

A DEVICE FOR CUTTING PACKAGES CONTAINING A PLURALITY OF
PRODUCT UNITS

The present invention relates to a device for cutting packages containing a plurality of product units and in particular packages containing a plurality of pharmaceutical products, for example, tablets, capsules or phials. The present invention has been developed with particular reference to "blister" packs, that is, packages comprising a generally rectangular base element having four edge portions and made of rigid material, for example, card, plastics, or aluminium, on which a shell containing the product units is engaged.

There are many known devices for cutting packages of medicaments, of the type comprising means for supporting a package, cutting means disposed in the vicinity of a region for the cutting-off of a package portion and projecting from the support means, and feed means for feeding the package towards the cutting region. United States patent US 5,630,347, for example, describes a device for cutting a blister pack resting on a cutting surface and coming from a feed reel. The device comprises a blade which is driven by means of a rack and which cooperates with the edge of the cutting surface in order to separate a portion of blister pack projecting from the surface.

One of the main disadvantages that is common to known devices is cutting inaccuracy since, instead of being cut, the projecting portion of the blister pack often bends under the thrust of the blade and becomes caught between the blade the edge of the cutting surface, preventing further operation of the device. This cutting inaccuracy sometimes leads to the projecting portion of the blister pack being only partially cut off and frequently acquiring an edge which has not been

cut cleanly, causing separation of the layers of which the blister pack is formed and inevitable leakage of the doses.

Another disadvantage of known devices is the poor adaptability of the device to the dimensions of the blister pack so that, for blister packs and/or portions thereof which have different dimensions it is necessary to use a further device which is arranged for receiving a blister pack and/or a portion of different dimensions.

The object of the present invention is to overcome the problems of the prior art and in particular to provide a device for cutting packages of the type indicated above which performs clean and effective cutting that gives rise to a cut-off package portion with well-defined and intact edges.

Another object of the present invention is to provide a device which furnishes the above-mentioned cutting conditions irrespective of the dimensions of the package.

A further object of the present invention is to provide a device which can be produced economically, is easy to use, and is very reliable.

In order to achieve the objects indicated above, the subject of the invention is a device for cutting packages of the type indicated in the introduction to this description, as defined in the appended claims.

In a preferred embodiment, the cutting means comprise a first blade and a second blade which act on opposite sides of the package or blister pack in use in order to perform the cutting-off of the projecting portion. For example, the two blades may be articulated like scissors, only one blade or both blades being movable. The blades may be connected to linear actuators which bring about the cutting action.

In a particularly advantageous variant of the present invention, receiving means such as, for example, surfaces or hoppers, are mounted or formed in the vicinity of the blades, for receiving the cut-off projecting portion of blister pack. The portion of blister pack can thus be collected and transferred to a second cutting region disposed, for example, on a side of the device, in order to perform a second cutting operation without the need to use a further device.

According to a particularly advantageous embodiment, the device comprises means for guiding the blister pack from a blister-pack input region towards a first cutting region, for example, such as a passage with a sliding surface delimited by straight parallel profiled bars. The repeatability of the correct positioning of the blister packs in the cutting region is thus ensured. In addition to this, the guide means may be movable so as to be adaptable to the dimensions of the blister packs so that the guide means are immediately compatible with each new blister-pack format to be supplied thereto. In a preferred variant of the present invention, the device comprises symmetrical internally threaded drive systems which are connected to a common motor and bring about parallel translation of the profiled bars so that their adaptation to the blister pack is fully automated.

Further characteristics and advantages will become clear from the following detailed description with reference to the appended drawings which are provided purely by way of non-limiting example and in which:

Figure 1 is an axonometric view of a cutting device for blister packs according to the present invention,

Figure 2 is an axonometric view of the device of Figure 1 arranged in a different orientation,

Figure 3 shows, on an enlarged scale, a detail of Figure 1 from which some elements have been omitted to give a better view of the concealed parts,

Figure 4 is a section taken on the line IV-IV of Figure 1, on an enlarged scale,

Figure 5 is a section taken on the line V-V of Figure 1, on an enlarged scale,

Figure 6 is a partial axonometric view of an alternative embodiment of the present invention in a stage of its operation,

Figure 7 is a partial axonometric view of the device of Figure 6 in a further stage of its operation,

Figure 8 is a partial axonometric view of a cutting device for blister packs according to the present invention comprising a pressing unit for pressing blister packs, and

Figure 9 is a partial axonometric view of the device of Figure 8 arranged in a different orientation and at different stage of operation.

With reference now to the attached Figures, a device 10 for cutting packages, for example, blister packs 120 containing capsules, tablets, doses of medicaments, or the like, comprises a main body 12.

Cutting means are mounted on the main body 12 and comprise a first cutting unit 14 disposed in a first cutting region 16 and a second cutting unit 18 disposed in a second cutting region 20. Guide means are also mounted on the main body 12 and comprise a guide unit 22 for blister packs and feed means

comprising a feed unit 24 for feeding the blister packs 120 towards the first cutting region 16.

The main body 12 preferably takes the form of a general support frame for units of the device 10, for example, a parallelepipedal box which is open on one side in the vicinity of the first cutting region 16 and on one side for access to the guide unit 22.

Each blister pack 120 comprises a generally rectangular base element which has four edge portions 130 and is made of rigid material, for example, card, plastics, or aluminium, and on which a shell containing the product units is engaged.

A first unit 14 for cutting a blister pack 120 is mounted externally on the side of the box 12 in the first cutting region 16 and comprises, for example but in non-limiting manner, a first blade 26 and a second blade 28 which are articulated like scissors and are spaced from the edge of the box 12 and from any support point of the blister pack 120. The first blade 26 is cantilevered on a support block 30 which keeps it stationary relative to the box 12. The second blade 28 has an end 32 which is remote from a cutting portion 34 and which is articulated to an actuator 36 from which it receives the cutting motion. The actuator 36 is preferably of a linear type, such as a pneumatic cylinder or an electrically driven thrust member, and is connected to the side of the box 12 corresponding to the cutting region 16 by means of a bracket 38. Means for receiving the cut-off portion of the blister pack 120 are also mounted on the box 12 and comprise one or more elements having ends 31 which project outwards beyond the blades 26 and 28. Receiving surfaces 33, on which the cut-off portion of blister pack is deposited are formed on the upper sides of the ends 31.

The second cutting unit 18 is mounted, preferably but in non-limiting manner, on a side of the box 12 perpendicular to the side on which the first cutting unit 14 is mounted and comprises a first blade 40 and a second blade 42 which are articulated like scissors. The first blade 40 is cantilevered on a block 44 which keeps it stationary on the box 12. The second blade 42 has an end 46 which is remote from a cutting portion 47 and which is articulated to an end of a linear actuator 48 which is preferably of the same type as the linear actuator 36 and is connected, at the opposite end, to the box 12. One or more elements 41, for example, blocks fixed to the box 12, project beside or beneath the blades 40 and 42 and a surface 43 for receiving the cut-off portions of blister pack is formed on their upper sides.

Naturally, a person skilled in the art will be able to identify different cutting means which can perform a cutting operation on the packages which starts on the edge portions of the packages, such as, for example, a hot, incandescent, or laser cutting device, without thereby departing from the scope of the present invention.

The guide unit 22 preferably comprises a pair of profiled bars 50 mounted parallel to one another inside the box 12 so as to form a guide channel for the blister packs, which opens into the first cutting region 16. The profiled bars 50 are movable parallel to one another and relative to a support surface 52 for the blister packs 120 or to any other equivalent support means. In the vicinity of the first cutting region 16, at least one profiled bar 50 has a groove 54, shown in Figure 3, of sufficient width for the insertion of the edge of a blister pack 120. The groove 54 is formed in a thickened portion 56 of the profiled bar 50 and has an inclined lead-in plane 57 at its opening remote from the cutting region 16.

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A position sensor 51 is preferably mounted firmly on one of the profiled bars 50 with a portion 51a that is sensitive to the edge of the blister pack 120 facing towards the adjacent profiled bar 50.

With reference now to Figure 3, each of the profiled bars 50 is preferably connected to threaded shafts 58, for example, two threaded shafts 58, which extend through holes 60 in the box 12 in order to project outside the box. The holes 60 are of larger diameter than the shafts 58 so that the shafts 58 can rotate freely inside them with ample clearance. Each shaft 58 is coupled with an internally threaded member 62, shown in Figure 4, which is mounted on a pulley 64. Each pulley 64 is mounted on a flange 66 so as to be freely rotatable by virtue of bearings 68 coaxial with the holes 60 and keeps a belt 70 under tension. Preferably, there is a belt 70 on each of the sides of the box 12 from which the shafts 58 project, the belt 70 forming a closed loop around the pulleys 64 which are connected to the shafts 58 projecting on that side. In the embodiment illustrated in Figures 1 and 2, two belts 70 are visible; these belts 70 form respective closed loops arranged symmetrically with respect to the box 12 and are coupled with drive pulleys 72. The drive pulleys 72 in turn are connected by means of a drive shaft 74 which extends through the box 12 and is connected to an electric motor 76.

As shown in Figures 2 and 5, the feed unit 24 comprises a thrust member 78, for example, in the form of two teeth 80 projecting from the support surface 52 and made of sheet metal or bars of various cross-sections. The teeth 80 are slidable parallel to the support surface 52 along a guide 82 to which they are connected by means of two blocks 84. An internal thread 86 is formed in one of the two blocks 84 and is coupled with a threaded shaft 88 which is parallel to the guide 82, is of a length approximately equal to that of the

box 12, and is connected to a drive system 89. The drive system 89 preferably comprises a pulley 90 fitted on the end of the shaft 88 that projects outside the box 12, an electric motor 94 connected to a drive pulley 96, and a connecting belt 92 between the drive pulley 96 and the pulley 90. A plate 98, for example, bent into an L-shape, or any other device suitable for preventing the lifting of a blister pack 120 from the support surface 52, for example, such as a pressing unit, is fixed to the box 12 above the support surface 52. The plate 98 comprises a flange 100 facing and parallel to the guide 82 so as to leave a space equal to or greater than the thickness of a blister pack 120 between the two.

As shown in Figures 8 and 9, one of the preferred embodiments of the present invention comprises a pressing unit 150 for pressing the blister pack 120 on the support surface 52. The pressing unit 150 is mounted at an edge of the support surface 52 corresponding to the first cutting zone 16 and comprises an U-shaped main body 152 fixed to the main body 12. Pressing means 154, such as, for example, a shaped bar with a front portion 156, facing the first cutting zone 16, thinner than a back portion 158, is selectively tiltable to pass from a position substantially parallel to the support surface 52 to the tilted position shown in figure 9, and vice-versa. The pressing means 154, preferably, comprises longitudinal passages 160 for the teeth 80 of the feed unit 24. The pressing means 154 can comprise a single bar or a compound bar comprising, for example, a back portion 158 articulated to the front portion 156 so that only the back portion 158 is tiltable.

A control system 102 as shown in figure 1, the cutting device 10, is preferably connected to the first and second cutting units 14 and 18, to the guide unit 22, and to the feed unit 24. The control system 102 may also be connected to sensors

104 such as, for example, photocells or feelers, mounted at various points of the device 10, for example, at the output of the groove 54 in the first cutting region 16, in order to detect some states of the system and to collect data relating to the blister packs. In addition or alternatively, the control system 102 may contain a memory in which predetermined programs for the operation of the device 20, corresponding to various types of blister pack, are stored, and an interface for the selection of one of these programs. The control system 102 can comprise also position control means 162 and/or pressure control means 164 to control, respectively, the position of the pressing means 154 of the pressing unit 150 and the pressure exerted, in use, by said pressing means 154 on a blister pack 120.

In use, a blister pack 120 of the type commonly contained in packages sold in pharmacies, containing medicaments in separate doses, is first of all placed on the support surface 52. The position sensor 51 sends information to the control system 102 relating to the position of the edges of the blister pack 120 and, in response, the control system operates the motor 76 in order to move the profiled bars 50 towards one another or apart until the space between them is sufficient to house the blister pack 120. The motor 76 brings about rotation of the drive pulleys 72 which drive the pulleys 64 by means of the belts 70. As the pulleys 64 rotate they move the internally threaded members 62 bringing about translation of the threaded shafts 58 with which they are coupled, and hence of the profiled bars 50 fixed to the shafts.

The control system then operates the feed unit 24 by activating the motor 94 which rotates the threaded shaft 88 by means of the belt 92 and the pulleys 90 and 96. The threaded shaft 88 in turn brings about rectilinear translation of the blocks 84 by means of the internally

threaded member 86. The blocks slide on the guide 82 towards the first cutting region 16, pulling along the teeth 80 which come into abutment with the blister pack 120 and urge it in a preferential direction towards the first cutting region 16. When the edge of the blister pack 120 encounters the inclined lead-in plane 57, it is forced to enter the groove 54 which guides and supports it as far as the start of the cutting region 16.

As shown in Figure 7, when a portion of blister pack containing the desired number of doses, for example, measured by means of the sensors 104, projects from the end of the groove 54 beyond the blades 26 and 28, the control system 102 stops the feed system 24 and activates the pneumatic cylinder 36. The blades 26 and 28 are opened out in positions ready for cutting on two opposite sides of the blister pack 120 and the thrust of the pneumatic cylinder 36 on the end 32 of the second blade 28 causes it to close in a scissor-like manner onto the first blade 26 which remains stationary. The first and second blades 26, 28 act on opposite sides of the blister pack 120, performing a cutting operation which starts on the edge portion 130 of the blister pack 120 and continues along a line which is situated on the portion of the blister pack 120 that projects from the groove 54, and which is spaced from any support provided by the parts of the device 10.

The projecting blister-pack portion which has just been separated remains on the receiving surfaces 33 from which it is picked up for use or for further division. In the latter case, one or more suction cups mounted on a movable device (not shown) preferably but in non-limiting manner pick up the blister-pack portion and transport it to the second cutting region 20 where the first and second blades 40 and 42 are in the open position. The same operation may be performed manually by an operator or with the use of any automated system of known type. A blister-pack portion to be separated

is held projecting through the open blades by means of the suction cups or the receiving surface 43 so as to be suspended in air. The control system 102 operates the pneumatic cylinder 48 the thrust of which closes the blade 40 in a scissor-like manner onto the blade 42 which remains stationary, giving rise to a cut along a line that is spaced from any point of support on the suction cups or on the receiving surface 43. The projecting blister-pack portion which is thus separated is received on the receiving surface 43.

In a preferred embodiment, the receiving surfaces 33 and 43 cooperate to provide respective second supports for the projecting blister-pack portions, separate from and outside the cutting regions 16 and 20, to prevent the blister-pack portions from bending during the cutting by the action of the second blade 28 or 42.

One of the main advantages of the device described above is that the thrusts which the cutting means exert on the sides of the blister pack 120 in the direction in which it offers least resistance to bending cancel one another out completely whereas, in contrast, the thrusts which they exert in the direction in which the blister pack offers most resistance to bending are added together, giving rise to a progressive propagation of the cut in that direction, preventing any bending of the blister pack or catching between the blister pack and the cutting means.

By virtue of its extensive adjustment and control capabilities, the device can be used in association with blister packs of different types and not necessarily only of the type containing medicaments. Adaptation to the measurements of the blister pack to be cut is automatic and quick and can also be performed upon each new working cycle. Naturally, the arrangements described for driving the various

members are given purely as examples of the construction of the cutting device 10 and may be replaced by any equivalent systems.

Naturally, the principle of the invention remaining the same, the characteristics and principles of construction may vary widely from those described and illustrated without thereby departing from the scope of the present invention.

CLAIMS

1. A device for cutting packages of product units, comprising support means (52, 54) for packages (120) having at least one edge portion (130), cutting means (14, 18) particularly suitable for cutting the packages in use, and feed means (24) for feeding the packages towards the cutting means (14, 18), the cutting means (14) being mounted, separated by the support means (52, 54), in a position such as to perform a cutting operation on the packages starting on the at least one edge portion (130) of each package, the device further comprising a second cutting region (20), characterized in that the cutting means (14) comprise at least one pair of blades (26, 28) articulated like scissors, which act on the said edge portion of each package in order to perform the cutting operation, in use.

2. A cutting device according to Claim 1, characterized in that it comprises receiving means (33) in the vicinity of the first and second blades (26, 28) for receiving the cut-off portions of packages.

3. A cutting device according to Claim 2, characterized in that the cutting means (18) comprise a second pair of blades (40, 42) articulated like scissors and disposed in the second cutting region (20).

4. A cutting device according to Claim 3, characterized in that it comprises a package-input region and guide means (50, 52, 54) for guiding the packages from the input region towards the first cutting region (16) in use.

5. A cutting device according to Claim 4, characterized in that the guide means (50, 52, 54) are adjustable.

6. A cutting device according to Claim 5, characterized in that the guide means comprise two parallel profiled bars (50) movable in a parallel manner and each having a portion (56) which is disposed adjacent the first cutting region (16) and on which are formed a guide groove (54) for the packages and means (57) for the insertion of the packages in the groove (54).

7. A cutting device according to any one of Claims 1 to 6, characterized in that it comprises a pressing group (150).

8. A method of separating a plurality of product units contained in packages, characterized in that it comprises the following steps:

- providing a cutting device of the type comprising first cutting means located in a first cutting region, the first cutting means comprising at least one pair of blades (26, 28) articulated like scissors, and feed means (24) for feeding at least one package towards the first cutting means (14),

- performing a first cutting operation on a portion of the package in order to separate a portion of package containing two or more packaged product units,

- positioning the cut-off package portion containing two or more packaged product units on support means (41),

- feeding the cut-off portion towards second cutting means located in a second cutting region, and

- performing a second cutting operation on the cut-off package portion in order to separate a second portion of package containing a single packaged product unit.

9. A separation method according to Claim 8, characterized in that the cutting device is defined by any one of Claims 1 to 7.

10. A separation method according to Claim 9, characterized in that each package comprises a base element made of rigid material on which a shell containing units of pharmaceutical products is engaged.

11. A system for separating a plurality of product units contained in packages, characterized in that it comprises a cutting device according to any one of Claims 1 to 7.