

## **Storage and dispensing station for a blister dispenser**

The present invention relates to a storage and dispensing station for a blister packaging machine for drug portions.

5 Modern blister packaging machines, such as those disclosed in WO 2013/034504 A1 for example, comprise several hundred storage and dispensing stations depending upon the expansion stage of the blister packaging machine. In each case, a plurality of drug portions of a particular drug are stored  
10 therein and individual drug portions can be dispensed on request. With blister packaging machines, the drug portions stored in the storage and dispensing stations are assembled and blister-packed on an individual patient basis according to the medically prescribed ingestion times.

15 In order to assemble a plurality of drug portions, appropriate storage and dispensing stations for dispensing one or more drug portions are activated by means of a control device of the blister packaging machine. To dispense a drug portion, a drug portion stored in a storage container is separated by means  
20 of a singulating device of the storage and dispensing station and transferred via a dispensing opening to a guide device of the blister packaging machine. By means of the guide device, the dispensed drug portion is fed, if necessary with the interposition of a collecting device, to a packaging device  
25 which blister-packs individual or several drug portions.

The singulating device, which is arranged in a section of the storage container, is usually designed in the form of a rotor which has a plurality of channels which extend in an axial direction through the singulating device. Above the singulating  
30 device is a receiving chamber for the drug portions to be singulated.

In order to separate drug portions, the singulating device is rotated by a drive. The rotation of the singulating device causes at least some of the drug portions stored in the storage  
35 container to rotate at the same time so that they come into

contact with one another and also with the singulating device and an inner wall of the storage container during the separation process. In doing so, minute flaking of the drug portions occurs resulting in a kind of drug dust which settles on the  
5 singulating device and on the wall of the storage container.

An accumulation of drug dust in the storage container is undesirable as this makes cleaning the storage container more difficult. Further, there is a risk that the drug dust is conveyed into other components of the blister packaging machine  
10 and possibly blister-packed with other kinds of drug portions which, in the case of sensitive patients for example, can lead to allergic reactions.

The object of the present invention is therefore to provide a storage and dispensing station for a blister packaging machine  
15 in which the accumulation of drug dust is reduced.

According to the invention, this object is achieved by a storage and dispensing station according to patent claim 1. The storage and dispensing station according to the invention for a blister packaging machine comprises a base part, by means of  
20 which the storage and dispensing station is usually fixed to a blister packaging machine, at least one contact means with which the storage and dispensing station can be electrically coupled to a blister packaging machine and by means of which electrical charges can be dissipated to the blister packaging machine, a  
25 storage container arranged on the base part which has a housing enclosing a receiving chamber for drug portions, which housing has a circular cylindrical receiving chamber, a bottom surface and, rotatably arranged in the circular cylindrical receiving chamber, a singulating device having a plurality of channels  
30 extending in an axial direction through the singulating device, and a coupling means, and a drive for moving the singulating device.

According to the invention, it is provided that the singulating device is electrically conducting at least in the  
35 case of an outer surface which comes into contact with drug portions to be singulated, and that a conductor device is provided, by means of which the electrically conducting outer

surface of the singulating device is coupled to the contact means in an electrically conducting manner.

According to the invention, therefore, an electrical connection always exists between the electrically conducting  
5 outer surface of the singulating device and the contact means, by means of which electrical charges can be transferred to the blister packaging machine.

As already stated above, the rotation of the singulating device causes at least some of the drug portions stored in the  
10 storage container to rotate at the same time during separation or singulation of a drug portion. This leads to friction between drug portions themselves and friction between drug portions and the singulating device and an inner wall of the storage container. It has been established that the above-mentioned  
15 friction is sufficient to effect an electrostatic charging in particular of the singulating device.

As a result of the design of the singulating device according to the invention and provision of the conductor device according to the invention, the electrostatic charge of the  
20 singulating device can be dissipated via the contact means to the blister packaging machine which forms or has a reference potential with respect to the singulating device. The reduction in the electrostatic charge of the singulating device has the effect that the drug dust produced during singulation no longer  
25 adheres thereto or only adheres thereto to a lesser extent. This simplifies cleaning of the singulating device, and deposited or broken-off accumulations of drug dust are prevented from being carried from the storage and dispensing station to other parts of the blister packaging machine.

30 Further, it has certainly been established that the above-mentioned electrostatic charge causes drug portions to be attracted by electrostatically charged components of the storage and dispensing station and to no longer slip or slide freely along these components. Particularly in the case of smaller drug  
35 portions, this leads to the channels no longer filling reliably with drug portions. Discharging electrostatic charges prevents an attraction of the drug portions to the components, and the drug portions can slide freely into the channels.

The singulating device is arranged in the circular cylindrical receiving chamber of the housing. Depending on the exact design of the receiving chamber and of the singulating device, this can be accommodated fully in the receiving chamber; however, it is possible for an upper section of the singulating device to project from the circular cylindrical receiving chamber.

A storage and dispensing station is electrically coupled to the blister packaging machine by the contact means, namely in such a way that electrical charges can be dissipated to the blister packaging machine. When the dispensing and storage station is coupled to a blister packaging machine (via the contact means), the singulating device is thereby grounded.

The exact design of the contact means and how exactly charges are dissipated are related to the exact design of the relevant components of the storage and dispensing station. Accordingly, the contact means can be arranged in the base part or in the storage container, which can be designed as a common component or as separate, connectable components.

With the storage and dispensing stations normally used with the blister packaging machines according to the above-mentioned WO publication, the base part and the storage container are designed as separate but coupleable components, wherein the storage container can be pushed onto the base part. To top up with drug portions or to clean components of the storage container, this can simply be released from the base part and subsequently cleaned and/or refitted when it has been refilled.

The base part is releasably connected to the blister packaging machine, wherein electrical contacts between blister packaging machine and base part, for example a supply of power for a drive and/or a cable for a control unit of the storage and dispensing station, can be designed as plug-in connectors.

To avoid further components, in a preferred embodiment of the storage and dispensing station according to the invention, it is provided that the contact means is provided at least in sections by means of a ground wire which is coupled to a motor of the drive or is formed as such. In this embodiment, a component or group of components which is present in any case,

namely the grounding of the motor of the drive, is also used to dissipate electrical charges. It is therefore usual, for example, to mount the motor on a stable supporting plate. According to the invention, this is designed at least in  
5 sections to be conducting and is provided with a ground wire by means of which charges from the motor can be dissipated.

According to the invention, the singulating device is electrically conducting at least in the case of the outer surface which comes into contact with drug portions to be  
10 singulated. In a cost-effective embodiment of the singulating device, the electrically conducting outer surface of the singulating device is formed as a planar conducting coating. Here, a cost-effective, non-conducting material can be used as the carrier material and the more cost-intensive conducting  
15 coating, which is then coupled in an electrically conducting manner to the contact means by the conductor device, can be provided only in those areas which come into contact with drug portions to be singulated.

In the above-mentioned embodiment, an electrically  
20 conducting coating is to be applied to a base body. In an alternative embodiment, it is provided that the singulating device, at least in the case of its electrically conducting outer surface, is made of an electrically conducting material, preferably an electrically conducting plastic. This conducting  
25 region is then again coupled to the contact means. Depending on material and manufacturing costs, it may also be advantageous for the singulating device to consist entirely of a conducting material.

In the present invention, in order to enable the  
30 electrostatic charge to be dissipated, it is necessary to provide a conductor device by means of which the electrically conducting outer surface of the singulating device is coupled in an electrically conducting manner to the contact means, by means of which the electrical charge is dissipated to a blister  
35 packaging machine. In a structurally very simple embodiment, the above-mentioned conductor device comprises a slip ring, which is arranged in the bottom surface and/or in a housing section which forms the circular cylindrical receiving chamber, and a contact

element arranged in the singulating device. By means of the contact element, an electrical connection is made between the singulating device and the slip ring which, in turn, is coupled in an electrically conducting manner to the contact means. The  
5 contact element can be a kind of spring contact, for example, which rests temporarily or permanently on the slip ring. The slip ring itself can be formed without any breaks; however, it is also possible for the slip ring to be formed by different segments which are only temporarily in contact with the contact  
10 element. These segments can then be connected to one another or coupled individually, if necessary with the interposition of a node point, to the contact means.

The above-mentioned embodiment is structurally simple but requires the provision or use of further components. In a  
15 preferred embodiment, it is provided that the conductor device comprises an electrically conducting drive hub, an electrically conducting drive shaft, a motor, and an electrically conducting coupling means, wherein the electrically conducting outer surface of the singulating device is coupled in an electrically  
20 conducting manner to the coupling means and wherein the motor is coupled to the contact means. With this embodiment, existing components are designed to be conducting in such a way that the electrical charge of the singulating device can be dissipated by means thereof.

25 The drive motor of the storage and dispensing station is usually coupled to the central power supply of the blister packaging machine by a cable. Further, the motor is connected to a blister packaging machine by the contact means, and this contact means ensures that the motor is grounded. In this way,  
30 charges, which are transferred to the motor by the coupling means, the drive hub and finally the drive shaft, can be dissipated to the blister packaging machine.

Due to the electrostatic charge of the singulating device, the drug dust is deposited mainly at or on said singulating  
35 device. As already stated above, the electrostatic charge also causes a certain adhesion of the drug portions to the singulating device, thus making it more difficult for drug portions to enter the channels. However, due to the friction

resulting from the singulation process, other components of the storage and dispensing station are also electrostatically charged so that, in a preferred embodiment, it is provided that surfaces of the bottom surface, the circular cylindrical section  
5 of the housing and/or other sections of the housing which come into contact with drug portions are electrically conducting and are electrically coupled to the contact means. Here too, it is again possible to provide the above-mentioned components or component sections with an electrically conducting coating or to  
10 provide these made entirely from an electrically conducting material. The coupling to the contact means, by means of which the electrical charges are finally dissipated to the blister packaging machine, can be produced by any means known to the person skilled in the art.

15 Preferred embodiments of the storage and dispensing station according to the invention are explained in more detail below with reference to the drawing, in which

Figures 1a and 1b show a first embodiment of the storage and dispensing station according to the invention with separate base  
20 part and storage container;

Figure 2 shows an oblique view of a storage container according to the first embodiment;

Figure 3 shows a sectional view of a storage container according to the first embodiment;

25 Figure 4 shows a detail view of a singulating device inside a storage container;

Figure 5 shows a further sectional view of a storage container mounted on a base part according to the first embodiment;

30 Figure 6 shows a sectional view of the first embodiment of the storage and dispensing station according to the invention;

Figure 7 shows an exploded view of a transition of the storage device/drive in a second embodiment; and

35 Figure 8 shows a sectional view of the second embodiment of the storage and dispensing station.

Figures 1a and 1b show oblique views of a first embodiment of the storage and dispensing station according to the invention. In the first embodiment, the storage and dispensing

station comprises a base part 100 and a storage container 200 which, in the first embodiment, is designed as a separate component.

In the embodiment shown, the base part 100 is part of a  
5 combination of five base parts 100. In alternative embodiments, the base parts can be realized separately from one another. The components mentioned in the following description of the base part 100 are in each case present in each base part 100 regardless of whether these are realized as a combination (as in  
10 Figures 1a and 1b) or separately.

Each base part 100 according to the first embodiment comprises a bottom section 130 and a top section 120. The top section 120 includes a projection 121 onto which a storage container 200 can be pushed. For this purpose, a bottom housing  
15 section of the storage container 200 is matched to the geometry of the projection 121.

In the case of a face of a base part 100, which is shown in Figure 1b and is formed by a housing part of the top section 120 and the bottom section 130, this is fixed to a blister packaging  
20 machine (not shown). A chute 140, by means of which separated drug portions are transferred from a storage and dispensing station to a guide device within the blister packaging machine, is formed in the above-mentioned face. The chute 140 extends through the base part 100 as far as the projection 121 in which  
25 an opening 123 is formed to receive a drug portion.

In the above-mentioned face of the base part 100, a contact means 124 is provided, with which the storage and dispensing station can be electrically coupled to the blister packaging machine and by means of which electrical charges can be  
30 dissipated to the blister packaging machine. In the embodiment shown, the contact means 124 is arranged in the face section of the top section of the base part 100; in an alternative embodiment, the contact means 124 can also be arranged in the face section of the bottom section 130. Alternatively, the  
35 contact means can be designed as a plug or similar for example. Further, with appropriate design of the storage container, it is possible to arrange the contact means therein. The important

thing is that electrical charges can be dissipated via the contact means to the blister packaging machine (not shown).

In the embodiment shown in Figures 1a and 1b, a contact element 122, which, on the one hand, is electrically coupled to the contact means 124 and, on the other, to the electrically conducting outer surface of a singulating device (not shown here), is arranged in the projection. In the embodiment shown, the contact element is part of the conductor device.

The use of the contact element is necessitated by the exact design of the conductor device of the first embodiment. Alternatively, the conductor device can also be provided such that the use of a contact element formed as a separate component is superfluous (see embodiments described below). Neither is the position restricted to that shown; the contact element can also be formed outside the projection.

Figure 2 shows an oblique view of the storage container according to the first embodiment of the storage and dispensing station according to the invention. As already stated with reference to Figures 1a and 1b, in the first embodiment the base part 100 and the storage container 200 are designed as separate components of the storage and dispensing station. The storage container 200 comprises a housing 210 with a section 217 (receiving chamber section) encompassing a circular cylindrical receiving chamber 211 (shown in Figure 3), a bottom section 212 and a handle element 214. Further, the storage container 200 comprises a cover 213, which can be removed for among other things topping up drug portions.

Figure 3 shows a sectional view of a storage container according to the first embodiment. The arrangement of a singulating device 230 in the receiving chamber 211 of the receiving section 217 of the housing 210 can be seen with reference to this sectional view. The singulating device 230 is formed as a kind of rotor with a plurality of projections 234 and channels 235 which extend in an axial direction through the singulating device 230. In the embodiment shown, the channels 235 are defined by the projections 234 on a central component of the singulating device 230 so that the channels are open to the outer circumference of the singulating device.

The singulating device 230 comprises a central conical cover surface 232 which, together with the housing 210, defines a receiving chamber 202 for drug portions. As a result of the conical design of the cover surface, drug portions resting  
5 thereon slide towards the channels 235.

In the embodiment shown, a step is formed between the conical cover surface 232 and the projections 234, thus forming a kind of annular chamber in the region above the channels and the projections. A corresponding annular chamber can facilitate  
10 the feeding of drug portions into the channels in the case of drug portions with a particular form.

As can be seen on the "left-hand" side of Figure 3, the bottom surface 220 has a dispensing opening 221 by means of which separated drug portions are fed to the chute 140 through  
15 an opening 123 in the projection 121 of the base part 100 (see Figure 1a).

As can further be seen on the "left-hand" side of Figure 3, a retaining section 216 of a retaining means 215 is introduced into the annular chamber above the dispensing opening 221. In  
20 addition, an opening is provided in the circular cylindrical section 211 of the housing 210. The function of the retaining means, and in particular of the retaining section, is to retain drug portions arranged in the receiving chamber 202 above the dispensing opening when a channel 235 is aligned with the  
25 dispensing opening 221.

Separation and dispensing of drug portions takes place in that a channel containing a defined number of drug portions is moved over the dispensing opening 221 so that the defined number of drug portions can be dispensed from the aligned channel. The  
30 retaining section 216 prevents overlying drug portions from also being dispensed, thus ensuring that only the number of drug portions arranged in a channel is ever dispensed.

As can be seen in Figure 3, the singulating device 230 further comprises a coupling means 240 with which the  
35 singulating device 230 can be coupled to a drive by means of which the singulating device can be rotated to separate drug portions. In the embodiment shown, the coupling means is designed as a separate component; alternatively, however, it can

also be provided that the coupling means is an integral component of the singulating device 230.

According to the invention, the singulating device is electrically conducting at least in the case of its outer  
5 surface which comes into contact with drug portions to be singulated. In the first embodiment, it is provided that the singulating device has a planar conducting coating 231.

According to the invention, a conductor device is provided in order to divert the electrical charges from the singulating  
10 device to the contact means 214 (see Figure 1b), by means of which the charges are then dissipated to the blister packaging machine. In the first embodiment, the conductor device comprises a contact element 236, 237 arranged in the singulating device 230.

15 In the embodiment shown in Figure 3, the singulating device 230 is almost completely accommodated in the receiving chamber 211. The projections 245 end below the opening of the receiving chamber 211, thus resulting in a kind of annular chamber above them. In alternative embodiments however, the receiving chamber  
20 (or the singulating device) can also be designed such that the projections project above the top opening of the receiving chamber. As long as the projections and channels are designed as in Figure 3, that is to say the channels are open to the outer circumference of the singulating device, in such an embodiment,  
25 drug portions can (also) enter the channels from the side. The exact design of the receiving chamber and the singulating device depends on the drug portions to be singulated.

Two variants of the arrangement of the contact element are shown in Figure 4; in one case, the contact element is arranged  
30 in the outer region of a projection 234 and, in another case, in the bottom surface of a projection 234. An electrical coupling to a slip ring 222, 215 arranged in the bottom surface 220 and/or in the receiving section 217 is made by means of the contact element. The arrangement of the above-mentioned slip  
35 rings in the bottom surface 220 and the receiving section 217 is shown in Figures 5 and 6.

Figure 5 shows a further sectional view of a storage container mounted on a base part according to the first

embodiment. Figure 6 shows a sectional view of the complete storage and dispensing station according to the first embodiment.

Figures 5 and 6 show, in particular, the coupling between the base part 100 and storage container 200, which are designed as separate components. The storage container 200 is pushed onto the projection 121 of the base part 100 at its bottom section 212, for which purpose the bottom section 212 is appropriately matched.

Figure 6 further shows the coupling between the singulating device 230 and a drive arranged in the base part. The drive comprises a motor 112, a drive shaft 111 and a drive hub 110. An outer contour of the drive hub 110 acts in a frictional manner together with an inner contour of the coupling means 240 which, in turn, interacts with the singulating device itself by means of an appropriate connection. In alternative embodiments, the coupling means 240 can be an integral component of the singulating device 230.

In Figures 5 and 6, the singulating device 230 is shown in a dispensing position. One channel is aligned with the dispensing opening 221 in the bottom surface 220; drug portions arranged in the channel fall through the dispensing opening 221 into the chute 140 and from there pass to the interior of the blister packaging machine.

Above the channel which is aligned with the dispensing opening 221, the retaining section 216 of the retaining element 215 is fed into the annular chamber and ensures that no further drug portions slide out of the receiving chamber.

Figure 7 shows an exploded view of the singulating device 230 / drive transition in a second embodiment of the storage and dispensing station according to the invention. The outer contour of the drive hub 110 can be seen in an opening in the projection 121 of the top section of the base part. Above this can be seen the coupling means 240 and above this the singulating device 230. In this embodiment, the coupling means 240 is also designed as a separate component with reference to the singulating device 230.

Figure 8 shows a sectional view through the second embodiment, wherein a major part of the storage container has been omitted in order to show, in particular, the coupling between singulating device and drive.

5       An electric motor 112, which is connected to the contact means 124 by a cable 113, is arranged centrally in the base part 100. In this case, among other things, the contact means serves to supply power for the electric motor 112. Further, other components inside the base part or of the storage container can  
10 be connected to a control device (not shown) via the contact means. For example, a sensor (not shown), which determines whether a drug portion is actually dispensed in a dispensing operation, can be associated with the chute 140 or the dispensing opening in the bottom of the storage container.

15       The electric motor 112 comprises a drive shaft 111 which ends in a drive hub 110. The drive hub 110 has an outer contour (see Figure 7) which acts together with an inner contour 241 of the coupling means 240 in an interlocking and releasable manner. The coupling means 240 is (releasably) connected to the  
20 singulating device.

      The type of connection between drive hub 110 and coupling means 240 of the singulating device guarantees that the storage container can be easily removed from the base part without further working steps. Although, in the embodiment shown, the  
25 coupling means is designed separately with reference to the singulating device 230, a connection remains between coupling means 240 and singulating device on removal.

      According to the invention, it is provided that a conductor device is provided, by means of which the electrically  
30 conducting outer surface 231 of the singulating device 230 is coupled in an electrically conducting manner to the contact means. In the second embodiment, the coupling means 240, the drive hub 110, the drive shaft 111 and the electric motor 110 constitute components of the conductor device.

35       The coupling means 240 is electrically conducting and is connected to the electrically conducting outer surface 231 of the singulating device 230 in a conducting manner. This can be achieved, for example, by using a singulating device which

consists entirely of a conducting material (for example an electrically conducting plastic). Alternatively, cables can be provided from the outer surface to the coupling means. The drive hub and the drive shaft are likewise electrically conducting,  
5 wherein the above comments apply with regard to the exact design.

The electrostatic charge which occurs during separation or singulation can be dissipated via the outer surface of the singulating device to the coupling means and from there to the  
10 drive hub and drive shaft. The charge can be dissipated from the drive shaft via the motor and the cable 113 to the contact means 124, by means of which the charge is or can be finally dissipated to the blister packaging machine.

In this embodiment, no extra components are required to  
15 dissipate the charge; due to the design of existing components, the build-up of a potential difference is avoided and adhesion of drug dust and other fine contamination is prevented. The singulating device and/or other components of the storage container which come into contact with drug portions (circular  
20 cylindrical section 211 of the housing, the housing 210 itself) are effectively grounded via the blister packaging machine.

## Patent claims

1. A storage and dispensing station for a blister packaging  
5 machine for drug portions, having  
a base part (100),  
at least one contact means (124) with which a storage and  
dispensing station can be electrically coupled to a blister  
packaging machine and by means of which electrical charges can  
10 be dissipated to the blister packaging machine,  
a storage container (200) arranged on the base part (100)  
with  
a housing (210) enclosing a receiving chamber (202) for  
drug portions, which housing has a circular cylindrical  
15 receiving chamber (211) and a bottom surface (220),  
a singulating device (230) rotatably arranged in the  
circular cylindrical receiving chamber (211) of the housing  
(210), which singulating device comprises a plurality of  
channels (235) extending in an axial direction through the  
20 singulating device (230), and a coupling means (240),  
and a drive (110, 111, 112) for moving the singulating  
device (230),  
characterized in that  
the singulating device (230) is electrically conducting at  
25 least in the case of its outer surface (231) which comes into  
contact with drug portions to be singulated, and  
a conductor device is provided, by means of which the  
electrically conducting outer surface (231) of the singulating  
device (230) is coupled in an electrically conducting manner to  
30 the contact means (124).

2. The storage and dispensing station for a blister  
packaging machine for drug portions according to claim 1,  
characterized in that

the contact means (124) is provided at least in sections by means of a ground wire which is coupled to a motor (112) of the drive.

5        3. The storage and dispensing station (1) for a blister packaging machine for drug portions according to claim 1 or 2, characterized in that  
the electrically conducting outer surface (231) of the singulating device (230) is formed as a planar conducting  
10 coating.

4. The storage and dispensing station (1) for a blister packaging machine for drug portions according to one of claims 1 - 3,  
15 characterized in that  
the singulating device (230), at least in the case of its electrically conducting outer surface (231), is made of an electrically conducting material, preferably an electrically conducting plastic.

20 5. The storage and dispensing station (1) for a blister packaging machine for drug portions according to one of claims 1 - 4, characterized in that  
25 the conductor device comprises a slip ring (222, 215), which is arranged in the bottom surface (220) and/or in a housing section (217) which forms the circular cylindrical receiving chamber (211), and a contact element (236, 237) arranged in the singulating device (230).

30 6. The storage and dispensing station (1) for a blister packaging machine for drug portions according to one of claims 1 - 4, characterized in that  
35 the conductor device comprises an electrically conducting drive hub (110), an electrically conducting drive shaft (111), a motor (112), and an electrically conducting coupling means

(240), wherein the electrically conducting outer surface of the singulating device (230) is coupled in an electrically conducting manner to the coupling means (240) and wherein the motor (112) is coupled in an electrically conducting manner to  
5 the contact means (122).

7. The storage and dispensing station (1) for a blister packaging machine for drug portions according to claim 5, characterized in that  
10 surfaces of the bottom surface (220) and/or of the housing (210) which come into contact with drug portions are electrically conducting and are electrically coupled to the contact means (124).