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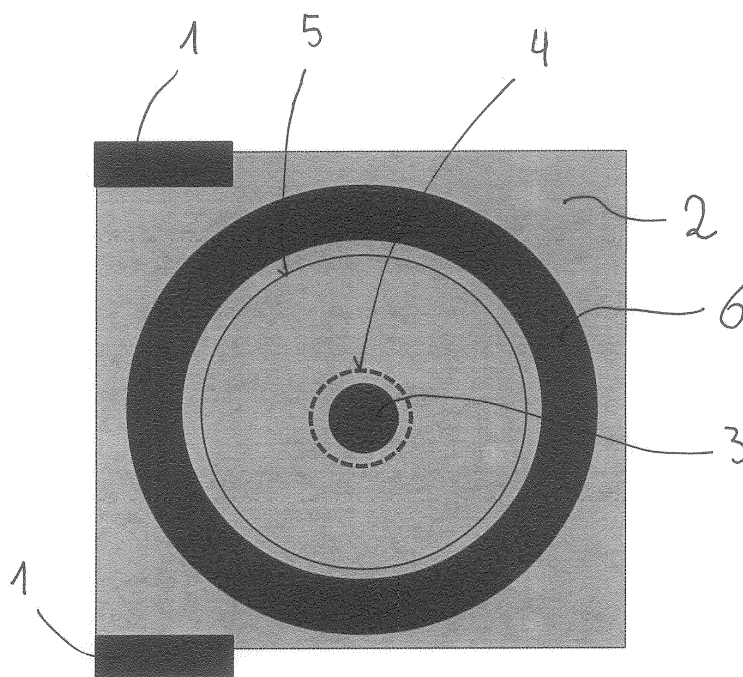
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(54) **Rotary closure with liner for a container**

(57) The invention concerns a rotary closure especially for medication bottles, which has a rotary cap, in which a liner that closes the opening is provided. The liner has at least two layers, which contact each other along a contact surface; the upper layer initially lies in the rotary cap is to it at least in the central part of the face and the lower is firmly joined to the annular face of the

opening and the linear has a weakening line (4).

In order to achieve simple and clean opening, it is prescribed that the weakening line (4) is closed and leads around the central part (3) of the face and that in the area of the contact surface the weakening line (4) joining of the two is strong and the weakening line (4) it is not present or only weak.



Description

[0001] The invention concerns a rotary closure for a container, a bottle, especially a medication bottle or the like according to the preamble of claim 1.

[0002] There is a major demand to close containers and especially the bottles or vials mentioned in the introduction so that it is possible for the user to make a predefined opening within the closure accessible in the simplest possible manner in order to permit, on the one hand, simple filling through a large opening of the actual closure and, on the other hand, to enable the user to remove the contained product in as controlled a manner as possible. The product can then be a liquid, a pasty material, but especially a particulate product, subsequently referred to simply and in all-encompassing fashion as tablets.

[0003] A group of publications are mentioned as fundamental but not generic prior art, which include, among many others, CA 2,179,840, DE 37 06 962, EP 1 046 595 and EP 1 278 630. All these documents disclose the use of plates or liners with which removal openings of any container are sealed, the liners being designed multilayered and it being possible to separate them along a predetermined contact surface between two generally multilayered layers. For this purpose the upper layer has a tab for grasping and weakening lines are provided in the lower layer, which are generally closed so that during the peeling off process along the contact surface the material of the lower layer remains on the upper layer in this closed area and the removal opening defined by the weakening line is formed.

[0004] In principle, these technologies is also applicable to bottles and vials with screw caps, as shown in WO 2012/079971, but entails the drawback that the tab must be suitably stowed in some way and not interfere with the tightening process during closure of the vial after its filling and to at least survive the first opening of the vial. Moreover, it is generally sought that during opening of such containers no additional objects are present, as in the peeled-off upper layer and the small area of the lower layer in the closures explained in the mentioned documents.

[0005] EP 1 462 381 pursues a different strategy: it also uses a two-layered liner within a screw cover, which after tightening of the screw cover and liner is sealed on the vessel edge by induction or heat transfer. The upper layer of the liner is then firmly joined to the screw cap; the lower layer already has finished openings and therefore fails completely as a barrier layer or the like. During first opening the two layers are separated and the layers sealed to the vial or container together with its opening already produced in the factory is available for removal of the product. The making of holes before mounting of the liner in the screw closure can be mentioned as an essential shortcoming here, since this must occur with corresponding position accuracy. Perforation must even occur before joining the two layers to the endless material of the liner material.

[0006] One variant of this strategy according to the basic idea mentioned in the introduction is described in EP 1 582 477: here a two-layered liner is peeled off by the user as in the first variant, but the lower layer has no weakening lines, but already finished openings as in the last mentioned variant, in which case a combination of drawbacks without noticeable advantage occurs here.

[0007] US 2,646,183, going back to the year 1950, uses a two-layered liner in which the two layers to be separated are only weakly joined to each other (glued), in which case the lower layer was glued (according to the technique at that time during first screwing on of the screw cap together with liner) to the container edge. Since the upper layer was very strongly glued to the screw cap, the weak glue joint between the two layers rupture during first opening but the layers that have neither a weakening line nor an opening remaining on the container had to be perforated by hand or by means of a spoon, knife or the like. The lower layer was therefore included in producing the barrier effect but because of the forced destruction during first opening the result was not a defined removal opening for the corresponding product but de facto a crack, a split or the like and, during the completest possible removal of the lower layers up to the filling opening, residues of the layers generally remained glued to the container edge, which is optically undesired, especially in medications.

[0008] A type of further development of this principle, but also a back development of the advantageous principle of two separable layers is known from US 4,719,740 in which a multilayered but not separable liner is firmly sealed on the container edge and sealed in areas on the screw cap and during opening, initiated by weakening lines, tears off in fully uncontrolled fashion which cannot be influenced. The advantage relative to the previously mentioned US 2,646,183 lies essentially in that tearing off of the lower layer occurs simultaneously with opening.

[0009] As follows from this prior art, there is still a demand for a closure with the properties mentioned in the introduction, through which, on first opening, a defined and clean removal opening is created without additional parts occurring as waste and without opening of the closure being complicated or unusual to perform.

[0010] These objectives are achieved according to the invention through the measures stated in the characterizing part of claim 1; in other words, firm joining, for example, gluing, of the upper layer of a multilayered separable liner with the inner face of the screw cap occurs, the lower layer is firmly sealed to the container edge or bottle neck edge, the lower layer has a closed weakening line preferably running in a circle concentric to the rotational axis of the screw cap and the two layers are strongly joined to each other in the area within the closed weakening line, for example, glued or sealed, and in the other areas they are not joined or only weakly joined to each other. The contact surface, in which

holding forces, gluing forces, etc. can occur between the layers being separated, can then be positioned on different locations of the multilayered overall structure and the design of the weakening line must take this into account, as explained further below.

[0011] The term "closed weakening line" means that, the weakening line encircles an area in form of a circle, a triangle, a pentagram or any similar regular or irregular shape. It is of importance to mention that, the weakening line known from the already mentioned US 4,719,740 is not closed.

[0012] The adhesive can then preferably be applied by a printing method so that precise adjustment of the glue sites and therefore precise geometric coordination occurs with application of the weakening line. The adhesive force can also be adjusted by the printing method over broad limits precisely to predetermined values.

[0013] An additional line, namely a separation line essentially passing through the liner material, is preferred, corresponding to the outline of the interior of the screw cap in order for the liner to fit during introduction in the screw cap. In areas outside the separation line the adhesive can be provided in almost arbitrary fashion without adversely affecting the invention, serving there for holding the two layers together with precise position.

[0014] The invention is further described below by means of a practical example. The only figure shows a schematic top view of a section from an endless material that already has the two layers in joined form.

[0015] The areas provided with adhesive between the two layers are drawn in this example with a dark color in the purely schematic (as stated) top view. Two areas are involved, which serve as markings 1 for positioning of the liner material 2 during production and assembly.

[0016] A central glue site 3 is arranged within a closed weakening line. The weakening line 4, as is preferred, has a circular shape, the center of the circle is as congruent as possible with the screw axis of the screw cap into which the liner is inserted. In this way undesired shear forces are avoided during first opening.

[0017] A separation line 5 is provided concentric to weakening line 4, which need not actually entail complete separation of the lower and/or upper layer, but which restricts the mechanical stability of the liner material 2 as a whole so that during introduction into the screw cap full separation of both layers occurs along this line and the liner broken out or punched out from the liner material 2 comes to lie on the interior of the screw cap and with the outer layer comes to lie on the inner face of the screw cap, covering its surface as much as possible, and is firmly and reliably glued or welded to it.

[0018] The area outside the separation line 5 does not enter the closure cap and does not belong to the closure and this part of the liner material 2 after introduction of the liner into the screw cap is disposed of. The large-area annular glue site 6 outside the separation line 5 serves for precise fixation of the two layers relative to each other to obtain geometric correlation. Since no effect on the later liner occurs from areas outside the separation line 5, the glue surface here 6 can be modified in a variety of ways, for example, in several rings or a number of glue points and it is also possible to create additional glue sites in the areas that are the corner areas of the liner material 2 present as endless material in the figure.

[0019] It is likewise possible to conduct gluing of both layers to be separated in the annular area between the weakening line 4 and the separation line 5, which, however, must be much weaker than the central glue surface 3, for example, in order not to compromise separation of the two layers during first opening.

[0020] The following can be mentioned as an example for the structure of such a closure, stated from the cap side (usually "top") to the container side (usually "bottom"), in which this example of the structure is essentially simple and much more complex systems are known for the liner material in the prior art. The joint can be produced both by lamination and by extrusion or coextrusion and the adhesives, film materials and basis weights to be employed are then modified in ways known to one skilled in the art and with knowledge of the invention he therefore has no problems.

Cap inside	Example for thickness/basis weight
A) PET (polyethylene terephthalate)	5-50 μm
B) Adhesive	see below
C) CPP film (unstretched polypropylene)	70-140 μm (preferably around 100)
D) Adhesive	see below
E) Aluminum foil	6-50 μm (preferably around 30)
F) Adhesive, optionally colored	see below
G) Sealing film	15-100 μm

Container edge

[0021] Instead of CPP, blown PP or orientated PP may be used with good results, too.

[0022] The glue is, for example, a one- or two-component glue based on polyurethane and other peelable glues can also be used. The employed amounts, as known to one skilled in the art, can vary over a broad range and lie between

0.001 g/m² and 5 g/m².

[0023] Within weakening line 4 gluing of the layers must occur strongly from the cap to the sealing film G, since all these layers A-G must remain in this area on the cap. Outside the weakening line 4 gluing between the layers being separated, i.e., either glue layer F or D, is provided weakly or not at all, in order to permit separation along this contact surface.

[0024] As already mentioned above, it is possible to provide separation of the layers being separated in the area of glue layer D and glue in the area outside the weakening line 4 is then applied so sparsely that loosening can occur and not only the sealing film G but also the aluminum foil E in the area of weakening line 4 (preferably flush with it) need only be weakened so that during first opening the area within the weakening line 4 remains firmly joined to the cap and the weakening line tears off in the aluminum foil E.

[0025] This weakening line is to be applied from the side of the sealing film G which must be separated anyway and the aluminum foil, on the one hand, must also be mechanically weakened in this case but, on the other hand, must completely fulfill its barrier property reliably in the area of the weakening line.

[0026] One thus obtains a partial joint remaining on the container, which contains in the surface outside the weakening line 4 (and the weakening line in the aluminum foil) the sealing film G and aluminum foil E, and therefore still has excellent barrier properties and high mechanical stability but entails some demands for this purpose in terms of accuracy of the weakening line, which must be formed through the sealing film G up to but in no case through the aluminum foil E.

[0027] If simpler production of the weakening line 4 is a primary concern, this is to be created from the later container side so that it causes the sealing film G to reliably rupture during first opening and can reach up to the aluminum foil E but not into it or only scarcely so; separation of the layers occurs in the area of glue layer F, which therefore is or contains the contact surface.

[0028] In a weakening line 4 designed in this way the aluminum foil E remains joined in its entirety to the cap and during first opening carries along the material of sealing film G placed within the weakening line. For this purpose the glue joint between the sealing layer and aluminum foil is designed strongly within the weakening line 4 but is weak or not present at all outside of it.

[0029] The weakening line may be created by any way known in the prior art, preferred by use of a laser beam, or a high energy ion beam, or by using a mechanical tool, e.g. a cutting tool. The man skilled in the art knows which technology to use when he or she takes into account the kind of container and the kind of goods.

[0030] The sealing of the liner to the container, namely the rim of the opening of the container, would in many cases be achieved by the use of induction sealing, with the heating of the aluminum foil by electro-magnetic waves, as it is known for such caps. Of course, the use of heat, provided by conductive heat transmission, without induction, and of pressure, as it is known since long time for all kinds of sealing purposes, may be used, too.

[0031] To summarize, one can state that the invention concerns a rotary closure for a container, like a bottle, especially a medication bottle or the like, which in the original closed state has a rotary cap that is screwed onto the opening of the container, in which case a liner that closes the opening is provided between the circular face of the inside of the rotary cap and the annular face of the opening, which has at least two multilayers independent of each other, which are in surface contact with each other along a contact surface, which optionally contains glue, in which case the upper layer initially lies in the rotary cap and is joined to it at least in the central area of the face and in which the lower layer is firmly joined to the annular face of the opening and in which the liner has a weakening line 4, characterized by the fact that the weakening line 4 is closed and leads around the central part of the face and that in the area of the contact surface within the weakening line 4 joining of the two layers is strong and it is not present or only weak outside of the weakening line 4.

[0032] For jurisdictions, where it is possible, the contents of the CA 2,179,840, the DE 37 06 962, the EP 1 046 595, the EP 1 278 630 the WO 2012/079971, the EP 1 462 381, the EP 1 582 477, the US 2,646,183, the US 4,719,740 are incorporated into the disclosure of this description by reference.

List of reference numbers:

01	Marking	04	Weakening line
02	Liner material	05	Separation line
03	Central glue site	06	Annular glue site

Claims

1. Rotary closure for a container, like a bottle, especially a medication bottle or the like, which in the original closed state has a rotary cap that is screwed onto the opening of the container, in which a liner that closes the opening is provided between the circular face of the inside of the rotary cap and the annular face of the opening, which has at

least two multilayers optionally independent of each other, which are joined to each other along a contact surface that optionally contains adhesive, in which the upper layer initially lies in the rotary cap and is joined to it at least in the central part of the face and in which the lower layer is firmly joined to the annular face of the opening and in which the liner has a weakening line (4), **characterized by** the fact that the weakening line (4) is closed and leads around the central part (3) of the face and that in the area of the contact surface within the weakening line (4) connection of the two layers is strong and outside the weakening line (4) it is not present or only weak.

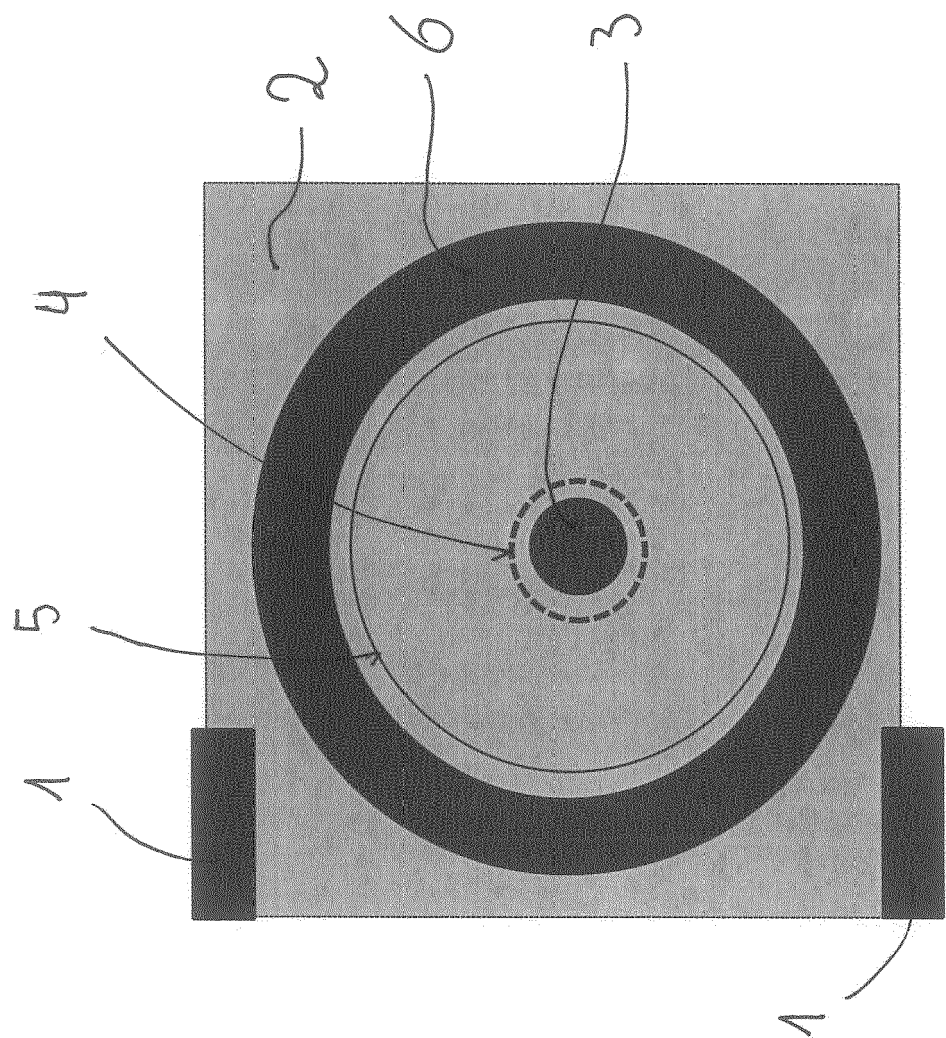
2. Rotary closure according to claim 1, **characterized by** the fact that the liner, from the cap inside to the container edge, has the following structure:

Cap inside

- A) PET (polyethylene terephthalate)
- B) Glue
- C) CPP film (unstretched polypropylene)
- D) Glue
- E) Aluminum foil
- F) Glue, optionally colored
- G) Sealing film

Container edge

3. Rotary closure according to claim 2, **characterized by** the fact that the weakening line (4) weakens the sealing film (G).
4. Rotary closure according to claim 3, **characterized by** the fact that the contact surface lies in the area of glue (F).
5. Rotary closure according to claim 3, **characterized by** the fact that the weakening line (4) also weakens the aluminum foil and that the contact surface lies in the area of glue (D).
6. Rotary closure according to one of the preceding claims, **characterized by** the fact that a separation line (5) concentric to the weakening line (4) is provided, whose diameter essentially corresponds to the inside diameter of the rotary cap.
7. Rotary closure according to one of the preceding claims, **characterized by** the fact that the sealing of the liner to the container is achieved by induction sealing.
8. Rotary closure according to one of the preceding claims, **characterized by** the fact that the weakening line (4) is created by the use of a laser beam.





EUROPEAN SEARCH REPORT

Application Number
EP 14 16 4212

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5

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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