

Individual blister pack for optimized stacking

The present invention relates to individual blister packs, methods for production thereof, stack-like arrangements containing individual blister packs of this type, and boxes containing stack-like arrangements of individual blister packs.

Blister packs have long been known. Medicinal product portions, such as tablets and capsules, are preferably supplied in blister packaging as primary packaging. In a blister pack, the tablets or capsules are present in an arrangement of individual indentations (bubbles). The indentations are usually sealed by an aluminium foil. The medicinal product portions can be removed individually and are protected against dirt and air moisture. A further advantage of medicinal product portions in blister packs lies in the easy identification of the remaining number of available medicinal product portions.

A typical blister pack is illustrated in Figure 1a of the laid-open application GB2184086A: 15 individual medicinal product portions are provided in a planar arrangement of approximately 6-8 cm x 4-6 cm.

Blister packs are typically introduced into yet a further packaging before being passed on to the patient. This secondary packaging is typically a folding box which, besides a number of approximately 1 to 10 blister packs, usually also contains a package leaflet containing use and safety information. The secondary packaging prevents a shifting of blister packs stacked on top of one another. It is required essentially only for transport and is accrued by the user as waste. On account of the bulky and voluminous bubble structure of conventional blister packs, the secondary packaging is also comparatively voluminous.

Different approaches have been followed in order to simplify and make smaller the secondary packaging.

DE 10044118 A1 discloses a blister pack, which, besides the indentations for receiving medicinal product portions, additionally has centring nubs, which extend beyond the underside of the indentations. The blister pack additionally has supporting nubs, which likewise protrude beyond the underside of the indentations. Perforations are disposed in the cover, in the region of each centring nub, such that, when the blister packs are stacked in alignment, each centring nub of a blister strip rests against a perforation of the blister strip disposed beneath. If a stack of blister packs of this type is pressed together, the centring nubs destroy the perforations disposed beneath, and the centring

nubs protrude into the resultant openings. The blister packs are thus centred relative to one another in the horizontal plane in an interlocking manner. Here, the supporting nubs rest against the cover film of the blister strip disposed beneath, such that the blister strips are supported against one another. Since the blister packs stacked above one another cannot shift relative to one another, it is possible to dispense with a complex surrounding packaging, or such packaging can be formed in a very simple manner. However, it is disadvantageous that, as a result of the described stacking, there is no volume reduction of the surrounding packaging compared with a stacking of similar blister strips without centring nubs. Furthermore, an individual blister strip cannot be easily removed from the surrounding packaging; it must first be removed from the stack, which is possible only in one direction.

DE 19680564 T1 discloses a foldable blister strip. It has two parallel rows of bubbles, which are offset relative to one another in such a way that the bubbles in one row enter the gaps between the bubbles in the other row when the blister strip is folded. The folded blister strip thus takes up less space compared with when the rows of bubbles are stacked above one another in the conventional manner. However, for use, the folded blister strip must first be removed from the surrounding packaging and unfolded, which is comparatively laborious. A similar foldable blister pack is also disclosed in DE 29780456 U1.

The previously described blister packs contain more than one medicinal product portion. However, a patient generally takes just an individual medicinal product portion at the time at which said medicinal product portion is to be taken. If, for example, the patient must take a medicinal product portion every day, the patient will gradually empty the blister pack by removing an individual medicinal product portion each day. A patient often carries with them a blister strip containing a plurality of medicinal product portions, for example in order to have ready a medicinal product portion as required and/or in order to be reminded to take said medicinal product portion regularly. Generally, more medicinal product portions than are actually used are thus generally carried with the patient. There is thus a risk that the blister strip will be lost or damaged and individual medicinal product portions will be lost, will become broken, will become wet, or will become otherwise unusable.

Similar problems can occur in hospitals, care homes or comparable establishments in which medicinal product portions are provided to the patients/residents by the care staff. In an establishment of this type, the member of care staff often removes individual medicinal product portions from the blister packs, which contain a plurality of medicinal product portions, and gives the individual product portions to the patients in small containers when said portions are to be taken. It is conceivable that

mix-ups can occur here. It is also conceivable that a container of this type accidentally tips over and the content falls to the ground. It is conceivable that the spilled medicinal product portions therefore can no longer be used for hygiene reasons. However, it is also conceivable that the spilled medicinal product portions can no longer be assigned to the patients. In some establishments it is also usual for medicinal product portions to be removed from blister packs and stored in day or week pots/boxes, where they are exposed to light and moisture (in particular when the rations are stored in a bathroom). In this respect, it would be advantageous if the medicinal product portions remained packaged in a blister pack until just before their removal by the patient, said blister pack containing the necessary labelling in order to clearly identify the content.

In order to solve the specified problems, blister strips are offered which have perforations so as to be able to separate off individual bubbles containing medicinal product portions (see, for example, EP 679587 A1). It is thus possible for the patient to carry with them only the amount of medicinal product portions actually used. It is also possible to give packaged medicinal product portions to a patient in a hospital or a resident in a care home. However, these blister units generally do not have the complete information concerning the content, since the labelling on the rear side of a blister strip is usually destroyed by separating off individual blister units. In addition, when separating off individual blister units, there is the risk that blister strips and/or blister units will be damaged; by way of example, the cover film can tear. By separating off individual units, sharp edges and corners are additionally often produced, on which a person can injure themselves, or as a result of which damage to materials can be caused, for example when blister units or remainders of blister strips without surrounding packaging are stored in pockets or coats.

In addition, blister strips having a fixed number of a plurality of medicinal product portions limit flexibility. By way of example, if a blister strip contains 10 medicinal product portions, only packs containing this number or a multiple thereof (20, 30, etc.) can be offered.

The problem forming the basis of the present invention is therefore that of providing medicinal product portions in packaged form that allows a greater degree of flexibility and reliability when it comes to provision and handling, and at the same time is space-saving and resource-saving.

This problem is solved in accordance with the invention by the subjects of independent Claims 1, 12, 20 and 21. Preferred embodiments can be found in the dependent claims.

A first subject of the invention is a stack-like arrangement of N individual blister packs, where N is an integer greater than 1,

each single individual blister pack comprising

- a planar main body with a bubble,
- one or more medicinal product portions in the bubble, and
- a cover film, which closes the bubble,

the height h_S of the stack-like arrangement being less than N -times the sum of the height h_B of a bubble, the thickness d_G of a planar main body and the thickness d_D of a cover film:

$$h_S < N \cdot (h_B + d_G + d_D).$$

A medicinal product portion is understood to mean a solid administration form of a medicinal product that can be taken by a patient as an individual unit. Examples of medicinal product portions are tablets, pills, lozenges and capsules.

An individual blister pack is understood to mean a combination of an individual blister packaging and a medicinal product portion or a plurality of medicinal product portions. One or more medicinal product portions is/are packaged in the individual blister packaging and together with this individual blister packaging form an individual blister pack containing one or more medicinal product portions, or an individual blister for short. The term "individual" relates to the number of bubbles. An individual blister is therefore a unit having an individual bubble. Synonymous terms that are used in the prior art instead of the term bubble are cavity and indentation, for example.

The individual blister packaging comprises a planar main body. The planar main body usually consists of a film layer. A further film layer – referred to here as the cover film – serves to seal the bubble.

A planar body is understood to mean a body that, in two of the three spatial directions in a Cartesian coordinate system, has a greater extent than in the third spatial direction. If it is imagined that the bubble is not there and if it is assumed that the main body does not have any curvature, the extent in the third spatial direction (z-direction, thickness of the film layer) is only a fraction of the extent in the two other spatial directions (x- and y-direction). The thickness of the film layer d_G (extent in the z-direction) is preferably less than a tenth of the extent in the orthogonal spatial directions extending perpendicularly to the thickness (x- and y-direction), particularly preferably less than a twentieth.

The planar main body preferably has no curvature or only a slight curvature. In a preferred embodiment the radius of curvature is at least 10 times the extent in the x- and/or y-direction. In a particularly preferred embodiment the radius of curvature is at least 20 times the extent in the x- and/or y-direction. In an even more particularly preferred embodiment the radius of curvature is at least 50 times the extent in the x- and/or y-direction.

It is clear to a person skilled in the art of plastics processing that the planar main body always has a certain curvature, even if the objective is to form the main body (with the exception of the bubble) as flat as possible. The introduction of the bubble into the main body, which is usually implemented by thermoforming, can cause stresses in the main body, which lead to a curvature. Furthermore, curvatures can be introduced into the main body by the mechanical processing, such as printing, cutting, gripping (for example during transport), etc. The application of the cover film also constitutes a mechanical loading, which can lead to a deformation. For the sake of simplicity, an ideal, uncurved main body is assumed in the present description. However, this is only so as to be able to better present the invention and is not to be understood as a limitation of the invention.

The planar main body can assume a wide variety of forms. It can assume a circular, oval, triangular, quadrangular (for example rectangular or square), pentagonal, hexagonal and further basic forms in the xy plane, and the corners can be rounded in each case.

The planar main body preferably has a square, rectangular or angular basic form in the xy plane, however the corners can be rounded. The term "angular" is explained in greater detail further below.

The corners of the planar main body are preferably rounded in order to avoid injury to the individuals handling the individual blisters and/or in order to avoid damage to materials with which the individual blisters come into contact.

The main body must at least be large enough for a bubble for receiving a medicinal product portion to be introduced and for the bubble to be closed by a cover film. A typical size is, for example, an extent in the x- and y-direction from 0.6 cm to 6 cm and in the z-direction from 0.2 mm to 2 mm. However, the main body can also be larger or smaller.

Information regarding the medicinal product situated in the bubble is preferably applied to the cover film. Information of this type can be, for example, the name of the active substance, the name of the

manufacturer and/or distributor, a batch number, the expiry date, a dosage, and other information. Some information is requested by authorities monitoring a circulation of medicinal products, and other information can be useful for the individuals encountering the packaged medicinal product, for example patients, doctors, care staff, transport and logistics companies, packers, etc.

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Information regarding the time at which the medicinal product is to be taken is also useful. For example, specific colourings can be used; for example a red colour for taking the medicinal product in the morning and a blue colour for taking the medicinal product in the evening/at night is conceivable.

10 It is also conceivable for information to be applied to the cover film, which information provides access to further information, for example an optical code which provides information via the Internet regarding risks and side effects.

The provision of medicinal product portions and individual blisters thus provides a high flexibility with regard to individual design possibilities. The individualization of the individual blisters, for example by an individual optical code, is also conceivable.

Information can additionally or alternatively also be applied to the main body on the belly side. The belly side is the side on which the bubble protrudes from the main body and the side arranged opposite the side on which the cover film is applied.

20 The main body therefore has a minimum size, which makes it possible to apply at least the legally required information to the main body and/or the cover film.

25 A particular minimum size additionally offers the advantages that the individual blister will not be so quickly lost, and that it can be more easily handled and opened, in particular for older individuals.

Of course, information can also be introduced for example as an engraving into the main body and/or the cover film.

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The bubble is formed in the main body. It usually serves to receive an individual medicinal product portion. However, it is also conceivable for a plurality of medicinal product portions to be situated in a bubble. For example, it is conceivable for the active substance quantity that must be taken by a patient at a defined moment in time to be too large for an individual medicinal product portion

because problems can occur during swallowing. It can therefore be expedient to divide the active substance between a plurality of smaller medicinal product portions. The bubble preferably contains at the most four medicinal product portions; it particularly preferably contains a single medicinal product portion.

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The bubble can be formed in the main body centrally or in a decentralized manner. The terms “centrally” and “decentralized” will be explained in greater detail further below.

10 The cover film is applied to what is referred to as the rear side of the main body and closes the bubble, which protrudes from the main body on the opposite belly side. Figure 1 illustrates this.

Figure 1 shows an example of an individual blister 1 in plan view and from two sides. The individual blister 1 comprises a planar main body 2, in which a bubble 3 is formed. In the bubble 3 there is situated a single medicinal product portion (not illustrated in Figure 1). The bubble is closed by a cover film 4.
15 The bubble 3 is formed centrally in the planar main body 2. The basic shape of the main body is rectangular - the corners being rounded.

The cover film extends usually, but not necessarily, over the entire rear side of the main body and terminates flush with the edges of the main body. The cover film thus preferably likewise has the basic
20 shape of the main body and in the ideal case is flat (without curvature).

In the stack according to the invention, the cover films preferably lie in planes extending parallel to one another.

25 There are various possibilities for stacking which, in the case of cover films extending in parallel, are provided by the orientation of the cover films with respect to the direction of the force of gravity. In the “simplest case” the cover films extend horizontally to the force of gravity and the individual blister packs are stacked “on top of one another”. In another case the cover films extend vertically to the force of gravity and the individual blister packs are stacked “adjacently”. In addition, the cover films
30 can be brought into any other orientation between “vertical” and “horizontal” by rotation of the stack. The present invention is not limited to any orientation of the stack with respect to the force of gravity. The term “stack” in the present description is interpreted more broadly than in colloquial language, in which case it is usually understood to mean only an “arrangement on top of one another”. The term “height h_s of the stack-like arrangement” also is not to be understood to mean that only individual

blisters stacked “on top of one another” are the subject of the present invention. The term “height” is thus interpreted here more broadly than is usually understood thereby. These considerations, which are assumed of cover films extending in parallel, also are not intended such that they apply only to stacks with cover films extending in parallel. By way of example, the present invention also includes
5 stacks in which the cover films of the individual blisters do not lie in planes extending parallel to one another.

For the following consideration, a stack is assumed in which the cover films of the individual blisters are arranged horizontally to the force of gravity, and the individual blisters are therefore arranged “on
10 top of one another”. This therefore results in an individual blister disposed at the very bottom in the stack and an individual blister disposed at the very top in the stack. Further individual blisters can be situated therebetween. In a stack of this type an adjacent individual blister is to be understood to mean the individual blister that is in contact with the individual blister in question. Here, the adjacent individual blister can be situated above or below the individual blister in question. The individual blister
15 at the very bottom has only a single adjacent individual blister; this lies above the individual blister situated at the very bottom. Similarly, the individual blister at the very top also has just one adjacent individual blister; this lies below the individual blister situated at the very top. Should further individual blisters be provided between the individual blisters at the very bottom and at the very top, these each have two adjacent individual blisters, one of the adjacent individual blisters being situated above the
20 individual blister in question, and the other of the adjacent individual blisters being situated below the individual blister in question. Similar considerations apply to a stack in which the individual blisters are arranged “adjacently”.

Typical numbers N of individual blisters in a stack-like arrangement are 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14,
25 16, 18, 20, 21, 28, 30 and 31. However, other quantities are also conceivable.

In a preferred embodiment, N is an integer in the range from 2 to 31.

In a further preferred embodiment, N is 7.

In a further preferred embodiment, N is 28.

In the stack according to the invention the bubbles preferably point in the same direction. However, it is also conceivable for the individual blisters to be arranged rear side to rear side and belly side to belly side in alternation. Mixed forms of the specified stack forms are also conceivable.

- 5 In a conventional blister stack, in which N blisters are stacked rear side to belly side, the height h_S of the stack-like arrangement is N times the sum of the height h_B of a bubble, the thickness d_G of a flat main body and the thickness d_D of a cover film:

$$\text{Conventional blister stack: } h_S = N \cdot (h_B + d_G + d_D)$$

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This is illustrated in Figure 2, where, for schematic reasons, the thickness D of the film composite consisting of the flat main body and the cover film is specified. The following is true: $D = d_G + d_D$.

The stack height is reduced in accordance with the invention:

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$$\text{blister stack according to the invention: } h_S < N \cdot (h_B + d_G + d_D)$$

In a preferred embodiment the height of the stack-like arrangement is:

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$$h_S = N \cdot (d_G + d_D) + h_B$$

In a particularly preferred embodiment, the following is true for the stack height:

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$$N \cdot (d_G + d_D) + h_B \leq h_S < N \cdot (h_B + d_G + d_D)$$

in a further preferred embodiment the height of the stack-like arrangement is:

$$h_S = (N - 1) \cdot (d_G + d_D + h_N) + (h_B + d_G + d_D), \text{ where } h_N < h_B$$

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h_N denotes the height of the supporting structures, which will be described in greater detail further below.

In a further preferred embodiment the height of the stack-like arrangement is:

$$h_S = \frac{1}{2} \cdot (N+1) \cdot (h_B + d_G + d_D)$$

In one embodiment of the present invention the individual blisters are stacked such that the cover film of an individual blister rests on the main body of an adjacent individual blister in a region that lies beside the bubble. Figure 3 illustrates this embodiment.

Figure 3 shows an example of an arrangement according to the invention in plan view (bottom) and from a side (top). Seven examples (1-1, 1-2, 1-3, 1-4, 1-5, 1-6, 1-7) of the individual blister 1 from Figure 1 are arranged on top of one another in a stack-like manner. All bubbles point in the same direction. The individual blister 1-1 is arranged at the very bottom in the stack. The individual blister 1-2 rests on the individual blister 1-1. Here, the cover film of the individual bubble 1-2 rests on the main body of the adjacent individual bubble 1-1, more specifically in a region beside the bubble. For the individual blister 1-7, it is specified which side is the belly side B and which side is the rear side R. The belly side B is therefore the side on which the bubble 3 protrudes from the main body 2. The rear side R is the side on which the cover film 4 is applied that closes the bubble 3.

The height of the stack-like arrangement shown in Figure 3 is:

$$h_S = N \cdot (d_G + d_D) + h_B = 7 \cdot (d_G + d_D) + h_B$$

If the stack from Figure 3 is projected onto the plane extending parallel to the basic shapes (rectangle with rounded corners) of the flat main body (xy plane), the following area requirement F_S results:

$$F_S = 7 \cdot F_E - 6 \cdot F_O$$

F_E is, here, the area content of a single individual blister in the projection onto the plane disposed parallel to the basic shape of the planar main body (xy plane), and F_O is the overlap region of two adjacent individual blisters in the same projection plane.

If N individual blisters are disposed adjacently in alignment on a table, their area requirement is N times the area requirement F_E of an individual blister:

$$F_S = N \cdot F_E$$

The following is generally true for a stack-like arrangement according to the invention:

$$F_S < N \cdot F_E$$

The area requirement of a stack-like arrangement according to the invention is smaller than the area requirement of adjacently arranged individual blisters, since the individual blisters of the stack-like arrangement overlap in the xy projection plane.

For example, the following is true for a stack as shown in Figure 3:

$$F_S = N \cdot F_E - (N - 1) \cdot F_O$$

Preferred embodiments of stacks according to the invention or those that have a greater relative overlap region F_O^{rel} :

$$F_O^{rel} = F_O / F_E \leq 1$$

Preferably, F_O^{rel} is from 0.3 to 1, particularly preferably from 0.5 to 1.

The size of the relative overlap region can be maximized in different ways, for example by a decentralized arrangement of the bubbles and/or by recesses in the main body, as will be explained in greater detail hereinafter.

In a further embodiment of the present invention the bubbles of the individual blisters are arranged in a decentralized manner with respect to the basic shape of the planar main body.

The centre of the basic shape of the planar main body is determined either by its centre of symmetry or, if the basic shape has no centre of symmetry, by the centre of gravity of the basic shape. The bubble also has a centre, which is determined either by the centre of symmetry or, if the bubble has no centre of symmetry, by the centre of gravity of the bubble.

A decentralized arrangement of the bubble is to be understood to mean an arrangement in which the centre of the bubble does not coincide with the centre of the basic shape of the planar main body.

Due to the decentralized arrangement, there is a greater bubble-free area on the main body beside the bubble, on which area an adjacent individual blister can rest via its cover film. The adjacent

individual blisters can thus “move closer to one another” in the xy plane, such that not only a denser packing of the individual blisters in the stack direction, but also perpendicularly thereto, results. Figures 4 and 5 illustrate this embodiment.

5 Figure 4 shows an example of an individual blister 1 in plan view and from two sides. The individual blister 1 comprises a planar main body 2, in which a bubble 3 is formed. In the bubble 3 there is situated an individual medicinal product portion (not illustrated in Figure 4). The bubble is closed by a cover film 4. The bubble 3 is formed in the planar main body 2 in a decentralized manner. The basic shape of the main body is rectangular - the corners being rounded.

10 Figure 5 shows an example of an arrangement according to the invention in a plan view (bottom) and from a side (top). Seven examples (1-1, 1-2, 1-3, 1-4, 1-5, 1-6, 1-7) of the individual blister 1 from Figure 4 are arranged on top of one another in a stack-like manner. All bubbles point in the same direction. The height of this stack-like arrangement is:

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$$h_s = N \cdot (d_G + d_D) + h_B = 7 \cdot (d_G + d_D) + h_B$$

In a further embodiment the base area of each individual blister has a recess, within which the bubble of an adjacent individual blister can be placed. This also results in a denser packing both in the stack direction and perpendicularly thereto. Figures 6 and 7 illustrate this embodiment.

20 The height of this stack-like arrangement is:

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$$h_s = N \cdot (d_G + d_D) + h_B$$

The term “recess” is to have a broad meaning here. Under consideration of the main body of conventional blister packs (for example see Figure 1a of the laid-open application GB2184086A), the edges of the basic shape have a convex contour. By way of example, a circular, a square, and a rectangular basic shape always have a convex contour (see Figure 6, for example). If, by contrast, a semi-circular recess is punched out in the edge region of a square basic shape, the contour of the basic shape is no longer convex at all points, but is concave in the region of the recess.

Accordingly, the expression “basic areas with recess” is to be understood to mean all basic areas where the contour, besides convex regions, also comprises at least one concave region.

The recess is preferably round, semi-circular, ellipsoidal, semi-ellipsoidal, or rectangular.

5 In a preferred embodiment two different individual blisters, which behave like an image and mirror image relative to one another, are stacked in alternation. Figure 6 shows an example. The two individual blisters 1 and 1' behave like an image and mirror image relative to one another. Both have a planar main body 2, in which a bubble 3 for receiving a medicinal product portion is formed. The bubble is arranged in a decentralized manner with respect to the main body. Both main bodies have a semi-circular recess 5. Figure 7 shows how two of the individual blisters 1 and 1' are arranged on top
10 of one another in alternation in a stack-like manner. The stack height is:

$$h_S = 4 \cdot (d_G + d_D) + h_B$$

15 In a further embodiment the main body of each individual blister has supporting structures. The supporting structures can be formed in the main body, similarly to the bubble. It is also conceivable for the supporting structures to be applied to the main body. In accordance with the invention, the supporting structures have a lower height than the bubble: $h_N < h_B$.

20 In a stack of individual blisters with supporting structures, the cover film of an individual blister rests against the supporting structures of the adjacent individual blister. Such supporting structures lead to a stabilization of the stack, but possibly at the cost of the packing density in the stack direction. The height of the stack-like arrangement is:

$$h_S = (N - 1) \cdot (d_G + d_D + h_N) + (h_B + d_G + d_D) = N \cdot (d_G + d_D) + (N - 1) \cdot h_N + h_B$$

25 Figure 8 shows an example. A bubble 3 is arranged in a decentralized manner in the main body 2 of the individual blister 1. A circular recess 5 is formed in the main body 2, in which recess a bubble of a further individual blister in a stack-like arrangement can be placed. The main body also has supporting structures in the form of two supporting nubs 7, of which the height h_N is less than the height of the
30 bubble h_B .

In Figure 9, two of the individual blisters from Figure 8 are stacked on top of one another. Here, the lower individual blister is rotated through 180° relative to the upper individual blister, such that the

bubble of the lower individual blister falls precisely into the recess in the upper individual blister. The main body of the upper individual blister rests on the supporting nubs of the lower individual blister. The height of the stack-like arrangement is:

$$h_S = (N - 1) \cdot (d_G + d_D + h_N) + (h_B + d_G + d_D) = 2 \cdot (d_G + d_D) + h_B + h_N$$

The size of the relative overlap region is $F_O^{rel} = 1$

A special form of a “base area with recess” is the angular base area, which constitutes a particularly preferred embodiment. Here, the recess is rectangular. An example of an angular base area is shown in Figure 10. An angular base area is understood to mean an area in which two area elements extend in different directions starting from a common area and delimit a free region between the area elements. In the preferred embodiment discussed here of a stack-like arrangement according to the invention, the bubble of an individual blister falls into the free region between the area elements of the main body of an adjacent individual blister. The area elements extending in different directions enclose an angle of less than 180°. The angle preferably lies in a range from 120° to 60°, particularly preferably in a range from 100° to 80°; and the angle is most preferably 90°. The area elements extending in different directions are preferably of the same shape; they are preferably rectangular. They can be the same size or different sizes. In a preferred embodiment they are the same size; in another preferred embodiment they are different sizes.

In Figure 10 an individual blister having an angular main body is illustrated. The main body 2 comprises two rectangular area elements 6 and 6', which are arranged at an angle of 90° to one another and delimit a free region, in which the bubble of a further individual blister in a stack-like arrangement can be placed. The main body 2 has supporting structures in the form of supporting nubs 7, of which the height h_N is less than the height h_B of the bubble 3. Figure 11 shows, in a plan view (bottom) and in a side view (top), how two of the individual blisters from Figure 10 are stacked on top of one another. The stack height is:

$$h_S = (N - 1) \cdot (d_G + d_D + h_N) + (h_B + d_G + d_D) = 2 \cdot (d_G + d_D) + (h_N + h_B)$$

The size of the relative overlap region is $F_O^{rel} = 2/3$.

In a further embodiment, the bubble of each individual blister of a stack according to the invention is arranged in a decentralized manner with respect to the basic shape of the main body, and the main body additionally has a recess, in which the bubble of an adjacent individual blister can be placed. Figures 12 and 13 illustrate this embodiment. In Figure 12, an individual blister 1 is illustrated, of which the main body 2 has two rectangular area elements 6 and 6', which are arranged at an angle of 90° to one another and delimit a free region, in which the bubble of a further individual blister can be placed in a stack-like arrangement. The main body 2 also has supporting structures in the form of a supporting rib 8. Twice the height h_N of the supporting rib added to the thickness d_G of the main body and the thickness d_D of the cover film corresponds in the present example to exactly the height h_B of the bubble: $2 \cdot h_N + d_G + d_D = h_B$

Figure 13 shows how three of the individual blisters from Figure 12 are stacked on top of one another in a spiralled manner.

The stack height is:

$$h_S = (N - 1) \cdot (d_G + d_D + h_N) + (h_B + d_G + d_D) = \frac{1}{2} \cdot (N+1) \cdot (h_B + d_G + d_D) = 2 \cdot (h_B + d_G + d_D)$$

The size of the relative overlap region is $F_O^{rel} = 1$

Figures 14, 15, 16 and 17 show further embodiments of the present invention, in which the medicinal product portion and accordingly also the bubble have an elongate form.

In Figure 14 an individual blister 1 is illustrated, of which the main body 2 has two rectangular area elements 6 and 6', which are arranged at an angle of 90° to one another and delimit a free region, in which the bubble of a further individual blister in a stack-like arrangement can be placed. The area elements 6 and 6' are of different sizes.

In Figure 15 three of the individual blisters from Figure 15 are stacked on top of one another.

Figure 16 shows an individual blister 1, in the main body 2 of which a bubble 3 is arranged in a decentralized manner. A recess 5 is introduced into the main body 2, into which recess a bubble of a further individual blister in a stack-like arrangement can be placed. The main body also has supporting structures in the form of four supporting nubs 7, of which the height h_N is less than the height of the bubble h_B .

In Figure 17 two of the individual blisters from Figure 16 are stacked on top of one another. Here, the lower individual blister is rotated through 180° relative to the upper individual blister, such that the bubble of the lower individual blister falls precisely into the recess in the upper individual blister. The main body of the upper individual blister rests on the supporting nubs of the lower individual blister.

A further subject of the present invention is a box containing a stack-like arrangement according to the invention of individual blisters. The box serves as secondary packaging. It usually also contains a package leaflet containing information regarding taking the medicinal product portions. The box serves to stabilize the stack-like arrangement according to the invention. It consists for example of card, plastic, metal or also a composite material. In a preferred embodiment the box is a folding box made of card, as is also used for conventional blister strips.

In a preferred embodiment the box contains a viewing window, via which the remaining amount of individual blisters provided in the box can be determined.

In a further preferred embodiment the box has a lateral opening in the lower region of the box, via which a single individual blister can be removed from the box. On account of the force of gravity, the individual blisters remaining in the box move down when the lower individual blister is removed and can be individually removed in succession until the box is empty.

In Figure 18 three boxes according to the invention are illustrated. The right-hand box contains seven individual blisters, the middle box contains fourteen individual blisters, and the left-hand box contains 28 individual blisters. The left-hand box has a viewing window on its side, via which viewing window the remaining number of individual blisters can be determined. The left-hand box also has an opening in the lower region, via which the individual blisters can be removed laterally.

A further subject of the present invention is constituted by individual blisters embodied in a particular manner in order to enable a stacking according to the invention.

In a preferred embodiment the individual blisters are characterized in that the bubble is arranged in a decentralized manner with respect to the main body. Particularly preferred embodiments are illustrated in Figures 4, 6, 8, 12, 14 and 16.

In a further preferred embodiment the individual blisters have a recess, in which the bubble of an adjacent individual blister in a stack-like arrangement according to the invention can be placed. Particularly preferred embodiments are illustrated in Figures 6, 8, 10, 12, 14 and 16.

5 In a further preferred embodiment the individual blisters have supporting structures, of which the height h_N is less than the height of the bubble h_B . In a further preferred embodiment, the height h_B of the bubble corresponds to the sum of twice the height h_N of the supporting structures, the thickness d_G of the main body and the thickness d_D of the cover film: $h_B = 2 \cdot h_N + d_G + d_D$. Particularly preferred embodiments are illustrated in Figures 8, 10, 12, 14 and 16.

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In a further preferred embodiment, the main body of the individual blister according to the invention has a rectangular or square basic shape, in which the corners are optionally rounded. Particularly preferred embodiments are illustrated in Figures 4, 6, 8 and 16.

15 In a further preferred embodiment the main body of the individual blister according to the invention has an angular basic shape, in which the corners are optionally rounded. Particularly preferred embodiments are illustrated in Figures 10, 12 and 14.

20 In a further preferred embodiment the individual blister exists in two different copies, which behave like an image and mirror image relative to one another. A particularly preferred embodiment is illustrated in Figure 6.

In a further preferred embodiment, the planar main bodies have one or more basic shapes which, apart from optionally rounded corners, allows/allow a tessellation of a rectangular area.

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Tessellation (also referred to as tiling, paving or scrap-free blanking) is understood to mean the covering of an area by smaller areas of identical shape, with no gaps and no overlaps. The basic shapes of the planar main bodies form the sub-areas here. The advantage of tessellation lies in the fact that the main body can be obtained by dividing a larger blister sheet, wherein division leftovers (cutting leftovers, waste) are reduced to a minimum.

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By way of example, the individual blisters shown in Figures 1, 4, 8, 10, 12, 14 and 16 allow a tessellation.

A further subject of the present invention is a method for producing individual blisters according to the invention.

- 5 The method according to the invention is characterized in that the individual blisters are separated off from a sheet or a web comprising a multiplicity of individual blisters. The separation can be implemented by conventional methods, such as laser cutting, mechanical cutting, punching, etching, electron beam machining, ultrasound and water jet. These and further methods are described, for example, in DIN standards 8588, 8589 and 8590.
- 10 In a particularly preferred embodiment, the individual blisters are produced from a macro blister pack, which is described in greater detail in EP15182316.8.

Claims

1. Stack-like arrangement of N individual blister packs, where N is an integer greater than 1, each single individual blister pack comprising

- 5
- a planar main body with a bubble,
 - one or more medicinal product portions in the bubble, and
 - a cover film, which closes the bubble,

the height h_s of the stack-like arrangement being less than N -times the sum of the height h_B of a bubble, the thickness d_G of a planar main body and the thickness d_D of a cover film.

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2. Stack-like arrangement according to Claim 1, a number $(N - 1)$ of individual blisters resting via the rear side of their main body against an adjacent individual blister on the belly side in a region lying beside the bubble of the adjacent individual blister, the belly side denoting the side on which the bubble protrudes from the main body and the rear side denoting the side on which the cover film is

15 disposed.

3. Stack-like arrangement according to either one of Claims 1 or 2, characterized in that the bubbles of the individual blisters are arranged in a decentralized manner with respect to the relevant main body.

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4. Stack-like arrangement according to any one of Claims 1 to 3, characterized in that recesses are formed in the main body, in each of which recesses the bubble of an adjacent individual blister is placed.

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5. Stack-like arrangement according to any one of Claims 1 to 4, characterized in that the main bodies have supporting structures, against which an adjacent individual blister rests, the following being true for the height h_N of the supporting structures: $h_N < h_B$.

6. Stack-like arrangement according to any one of Claims 1 to 5, the following being true for the height h_s of the stack-like arrangement: $h_s = \frac{1}{2} \cdot (N+1) \cdot (h_B + d_G + d_D)$.

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7. Stack-like arrangement according to any one of Claims 1 to 6, characterized in that two types of individual blisters, which behave like an image and a mirror image relative to one another, are arranged following one another in alternation.

8. Stack-like arrangement according to any one of Claims 1 to 7, characterized in that the following is true for the relative region of overlap $F_O^{rel} = F_O / F_E$ of each two adjacent individual blisters:

$$0.5 \leq F_O^{rel} \leq 1$$

where F_E specifies the area content occupied by a single individual blister in the projection onto a plane lying parallel to the rear side of the main body, and F_O specifies the overlap region of adjacent individual blisters in the same projection plane.

9. Stack-like arrangement according to any one of Claims 1 to 8, characterized in that the main bodies of the individual blisters have a rectangular or square basic shape, the corners being rounded, optionally.

10. Stack-like arrangement according to any one of Claims 1 to 8, characterized in that the main bodies of the individual blisters have an angular basic shape, the corners being rounded, optionally.

11. Stack-like arrangement according to any one of Claims 1 to 10, characterized in that successive individual blisters are rotated relative to one another by an angle of 60°, 90°, 120° or 180°.

12. Individual blister for a stack-like arrangement according to any one of Claims 1 to 11, comprising

- a planar main body with a bubble,
- one or more medicinal product portions in the bubble, and
- a cover film, which closes the bubble,

characterized in that the bubble is arranged in a decentralized manner with respect to the main body.

13. Individual blister according to Claim 12, characterized in that it has a recess, in which recess the bubble of an adjacent individual blister in the stack-like arrangement can be placed.

14. Individual blister according to one of Claims 12 and 13, characterized in that it has supporting structures, of which the height h_N is smaller than the height of the bubble h_B .

15. Individual blister according to Claim 14, characterized in that twice the height h_N of the supporting structures added to the thickness d_G of the main body and the thickness d_D of the cover film corresponds to the height h_B of the bubble: $2 \cdot h_N + d_G + d_D = h_B$.

16. Individual blister according to any one of Claims 12 to 15, characterized in that the main body has a rectangular or square basic shape, the corners being rounded, optionally.
17. Individual blister according to any one of Claims 12 to 15, characterized in that the main body has
5 an angular basic shape, the corners being rounded, optionally.
18. Individual blister according to any one of Claims 12 to 17, characterized in that the basic shape of the main body allows the tessellation of a rectangular area.
- 10 19. Individual blister according to any one of Claims 12 to 18, characterized in that it exists in two different embodiments that behave like an image and mirror image relative to one another.
20. Method for producing an individual blister according to any one of Claims 12 to 19, characterized
in that the individual blisters are separated off from a sheet or a web comprising a multiplicity of
15 individual blisters.
21. Box containing a stack-like arrangement according to any one of Claims 1 to 11.
22. Box according to Claim 21, the box being a folding box made of card.
20
23. Box according to either one of Claims 21 or 22, comprising a viewing window, via which the number of contained individual blisters is visible.
24. Box according to any one of Claims 21 to 23, characterized in that it has a lateral opening in the
25 lower region, from which opening the single individual blisters can be laterally removed.