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(54) **TABLET CASSETTE FOR TABLET FEEDER**

(57) A tablet cassette for a tablet feeder requires only a small number of support members for a fall prevention member while taking over the properties of an endless belt, that is, to prevent fall of two tablets at a time by gently pushing a tablet from an outer peripheral side toward an inner peripheral side over a discharge port. A tablet cassette includes a support structure (21, 23, 25) configured to support a rotary member 22 (fall prevention member) in a circular plate shape, which is easily deformable, so as to be rotatable about the center of rotation. The support member 21 is mounted outside a tablet container 12 with a rotary peripheral portion 22a of the rotary member 22 inserted into a through hole 12a formed in a peripheral wall portion 13a of the tablet container 12 at a position above partition walls 31 of a rotor 30 and upward from a discharge port 14. When one of tablet receiving portions 15, ..., 15 comes closer to the discharge port 14 due to axial rotation of the rotor 30, a tablet protruding out of the tablet receiving portion 15 abuts on the rotary member 22, thereby preventing the tablet from falling into the discharge port 14.

FIG.1A

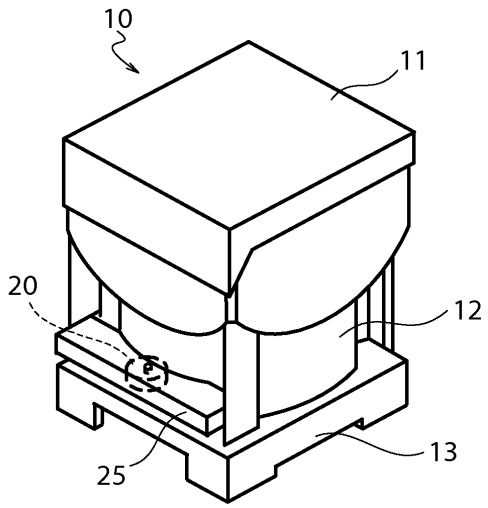

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FIG.1B

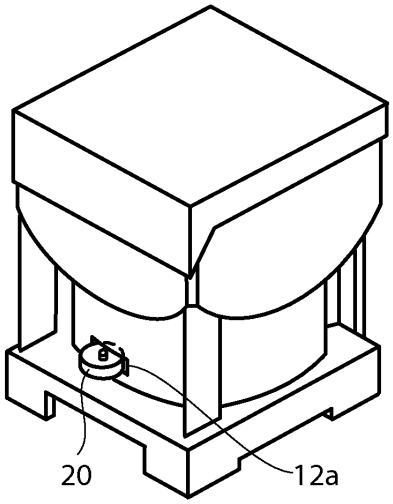


FIG.1C

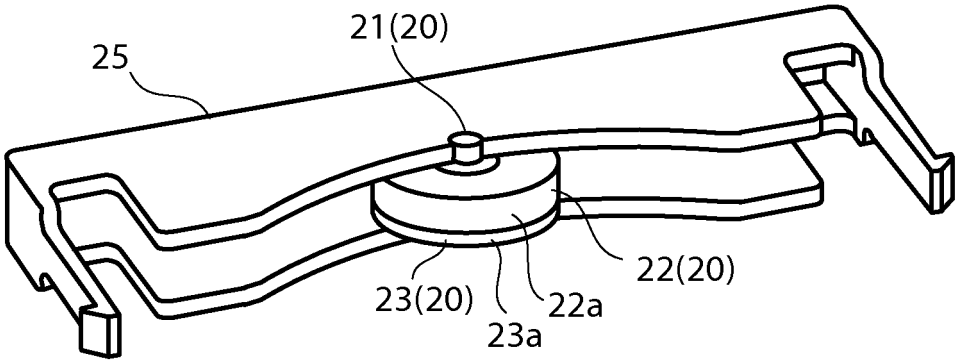
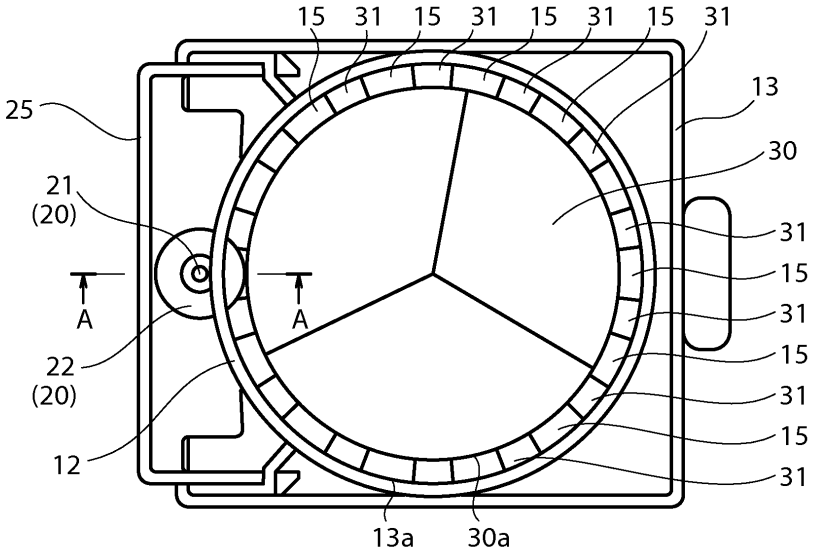


FIG.1D



Description

TECHNICAL FIELD

[0001] The present invention relates to a tablet cassette that forms a driven portion in a tablet feeder configured to automate dispensing of medicines in hospitals, pharmacies, etc. Particularly, the present invention relates to a tablet cassette for a tablet feeder, including a tablet container configured to contain tablets and a rotor located in the tablet container, wherein the tablet cassette causes the tablets to consecutively fall through a discharge port of the tablet container while aligning the tablets around the rotor when the rotor is driven to axially rotate. More particularly, the present invention relates to the structure of a rotary member (a fall prevention portion, /a partitioning portion) configured to limit only the lowermost one of the tablets above the discharge port as the tablet that is to fall down.

BACKGROUND ART

[0002] Tablet feeders that have conventionally been used (see Patent Documents 1 to 4: JP H02-205523 A, JP 2002-153541 A, JP 2002-154637 A, and JP 2012-120719 A) include a base (a drive portion) fixed to a drawing shelf or the like of a tablet dispensing apparatus for power supply and control, and a tablet cassette removably attached to the base to facilitate tablet replenishment or the like. A large number of tablets are contained in the tablet cassette in a random manner, and the base is caused to intermittently or continuously operate, as necessary, to feed the tablets, one at a time. In some of tablet splitting apparatuses of an independent type (see Patent Document 5: JP 2012-179127 A, for example), the tablet cassette discussed above is removably attached on top of a body portion that includes a cassette drive portion in addition to a tablet cutting mechanism.

[0003] Such a tablet cassette for a tablet feeder includes a tablet container, a rotor and a partition plate. The tablet container is configured to contain a large number of tablets, which have been supplied with an upper lid of the container being opened, in the internal space of the tablet container. The rotor is axially rotatably provided in the tablet container and includes a rotation transmission shaft configured to receive drive of a drive portion. The tablet container includes a bottom wall portion defining a lower end portion of an annular gap formed between the tablet container and the rotor. The bottom wall portion has a discharge port formed therein so as to penetrate the bottom wall portion. The partition plate is provided to face the discharge port and configured to partition a part of the annular gap on the upper end side. A through hole shaped in a slit that allows insertion of the partition plate is formed in a peripheral wall portion of the tablet container at a position above partition walls and upward from the discharge port, in order to allow the partition plate to be mounted from the outside of the tablet container.

[0004] The annular gap, in which the tablets are to be aligned, is partitioned by a plurality of partition walls into spaces to receive the tablets on one-for-one basis. The plurality of partition walls are each shaped in a blade and are formed at an equal pitch on an outer peripheral portion of the rotor to project into the annular gap. Spaces between adjacent partition walls serve as tablet receiving portions configured to each receive one tablet which has fallen from above the rotor.

[0005] When the tablet cassette for a tablet feeder is mounted to a base or the like (a drive portion), the rotation transmission shaft of the rotor is engaged with a rotational drive shaft of the drive portion and is rotationally driven.

[0006] When a tablet is carried in the annular gap by the rotor that is rotating to a location directly above the discharge port, the tablet falls to be discharged through the discharge port, and tablets above the falling tablet are prevented from entering the discharge port by the partition plate. This prevents fall of two tablets at a time, and the tablets are discharged according to the amount of rotation, one at a time.

[0007] While the tablet container and the rotor are made from a hard plastic material, the partition plate for tablet fall prevention is made from metal or a soft material. The partition plate which is made from metal (see Patent Document 1: JP H02-205523 A, for example) is formed by bending a thin metal plate or the like, and includes a vertical plate portion for attachment from the outside of the tablet container, and a horizontal plate portion extending into the internal space of the tablet container to exhibit the partitioning function. Meanwhile, the partition plate which is made from a soft material (see Patent Documents 2 and 3: JP 2002-153541 A and JP 2002-154637 A, for example) is formed by plastic molding or the like. Such a partition plate is shaped in a flat plate to be soft and easily deformable so as not to damage the tablets. A partition plate with a saw-tooth shaped portion that exhibits the partitioning function is especially soft. Further, some partition plates are of a so-called cantilever type in which only one end portion of the partition plate is attached to the tablet container (see Patent Document 1: JP H02-205523 A, for example), while other partition plates are of a so-called double support type in which both end portions of the partition plate are attached to the tablet container (see Patent Documents 2 and 3, for example). The attachment of the partition plates is different, direct attachment (see Patent Document 1, for example) and indirect attachment in which the partition plate is attached via a support or the like (see Patent Documents 2 and 3, for example).

[0008] Such tablet cassettes for a tablet feeder handle tablets, not powdered medicine. While tablets shaped in a circular plate are typical, the tablet cassettes for a tablet feeder often handle tablets shaped in regular polygon, cylindrical capsules, etc.

[0009] The tablet cassettes for a tablet feeder occa-

sionally handle oddly shaped tablets having a shape of a diamond plate shape, a spindle with a swelled middle portion, halved tablets prepared by cutting one tablet in half to allow dosing of less than one tablet at a time, rather than so-called regular shaped tablets such as those of a circular shape, a spherical shape, a regular polygonal shape, and a regular polyhedron shape.

[0010] In order for the conventional tablet cassettes for a tablet feeder discussed earlier to handle the oddly shaped tablets or the halved tablets discussed above, careful adjustment or troublesome preparation that is not necessary for the regular shaped tablets is required. Therefore, a tablet cassette for a tablet feeder that can handle even the oddly shaped tablets and the halved tablets as easily as the regular shaped tablets has been developed and well-received.

[0011] Such tablet cassettes for a tablet feeder will be discussed in detail (see Patent Documents 1 to 5). If the tablet cassette for a tablet feeder that uses a partition plate handles the regular shaped tablets, and when one tablet is received in a tablet receiving portion between partition walls in an annular gap formed between the tablet container and the rotor and another tablet comes over the tablet that is already received in the tablet receiving portion, the tablet overlies the one tablet in the tablet receiving portion or the partition walls, and even a part of the overlying tablet cannot be received in the tablet receiving portion. Thus, the tablets can reliably fall consecutively and be consecutively discharged since the tablets are vertically separated from each other appropriately in this situation naturally and appropriately, even if the positional adjustment of the partition plate is more or less imprecise. Thus, the partition plate can be relatively adjusted with ease.

[0012] In contrast, for the oddly shaped tablets with a narrow or pointed end portion and the halved tablets, a relatively large space tends to be left unoccupied at the lower portion or the upper portion of a tablet receiving portion of the annular gap when such oddly shaped tablet is received in the tablet receiving portion. Therefore, when another tablet subsequently comes over the tablet receiving portion in which the preceding tablet is already received, the lower end portion of the subsequently coming tablet occasionally enters the upper space in the tablet receiving portion, depending on the posture of the upper tablet. In such a case, however, the partition plate does not have any position at which the partition plate can vertically separate the tablets from each other, or if any, such position as allows for vertical separation of the tablets is limited to a narrow range. Therefore, it is necessary to find an appropriate position of the partition plate by trial and error through an experiment or the like, and even if such a position is found, the position of the partition plate must be exactly adjusted. In addition, in order for a tablet, a part of which has entered a tablet receiving portion, to move upward completely out of the tablet receiving portion such that the entire tablet moves to a location above the partition plate when the tablet abuts on the partition plate, it is important to have end portions of the oddly shaped tablets and cut surfaces of the halved tablets smoothed. Thus, it is occasionally necessary to make preparations such as screening the tablets in advance, neatly cutting the tablets, and finishing the surfaces.

[0013] Since the oddly shaped tablets and the halved tablets are more difficult to handle than the regular shaped tablets as described above, frequently the oddly shaped tablets and the halved tablets are not handled by a fully automatic tablet cassette for a tablet feeder, and are often handled by a semi-automatic medicine hand-dispensing device or manually. While the oddly shaped tablets are increasing along with an increase in the number of types of medicines, prescription of the halved tablets also tends to increase from the viewpoint of finely adjusting the number of tablets as dosage according to the weight or the like of each patient, for example, in order to suppress a side effect. Along with such tendency, there has been an increasing demand to automate medicine dispensation and improve efficiency. Thus, a tablet cassette for a tablet feeder, which can handle the oddly shaped tablets and the halved tablets as easily as the regular shaped tablets, has been developed in order to meet such a demand.

[0014] Specifically (see Patent Document 6: JP 2015-012893 A), the fall prevention member that prevents fall of two tablets at a time has been changed from the partition plate discussed above to an endless belt of a flat string shape or a round string shape.

[0015] Moreover, the endless belt that is newly adopted in place of the partition plate is formed from an elastic member or a flexible member that is easily deformable, and is provided at a position above the partition walls and upward from the discharge port. When one of the tablet receiving portions comes closer to the discharge port due to axial rotation of the rotor, a tablet that protrudes out of the tablet receiving portion abuts on the endless belt, and the endless belt exerts its repulsive force to push the tablet from the outer peripheral side toward the inner peripheral side, thereby preventing the tablet from falling into the discharge port.

[0016] Such a tablet cassette for a tablet feeder that adopts the endless belt as the fall prevention member has demonstrated improved compatibility with not only the regular shaped tablets but also the oddly shaped tablets and the halved tablets by means of partial modifications while following the proven basic structure according to the related art as a whole. That is, when one of the plurality of tablet receiving portions comes closer to the discharge port due to axial rotation of the rotor, the fall prevention member located above the discharge port abuts on a tablet that protrudes out of the tablet receiving portion from the outer peripheral side to push the tablet toward the inner peripheral side, and only a tablet in the tablet receiving portion falls through the discharge port, thereby preventing fall of the overlying tablet that protrudes out of the tablet receiving portion. In that event, the protruding main part of the tablet that protrudes out

of the tablet receiving portion is pushed toward the inner peripheral side, even if a part of the tablet has entered the tablet receiving portion, and the entire tablet is held between the rotor and the fall prevention member, or the main part of the tablet is gently pushed up to a location above the rotor so that the remaining part of the tablet in the tablet receiving portion also gets out of the tablet receiving portion accordingly. Thus, there is no concern that a part of the tablet that has entered the tablet receiving portion and the main part of the tablet that protrudes out of the tablet receiving portion are separated from each other. Therefore, even if the tablets are the oddly shaped tablets or the halved tablets, there is no need to make careful adjustment or troublesome preparation, and it is only necessary to make adjustment and preparation that are the same as or similar to those for the regular shaped tablets.

Related-Art Documents

Patent Documents

[0017]

Patent Document 1: JP H02-205523 A
Patent Document 2: JP 2002-153541 A
Patent Document 3: JP 2002-154637 A
Patent Document 4: JP 2012-120719 A
Patent Document 5: JP 2012-179127 A
Patent Document 6: JP 2015-012893 A

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0018] As described above, the tablet cassette for a tablet feeder which adopts the endless belt is easy to use with not only the regular shaped tablets but also non-regular shaped tablets.

[0019] In the tablet cassette for a tablet feeder that adopts the endless belt, however, the endless belt must be supported at two or more locations for tension of the belt, and it is necessary to incorporate axial rotation members at support portions for smooth circulation of the endless belt.

[0020] Therefore, the tablet cassette for a tablet feeder that adopts the endless belt requires a large number of members for the support portions for the fall prevention member compared to the tablet cassette for a tablet feeder that adopts the partition plate of the double support type, not to mention the tablet cassette for a tablet feeder that adopts the partition plate of the cantilever type. In addition, it is difficult to reduce the cost of the tablet cassette for a tablet feeder that adopts the endless belt.

[0021] Thus, it is a technical issue to provide a tablet cassette for a tablet feeder that requires only a small number of support members while taking over the properties of a fall prevention member of an endless belt type, that is, to prevent fall of two tablets at a time, by gently pushing a tablet from the outer peripheral side toward the inner peripheral side over a discharge port.

SOLUTION TO PROBLEM

[0022] The tablet cassette for a tablet feeder according to the present invention has been devised to address the foregoing issue. The tablet cassette for a tablet feeder includes: a tablet container configured to contain a large number of tablets, and including a bottom wall portion having a discharge port formed therein, and a peripheral wall portion; a rotor having a rotary shaft that rotatably penetrates the bottom wall portion of the tablet container and being rotatable about the rotary shaft, the rotor having an upper surface shaped to align a plurality of tablets; and a plurality of partition walls extending radially from an outer peripheral portion of the rotor and disposed at predetermined intervals in a circumferential direction of the rotor to partition an annular gap formed between the rotor and the peripheral wall portion of the tablet container into a plurality of tablet receiving portions formed at an equal pitch. A through hole is formed in the peripheral wall portion of the tablet container at a position above the partition walls and upward from the discharge port. The tablet cassette for a tablet feeder according to the present invention also includes: a rotary member formed from an elastic member or a flexible member that is easily deformable, and having a center of rotation at a center of a rotary peripheral portion of the rotary member, whereby a part of the rotary peripheral portion is inserted into the tablet container through the through hole; and a support structure that supports the rotary member so as to be rotatable about the center of rotation with the part of the rotary peripheral portion penetrating the through hole. The position of the through hole and geometric dimensions of the rotary member are determined such that when one of the plurality of tablet receiving portions comes to a location closet to the discharge port due to the rotation of the rotor, one or more extra tablets that protrude out of the one of the plurality of tablet receiving portions abut on the part of the rotary peripheral portion, thereby preventing the one or more extra tablets from falling into the discharge port.

[0023] In the present invention, the rotary member is used as the fall prevention member.

[0024] The tablet cassette for a tablet feeder according to the present invention described above takes over the properties to prevent undesirable fall of two tablets at a time by gently pushing tablets, which are entirely or partially received in a tablet receiving portion but which are not the lowermost one and therefore should not fall and be discharged, from the outer peripheral side toward the inner peripheral side by using the elastic repulsive force of the rotary member that serves as the fall prevention member. Since the fall prevention member has been changed from an endless belt to the rotary member that is supported so as to be rotatable about the center of

rotation, the rotary member is centrally supported at one location, rather than a plurality of locations, thereby reducing the number of axial rotation members . In the present invention that adopts the rotary member, an arcuate projecting portion is inserted into the through hole, which provides a further advantage that the slit length of the through hole can be reduced, in contrast with the related art in which the endless belt is adopted and a through hole of a slit shape will accordingly be long enough to allow insertion of a straight tense portion of the belt.

[0025] The rotary peripheral portion of the rotary member may have a circular outline shape. The rotary peripheral portion of the rotary member may have an outline shape in which a plurality of projecting portions are arranged at constant intervals in a circumferential direction.

[0026] The support structure may include a support member and a shaft holding member. The support member is unitarily formed of a reinforcing member and a shaft portion. The reinforcing member is harder than the rotary member, and is shaped in a thin circular plate to support the rotary member from below, and the shaft portion is rotatable about the center of rotation. The shaft holding member is disposed outside the tablet container to rotatably hold the shaft portion. The rotary member is supported from below by the reinforcing member that is hard and thin and is shaped in a circular plate. Thus, when the rotary member is deformed as the tablets to be prevented from falling abut on the rotary member, the rotary member tends to be deformed upward, rather than downward. Therefore, the tablets to be prevented from falling are gently retained while being lifted up, thereby improving the fall prevention effect. Alternatively, the support structure may include: a reinforcing member that is harder than the rotary member and is shaped in a thin circular plate to support the rotary member from below; a bearing that rotatably supports the rotary member and the reinforcing member; and a shaft holding member disposed outside the tablet container and fitted with both ends of a shaft portion supported by the bearing to hold the shaft portion.

[0027] Further, the reinforcing member is preferably smaller in diameter than the rotary member. Since the reinforcing member is smaller than the rotary member, the reinforcing member and the tablets never or seldom interfere with each other, which makes it easy to support the rotary member from below and also to support buffer the shock of the abutment on the tablets.

[0028] An annular groove may be formed in a portion of the outer peripheral portion of the rotor that faces the rotary peripheral portion of the rotary member, and an annular buffer member formed from an elastic member or a flexible member that is easily deformable may be fitted with the annular groove. Not only the rotary member that presses the tablets to be prevented from falling against the rotor but also the corresponding portion of the rotor that receives such tablets gently abuts on the tablets with an elastic repulsive force, thereby improving the buffering effect.

[0029] An annular groove may be formed in a portion of the outer peripheral portion of the rotor that faces the rotary peripheral portion of one or both of the rotary member and the reinforcing member, and an annular buffer member formed from an elastic member or a flexible member that is easily deformable may be fitted with the annular groove. The buffering effect is improved even when the reinforcing member is attached to the rotary member, by adjusting the width of the buffer member to the width of abutment of the rotary member and the reinforcing member according to the attachment of the reinforcing member to the rotary member.

BRIEF DESCRIPTION OF DRAWINGS

[0030]

Fig. 1 generally illustrates the structure of a tablet cassette according to a first embodiment of the present invention; specifically Fig. 1A is a perspective view illustrating the appearance of the tablet cassette, Fig. 1B is a perspective view illustrating the appearance of the tablet cassette with a frame portion of a fall prevention unit removed, Fig. 1C is a perspective view illustrating the appearance of the fall prevention unit, and Fig. 1D is a plan view of the tablet cassette with a lid removed.

Fig. 2A is a perspective view illustrating the appearance of a rotor, and Fig. 2B is a vertical sectional view (as taken along line A-A) of the tablet cassette, illustrating a discharge port for tablets and a portion above the discharge port.

Fig. 3 is a vertical sectional view of a fall prevention unit using a bearing.

Fig. 4 generally illustrates the structure of a tablet cassette according to a second embodiment of the present invention; specifically, Fig. 4A is a perspective view illustrating the appearance of a fall prevention unit as seen from above, Fig. 4B is a perspective view illustrating the appearance of the fall prevention unit as seen from below, and Fig. 1C is a vertical sectional view of the tablet cassette, illustrating a discharge port for tablets and a portion above the discharge port.

Fig. 5 is a plan view of a rotary member according to a third embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

[0031] Tablet cassettes for a tablet feeder according to the first to third embodiments of the present invention will be described to show specific configurations of the present invention.

[0032] In the drawings, for the sake of clarity etc., fasteners such as bolts and couplers such as hinges are not illustrated, and components that are necessary for or related to the description of the present invention are mainly

illustrated.

First Embodiment

[0033] A specific configuration of a tablet cassette according to a first embodiment of the present invention will be described with reference to the drawings. Fig. 1 generally illustrates the structure of a tablet cassette 10. Specifically, Fig. 1A is a perspective view illustrating the appearance of the tablet cassette 10, Fig. 1B is a perspective view illustrating the appearance of the tablet cassette 10 with a unit frame portion 25 of a fall prevention unit 20 removed, Fig. 1C is a perspective view illustrating the appearance of the fall prevention unit 20 which is held by the unit frame portion 25, and Fig. 1D is a plan view of the tablet cassette 10 with a lid 11 removed. Fig. 2A is a perspective view illustrating the appearance of a rotor 30, and Fig. 2B is a vertical sectional view (as taken along line A-A) of the tablet cassette 10, illustrating a discharge port 14 for tablets and a portion above the discharge port 14.

[0034] The tablet cassette 10 includes an improved fall prevention member etc., and follows the tablet cassette according to the related art discussed earlier as a whole.

[0035] The tablet cassette 10 includes a tablet container 12 and a rotor 30. The tablet container 12 is configured to contain a large number of tablets supplied with its top lid 11 opened. The tablets are contained in the internal space of the tablet container 12. The rotor 30 is axially rotatably provided in the tablet container 12 and having a rotation transmission shaft 32 configured to receive drive from the outside. An annular gap (15, ..., 15), in which the tablets are to be aligned, is formed between the tablet container 12 and the rotor 30. A bottom wall portion 13 defining a lower end portion of the annular gap has a discharge port 14 formed therein to penetrate the bottom wall portion 13 to allow the tablets to fall down.

[0036] In order to partition the annular gap into spaces each receiving one tablet, a plurality of partition walls 31 of a blade shape are formed at an equal pitch on an outer peripheral portion 30a of the rotor 30 to project into the annular gap, and spaces between adjacent partition walls 31, 31 serve as a plurality of tablet receiving portions 15 configured to each receive one tablet which has fallen from above the rotor 30.

[0037] When the tablet cassette 10 is mounted to a base or the like (a drive portion), not illustrated, the rotation transmission shaft 32 of the rotor 30 is engaged with a rotation transmission shaft of the drive portion to be rotationally driven, and the tablets that are received in the tablet receiving portions 15 consecutively fall through the discharge port 14 along with axial rotation of the rotor 30.

[0038] Through improvement of the fall prevention member etc., the tablet cassette 10 includes a rotary member 22, rather than the partition plate or the endless belt discussed earlier, as the fall prevention member. In the present embodiment, the rotary member 22 is a circular plate member that includes a rotary peripheral portion 22a having a circular outline shape. The rotary member 22 is formed from an elastic material or a flexible material that is easily deformable. The rotary member 22 is combined with a support member 21 to constitute the fall prevention unit 20. Here, the support member includes a shaft portion 21a and a circular plate-shaped reinforcing member 23 that are unitarily formed, and the shaft portion 21a is configured to axially rotatably support the rotary member 22. In the present embodiment, the fall prevention unit 20 is rotatably held by the unit frame portion 25 that constitutes a shaft holding member that is removably attached to the tablet container 12 from the outer lateral side. Thus the rotary member 22 is conveniently replaceable. In the present embodiment, the support member 21 and the unit frame portion 25 constitute a support structure configured to rotatably hold the rotary member 22.

[0039] With the introduction of the rotary member 22, a small through hole 12a of a horizontally long slit shape is formed in a peripheral wall portion 13a of the tablet container 12 at a position above the partition walls 31 and upward from the discharge port 14. The slit length of the through hole 12a of the tablet cassette 10 according to the present embodiment is shorter than at least that of the through hole of the tablet cassette with the endless belt described in Patent Document 6.

[0040] Further, the rotor 30 includes a buffer member 33, and the buffer member 33 extends around a part of the outer peripheral portion 30a of the rotor 30 above the partition walls 31, ..., 31.

[0041] The structural portions will be discussed in detail below.

[0042] The fall prevention unit 20 includes the support member 21, the rotary member 22, and the circular plate-shaped reinforcing member 23, and is removably attached to the tablet container 12, and the fall prevention unit 20 is held by the unit frame portion 25. In the present embodiment, the shaft holding member is the unit frame portion 25, and the support member 21, the circular plate-shaped reinforcing member 23, and the unit frame portion 25 constitute a support structure (21, 23, 25). The support member 21 is a vertical shaft body, and is held by the unit frame portion 25 at both its upper and lower end portions engaged with the unit frame portion 25. In the present embodiment, the shaft portion 21a of the support member 21 is axially rotatably supported by the unit frame portion 25 from the viewpoint of placing emphasis on cost reduction. As illustrated in Fig. 3, however, only one bearing 21b may be provided at the middle portion of the shaft portion 21a of the support member 21, and the rotary member 22 and the circular plate-shaped reinforcing member 23 may be attached to the outer peripheral portion of the bearing 21b when emphasis is placed on smooth axial rotation. With such a structure, both the members 22 and 23 are smoothly rotatable, being orthogonal to the shaft portion 21a of the support member 21.

[0043] The rotary member 22 is a fall prevention member of a circular plate shape formed from an elastic member or a flexible member that is easily deformable. In this embodiment, the rotary member 22 is prepared by punching a flat plate of stretchable sponge into an annular shape. The rotary member 22 is externally fitted with the shaft portion 21a of the support member 21. When the rotary peripheral portion 22a of the rotary member 22 is pushed in the circumferential direction, the rotary member 22 is lightly rotated about the shaft portion 21a.

[0044] In this embodiment, the circular plate-shaped reinforcing member 23 has the same diameter as that of the rotary member 22, is thinner than the rotary member 22, and is formed in a circular plate unitarily with the shaft portion 21a. If the bearing 21b is used as illustrated in Fig. 3, the circular plate-shaped reinforcing member 23 can be prepared by punching a thin flat plate made from metal or hard plastic into an annular shape. In the structure in Fig. 3, the circular plate-shaped reinforcing member 23 is externally fitted with the bearing 21b for the shaft portion 21a of the support member 21, and is located directly under the rotary member 22 to support the rotary member 22 from below and to lightly rotate about the shaft portion 21a together with the rotary member 22.

[0045] Then, the unit frame portion 25 that is combined with the fall prevention unit 20 is held by a hand; a portion of the fall prevention unit 20 that is exposed from the unit frame portion 25 is directed toward the through hole 12a of the tablet container 12; and the exposed rotary peripheral portions 22a and 23a of the rotary member 22 and the circular plate-shaped reinforcing member 23 are each inserted into the through hole 12a. When the unit frame portion 25 is mounted to the tablet cassette 10 from the outside, the support member 21 of the fall prevention unit 20 is disposed directly outside the tablet container 12. As a result, a part of the rotary peripheral portion 23a of the circular plate-shaped reinforcing member 23 and a part of the rotary peripheral portion 22a of the rotary member 22 of the support member 21 enter the internal space of the tablet container 12 through the through hole 12a and are situated above the discharge port 14.

[0046] In the present embodiment, the through hole 12a is formed at a position of the tablet container 12 to face the annular gap between the rotor 30 and the tablet container 12, slightly higher than the partition walls 31 of the rotor 30, and slightly higher than one tablet that has entered the tablet receiving portion 15, as with the through hole for insertion of the partition plate or the endless belt according to the related art. Therefore, among tablets received in one of the large number of tablet receiving portions 15, ..., 15 that has come closer to the discharge port 14 due to axial rotation of the rotor 30, the lowermost tablet falls through the discharge port 14 without interfering with the fall prevention unit 20. A tablet overlying the lowermost tablet and at least partially protruding out of the tablet receiving portion 15 abuts on the respective rotary peripheral portions 22a and 23a of the rotary member 22 and the circular plate-shaped reinforcing member 23, and goes over the circular plate-shaped reinforcing member 23 while depressing the abutting portion of the rotary member 22. Thus, the fall prevention unit 20 prevents fall of two tablets at a time into the discharge port 14.

[0047] An annular groove is formed in a portion (a part of the outer peripheral portion) of the outer peripheral portion 30a of the rotor 30 that faces the respective rotary peripheral portions of the rotary member 22 and the circular plate-shaped reinforcing member 23 of the fall prevention unit 20 discussed above. The annular groove completely extends around the outer peripheral portion 30a of the rotor 30. The annular buffer member 33 is fitted with the annular groove. The buffer member 33 is made from an elastic member or a flexible member that is easily deformable. In this embodiment, the buffer member 33 is made from sponge as with the rotary member 22. In this embodiment, the thickness of the buffer member 33 is the same as the total thickness of the rotary member 22 and the circular plate-shaped reinforcing member 23 that face the buffer member 33. However, the thickness of the buffer member 33 may be larger than the total thickness of the rotary member 22 and the circular plate-shaped reinforcing member 23.

[0048] The use and operation of the tablet cassette 10 according to the first embodiment will be described with reference to Figs. 1 and 2 discussed above.

[0049] Tablet dispensing apparatuses and the like often handle a variety of tablets such as tablets of a circular plate shape, halved tablets obtained by cutting the tablets of a circular plate shape, and tablets of different shapes. It is desirable to use the same tablet container 12 and bottom wall portion 13 of the tablet cassette 10 for tablets of various shapes as far as it is possible in consideration of storage in the tablet dispensing apparatus, commonality of parts, etc. For this purpose, an appropriate rotor 30 is selected to handle tablets of various types. Such rotor 30 is selected as the one with the tablet receiving portions 15 that are slightly larger than the tablets such as the halved tablets so that the tablet receiving portions 15 each receive one tablet.

[0050] When forming the through hole 12a in the tablet container 12, a slit of such a size that allows insertion of the respective rotary peripheral portions 22a and 23a of the rotary member 22 and the circular plate-shaped reinforcing member 23 of the fall prevention unit 20 is formed at a location slightly above the partition walls 31 of the rotor 30.

[0051] When mounting the fall prevention unit 20 to the tablet container 12, the fall prevention unit 20 is mounted to the tablet container 12 while inserting the respective rotary peripheral portions 22a and 23a of the rotary member 22 and the circular plate-shaped reinforcing member 23 into the through hole 12a described above from the outside.

[0052] Then, when the rotor 30 is axially rotated according to drive of the drive portion in the base of the tablet dispensing apparatus or the like with a large

number of tablets such as halved tablets already received in the tablet container 12, the tablets, which have been stirred on the upper surface of the rotor 30, slide down into the annular gap that is formed between the rotor 30 and the tablet container 12, and then are received in the tablet receiving portions 15 with one tablet in one tablet receiving portion 15. As a result, the tablets are aligned in the plurality of tablet receiving portions 15, ..., 15 that are circularly arranged, and are sequentially moved toward a location above the discharge port, following an arcuate track together with the tablet receiving portions 15.

[0053] At that time, tablets that have slid down to the tablet receiving portions 15 already occupied by other tablets, do not reach the respective inner bottoms of the tablet receiving portions 15. Thus, the tablets abut on the rotary member 22 of the fall prevention unit 20 before a location above the discharge port 14, recess the rotary peripheral portion of the rotary member 22, and are sequentially moved to a location above the discharge port 14 together with the abutting portion of the rotary member 22 of the fall prevention unit 20 as the rotary member 22 is rotationally moved.

[0054] Then, each time the tablet receiving portion 15 in which tablets are received comes to a location right above the discharge port 14, the lowermost one of the tablets falls from the tablet receiving portion 15 and is discharged downward through the discharge port 14.

[0055] In contrast, even if a tablet overlying the lowermost tablet is partially received in the tablet receiving portion 15, a portion of the tablet protruding out of the tablet receiving portion 15 is pushed from the outer peripheral side toward the inner peripheral side of the annular gap by the rotary member 22, and then is pushed from the inner peripheral side toward the outer peripheral side of the annular gap by the buffer member 33 as a counter-action. Therefore, tablets other than the lowermost tablet are gently sandwiched between the rotary member 22 and the buffer member 33, either of which is easily recessed.

[0056] At that time, the rotary member 22 is deformed such that its thickness is increased to compensate for the recess. Since the rotary member 22 is supported by the circular plate-shaped reinforcing member 23 from below, a portion of the rotary member 22 that is deformed to be recessed radially due to abutment with the tablets is suppressed from being deformed downward as the thickness increases to compensate for the recess. Thus the rotary member 22 is inevitably recessed radially as the thickness is likely to increase upward.

[0057] Therefore, the tablets other than the lowermost tablet that should be prevented from falling are held so as to be slightly lifted up, and reliably carried over the discharge port 14 without being damaged. Even if the lower part of a tablet that should be prevented from falling interferes with the circular plate-shaped reinforcing member 23, the tablet is also gently held by the lift-up action due to the upward deformation of the rotary member 22 and the relieving action due to the deformation of the buffer member 33, and is also carried over the discharge port 14 without being damaged.

[0058] Then, the tablet that is gently sandwiched between the rotary member 22 and the buffer member 33 is reliably held above the tablet receiving portion 15 without being damaged until after the tablet passes through a location above the discharge port 14 even if the tablet receiving portion 15 below is emptied. Thus, there is no fear that two tablets fall at a time.

[0059] After the sandwiched tablet passes over the discharge port 14, the abutting portion and the acting portion of the rotary member 22 are separated from those of the buffer member 33, thereby loosening the sandwiching of the tablet. Further, when the tablet is released from sandwiching, the released tablet falls down to be swiftly received in the tablet receiving portion 15 below.

[0060] In the manner described above, the tablets are consecutively discharged rapidly and accurately.

Second Embodiment

[0061] A specific configuration of a tablet cassette according to a second embodiment of the present invention will be described with reference to the drawings. Fig. 4A is a perspective view illustrating the appearance of a fall prevention unit 40 as seen from above, Fig. 4B is a perspective view illustrating the appearance of the fall prevention unit 40 as seen from below, and Fig. 4C is a vertical sectional view of the tablet cassette, illustrating a discharge port 14 for tablets and a portion above the discharge port 14.

[0062] The tablet cassette of this embodiment differs from that according to the first embodiment discussed above in that the fall prevention unit 20 is replaced with the fall prevention unit 40. The fall prevention unit 40 differs from the fall prevention unit 20 in that a circular plate-shaped reinforcing member 43 is smaller in diameter than the circular plate-shaped reinforcing member 23, and that the space generated by the reduction in the diameter is occupied by a rotary member 42 that replaces the rotary member 22.

[0063] In this case, a tablet abuts on the rotary member 42 before abutting on the circular plate-shaped reinforcing member 43 since the outside diameter of the circular plate-shaped reinforcing member 43 is smaller than that the outside diameter of the rotary member 42 while maintaining the function of the circular plate-shaped reinforcing member 43 to support the rotary member 42 from below. As a result, the tablet hardly abuts directly on the circular plate-shaped reinforcing member 43, and therefore there is no need at all for concern that the tablet is strongly pressed by the circular plate-shaped reinforcing member 43 and may be damaged.

Third Embodiment

[0064] A specific configuration of a tablet cassette ac-

cording to a third embodiment of the present invention will be described with reference to the drawing. Fig. 5 is a plan view of a rotary member 52.

[0065] This tablet cassette of this embodiment differs from that according to the first embodiment discussed above in that the rotary member 22 is replaced with the rotary member 52. The rotary member 52 differs from the rotary member 22 in that a rotary peripheral portion 52a of the rotary member 52 has an outline shape in which a plurality of projecting portions 52b are arranged at constant intervals in the circumferential direction while the rotary peripheral portion 22a of the rotary member 22 has a circular outline shape.

[0066] In this case, when the rotary member 52 is rotated, the respective distal ends (portions that are the farthest from the center of the rotary peripheral portion 52a of the rotary member 52) of the plurality of projecting portions 52b are moved on a circular track. Therefore, the rotary member 52 acts substantially uniformly to gently push a tablet from the outer peripheral side toward the inner peripheral side of the rotor 30.

[Other Embodiments]

[0067] In the first to third embodiments described so far, the tablet cassette is removably attachable, and is manually mounted to a base or the like (a drive portion) to complete a tablet feeder. However, the combination of a tablet cassette and a drive portion is not limited to these embodiments. For example, not only the tablet cassette but also the drive portion may be movable or portable. In addition, the tablet cassette and the drive portion may be automatically correlated with, mounted to, and separated from each other. The tablet cassette may be fixed to the drive portion to form an integral tablet feeder.

INDUSTRIAL APPLICABILITY

[0068] The tablet cassette for a tablet feeder according to the present invention may be used in a device in which a large number of drive portions are incorporated in a storage portion as in a medicine dispensing apparatus (see Patent Documents 1 to 3, for example), and also in a device in which only one drive portion is mounted such as a tablet splitting apparatus (see Patent Document 5, for example).

[0069] If the tablet cassette is removable, one tablet cassette for a tablet feeder can be selectively attached to one of several drive portions to be used, and one of several tablet cassettes for a tablet feeder can be selectively attached to one drive portion to be used.

[0070] Further, the tablets are not limited to tablets in a circular plate shape and halved tablets discussed above, and tablets of various types such as oddly shaped tablets and capsules can be handled without inconvenience.

Description of Reference Numerals

[0071]

10	tablet cassette
11	lid
12	tablet container
12a	through hole
13	bottom wall portion
13a	peripheral wall portion
14	discharge port
15	tablet receiving portion (annular gap)
20	fall prevention unit
21	support member
21a	shaft portion
21b	bearing
22	rotary member (fall prevention member)
22a	rotary peripheral portion
23	circular plate-shaped reinforcing member
23a	rotary peripheral portion
25	unit frame portion (shaft holding member)
30	rotor
30a	outer peripheral portion
31	partition wall
32	rotation transmission shaft
33	buffer member (annular groove)
40	fall prevention unit
42	rotary member (fall prevention member)
43	circular plate-shaped reinforcing member
52	rotary member (fall prevention member)
52a	rotary peripheral portion
52b	projecting portion

Claims

1. A tablet cassette for a tablet feeder, comprising:

a tablet container configured to contain a large number of tablets, and including a bottom wall portion having a discharge port formed therein, and a peripheral wall portion;

a rotor having a rotary shaft that rotatably penetrates the bottom wall portion of the tablet container and being rotatable about the rotary shaft, the rotor having an upper surface shaped to align a plurality of tablets;

a plurality of partition walls extending radially from an outer peripheral portion of the rotor and disposed at predetermined intervals in a circumferential direction of the rotor to partition an annular gap formed between the rotor and the peripheral wall portion of the tablet container into a plurality of tablet receiving portions formed at an equal pitch, whereby a through hole is formed in the peripheral wall portion of the tablet container at a position above the partition walls and upward from the discharge port;

a rotary member formed from an elastic member or a flexible member that is easily deformable, and having a center of rotation at a center of a rotary peripheral portion of the rotary member, whereby a part of the rotary peripheral portion is inserted into the tablet container through the through hole; and

a support structure that supports the rotary member so as to be rotatable about the center of rotation with the part of the rotary peripheral portion penetrating the through hole, wherein:

the position of the through hole and geometric dimensions of the rotary member are determined such that when one of the plurality of tablet receiving portions comes to a location closet to the discharge port due to the rotation of the rotor, one or more extra tablets that protrude out of the one of the plurality of tablet receiving portions abut on the part of the rotary peripheral portion, thereby preventing the one or more extra tablets from falling into the discharge port.

2. The tablet cassette for a tablet feeder according to claim 1, wherein
the rotary peripheral portion of the rotary member has a circular outline shape.

3. The tablet cassette for a tablet feeder according to claim 1, wherein
the rotary peripheral portion of the rotary member has an outline shape in which a plurality of projecting portions are arranged at constant intervals in a circumferential direction.

4. The tablet cassette for a tablet feeder according to claim 1, wherein:
the support structure includes:

a support member unitarily formed of a reinforcing member and a shaft portion, whereby the reinforcing member is harder than the rotary member, and is shaped in a thin circular plate to support the rotary member from below, and the shaft portion is rotatable about the center of rotation, and

a shaft holding member disposed outside the tablet container to rotatably hold the shaft portion.

5. The tablet cassette for a tablet feeder according to claim 1, wherein
the support structure includes:

a reinforcing member that is harder than the rotary member and is shaped in a thin circular plate to support the rotary member from below,

a bearing that rotatably supports the rotary member and the reinforcing member, and

a shaft holding member disposed outside the tablet container and fitted with both ends of a shaft portion supported by the bearing to hold the shaft portion.

6. The tablet cassette for a tablet feeder according to claim 4 or 5, wherein
the reinforcing member is smaller in diameter than the rotary member.

7. The tablet cassette for a tablet feeder according to claim 1, wherein
an annular groove is formed in a portion of the outer peripheral portion of the rotor that faces the rotary peripheral portion of the rotary member, and an annular buffer member formed from an elastic member or a flexible member that is easily deformable is fitted with the annular groove.

8. The tablet cassette for a tablet feeder according to any one of claims 4 to 6, wherein
an annular groove is formed in a portion of the outer peripheral portion of the rotor that faces the rotary peripheral portion of one or both of the rotary member and the reinforcing member, and an annular buffer member formed from an elastic member or a flexible member that is easily deformable is fitted with the annular groove.

FIG.1A

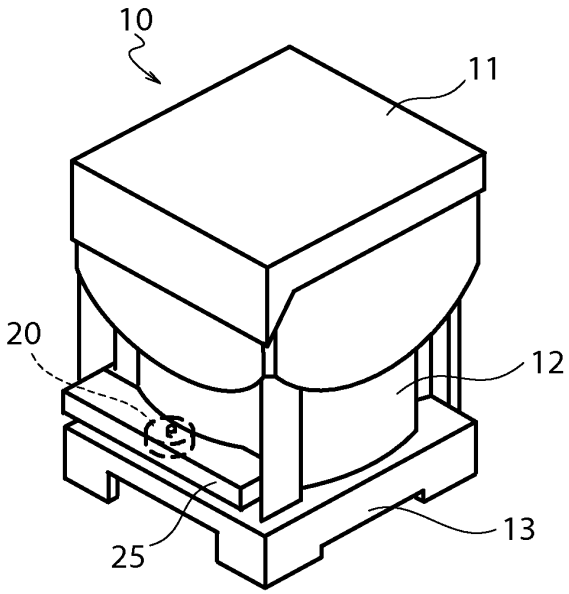


FIG.1B

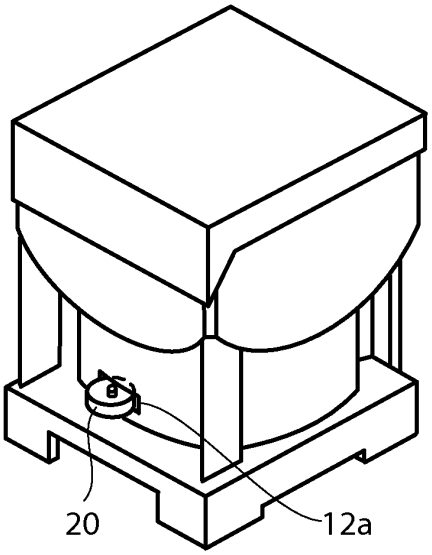


FIG.1C

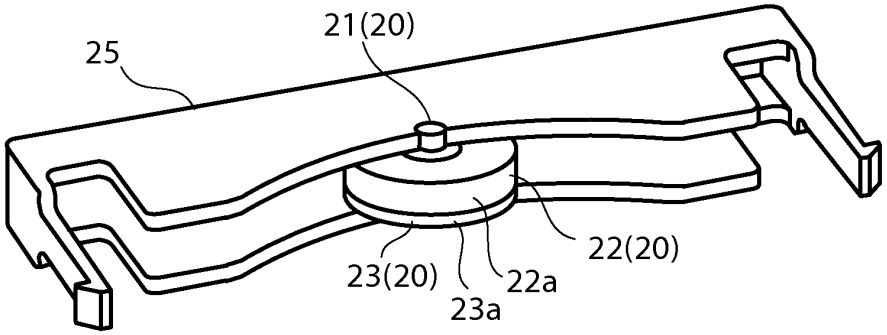


FIG.1D

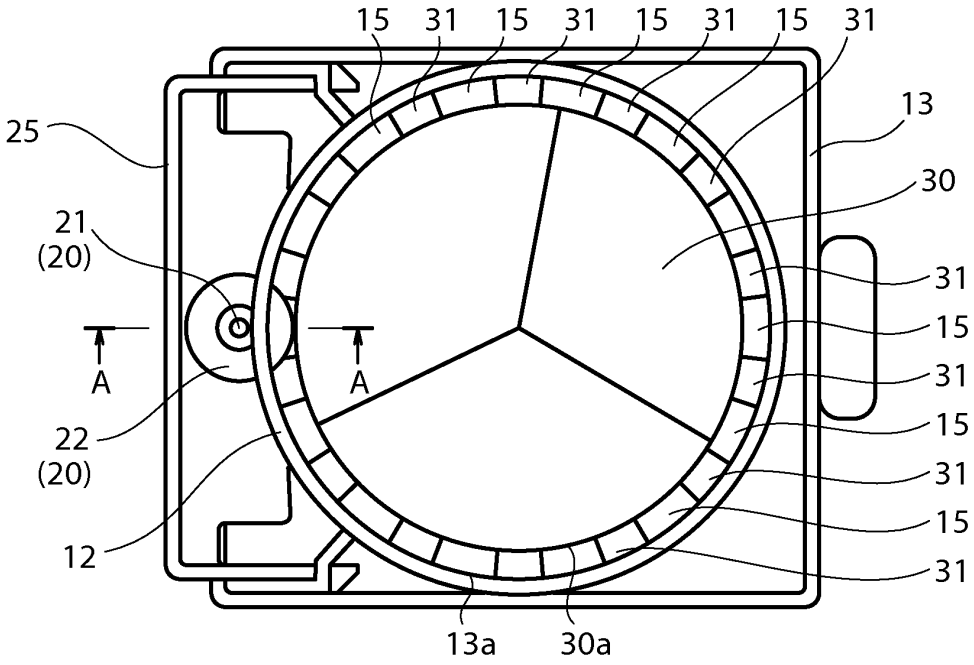
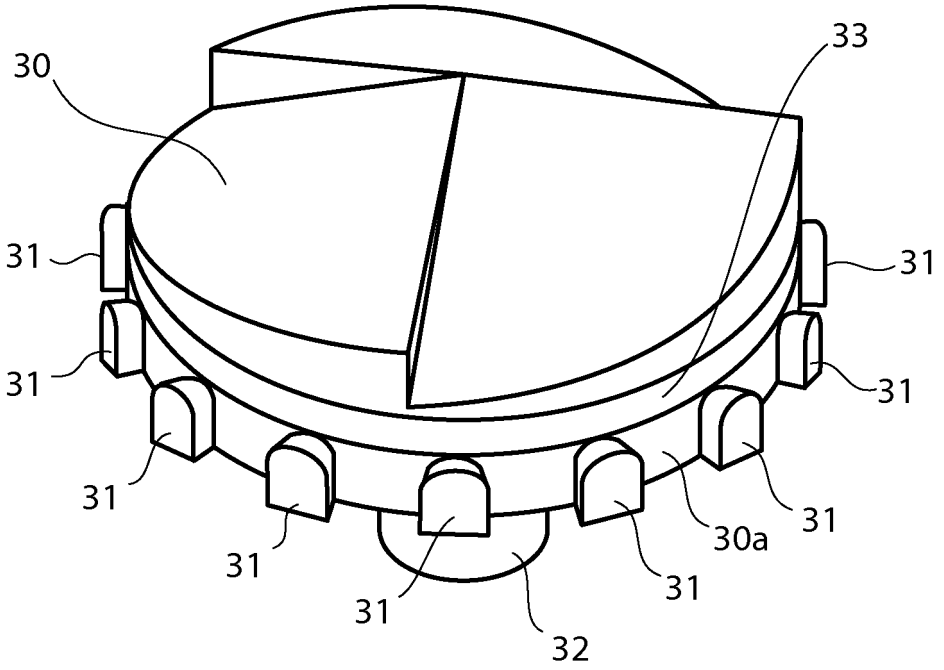


FIG.2A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33
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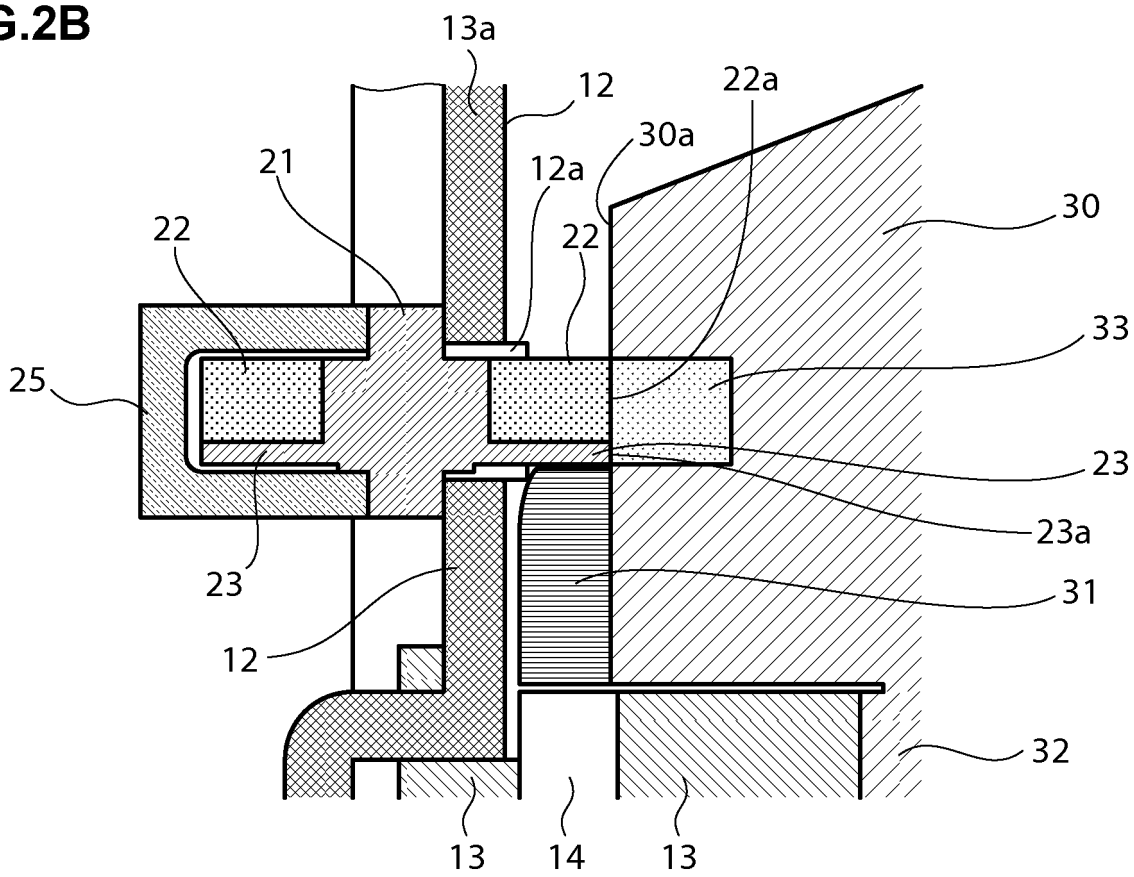
30a
31
31
32

FIG.2B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13

FIG.3

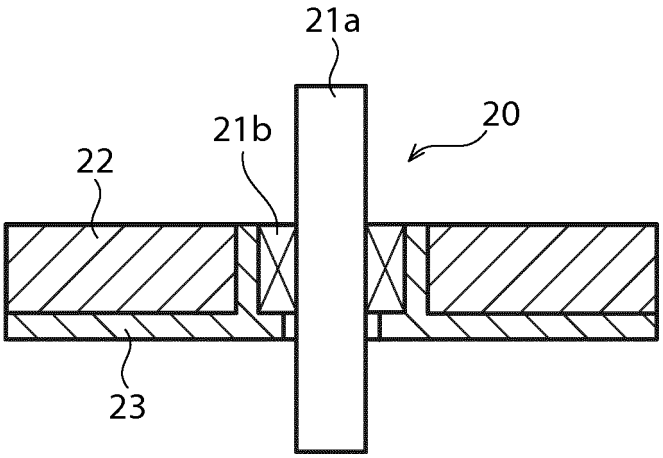


FIG.4A

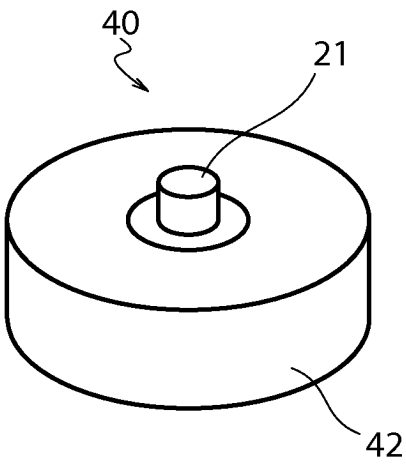


FIG.4B

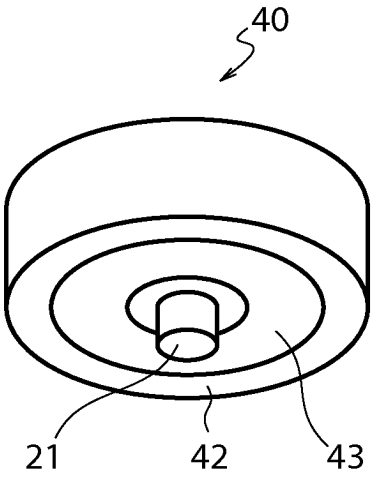


FIG.4C

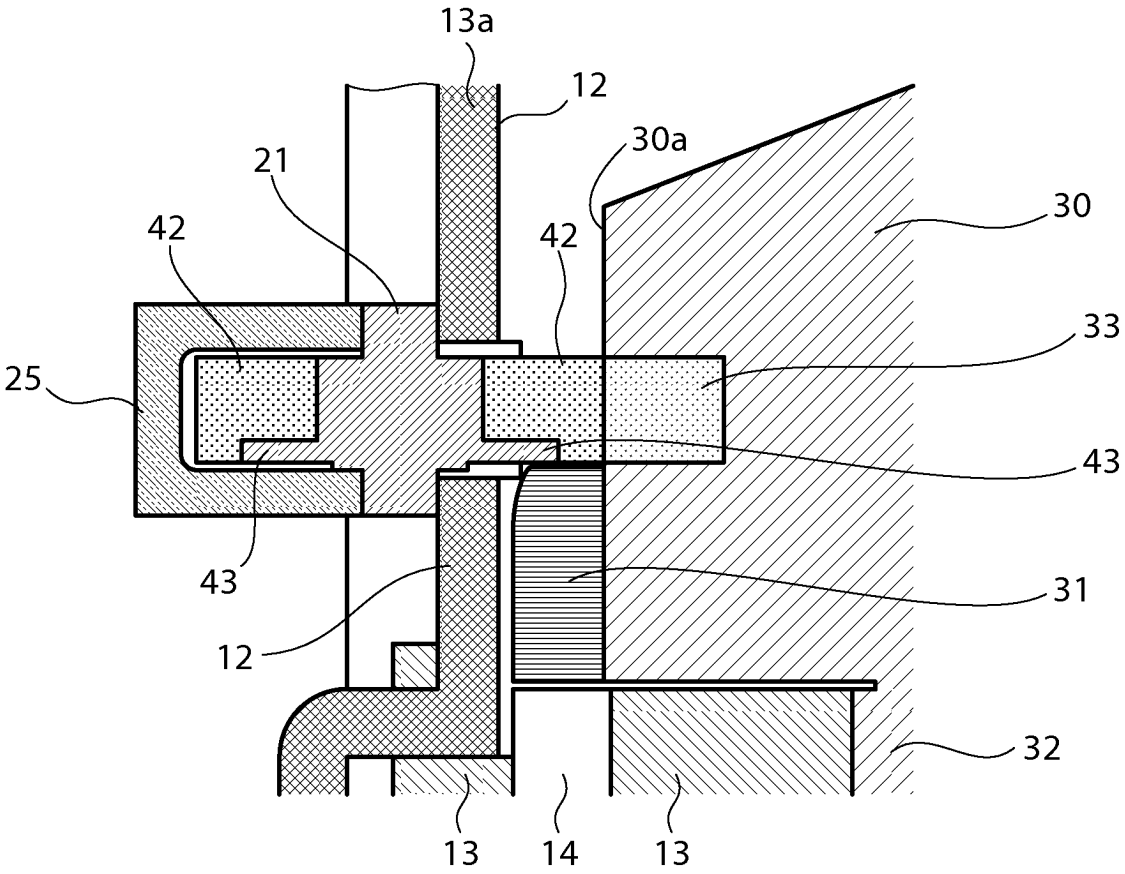
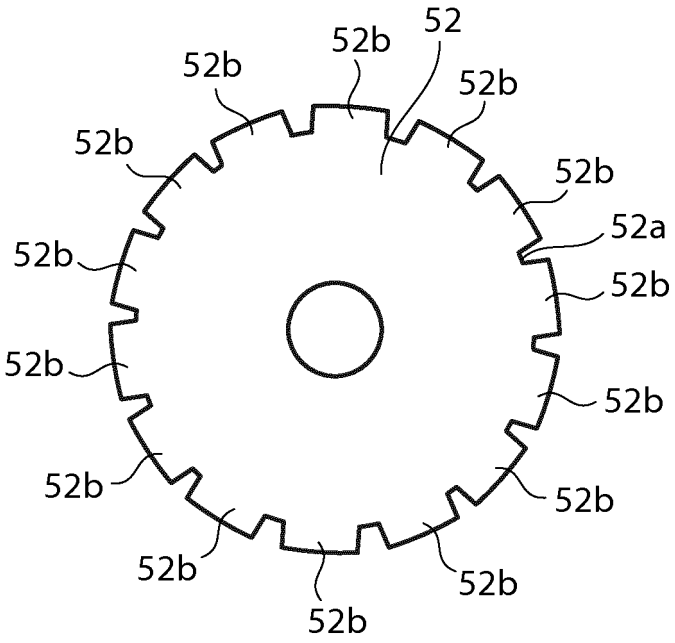


FIG.5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2017/027056

A. CLASSIFICATION OF SUBJECT MATTER
A61J3/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61J3/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2017
Kokai Jitsuyo Shinan Koho 1971-2017 Toroku Jitsuyo Shinan Koho 1994-2017

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	JP 2015-12893 A (Tosho, Inc.), 22 January 2015 (22.01.2015), paragraphs [0025] to [0036]; fig. 1 & US 2016/0371916 A1 paragraphs [0038] to [0054]; fig. 1A to 1D & WO 2015/002259 A1 & EP 3017805 A1 & CA 2916201 A1	1-2 3-8
A	JP 2002-154637 A (Tosho, Inc.), 28 May 2002 (28.05.2002), (Family: none)	1-8
A	US 3881596 A (TANGEN DRIVES, INC.), 06 May 1975 (06.05.1975), (Family: none)	1-8

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

* Special categories of cited documents:
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 October 2017 (10.10.17)	17 October 2017 (17.10.17)
Name and mailing address of the ISA/ Japan Patent Office 3-4-3,Kasumigaseki,Chiyoda-ku, Tokyo 100-8915,Japan	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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- JP 2002154637 A **[0002] [0007] [0017]**
- JP 2012120719 A **[0002] [0017]**
- JP 2012179127 A **[0002] [0017]**
- JP 2015012893 A **[0014] [0017]**