

SINGLING DEVICE FOR BLISTER PACKS

The present invention relates to a device and a method for singling products, particularly products grouped in blister packs and similar multiple packages.

The invention has been developed particularly, but not exclusively, with regard to a device for singling products, such as unit doses of medicines grouped in blister packs, by separating portions of the blister pack, each containing a single product.

As is known, medicines such as tablets, pills, capsules and the like are usually packaged in single doses grouped in blister packs. A blister pack, as is known, comprises a backing with a series of bubble-like compartments called cells, in which the tablets or similar are housed. A covering film is stretched out flat on the backing, and seals the bubble-like compartments containing the tablets. Alternatively, the tablets may be enclosed in compartments created between two flexible films welded together.

Blister packs are a convenient packaging solution for persons who need to use medicines at home, because they keep each dose sterile, while grouping together various doses of an identical medicine, thus facilitating their identification. However, blister packs are much less suitable for use in hospitals, where it is preferable for medicines to be stored separately in single doses, for more accurate and regular distribution in the various departments according to the exact dosage required by each patient.

The advent of automatic medicine management systems in hospitals makes it necessary to provide a machine for automatically separating the individual doses grouped in blister packs.

There are known automatic singling devices for blister packs, including the singling device described in Interna-

tional Patent Application no. WO 2012/020354 by the present applicant, which has an ultrasonic blade projecting from a flat surface; a blister pack to be cut is placed on the flat surface and pressed on to it by a pad. The pad is then moved so as to shift the blister pack along the flat surface. As a result of the movement of the blister pack relative to the blade, the point of the blade follows a cutting path on the blister pack, thereby cutting it.

The object of the present invention is to provide an alternative singling device which is simpler and less subject to wear. A further object is to provide a device which is economical, reliable in use, and safe.

In order to achieve the aforementioned objects, the present invention proposes a device for singling products grouped in blister packs, comprising a gripper for clamping the blister pack, moved by a suitable movement system, a cutting head terminating in a blade connected to a sonotrode, and a counterpart for the cutting head, wherein the blade, in use, makes cuts in the blister pack in the form of successive rectilinear segments.

The present invention also relates to a method for singling products grouped in blister packs, comprising the steps of:

- clamping a blister pack with blister pack clamping means,
- moving the blister pack and positioning it between a cutting head terminating in a blade, connected to a sonotrode, and a counterpart for the cutting head,
- pressing the cutting head against the counterpart of the cutting head, thus creating a cut in the form of a segment of predetermined length.

Further characteristics and advantages of the invention will be made clear by the following detailed description of a preferred embodiment of the invention, which refers to the

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attached drawings provided purely by way of non-limiting example, in which:

- Figure 1 shows an overall view of a cutting station,
- Figure 2 shows the cutting tool included in the cutting station of Figure 1,
- Figures 3a-3c show three variants of a counterpart included in the cutting station of Figure 1,
- Figure 4 shows a gripper for keeping a blister pack clamped during the cutting in the cutting station of Figure 1,
- Figure 5 shows a station for profiling the blister pack, and
- Figures 6 and 7 show two views of the cutting station of Figure 1 and of the gripper of Figure 3 during the operation of cutting the blister pack.

With reference to Figure 1, the cutting station 10 comprises an ultrasonic cutting head 12, driven by a cutting head drive motor 14, and connected to a sonotrode 16. Preferably, the cutting head 12 does not terminate in a sharpened blade, but in a blade 15 having no cutting edge (more clearly visible in Figure 2), in other words one which still has a rectangular cross section at its end 18. However, the rectangular cross section has one dimension much greater than the other. It has been found that the life of a tool with a blade having no cutting edge is significantly longer, while the cutting precision does not vary substantially. The blade 15 is orientated horizontally and with the longer dimension of its rectangular cross section placed horizontally. Thus, at the end of the cut, the cut portion of blister pack falls vertically, without being impeded by the blade itself.

The sonotrode 16 is connected to the cutting head 12, so as to impart an ultrasonic oscillatory motion to the blade 15, for cutting a blister pack.

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The drive motor of the cutting head 14 is preferably a linear axis motor, enabling a simpler configuration to be used for an automatic cutting process. It is configured so as to move the cutting head along an axis perpendicular to the surface to be cut, on which the cutting head substantially acts as a punch. Thus it makes cuts in the form of successive segments.

The cutting station further comprises a counterpart 20 for the cut, visible in section in Figures 3a, 3b, 3c. The counterpart 20 may have different shapes. According to a preferred variant (Figure 3a), it comprises a flat surface 22 in which is formed a slit 24 into which the blade 15 is made to enter in use, so that its end 18 does not strike the flat surface 22. Additionally, the slit 24 is sufficiently deep to ensure that the blade 15 does not strike the bottom 26 of the slit 24.

Alternatively, the counterpart 20' may have a flat surface 22' having no slit, in such a way that, in use, the blade 15 strikes the flat surface 22'. As a further alternative, the counterpart 20'' may have a flat surface 22'' with a slit 24'' of reduced depth, so that, in use, the blade 15 enters the slit 24'' and strikes its bottom surface 26''. It should be noted that the blade preferably strikes the blister pack during the cut in such a way that the whole end 18 of the blade contacts the blister pack. In other words, during the cut, the end 18 is parallel to the surface to be cut, and the contact area is rectangular. This area therefore corresponds to the whole end of the cutting head.

The cutting station further comprises a pressure member 30, configured so that, in use, it presses a blister pack against the counterpart 20, 20', 20''. The pressure member 30 comprises a body 32 with a flat surface 34 adapted to contact the blister pack. The body 32 also has a through opening 35 to allow the passage of the blade 15 of the cutting head 12.

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The pressure member 30 is moved by a drive motor 36 of the pressure member with a linear axis, which moves the pressure member along an axis parallel to the axis of movement of the cutting head 12. The pressure member 30 is movable between a retracted position, in which it is distant from the counterpart 20, and an advanced position, in which it presses the blister pack against the counterpart 20.

An end stop 38 halts the travel of the pressure member 30, so that the latter does not apply excess pressure to the blister pack. This is because excess pressure may damage the blister pack or even break the tablets housed in it. Since different blister packs have cells of different depths, the end stop 38 can be selectively positioned in different positions, according to the depth of the cells of the blister pack being processed.

The cutting station also has a funnel 40 for collecting the doses singled by the blade. The funnel 40 is normally placed under the blade 15 and the counterpart 20, to collect each singled dose at the end of the corresponding cut. However, a blister pack may have a very large surface which is free of cells, or which contains only empty cells. In these cases, the unwanted portions of blister pack, which are waste material, must be removed during singling. The cutting station therefore includes a waste discriminator 42, driven by a waste discriminator drive motor 44. The waste discriminator comprises a movable body on which the collecting funnel 40 is fixed, and a waste container 46 with a movable bottom 48. The waste discriminator 42 is movable between a first position, in which the funnel 40 is placed under the blade 15 to collect the singled doses, and a second position, in which the funnel 40 is displaced and the waste container 46 is placed under the blade 15, to collect the waste material cut off by the blade.

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With reference to Figure 4, a gripper 50 for clamping the blister pack comprises a first protrusion 52 and a second protrusion 54, which are respectively movable towards and away from one another. Each of the protrusions has a respective gripping surface 56 and 58, preferably coated in a material with a high coefficient of friction, adapted to grip a blister pack when the two protrusions are brought together.

Preferably, the gripper is of the pneumatic type. The gripper 50 is preferably mounted at the end of a robotic arm 60, visible in Figure 5, 6 and 7; clearly, however, variants in which the movement takes place by means of a four-axis system are not excluded.

The singling device further comprises an analysis station 70, for detecting the shape and dimensions of blister packs, as well as the positions of the cells. The analysis station 70 comprises a transparent panel 72 for supporting the blister pack and a corresponding covering panel 71 which presses the blister pack against the support panel 72 during the analysis of the blister pack. Thus the blister pack is kept as flat as possible. Three projectors (not illustrated) and a video camera 74 are placed under the support panel 72, forming a stereoscopic viewing system. In a similar way to that described in Italian patent application no.

BO2013A000407 by the present applicant, the analysis station 70 reconstructs the position and shape of the cells. The analysis station may possibly be of a different type, comprising for example a laser line profiling system.

In use, a blister pack B to be singled is placed on the support panel 72, preferably with the cells facing downwards, that is to say bearing on the panel 72, and is pressed onto the latter by the covering panel 71. It is then illuminated in turn by the projectors; the video camera 74 detects the reflected light diffused by the blister pack B. The images obtained in this way are used by a central control unit (not

illustrated) for creating a schematic plan of the blister pack, showing its shape, dimension and position, as well as the shape, dimension and position of each cell.

The blister pack B is then gripped by the gripper 50 which is moved by the robotic arm 60 to displace the blister pack towards the cutting station 10.

With reference to Figures 6 and 7, the blister pack is placed between the counterpart 20 and the pressure member 30, in a first predetermined position according to the first cut to be made. The end stop 38 is translated so as to prevent the pressure member from advancing beyond a predetermined position, dependent on the thickness of the blister pack as detected by the analysis station 70. The pressure member drive motor 32 causes the pressure member 30 to be translated to its advanced position, up to the end stop 38, thus pressing the blister pack against the counterpart 20.

The cutting head drive motor 14 moves the cutting head 12 so that the blade 15 enters the through opening 35 of the pressure member 30 and strikes the blister pack B, making a rectilinear cut, the length of which is substantially equal to the length of the larger dimension of the cross section of the blade 15. According to the preferred embodiment, during the cut the blade 15 also enters the slit 24 of the counterpart 20. Alternatively, in the other two embodiments described above, the blade 15 bears, respectively, against the flat surface 20' and against the bottom surface 26" of the slit 24".

It should be noted that the pressure member 30 not only keeps the blister pack B stationary during the cut, but also keeps it flat, thus preventing any curvature of the blister pack B from making the cut inaccurate.

After cutting, the cutting head drive motor 14 moves the cutting head 12, causing it to retract. The blade 15 thus departs from the cut that has been made and from the pressure

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member 30. The pressure member 30 is also moved to its retracted position by the pressure member drive motor 32.

The blister pack B, which is now no longer retained by the pressure member 30, is moved by the gripper so that it is placed in a second predetermined position corresponding to the second cut to be made. The pressure member 30 is moved back to its advanced position, in which it presses the blister pack against the counterpart 20. The cutting head drive motor 14 moves the cutting head 12 so that the blade 15 enters the through opening 35 of the pressure member 30 and strikes the blister pack B, making a second rectilinear cut which, in most cases, preferably has one end coinciding with one end of the first cut made.

By proceeding in this way, a cut is made in the blister pack in the form of successive segments which gradually cause portions of the blister pack to be separated. When a portion of the blister pack has been completely cut off, it is detached from the rest of the blister pack. While the rest of the blister pack is retained by the gripper 50, the cut-off portion falls by gravity. The singling system is capable of predicting whether the portion contains a dose of medicine or is a waste product. Accordingly, the waste discriminator 42 is moved by the discriminator drive motor 44 so that the funnel 40 or the waste container 46 is placed on the falling path of the blister pack portion. If a waste product is present, the waste discriminator is again translated after the collection in the waste container 46, so that the funnel is positioned on the falling path. In this position, the openable bottom 48 of the waste container 46 is opened, thus allowing the newly collected waste to fall into a suitable large container for subsequent disposal. In Figure 6, the openable bottom 48 is shown open.

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The sequence of all the movements of the components of the singling device may be predetermined according to the type of incoming blister pack.

Clearly, provided that the principle of the invention is retained, the forms of embodiment and the details of construction can be varied widely from what has been described and illustrated, without departure from the scope of the invention.

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CLAIMS

1. A device for singling products grouped in blister packs or similar multiple packages, comprising:

- blister pack clamping means (50), moved by a suitable movement system,
- a cutting head (12) terminating in a blade (15), connected to a sonotrode (16), and
- a counterpart (20, 20', 20'') for the cutting head (12), wherein the blade (15), in use, makes cuts in the form of successive rectilinear segments.

2. A device according to the preceding claim, wherein the end (18) of the blade (15) is orientated so as to be parallel to the surface to be cut during the cutting.

3. A device according to any of the preceding claims, further comprising a pressure member (30), configured so that, in use, it presses the blister pack against the counterpart (20, 20', 20'').

4. A device according to any of the preceding claims, wherein the pressure member (30) comprises a body (32) with a flat surface (34) adapted to contact the blister pack and a through opening (35) through which the blade (15) of the cutting head (12) can pass.

5. A device according to any of the preceding claims, wherein the pressure member (30) is movable along an axis parallel to the axis of movement of the cutting head (12), between a retracted position, in which it is distant from the counterpart (20), and an advanced position, in which it presses the blister pack against the counterpart (20).

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6. A device according to any of the preceding claims, further comprising an end stop (38) for the pressure member (30), which can be selectively positioned in different positions according to the depth of the cells of the blister pack being processed.

7. A device according to any of the preceding claims, wherein the counterpart (20) comprises a flat surface (22) in which is formed a slit (24) into which the blade (15) can be inserted in use, the slit being deep enough to prevent the blade from striking the bottom surface (26) of the slit (24).

8. A device according to any of the preceding claims, wherein the blade 15 has no cutting edge.

9. A device according to any of the preceding claims, wherein the blade 15 terminates in a rectangular cross section.

10. A device according to any of the preceding claims, further comprising a waste discriminator (42), comprising a movable body on which is fixed a collecting funnel (40) and a waste container (46), the waste discriminator (42) being movable between a first position, in which the collecting funnel (40) is placed under the blade (15) to collect the singled doses, and a second position, in which the funnel (40) is displaced and the waste container (46) is placed under the blade (15), to collect the waste material cut off by the blade.

11. A method for singling products grouped in blister packs or similar multiple packages, comprising the steps of:
- clamping a blister pack with blister pack clamping means (50),

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- moving the blister pack so as to position it between a cutting head (12) terminating in a blade (15), connected to a sonotrode (16), and a counterpart (20, 20', 20'') for the cutting head (12),
- pressing the cutting head (12) against the blister pack, towards the counterpart (20, 20', 20'') of the cutting head (12), thus creating a cut in the form of a segment of predetermined length.