

Storage container for a storage and dispensing station for drug portions

5 The present invention relates to a storage container for drugs and in particular a storage container for a storage and dispensing station for drugs.

Modern blister packing machines, as disclosed in WO 2013/034504 A1, for example, comprise several hundred storage
10 and dispensing stations depending on the scale of the blister packing machine. These machines store a plurality of drug portions of a specific drug and can dispense individual drug portions upon request. With blister packing machines, the drug portions stored in the storage and dispensing stations are
15 gathered and blister packed on an individual basis for each patient according to the physician-prescribed drug administration times.

For gathering multiple drug portions, corresponding storage and dispensing stations for dispensing one or more drug portions
20 are activated by means of a blister packing machine control device. For dispensing a drug portion, a drug portion stored in the storage container is separated by a sorting mechanism of the storage and dispensing station and transferred to a dispensing opening of a guide apparatus of the blister packing machine. The
25 drug portion being dispensed is conveyed via the guide apparatus, if necessary with the interposition of a collection apparatus, to a packing apparatus, which blister packs individual or multiple drug portions.

The sorting mechanism arranged in a section of the storage
30 container is usually realized in the form of a rotor. The outer circumference of the rotor is defined by a plurality of projections. Realized between each pair of projections is a channel extending parallel to the rotational axis of the rotor. The width and radial depth of these projections is adapted
35 precisely to the drug portions to be separated. In a channel, drug portions can thus be situated only over one another, but

not next to one another. Depending on their axial length, the channels can accommodate only one or more drug portions.

Above the sorting mechanism, a housing of the storage container defines a receiving space for the drug portions to be
5 sorted. The sorting mechanism or, as the case may be, the central main body of the sorting mechanism comprises a top surface, which abuts the receiving space with the drug portions to be sorted. The top surface is usually of conical design for the purpose of guiding the drug portions to the channel
10 openings. Moreover, an appropriate design of the top surface prevents the drug portions from remaining stationary thereon and not being available for sorting.

For dispensing a drug portion, a channel, which contains at least one dispensable drug portion when proper function is
15 present, is rotated by means of a partial rotation of the sorting mechanism over the dispensing opening, the drug portion falling under the force of gravity from the channel and through the dispensing opening and then being conveyed further. To prevent multiple drug portions being dispensed if a channel is
20 oriented in relation to a channel accordingly, detention means are provided over or inside the channel.

Despite the conical design of the top surface of the main body of the sorting mechanism, it can occur that drug portions can situate themselves on this top surface such that they do not
25 slip or make their way into a channel, i.e. a channel does not receive the drug portion to be dispensed. This results in no drug portion being dispensed when a typical dispensing procedure is performed (partial rotation of the sorting mechanism).

To avoid errors when assembling multiple drug portions, it
30 is thus necessary to detect the actual dispensing of a drug portion. If a failure to dispense (a non-dispensing of a drug portion) is detected, another dispensing procedure must be performed, thereby delaying the assembly of multiple drug portions. The speed at which a blister packing machine can
35 assemble and blister pack drug portions decreases depending on the frequency of failure to dispense.

The present invention seeks to furnish a storage container for storage and dispensing stations with a reduced frequency of failure to dispense.

According to the invention, this problem is solved by a storage container for storage and dispensing stations as claimed in claim 1. The storage container according to the invention comprises a housing, which has a circularly cylindrical section
5 and accommodates a receiving space for drug portions, and a sorting mechanism with a cylindrical main body rotatably arranged in the circularly cylindrical section of the housing.

The cylindrical main body features an, at least in sections, conical top surface and a main body casing surface on which a
10 plurality of projections is realized, which define channels with a circumferential width K_B and a radial depth K_T and the outer contours of which define a circularly cylindrical outer casing surface usually interrupted by the channels.

According to the invention, a projection with a height V_H
15 and an outer contour V_{AK} is arranged centrally on the conical top surface, the projection being realized such that a maximum radial distance V_{Amax} between outer contour V_{AK} and outer casing surface is less than two times the circumferential width K_B of a channel.

20 The result of the arrangement and configuration of the projection is that no two drug portions can lie flat radially next to one another on the top surface in the area between outer contour V_{AK} and the circularly cylindrical section of the housing (provided that the channel width, as is common in the
25 prior art, is only slightly larger than the largest drug diameter).

A corresponding arrangement of two drug portions would appear, particularly in the case of flat, circularly round drug portions, to be the reason for failure to dispense, since a
30 plurality of drug portions lie on the drug portions arranged radially next to one another owing to their circumference and exert a corresponding pressure on the two drug portions arranged radially next to one another, resulting in the drug portions abutting the housing not being able to enter a channel of the
35 sorting mechanism likewise abutting the housing.

By virtue of the maximal radial distance between the outer contour V_{AK} of the projection and the outer casing surface being smaller than two times the circumferential width K_B of a channel, a radial arrangement of two drug portions next to one

another causing a failure to dispense is prevented, [and] the drug portions can enter the channels unhindered.

If the criteria presented above are satisfied, the exact configuration of the projection depends on the particular shape of the drug portions to be sorted. The outer contour of the projection in turn depends on the exact shape of the projection. The maximum radial distance between outer contour and outer casing surface can be uniform (for example, in the case of a circularly cylindrical projection) or angle-dependent (in the case of a cylindrical projection with angular bottom surface). A cylindrical configuration of the projection is preferred, since a projection of this type is especially relatively easy to realize when manufacturing the sorting mechanism.

In a preferred refinement, it is envisioned that the projection has a circular bottom surface. This allows a projection that, at least in sections, is circularly cylindrical or conical. If projections are realized accordingly, there would be no risk of drug portions lying at the outer contour becoming damaged when the rotational motion necessary for sorting is performed.

As already stated, a cylindrically configured projection is preferred. In an especially preferred embodiment, the projection is designed to be vertical, at least in sections. At the transition between the conical top surface and the projection, a curved transition can be provided that, for example, prevents the accumulation of dust and/or drug debris.

In a preferred embodiment of the storage container, the projection has an at least partly conical top surface. A top surface designed accordingly prevents a drug portion from remaining thereon and directs the drug portion into the outer area of the sorting mechanism and to the opening of the channels.

As demonstrated above, the sense and purpose of the projection is to prevent two drug portions from being situated radially next to one another. Depending on the exact form of the drug portions, it can suffice for the height of the projection to be only a fraction of the radius of the drug portion.

However it is preferable, particularly if "flat", disc-shaped drug portions are to be sorted, that the projection has a

height V_H that is greater than one half the radial depth K_T of a channel. In this way, it is ensured that a drug portion does not slip at least partly onto the projection if appropriate pressure is applied, thereby resulting in two drug portions being
5 arranged radially next to one another on the top surface and the projection.

The channels for receiving drug portions to be sorted are usually open to the outer casing surface of the sorting mechanism defined by the outer contours of the projections, and
10 the radial channel depth is adapted to the maximum "height" of the drug portion.

In the case of a preferred embodiment that can be employed particularly for flat, disc-shaped drug portions, realized above the projections is an annular space, which is bordered by the
15 cylindrical main body, the radial width of the annular space preferably corresponding to the radial channel depth.

The annular space facilitates the drug portions being oriented toward the entrance into the channels, since owing to the configuration thereof the drugs can enter only in the
20 direction in which they also make their way into the channels. An annular space of this type is sensible particularly in the case of disc-shaped drug portions, since it would otherwise be difficult for the disc-shaped drug portions to make their way from the conical top surface into the channels.

25 As already mentioned, it regularly occurs that disc-shaped drug portions are oriented with their flat side facing the conical top surface. Whether or not the drug portions lie in a stationary manner on the top surface or the latter rotates away from the overlying drug portions depends on the fill level of
30 the storage container.

If fill level is high, the pressure of the overlying drug portions is great; the overlying drug portions impede movement into the channels or the annular space. To facilitate a "tipping" of the disc-shaped drug portions into the channels or
35 annular space, it is provided in a preferred embodiment that multiple elevations are arranged on the conical top surface of the cylindrical main body, it being especially preferable that these elevations are oriented radially to the channels.

Below, a preferred embodiment of the storage container according to the invention is described with reference being made to the drawing in which

Figures 1a and 1b show oblique views of the preferred
5 embodiment of the storage container according to the invention;

Figures 1c and 1d show a top view of the preferred embodiment of the storage container,

Figures 2a-2d show various sectional views of the preferred embodiment,

10 Figures 3a-3c show different views of a sorting mechanism according to the preferred embodiment, and

Figure 4 shows the arrangement of the sorting mechanism in a circularly cylindrical housing section.

Figures 1a and 1b show oblique views of a preferred
15 embodiment of the storage container 1 according to the invention for a storage and dispensing station for drug portions. Figures 1c and 1d show top views of the storage container, the sorting mechanism 30 visible from above in Figure 1c being omitted in Figure 1d. In Figures 1b-1d a cover 13, which is visible in
20 Figure 1a, is left out for better view of the interior of the storage container.

The storage container 1 according to the preferred embodiment shown here comprises a housing 10 surrounding a receiving space 2 for drug portions and having a circularly
25 cylindrical section 11 and a lower section 12. The housing 10 comprises a removable lid 13 and is defined on the bottom by a bottom surface 20 having a dispensing opening 21 for drug portions (see in particular Figure 1d). The bottom surface 20 has a further central recess 22 in which a coupling means 37
30 interacting with the sorting mechanism 30 is arranged (see likewise Figure 1d). While in the embodiment shown here, the coupling means 37 is realized as a separate component, it can also be integrally formed onto the sorting mechanism 30. This coupling means 37 interacts with a storage and dispensing
35 station drive (not illustrated), by means of which the sorting mechanism is rotated for furnishing separate drug portions.

In the embodiment shown the drive is arranged not in the storage container itself, but rather in a control unit (not shown) of the storage and dispensing station. The storage

container is usually realized as a separate component from the control unit, so that the storage container can be taken off by means of a handle piece 14 for refilling or filling with a new type of drug, while the control unit usually remains on the
5 blister packing machine.

As is visible in Figure 1c, the sorting mechanism 30 is arranged in the circularly cylindrical section 11 of the housing. The sorting mechanism 30 comprises a cylindrical main body (see, for example, Figure 3a) having a conical top surface
10 32 and a main body casing surface on which a plurality of projections 34 defining a plurality of channels 35 are realized. The outer contours of the projections 34 form a circularly cylindrical outer casing surface interrupted by channels 35 and abutting the housing wall of the circularly cylindrical section
15 11.

In the embodiment shown, the sorting mechanism is realized as a type of rotor, and, owing to the arrangement and configuration of the projections 34, the channels 35 are arranged on the casing surface. In other embodiments, the
20 channels can also be realized such that they do not open to the casing surface of the sorting mechanism.

In the embodiment shown, the projections are realized as a single piece with the main body. Alternatively, these projections can also be securable as separate components to the
25 main body to enable the sorting mechanism itself to be adapted to different drug portions if necessary.

As Figure 1c shows, a plurality of elevations 39 are arranged on the conical top surface 32, namely always adjacent to a channel 35. These elevations 39 facilitate a tipping of
30 drug portions into channels 35, as is described in greater detail using the following Figures.

As Figure 1b shows, a retaining means 15 is indicated on the circularly cylindrical section 11 of the housing, this retaining means having a retaining section, which extends through a slit
35 16 into the circularly cylindrical section 11 of the housing 10.

A storage and dispensing station comprising the storage container 1 according to the invention further comprises components which regulate or control, as the case may be, the dispensing or sorting, as the case may be, of drug portions.

While the aforementioned drive for moving the sorting mechanism 30 as well as a (likewise not shown) sensor for monitoring the dispensing of a drug portion are usually arranged the control unit not shown, they can also be part of the storage container
5 in an alternative embodiment, where they would then usually be arranged in the bottom housing section 12 of the storage container.

As is indicated in Figure 1c, the sorting mechanism comprises centered on the conical top surface an elevation 40,
10 which is explained in greater detail below using the following Figures.

Figures 2a-2d show various sectional views of the embodiment of the storage container according to the invention described in greater detail here. The sorting mechanism 30 comprises a
15 projection 40 centered on the main body 31. The projection 40 is realized as a single piece with the main body 31. In other embodiments, the projection 40 can be realized as a separate component and be screwed onto the main body 31, for example. The projection 40 comprises a circular bottom surface and is
20 designed to be circularly cylindrical parallel to the rotational axis of the sorting mechanism in a middle section 42.

In the embodiment shown, the projections 34 are of two-piece construction and surround a gap 34a in axial direction. A detention section 15a of the detention means 15 engages this gap
25 34a. The detention means 15 is arranged on the circularly cylindrical section 11 of the housing 10, such that the detention section 15a is always arranged over the dispensing opening 21 (see in particular Figures 2c and 2d). This arrangement of the detention section 15a of the detention means
30 15 ensures that drug portions arranged above the detention section in a channel 35 are held back when a channel of the sorting mechanism is oriented toward the dispensing opening 21. Only the drug portion arranged below the retaining section is dispensed when a channel is oriented toward the dispensing
35 opening.

The conical top surface 32 does not directly adjoin the surface of the projections 34, but rather the projections are offset downward, thus forming above the top surfaces of the projections an annular space 38 defined on the inside by the

cylindrical main body 31 and on the outside by the cylindrical section 11 of the housing 10. This annular surface facilitates the guiding of drug portions to the channels 35, as is described in greater detail using the following Figures.

5 The Figures 3a-3c show detailed views of the sorting mechanism 30 of the storage container according to the invention. The sorting mechanism 30 comprises a cylindrical main body 31 with a conical top surface 32 and a main body casing surface on which are realized multiple projections 34, which
10 define channels having a circumferential width K_b and a radial depth K_r . In the embodiment shown, the projections are realized as a single piece with the cylindrical main body 31. The outer contours of the projections form a circularly cylindrical outer casing surface 36 interrupted by channels 35 and represented as
15 a dashed-line circle in Figure 3b.

As Figures 3a and 3c show, the projections 34 have a circumferentially running annular gap 34a in which, as was described using Figures 2a-2d, a detention section of a detention means can engage.

20 In the embodiment shown, the projections 34 are offset downward relative to the conical top surface, thus forming above the projections an annular space 38, which is defined on the inside by the main body casing surface and on the outside by the circularly cylindrical section 11 of the housing (see Figure 4).

25 Arranged on the conical top surface is a plurality of elevations 39, which can support a tipping of a drug portion into a channel. This is indicated in Figure 3c, in which a drug portion 5 is indicated, namely lying on an elevation 39. Owing to this elevation, the flat-shaped drug portion is tipped by the
30 "left" side into the annular space. The elevations thus facilitate the drug portions being situated quickly and in a simple manner in the annular space and finally the channels.

In addition, realized centered on the conical top surface is a projection 40 with a circular bottom surface and a vertically
35 oriented circularly cylindrical section 42, which is completed by a conical top surface 43. In the embodiment shown, the vertical circularly cylindrical section 42 forms the outer contour $V_{AK}/41$ of the projection 40. The outer contour 41 of the projection 40 determines the maximum radial distance V_{Amax}

between the outer contour V_{AK} and the outer casing surface 36 defined by the projections. Depending on the configuration of the projection, this maximum radial distance can vary with the angle (if the cylindrical section has for example, a square
5 bottom surface) or be uniform (as illustrated in the case of the circularly cylindrical configuration).

Figure 3c shows in the lower section another coupling means 37 via which the sorting mechanism 30 is coupled to a drive (not shown) by means of which the sorting mechanism can be rotated
10 incrementally for sorting drug portions. The coupling means 37 can be realized as a separate component or can be a single piece with the main body 31 of the sorting mechanism.

According to the invention, the maximum radial distance specified above is smaller than two times the circumferential
15 width K_B of a channel 35. As Figure 4 illustrates, this results in no two drug portions 5 being able to situate themselves radially next to one another in a flat manner on the conical top surface, thereby preventing the drug portions from jamming on the top surface.

Claims

1. Storage container (1) for a storage and dispensing station for drug portions, comprising:

- 5 a housing (10) having a circularly cylindrical section (11) and surrounding a receiving space (2) for drug portions,
 a sorting mechanism (30) arranged rotatably in the circularly cylindrical section (11) of the housing (10) and having a cylindrical main body (31), the cylindrical main body
10 (31) having an, at least in sections, a conical top surface (32) and a main body casing surface on which a plurality of projections (34) are realized, which define channels (35) having a circumferential width K_B and a radial depth K_T and the outer contours of which define a circularly cylindrical outer casing
15 surface (36) interrupted by the channels (35),
 characterized in that a projection (40) with a height V_H and an outer contour V_{AK} is arranged centrally on the conical top surface (32), the maximum radial distance V_{Amax} between outer contour V_{AK} and outer casing surface (36) being less than two
20 times the circumferential width K_B of a channel (35).

2. The storage container (1) for a storage and dispensing station for drug portions according to claim 1,
 characterized in that the projection (40) is realized
25 cylindrically.

3. The storage container (1) for a storage and dispensing station for drug portions according to claim 2,
 characterized in that the projection (40) has a circular
30 bottom surface.

4. The storage container (1) for a storage and dispensing station for drug portions according to claim 2 or 3,
 characterized in that the projection (40) is, at least in
35 sections, realized vertically.

5. The storage container (1) for a storage and dispensing station for drug portions according to one of the claims 1-4, characterized in that the projection (40) has an at least partly conical top surface (43).

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6. The storage container (1) for a storage and dispensing station for drug portions according to one of the claims 1-5, characterized in that the projection has a height V_H which is greater than one half of the radial depth K_T of a channel

10 (35).

7. The storage container (1) for a storage and dispensing station for drug portions according to one of the claims 1-6, characterized in that realized above the projections (40) is an annular space (38) which is defined on the inside by the cylindrical main body (31).

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8. The storage container (1) for a storage and dispensing station for drug portions according to one of the claims 1-7, characterized in that arranged on the, at least in sections, conical top surface (32) of the cylindrical main body (31) is a plurality of elevations (39).

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9. The storage container (1) for a storage and dispensing station for drug portions according to claim 8, characterized in that the elevations (39) are oriented radially in relation to the channels (35).

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