheet 100 is taken from the medicine storage cassette 1. Therefore, as shown in Fig. 20C for example, the grasping main body 71 is pivoted so that the pockets will face frontward, so that the first and the second nails 81a, 81b of the second grasping section 8 are caused to grasp a left edge margin of the PTP sheet 100 at a shallow position. From the distance between the first nail 81a and the second nail 81b on grasping, it is possible to determine if the grasp was made on the wide edge 100a or not. In the state shown in Fig. 20, the controller 105 determines that the grasping is made on the side which is not the wide edge 100a. Next, as shown in Fig. 20D, Fig. 2(E and Fig. 20F, the fore-aft mover 73, etc. are operated to cause the sheet storage section 41 of the lid 4 to hold the PTP sheet 100. In this process, the long nail 71a of the grasping main body 71 moves into the cutout 4a of the lid 4. Thus, a state where

the pockets of the PTP sheets 100 face the lid 4 and the wide edge 100a is on the left side is achieved.

[0110]

As shown in Fig. 21A, if the forwardmost PTP sheet 100 is in the fourth state
 5 where the pockets face backward (facing a cassette side) and the wide edge 100a is on the right side, then the PTP sheet 100 is grasped as shown in Fig. 21B by the long nail 71a and the short nail 71b of the grasping main body 71. At this stage the long nail 71a is on the pocket side. The pocket orientation is already recognized by the controller 105 when the forwardmost PTP sheet 100 is taken from the medicine storage cassette 1.
 10 Therefore, as shown in Fig. 21C for example, the grasping main body 71 is pivoted so that the pockets will face frontward, so that the first and the second nails 81a, 81b of the second grasping section 8 are caused to grasp a left edge margin of the PTP sheet 100 at a shallow position. From the distance between the first nail 81a and the second nail 81b on grasping, it is possible to determine if the grasp was made on the wide edge 100a or not. Under the state shown in Fig. 21C the controller 105 determines that the grasp
 15 was made on the wide edge 100a; then un-grasps temporarily; operates the fore-aft mover 73 to re-grasp at a deeper position as shown in Fig. 21D and Fig. 21E; and then operates the second grasping section 8 to turn the pockets backward as viewed in the drawing, using a pivotal movement around the horizontal shaft (around the long axis of the sheet). Further, the grasping main body 71 is moved up; the long nail 71a and the short nail 71b are turned around the vertical axis (the short axis of the sheet) by 180° so that the long nail 71a is positioned on the pocket side of the PTP sheet 100. Thereafter,
 20 as shown in Fig. 21F, the fore-aft mover 73, etc. are operated to cause the sheet storage section 41 of the lid 4 to hold the PTP sheet 100. In this process, the long nail 71a of the grasping main body 71 moves into the cutout 4a of the lid 4. Thus, a state where the pockets of the PTP sheets 100 face the lid 4 and the wide edge 100a is on the left side is achieved.

[0111]

In the above example, description was made for a case where the first grasping
 30 section 7 and the second grasping section 8 constitute a double-axis pivoting section

which pivots the PTP sheet 100 around the first axis and the second axis that are perpendicular to each other within a plane; however, the double-axis pivoting section is not limited to the arrangement described as the above.

[0112]

5 There may also be an arrangement which includes: a normal-line-centered pivoting section which pivots the PTP sheet 100 around its normal line; and a single-axis pivoting section (e.g., the first grasping section 7 or the second grasping section 8) for a pivoting operation around one of the first axis and the second axis which are perpendicular to each other within a plane of the PTP sheet 100. The normal-line-centered pivoting
10 section is implementable by using a mechanism (such as a motor) which pivots the sucking operation section 6 around the normal line. The fore-aft mover 65 can move the normal-line-centered pivoting section close enough to the medicine sheet to make contact with a surface of the sheet on the normal-line direction (fore-aft direction) of the medicine sheet. It should be noted here that a tube is connected to a back of the sucking
15 disc 61a, and this tube is connected to the air sucking device. Therefore, the tube should be given an enough length for absorbing the pivotal movement of the sucking operation section 6.

[0113]

 In the above example, the pocket detector 62 includes the movable plate 62a which
20 is provided in the sucking operation section 6, and a move-amount detection section (the potentiometer) which detects an amount of move of this movable member, and with this arrangement, detection of the pockets is based on the amount of move made by the movable member until it makes contact with the forwardmost PTP sheet 100; however, the pocket detector 62 is not limited to such an arrangement as the above.

[0114]

25 For example, the pocket detector 62 may include a pressure detection section (The pressure detection section can be provided in the air sucking device for example) which detects a pressure (such as tube internal pressure) of a sucking and pick-up section (the sucking discs 61a) provided in the sucking operation section 6, and the detection of the
30 pockets may be based on the pressure at the time when the sucking operation is made to

the forwardmost PTP sheet 100 by the sucking and pick-up section. For example, based on dimensional data of a target PTP sheet 100 which may be obtained from a master table (medicine data base), a first sucking is attempted, with the suction main body 61 held by the lift 64 at a height of the pockets. If the pockets of the PTP sheet 100 are on the top side, the sucking discs 61a inclines by receiving an interference from the pockets and then the suction operation will not be successful, so the pressure will not reach a predetermined pressure value, and therefore it is possible to determine that the pockets of the PTP sheet 100 are on the top side. After the first suction, the suction main body 61 is moved by the lift 64 so that the suction main body 61 is at a non-pocket height (between two pockets) in the second suction. This ensures that the sucking discs 61a suck at the non-pocketed area on the PTP sheet 100, making it possible to dispense the PTP sheet 100.

[0115]

In the above example, detection is made on whether the wide edge 100a of the PTP sheets 100 is on the left side or right side; however, the invention is not limited to this. The PTP sheets 100 can be set with their long axes in an up-down direction in the medicine storage cassette 1. In this case, detection may be made on whether the wide edge 100a of the PTP sheet 100 is on the up side or on the down side.

[0116]

Next, reference will be made for Fig. 22 through Fig. 40 to describe a dispensing operation section 110A of another embodiment.

[0117]

As shown in Fig. 22 and Fig. 23, like the dispensing operation section 110, the dispensing operation section 110A includes, a lid opener/closer section 5 for opening, closing or otherwise operating a lid 4 of the medicine storage cassette 1; a sucking operation section (take-out section) 6 for sucking thereby drawing a forwardmost PTP sheet 100 from inside the medicine storage cassette 1; and so on; but does not include the first grasping section 7.

[0118]

The dispensing operation section 110A includes: a normal-line-centered pivoting

section 13 which pivots a PTP sheet 100 around a normal line of the sheet surface of the PTP sheet 100; and the second grasping section 8 which pivots the PTP sheet 100 around a long axis that is included in a plane of the PTP sheet 100. The second grasping section 8 functions also as a detector of the wide edge 100a. In the present embodiment, the
5 normal line of the sheet surface is provided by a normal line at a center of the sheet surface of the PTP sheet 100. The normal line at the center of the sheet surface is parallel with a perpendicular line (drawn at a right angle) to the sheet surface when the PTP sheets 100 is assumed to lie in a flat plane rather than a curved plane. Also, in the present embodiment, the normal line of the sheet surface runs in the same direction as
10 the fore-aft direction mentioned above, the direction in which the PTP sheets 100 are set inside the medicine storage cassette 1, and the direction in which the medicine storage cassette 1 is moved.

[0119]

As shown in Fig. 24, Fig. 25A and Fig. 25B, the normal-line-centered pivoting
15 section 13 includes a rotary suction pipe 13a in a center position of a line of four horizontally arranged sucking discs 61a. The rotary suction pipe 13a has a sucking disc 13b at its tip. Also, the rotary suction pipe 13a has its rear end region supported by bearing sections 13c. Also, a rotary joint 13d is connected to a rear end of the rotary suction pipe 13a. The rotary joint 13d is connected to a dedicated suction pump via a
20 tube. Further, a belt 13e is wound around a rear region of the rotary suction pipe 13a and a drive pulley of a motor 13f. As the motor 13f operates, the rotary suction pipe 13a rotates around its center axis.

[0120]

Whereas the rotary suction pipe 13a is fixed in the fore-aft direction, the suction
25 main body 61 is movable on guide rails 61c in the fore-aft direction, and with this fore-aft move the following operations are performed: As has been described earlier, the fore-aft direction, the direction in which the normal line of the sheet surface runs and the direction in which the PTP sheets 100 are placed inside the medicine storage cassette 1 are all the same in the present embodiment, and the direction in which the sucking disc
30 13b sucks is also the same direction as the fore-aft and the other directions.

(1) The suction main body 61 moves in a direction toward the medicine storage cassette 1 (in a direction facing the back of the medicine dispensing apparatus 101), whereby the movable plate 62a, which is formed like a hook, makes engagement with an engagement part of the medicine storage cassette 1 when the plate comes in a state that it is slightly forward of the sucking discs 61a (a state where the plate is slightly closer to the back of the medicine dispensing apparatus 101). The engagement is made from above, and the suction main body 61 is moved in an up-down direction, which will be described later.

(2) The suction main body 61 moves in a direction away from the loading space 101a (toward the front of the medicine dispensing apparatus 101), whereby the medicine storage cassette 1 is drawn from the loading space 101a. As the medicine storage cassette 1 is pulled out, the suction main body 61 is lifted, and the movable plate 62a of the pocket detector 62 moves away from the engagement part of the medicine storage cassette 1. Thereafter, an operation to open the lid 4 is performed.

(3) The suction main body 61 moves in the direction toward the medicine storage cassette 1, whereby the sucking discs 61a are brought to contact with a PTP sheet 100 inside the medicine storage cassette 1, to suck the PTP sheet 100. Also at this time, the movable plate 62a detects the orientation of the pocketed area of the PTP sheets 100.

(4) The suction main body 61 moves in the direction away from the loading space 101a, whereby a forwardmost PTP sheet 100 is pulled out of the medicine storage cassette 1.

[0121]

At times when such operations as making engagement with/disengagement from the engagement part of the medicine storage cassette 1 from the above position, a lift 640 is activated to raise/lower the suction main body 61, etc. The lift 640 includes a motor 640a which rotates a feeder screw 640b. The feeder screw 640b is threaded with a mover nut 640c. As the mover nut 640c moves, a chassis 640d moves up/down. The chassis 640d is provided with the suction main body 61 and a fore-aft mover 650 which moves this suction main body 61 in the fore-aft direction. The fore-aft mover 650 differs from the fore-aft mover 65 in its mechanism. Specific structure of the fore-aft mover 650 will be described later in detail.

[0122]

If a result of detection using the movable plate 62a indicates that the PTP sheet 100 has its pocketed area facing the top side (sucking disc side), then the suction main body 61 hands the PTP sheet 100 to the second grasping section 8 after the above-described operation (4). The second grasping section 8 turns the pocketed area to face
5 back side (medicine storage cassette side). Thereafter, the suction main body 61 receives the PTP sheet 100 from the second grasping section 8.

[0123]

In this process, as shown in Fig. 45A and Fig. 45B, when four sucking discs 61a of the suction main body 61 move to and make contact with the sheet surface of the PTP
10 sheet 100, there can be a case where the sucking disc 61a which is closest to the second grasping section 8 makes contact with the sheet surface of the PTP sheet 100 thereby deflects the PTP sheet 100, resulting in a situation that contact with the PTP sheet 100 is established only by this sucking disc 61a which is closest to the second grasping section 8. In this case, it can become impossible for the suction main body 61 to receive the
15 PTP sheet 100 from the second grasping section 8 since the other sucking discs 61a cannot suck the PTP sheet 100. Therefore, as shown in Fig. 45C, the sucking discs 61a are moved to a more forward position than a sheet supporting surface of the second grasping section 8 (i.e., moved toward the medicine storage cassette 1); and thereafter, as shown in Fig. 45D, the sucking discs 61a are retracted to or closely enough to the
20 position of the sheet supporting surface of the second grasping section 8. This operation makes it possible to suck the PTP sheet 100 with an increased number of the sucking discs 61a. Therefore, the PTP sheet 100 does not drop even when the second grasping section 8 ceases the grasp. The arrangement makes sure that the suction main body 61 can receive the PTP sheet 100.

25 [0124]

Upon grasping the PTP sheet 100, the second grasping section 8 determines whether or not the grasped side is the wide edge 100a of the PTP sheet 100. In the case where the second grasping section 8 grasped the wide edge 100a, the normal-line-centered pivoting section 13 does not perform a pivoting operation around the normal
30 line. The suction main body 61 moves in the direction toward the medicine storage

cassette 1 and drops the PTP sheet 100 onto the sheet storage section 41 of the lid 4. The wide edge 100a of the PTP sheet 100 which was dropped on the sheet storage section 41 now faces a sheet gripping section 14 which will be described later, and the other side which is away from the wide edge 100a now faces a cutter section 15 which is provided
 5 in the dispensing operation section 110A. It should be noted here that in cases where the pocketed area of the PTP sheet 100 is faced to the back side, the suction main body 61 also hands the PTP sheet 100 to the second grasping section 8 for detection of the wide edge 100a. In this case, however, the second grasping section 8 does not rotate the PTP sheet 100.

10 [0125]

On the other hand, if the second grasping section 8 grasps the side away from the wide edge 100a, then the suction main body 61 hands the PTP sheet 100 to the normal-line-centered pivoting section 13. The normal-line-centered pivoting section 13 pivots the PTP sheet 100 around the normal line. In this process, it is essential that the PTP
 15 sheets 100 is reliably handed from the four sucking discs 61a to the rotary suction pipe 13a.

[0126]

Fig. 26 is a flow chart which describes an operation in which the PTP sheet 100 is handed from the four sucking discs 61a to the sucking disc 13b of the rotary suction pipe
 20 13a; the PTP sheet 100 is turned over by 180 degrees; and the PTP sheet 100 is handed from the sucking disc 13b of the rotary suction pipe 13a to the four sucking discs 61a again. It should be noted here that the flipping operation for changing the orientation of the pocketed area and/or the wide edge 100a of the PTP sheet 100 is performed when there is a need for a fraction supply PTP sheet 100, but is not performed when there is
 25 no need to supply a fractional pack(s) of the medicine or when there is already a fraction supply PTP sheet 100 in the sheet storage section 41 of the lid 4. If there is no need for changing the orientation of the pocketed area and/or the wide edge 100a of the PTP sheets 100, then the suction main body 61 stops sucking on the PTP sheet 100 by means of the four sucking discs 61a once the PTP sheet 100 is pulled out of the medicine storage
 30 cassette 1, thereby letting the PTP sheet 100 drop onto a sheet transport section 16 and

be dispensed.

[0127]

In the flow chart, “suction rotary pump” is a pump connected to the rotary suction pipe 13a; “suction pump” is a pump connected to the four sucking discs 61a (pad section) which transport the PTP sheet 100; at “flip hand-over position”, the sucking disc 13b at the tip of the rotary suction pipe 13a becomes flush with the four sucking discs 61a; at “turn-around position”, the suction main body 61 retracts and the four sucking discs 61a are farther away from the PTP sheets 100 than the sucking disc 13b. In other words, the “turn-around position” is a position where only the sucking disc 13b of the rotary suction pipe 13a sucks the PTP sheets 100.

[0128]

When taking the PTP sheet 100 from the medicine storage cassette 1, the suction pump is turned ON (Step S1), the suction main body 61 comes close to the medicine storage cassette 1 and the four sucking discs 61a suck the forwardmost PTP sheet 100 in the medicine storage cassette 1 (Step S2). Then, the suction rotary pump is turned ON (Step S3), and the suction main body 61 moves to the flip hand-over position (Step S4). Next, determination is made on whether or not the suction main body 61 has arrived at the flip hand-over position (Step S5). Upon arrival, a delay time of, e.g., 0.15 seconds is allowed (Step S6) and thereafter, the suction pump is turned OFF to stop all sucking operations by the sucking discs 61a (Step S7). The suction pump is stopped after the lapse of 0.15 seconds, whereby the suction main body 61 is given appropriate time to hand the PTP sheet 100 to the rotary suction pipe 13a of the normal-line-centered pivoting section 13.

[0129]

Next, the suction main body 61 moves to the turn-around position (Step S8). Whether or not the suction main body 61 has arrived at the turn-around position can be determined by means of the number of pulse of a driving motor used for the move (Step S9). If it is determined that the suction main body 61 has arrived at the turn-around position, the rotary suction pipe 13a is rotated by 180 degrees (Step S10). Then determination is made on whether or not this 180 rotation has been completed (Step S11).

The determination can be made based on the number of pulse of a driving motor used for turning the rotary suction pipe 13a by 180 degrees, for example. In this 180 degree turning, the wide edge 100a of the PTP sheet 100 is turned to the other side.

[0130]

5 After the PTP sheet 100 is turned around by 180 degrees, the suction pump is turned ON (Step S12). Then, after a time lapse of 0.1 second since the suction pump was turned ON (Step S13), the suction main body 61 is moved to a position which is, e.g., 1 mm closer to the medicine storage cassette 1 than the flip hand-over position (hereinafter, called pushing position) (Step S14). By moving the suction main body 61
10 to the pushing position as described, it becomes possible to reliably bring the four sucking discs 61a into contact with the PTP sheet 100, thereby preventing the PTP sheet 100 from being dropped due to inappropriate sucking.

[0131]

Next, determination is made on whether or not the suction main body 61 has
15 arrived at the pushing position (Step S15). The determination can be made based on the number of pulse of a driving motor used for the fore-aft move of the suction main body 61 for example. After a time lapse of, e.g., 0.3 seconds from the arrival of the suction main body 61 at the pushing position (Step S16), determination is made on whether or not the four sucking discs 61a have successfully sucked the PTP sheet 100
20 (Step S17) based on, e.g., suction pressure change in the suction pump. If it is determined that a successful sucking is made, then the suction rotary pump is turned OFF (Step S18).

[0132]

After completing the turning operation for obtaining the fraction supply PTP sheet
25 100, the lift 64 lifts the normal-line-centered pivoting section 13 and the suction main body 61 which sucks and holds the PTP sheet 100, as high as the sheet storage section 41 of the lid 4. The fore-aft mover 650 moves the suction main body 61 which sucks and holds the PTP sheet 100 in a forward direction. This forward movement of the suction main body 61 brings the PTP sheet 100 above the sheet storage section 41.
30 Then, the suction by the four sucking discs 61a is stopped, to drop the PTP sheet 100

into the sheet storage section 41.

[0133]

However, if the suction pump is turned OFF here and all of the suction by the four sucking discs 61a is stopped at once, there is a likelihood that the PTP sheet 100 will spring off and drop onto an unintended location in the sheet storage section 41 as the four sucking discs 61a are returning to their natural shapes. If the PTP sheet 100 is not at an intended location of the sheet storage section 41, a failure can occur when the PTP sheet 100 is grasped by the sheet gripping section 14 (see Fig. 30) and is moved to the cutter section 15 (see Fig. 31) for a fraction cut.

[0134]

To avoid this, the four sucking discs 61a are turned OFF at different timings. An example may be that air suction by the two inner sucking discs 61a of the four sucking discs 61a is turned OFF; next, air suction by one of the two outer sucking discs 61a is turned OFF and next, air suction by the other sucking disc 61a is turned OFF. Turning OFF of the air suction can be implemented by arranging, for example, one suction pump, three diversion paths connected thereto, and an electromagnetic valve provided in each of the diversion paths, and by turning ON/OFF these electromagnetic valves. Of course, such a specific arrangement as the above is not limiting at all. There is no limitation, either, to the sequence of turning OFF the four sucking discs 61a; for example, air suction by the outer sucking discs 61a may be turned OFF first.

[0135]

After the PTP sheet 100 is dropped into the sheet storage section 41, fraction packs of the medicine are cut off by a sheet gripping section 14 and a cutter section 15 which will be described later. Also, if prescription data specifies a plurality of the PTP sheets 100 to be dispensed, then the operation that the suction main body 61 takes out a PTP sheet 100 from the medicine storage cassette 1 is repeated while the fraction packs of the medicine are being cut off. The PTP sheets 100 are sequentially dropped into the sheet transport section 16 as they are taken out. The arrangement as the above, for the process of cutting out fraction packs of the medicine performed simultaneously with the operation of taking out PTP sheets 100 from the medicine storage cassette 1 makes it

possible to decrease a time required for the dispensing.

[0136]

For example, a first PTP sheet 100 which was taken out of the medicine storage cassette 1 is used in the operation for setting a fraction supply PTP sheet 100 in the sheet storage section 41. Then, a first process of cutting fraction packs of the medicine out of the PTP sheet 100 which is set in the sheet storage section 41 is performed while a second process of taking a necessary quantity of PTP sheets 100 out of the medicine storage cassette 1 using the suction main body 61 is being performed. It should be noted here that instead of using the first PTP sheet 100, the second or later ones may be set into the sheet storage section 41. In this case, too, it is still possible to perform the first process and the second process simultaneously. Also, in cases where there is already a fraction supply PTP sheet 100 or some fraction packs of the medicine in the sheet storage section 41 and these will be used for fraction cut, then, the second process can be performed as far as there is any remainder. If the sheet storage section 41 becomes empty during this second process, the second process may be paused so that a fraction supply PTP sheet 100 is set in the sheet storage section 41.

[0137]

In cases where prescription data indicates a need for a process of dispensing a plurality of the PTP sheets 100 and a need for a process which requires a fraction supply PTP sheet 100, the following process may be performed. For example, orientation of the wide edge 100a of a first PTP sheet 100 which was taken out of the medicine storage cassette 1 is detected by the second grasping section 8. If the orientation of the wide edge 100a is not a predetermined one, then the first PTP sheet 100 is dropped and dispensed. The same process is performed to the second and later PTP sheets 100.

[0138]

As an example, assume a case where three PTP sheets 100 and some fraction packs of the medicine must be dispensed. If the third PTP sheet 100 has a matched orientation of wide edge 100a, this third PTP sheet 100 is set in the sheet storage section 41. In other words, the third PTP sheet 100 is used as the fraction supply PTP sheet 100. Since the quantity of the PTP sheets 100 for the dispensing is three, another PTP sheet 100 is

taken out of the medicine storage cassette 1 and dispensed.

[0139]

On the other hand, if the third PTP sheet 100 does not have a matched orientation of the wide edge 100a, the third PTP sheet 100 is dropped and dispensed. Then the
5 fourth PTP sheet 100 is taken out of the medicine storage cassette 1. If this fourth PTP sheet 100 does not have a matched orientation in the wide edge 100a, the PTP sheet 100 is rotated by the normal-line-centered pivoting section 13 and set in the sheet storage section 41.

[0140]

10 In other words, when it is necessary to store a PTP sheet 100 in a predetermined orientation in the fraction supply sheet storage section 41 inside the medicine storage cassette 1, a PTP sheet 100 which has a matched orientation is selected from a plurality of PTP sheets 100 which are taken out of the medicine storage cassette 1 and is stored in the sheet storage section 41. If none of the PTP sheets 100 which were taken out has
15 a matched orientation, then the last PTP sheet 100 is pivoted by the pivotal operation section, i.e., the normal-line-centered pivoting section 13.

[0141]

The above described method makes it possible to minimize the pivotal operation of a PTP sheet 100 by the pivotal operation section, so it becomes possible to decrease
20 medicine dispensing process time. It should be noted here, however, that in this case, there is a likelihood that an increased number of mechanical detection operation by the second grasping section 8 is required to detect the orientation of the wide edge 100a of the PTP sheet 100. As a solution, the orientation of the wide edge 100a of the PTP sheet which was taken out of the medicine storage cassette 1 is detected by an image
25 sensor. This makes none of the above-described mechanical actions required for the detection, making it possible to decrease dispensing time by improving image processing speed.

[0142]

Additionally, in the above-described method where a plurality of PTP sheets 100
30 are taken out of the medicine storage cassette 1, there may be an arrangement that one

of these PTP sheets 100 which has both a matched orientation of the wide edge 100a and a matched orientation of the pocketed area is stored in the sheet storage section 41. In this arrangement, if none of the PTP sheets which were 100 taken out has the matched orientation of the wide edge 100a and/or a matched orientation of the pocketed area, then
 5 the pivotal operation section, i.e., the normal-line-centered pivoting section 13 and/or the second grasping section 8 pivots the last PTP sheet 100. It should be noted here that the pocketed area of the PTP sheet which was taken out of the medicine storage cassette 1 is also detectable by means of image sensor.

[0143]

10 Fig. 27 and Fig. 28 show the fore-aft mover 650. In this fore-aft mover 650, a feeder screw 650a has its axis laid in a direction across the fore-aft direction. In this embodiment, the axis of the feeder screw 650a is set in a horizontal direction and is perpendicular to the fore-aft direction, and this feeder screw 650a is rotated by a motor 650d. The feeder screw 650a is threaded by a mover nut 650b. The mover nut 650b
 15 is pivotably connected to a first end of a swing arm 650c. The swing arm 650c has its second end pivotably connected to a chassis of the suction main body 61. The chassis is guided on the guide rails 61c in the fore-aft direction. In other words, the suction main body 61 is moved in the fore-aft direction by a swing arm mechanism which includes a feeder screw having its axis across the direction in which the medicine storage
 20 cassette 1 is drawn (i.e., direction of the normal line of the PTP sheet 100 and the fore-aft direction). This arrangement makes it possible to decrease a length (depth) of the fore-aft mover 650 in the fore-aft direction and a length of the medicine dispensing apparatus 101 in the fore-aft direction. It should be noted here that a conventional slide-shaft type requires a space for the entire fore-aft stroke.

25 [0144]

The arrangement also makes it possible to increase a length of the medicine storage cassette 1 and increase the quantity of medicine sheets which can be stored. Even if the motor 650d rotates at a constant speed, the moving speed of the second end of the swing arm 650c becomes increasingly slower as the mover nut 650b is driven, therefore,
 30 the speed becomes slower on one side of the feeder screw 650a than on the other. This

means that the speed of the second end of the swing arm 650c becomes slower as it approaches the medicine storage cassette 1, and it is possible to bring the four sucking discs 61 slowly into contact with the forwardmost PTP sheet 100 without decreasing the rotation speed of the motor 650d. This allows the sucking discs 61a to make spreading
 5 contact on the surface of the PTP sheet 100 for making suction on the surface of the PTP sheet 100.

[0145]

Fig. 29 shows the second grasping section 8 and the lid opener/closer section 5. The second grasping section 8 includes: the grasping main body 81 which is rotatable
 10 around a horizontal shaft; the rotator 82 which rotates the grasping main body 81; and the left-right mover 83 which moves the rotator 82 in a left-right direction. The lid opener/closer section 5 includes a shaft 51 which engages with engagement part formed in the lid 4. The lid 4 is opened/closed as the shaft 51 is moved along an arc track under a state where the shaft 51 is engaged with the engagement part. The lid opener/closer
 15 section 5 also includes a shaft 52 which engages with engagement part formed in the sheet storage section 41. The sheet storage section 41 is pivoted as the shaft 52 is pivoted under a state where the shaft 52 is engaged with the engagement part. As the sheet storage section 41 is pivoted to close, a PTP sheet 100 inside the sheet storage section 41 is positioned at a predetermined location.

[0146]

Fig. 30 shows the sheet gripping section 14. The sheet gripping section 14 includes: sheet gripping nails 14a; and a transfer section 14b which moves the sheet gripping nails 14a in a left-right direction of the lid 4. The sheet gripping nails 14a take
 hold on the wide edge 100a of the PTP sheet 100 which is held by the sheet storage section 41 from a lateral direction of the lid 4. The sheet gripping nails 14a are moved
 25 by the transfer section 14b into a side portion of the sheet storage section 41, to position the other edge of the PTP sheet 100 to a cutter of the cutter section 15. When the sheet gripping nails 14a enter the sheet storage section 41, the sheet storage section 41 is opened substantially to a horizontal state.

[0147]

Fig. 31 shows the medicine storage cassette 1, the cutter section 15, the sheet transport section 16, etc. Though not illustrated in this figure, the sheet gripping nails 14a take hold on the wide edge 100a of the PTP sheet 100 which is held by the sheet storage section 41, from a lateral direction of the lid 4. The cutter section 15 can be moved by the transfer section 150 toward and away from the lid 4, from a side of the lid 4. Under a state where the cutter section 15 is close to the side of the lid 4, a process of fraction cut is performed.

[0148]

Also on a side of the medicine storage cassette 1, at a position below the cutter section 15, a laterally protruding guide projection 151 is provided. The cutter section 15, which is provided in the dispensing operation section 110A, moves together with the dispensing operation section 110A so the guide projection 151, the cutter section 15 and the sucking operation section 6 are in a fixed positional relationship. On the other hand, on a tip region of a side plate of the medicine storage cassette 1, a guide recess 1a is formed for fitting by the guide projection 151 when the medicine storage cassette 1 is moved forward. When the medicine storage cassette 1 is drawn out of the loading space 101a, the guide projection 151 engages with the guide recess 1a and prevents the medicine storage cassette 1 from becoming out of position. In other words, under a state where the medicine storage cassette 1 is drawn, the medicine storage cassette 1, the cutter section 15 and the sucking operation section 6 are brought into a fixed positional relationship.

[0149]

In the dispensing operation section 110A, an intermediate stocker 152 is provided below the cutter section 15. The intermediate stocker 152 has a shutter plate 152a, onto which fraction packs of the medicine are dropped as they are cut by the cutter section 15. A shutter driver 152b slides the shutter plate 152a, upon which the fraction packs of the medicine which are no longer supported by the shutter plate 152a drop into a mix stocker 17 which serves as a final stocker inside the dispensing operation section 110A.

[0150]

Below the lid 4 of the medicine storage cassette 1 which is drawn from the loading

space 101a, there is the sheet transport section 16. A PTP sheet 100 which was taken out of the medicine storage cassette 1 by the four sucking discs 61a is supposed to be dropped onto the sheet transport section 16. In other words, a PTP sheet 100 which is not for fraction cutting is taken out of the medicine storage cassette 1; then the suction
5 by the four sucking discs 61a is stopped; and so the PTP sheet 100 drops immediately onto the sheet transport section 16.

[0151]

In cases where both of a PTP sheet(s) 100 and a fraction pack(s) of the medicine are to be dispensed, cutting of the fraction pack(s) of the medicine is performed by the
10 cutter section 15 while the PTP sheet(s) 100 are being transported by the sheet transport section 16 to the mix stocker 17. At this time, the shutter plate 152a is in closed state, and once the fraction packs of the medicine are cut, they drop and stay on the shutter 152a. After all of the PTP sheets 100 have been sent to the mix stocker 17, which can be determined, for example, from a sheet count value by an unillustrated sensor, then the
15 shutter 152a is opened to drop the fraction packs of the medicine into the mix stocker 17. In other words, the shutter 152a opens after the PTP sheets 100 are transported from the sheet transport section 16 to the mix stocker 17, so that the fraction packs of the medicine drop into the mix stocker 17 from above. The fraction packs of the medicine and PTP sheets 100 inside the mix stocker 17 are eventually sent to a tray for
20 the intended patient; at this time, the fraction packs of the medicine can stay on the PTP sheets 100. The arrangement makes it possible to prevent situations where the fraction packs of the medicine become invisible by migrating into spaces between the PTP sheets 100.

[0152]

25 As shown also in Fig. 32, the sheet transport section 16 is at a higher position than the mix stocker 17. The PTP sheets 100 which are transported by the sheet transport section 16 pass under the intermediate stocker 152 and drop into the mix stocker 17.

[0153]

Fig. 33 shows the sheet transport section 16 in an enlarged view. The sheet
30 transport section 16 has, on its bottom, a belt conveyer 16a. As the belt conveyer 16a

is driven, PTP sheets 100 are transported to the mix stocker 17. The belt conveyer 16a may be driven during the period in which the suction main body 61 takes out and drops PTP sheets 100, so that the PTP sheet 100 is immediately transported once they drop. This makes it possible to eliminate a problem that a PTP sheet 100 drops onto
5 other PTP sheets 100 which are already dropped. The sheet transport section 16 is also provided with a ramp 16b as a down slope toward the belt conveyer 16a. The ramp 16b gently guides the dropping PTP sheets 100 to the belt conveyer 16a thereby preventing PTP sheets 100 from being damaged.

[0154]

10 With the above, there is provided a contact piece 16c on an upper side of an exit of the sheet transport section 16, at a position which is slightly higher than a PTP sheet 100 on the belt conveyer 16a. In a structure where the contact piece 16c is not provided, the PTP sheet 100 which is passing a downstream end of the belt conveyer 16a begins dropping in a state where a rear end portion of the PTP sheets 100 rises up and a forward
15 tip thereof points down, to collide with a PTP sheet 100 which lies below. The contact piece 16c decreases the uprise of the rear end portion in the PTP sheets 100, preventing the dropping PTP sheet 100 from colliding with the PTP sheets 100 below, thereby preventing damage to the PTP sheets 100.

[0155]

20 The contact piece 16c may be replaced by a contact roller 16d as shown in Fig. 34. The contact roller 16d is urged downward by a spring which is connected to the bearing, and makes rolling contact with the PTP sheets 100 passing on the belt conveyer 16a, and presses the PTP sheets 100 downward. The contact roller 16d also can decrease the uprise of the rear end portion of the PTP sheets 100. Also, since the contact roller 16d
25 is under the urge from the spring when it makes rolling contact with the PTP sheets 100, it is always possible to press down the PTP sheets 100 regardless the pocket height (thickness) of the PTP sheets 100, which makes it possible to keep the PTP sheets 100 in a horizontal state to a maximum extent.

[0156]

30 Fig. 35A shows the mix stocker 17 in an enlarged view. The mix stocker 17 has

a bottom provided with a first shutter 17a and a second shutter 17b in an openable/closable fashion. The two-shutter configuration eliminates a need for a wide pivoting area which would be required in a single-shutter configuration, and therefore it is possible to make the apparatus compact. However, the two-shutter configuration has
5 a problem that PTP sheets 100 will be trapped between the two shutters.

[0157]

The first shutter 17a and the second shutter 17b are connected to respective shafts 17c. The two shafts 17c are rotated simultaneously as a motor 17d rotates. Rotation of the motor 17d is transmitted to the shafts 17c via a gear mechanism for example.
10 The first shutter 17a is like a flat plate. On the other hand, the second shutter 17b has a bent portion along its tip end, bending inward of the mix stocker 17. Therefore, the first shutter 17a and the second shutter 17b moves asymmetrically with each other when they open/close. The first shutter 17a and the second shutter 17b have their respective tip end regions overlapped each other, thereby preventing the PTP sheets 100 from
15 dropping from between the two end edges.

[0158]

Fig. 36 shows how a PTP sheet 100 drops from inside of the mix stocker 17 when the first shutter 17a and the second shutter 17b are opened. As will be understood from these illustrations, the PTP sheet 100 loses its horizontal attitude and therefore it is
20 possible to prevent the PTP sheet 100 from being stuck between the first shutter 17a and the second shutter 17b. Especially, as shown in Fig. 35B, a plurality of PTP sheets 100 stuck between the two shutters with keeping in a horizontal state often causes clogging, preventing the PTP sheets 100 from dropping. Causing the PTP sheets 100 to lose their horizontal state as described above helps the PTP sheets 100 to drop. In other words,
25 even if a gap between the first shutter 17a and the second shutter 17b at the time when they are opened is smaller than the shorter side of the PTP sheet 100, it is possible for the PTP sheet 100 to drop through the gap since the PTP sheet 100 is no longer horizontal.

[0159]

In the above example, the first shutter 17a and the second shutter 17b are given
30 different shapes from each other so as to cause them to move in an asymmetrical fashion.

However, any other difference than the shape (for example, difference in actuation timing of the two shutters, rotation speed difference thereof, etc.) may be utilized to make asymmetry.

[0160]

5 Fig. 37 shows a layout relationship between the suction main body 61, the sheet transport section 16 and a weight measurement section 18. As the suction main body 61 retracts to draw the medicine storage cassette 1, the medicine storage cassette 1 is on the weight measurement section 18. The weight measurement section 18 has a cassette receiving table 181 on which two pins 181a are erected. These two pins 181a are
10 designed to fit into recessed sections formed in a bottom surface of the medicine storage cassette 1. Also on the cassette receiving table 181, an electric magnet 181b is provided. As the electric magnet 181b is turned ON, a magnetic member provided on the bottom surface of the medicine storage cassette 1 is magnetically attracted and the medicine storage cassette 1 is sucked and fixed onto the cassette receiving table 181.

15 [0161]

As shown in Fig. 40, the ramp 16b of the sheet transport section 16 is urged by a spring 16e toward a back side of the medicine dispensing apparatus 101 (outward of the sheet transport section 16). When the weight measurement section 18 is lifted, a roller 182 is also lifted therewith, to press the ramp 16b, and the ramp 16b moves onto a front
20 side of the medicine dispensing apparatus 101 (inward of the sheet transport section 16) against the urge from the spring 16e. This opens up a space above the weight measurement section 18, so that the medicine storage cassette 1 can be fixed onto the cassette receiving table 181.

[0162]

25 Fig. 38A and Fig. 38B show the weight measurement section 18 in enlarged views. A mover nut 182 is threaded around a horizontally disposed feeder screw 183. As a motor 184 rotates the feeder screw 183, the mover nut 182 moves horizontally, guided by a guide shaft 185. This horizontal move of the mover nut 182 actuates a link 186. The link 186 is connected with the cassette receiving table 181. The cassette receiving
30 table 181 is supported by a vertical guide rail 187. As the motor 184 is driven for a

predetermined number of pulses, the cassette receiving table 181 is lifted by a predetermined distance. As the cassette receiving table 181 is lifted by the predetermined distance, the two pins 181a fit into the recessed sections formed in the bottom surface of the medicine storage cassette 1. Also, the electric magnet 181b is
5 turned ON, and the entire weight of the medicine storage cassette 1 is applied onto the cassette receiving table 181.

[0163]

As shown in Fig. 39, below the cassette receiving table 181, a first end (point of action) of a strain detection block 181d is fixed with a bolt 181e to an end of the cassette
10 receiving table 181. Also, a second end (fixed point) of the strain detection block 181d is fixed with a bolt 181f to a support section 181g. A line which connects the fixed point and the point of action in the strain detection block 181d is perpendicular to (across) a drawing direction (fore-aft direction) of the medicine storage cassette 1. The arrangement as described above makes it possible to make the dispensing operation
15 section 110A thinner than in cases where a line which connects the fixed point and the point of action in the strain detection block is parallel with the drawing direction of the medicine storage cassette 1. The support section 181g is connected to the mover nut 182. The strain detection block 181d has a hollow center portion, and a strain sensor 181c is provided at a region (see hatched region in the figure) where a strain is caused
20 by the weight. From a value outputted by the strain sensor 181c when the entire weight of the medicine storage cassette 1 is applied onto the cassette receiving table 181, it is possible to know the quantity of the PTP sheets 100, etc. placed in the cassette receiving table 181.

[0164]

25 When measuring the weight of the medicine storage cassette 1, the movable plate 62a of the pocket detector 62 is disengaged from the medicine storage cassette 1. Also, in order to disengage the guide projection 151 and the guide recess 1a from each other, the cutter section 15 may be moved.

[0165]

30 In the above-described embodiments, a medicine sheet taken out of a medicine

storage cassette is brought into a predetermined orientation in terms of both pockets and the wide edge. However, if the user will play the part of aligning the pocket orientation and then set the medicine sheets in the medicine storage cassette, means for detecting the pockets and means for flipping the pocket orientation may be eliminated.

5 [0166]

If at least the wide edge is on a predetermined side in all of the medicine sheets which are taken out of the medicine storage cassette, then it is possible to perform fraction cut of the medicine sheets even if the pocket orientation is not the same.

[0167]

10 Fig. 41 shows a relationship between the gripping nails 14a of the sheet gripping section 14, a PTP sheet 100 and the cutter section 15. In cases where the cutter section 15 includes a fixed blade 15a and a movable blade 15b, it is desirable that the fixed blade 15a is faced to the sheet side (non-pocket side) of the PTP sheet 100, because in this case, it is possible to make a gap between the sheet side and the fixed blade 15a small so as to
15 decrease deflection of the sheet at the time of fraction cut by the movable blade 15b. On the other hand, as shown in Fig. 42, in cases where the pocket side of the PTP sheet 100 is permitted to face the fixed blade 15a, it is necessary that the fixed blade 15a is sufficiently spaced so as not to contact the pockets of the PTP sheet 100. As a result, sheet deflection at the time of fraction cut by the movable blade 15b is large. It is
20 possible, however, to perform fraction cut appropriately to the PTP sheet 100 if the sheet deflection is within a tolerable range.

[0168]

In cases where the cutter section 15 includes two movable blades 15b as shown in Fig. 43, it is possible to decrease sheet deflection at the time of fraction cut by the
25 movable blade 15b regardless of the pocket orientation, so it is possible to appropriately perform the fraction cut to the PTP sheets 100. Also, as shown in Fig. 44, the gripping nails 14a of the sheet gripping section 14 may be made movable in the direction of a normal line of the sheet (in the direction for moving closer to and away from the fixed blade 15a), so that the PTP sheet 100 is moved to a cutting position, and then the PTP
30 sheet 100 is moved closely to the fixed blade 15a to perform fraction cut. In this case

again, it is possible to decrease deflection of the sheet at the time of fraction cut by the movable blade 15b, so it is possible to appropriately perform the fraction cut to the PTP sheet 100.

[0169]

5 In other words, it is possible to appropriately perform the fraction cut to the PTP sheet 100 even if the apparatus does not include means for detecting pockets or means for flipping the pocket orientation and even if the user does not face the pockets in a predetermined direction when he/she sets the medicine sheets in a medicine storage cassette.

10 [0170]

With the arrangements described thus far, even if a medicine sheet which is taken out of a medicine storage cassette has its wide edge not on a predetermined side, it is possible to turn the wide edge of the medicine sheet onto the predetermined side. Or, even if a medicine sheet which is taken out of a medicine storage cassette has its pockets not facing a predetermined direction and the wide edge not on a predetermined side, it is possible to make the pockets face the predetermined direction and turn the wide edge onto the predetermined side.

[0171]

Thus far, embodiments of the present invention have been described with reference to the drawings. However, the present invention is not limited to these illustrated embodiments. Any of these embodiments illustrated thus far may be modified or changed in many ways within the scope or within the equivalence of the present invention.

25 REFERENCE SIGNS LIST

[0172]

- 1 Medicine Storage Cassettes
- 11 Storage Portion
- 12 Partition Board
- 30 13 Normal-Line-Centered Pivoting Section (Pivotal Operation Section)

- 13b Sucking Disc (Pivot Contactor)
- 14 Sheet Gripper Portion
- 15 Cutter Portion
- 16 Sheet Transport Section
- 5 16c Contact Piece (Contact Member)
- 16d Contact Roller (Contact Member)
- 17 Mix Stocker
- 17a First Shutter
- 17b Second Shutter
- 10 2 Dispensing Portion
- 21 First Limiter Section
- 21a Contact Member
- 21b Support Portion
- 21c Spring (Urge Member)
- 15 22 Second Limiter Section
- 3 Moving Operation Section
- 31 Hold-On Member
- 32 Constant-Load Spring
- 32c Damper (Adjustment Means)
- 20 4 Lid
- 4a Cutout
- 41 Sheet Storage Section
- 50 Dispensing Operation Section
- 6 Sucking Operation Portion (Take-Out Portion)
- 25 61 Suction Main Body
- 61a Sucking Disc (Holding-Contacting Portion)
- 62 Pocket Detector
- 64 Lift
- 65 Fore-aft Mover (Movement Controller)
- 30 7 First Grasper Portion (Pivotal Operation Section)

- 71a Long Nail
- 71b Short Nail
- 71 Grasper Main Body
- 72 Rotator
- 5 73 Fore-aft Mover
- 74 Lift
- 8 Second Grasper Portion (Pivotal Operation Section)
- 81 Grasper Main Body
- 81a First Nail
- 10 81b Second Nail
- 82 Rotator
- 83 Left-Right Mover
- 101 Medicine Dispensing Apparatus
- 110 Dispensing Operation Section
- 15 110A Dispensing Operation Section
- 152 Intermediate Stocker

Claims

[Claim 1]

A medicine dispensing apparatus comprising: a medicine storage cassette for storage of a plurality of medicine sheets in a line along a normal-line direction of a surface of the medicine sheet; and a dispensing operation section for dispensing the medicine sheets from the medicine storage cassette; wherein

the medicine storage cassette includes:

a storage section for storage of the medicine sheets;

a dispensing section for dispensing the medicine sheets inside the storage section;

a moving operation section which moves the medicine sheets inside the storage section toward the dispensing section; and

a limiter section which limits a forwardmost one of the medicine sheets stored in the storage section from being dispensed from the dispensing section;

the dispensing operation section includes:

a take-out section which holds and takes out the forwardmost medicine sheet; and

a movement controller which dispenses the forwardmost medicine sheet by moving the take-out section which holds the forwardmost medicine sheet in a direction in which the medicine sheets are moved by the moving operation section and at a faster speed than a speed at which the medicine sheets are moved by the moving operation section; and

the movement controller moves the take-out section which holds the forwardmost medicine sheet, in the direction in which the moving operation section moves the medicine sheets, at a faster speed than a speed at which the moving operation section moves the medicine sheets, after moving the take-out section in an opposite direction from the direction in which the moving operation section moves the medicine sheets.

[Claim 2]

The medicine dispensing apparatus according to Claim 1, wherein the medicine storage cassette further includes adjustment means for adjusting the speed at which the moving operation section moves the medicine sheets.

[Claim 3]

A medicine dispensing apparatus comprising: a medicine storage cassette for storage of a plurality of medicine sheets in a line along a normal-line direction of a surface of the medicine sheet; and a dispensing operation section for dispensing the

medicine sheets from the medicine storage cassette; wherein

the medicine storage cassette includes:

a storage section for storage of the medicine sheets;

a dispensing section for dispensing the medicine sheets inside the storage section;

a moving operation section which moves the medicine sheets inside the storage section toward the dispensing section; and

a limiter section which limits a forwardmost one of the medicine sheets stored in the storage section from being dispensed from the dispensing section;

the dispensing operation section includes:

a take-out section which holds and takes out the forwardmost medicine sheet; and

a movement controller which dispenses the forwardmost medicine sheet by moving the take-out section which holds the forwardmost medicine sheet in a direction in which the medicine sheets are moved by the moving operation section and at a faster speed faster than a speed at which the medicine sheets are moved by the moving operation section; and

the limiter section is provided by a first limiter section which includes: a contact member which makes contact with an edge of the forwardmost medicine sheet; a support section which movably supports the contact member so that the contact member can ride over the edge of the medicine sheet; and an urge member which urges the contact member for stopping the medicine sheets from a move caused by the moving operation section while allowing the ride-over by the contact member at a time of dispensing.

[Claim 4]

The medicine dispensing apparatus according to Claim 3, wherein aside from the first limiter section, a second limiter section is provided for contact with the edge of the forwardmost medicine sheet.

[Claim 5]

The medicine dispensing apparatus according to Claim 4, wherein the second limiter section is provided by a rotatable roller which makes contact with the edge of the forwardmost medicine sheet.

[Claim 6]

The medicine dispensing apparatus according to Claim 4, wherein the first limiter section is disposed at a position to make contact with an edge of a longer side of the medicine sheet, whereas the second limiter section is disposed at a position to make

contact with an edge of a shorter side of the medicine sheet.

[Claim 7]

A medicine storage cassette comprising: a storage section for storage of medicine sheets; a dispensing section for dispensing the medicine sheets from the storage section; and a moving operation section for moving the medicine sheets inside the storage section toward the dispensing section; wherein

the dispensing section includes a first limiter section which has: a contact member which makes contact with an edge of a forwardmost medicine sheet; a support section which movably supports the contact member so that the contact member can ride over the edge of the medicine sheet; and an urge member which urges the contact member for stopping the medicine sheets from a move caused by the moving operation section while allowing the ride-over by the contact member at a time of dispensing;

aside from the first limiter section, a second limiter section is provided for contact with the edge of the forwardmost medicine sheet; and

the second limiter section is provided by a rotatable roller which makes contact with the edge of the forwardmost medicine sheet.