LID HAVING A BREAK LINE

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ABSTRACT
The invention relates to a lid comprising a tubular skirt including a non-removable portion permanently retained about a container neck and a removable portion attached removably to the neck, said non-removable and removable skirt portions being connected by a break line suitable for breaking the first time the lid is opened.
LID HAVING A BREAK LINE

[0001] The present invention relates to a lid for a container neck.

[0002] The invention generally relates to lids comprising a skirt which surrounds the neck of a container and a lower portion of which, when it is considered that this neck extends vertically with its pouring rim directed upwards, is intended to remain around the neck after the first opening of the lid, optionally appearing in the form of a tamper-proof strip. The remainder of the skirt, i.e. its upper portion, is provided so as to be removable relatively to the neck, while being initially connected to the non-removable lower portion of the skirt by a break line capable of being broken upon first opening of the lid. The break line is used as an indicator of this first opening, to the attention of the users. In practice, this kind of break lines is made by cutting or by molding. An example of this type of lid with a break line is provided by WO-A-99/58411 on which the preamble of claim 1 is based.

[0003] Within the scope of the present invention, the nature of the removable connection between the upper skirt portion and the container neck is immaterial, so that the invention targets for example both so-called "snap-on" lids, i.e. lids which may be clipped around the neck, and screwed-on lids.

[0004] For lids of relatively large diameters, making the aforementioned break line with a succession of breakable bridges, may be satisfactory, in the sense that when the user opens the lid for the first time he/she gets a rather good feel with his/her hand of the failure of the bridges provided in large number around the skirt on the one hand and after this first opening and putting back of the lid into place in order to close the neck, it is possible to observe the broken condition of the bridges on the other hand which is evidence that the lid has already been opened. On the other hand when considering lids of smaller diameters, such breakable bridges are necessarily less numerous and/or smaller, so that they provide a widely insufficient indication of a first opening, both as regards the feel which they provide at the first opening and their aspect after opening and reclosing.

[0005] Furthermore, the proportioning of such breakable bridges results from a compromise which is difficult to find between the breakage resistance which they have to guarantee during the initial placement of the lid around the neck on the one hand and their facility of breaking during the first opening of the lid on the other hand. This compromise is critical for screwed-on lids.

[0006] The object of the present invention is therefore to improve the performance of the means indicating the first opening of a lid.

[0007] For this purpose, the object of the invention is a lid for a container neck as defined in claim 1.

[0008] One of the ideas at the basis of the invention is to seek, by means of easy-to-apply layout and advantageously resistant to the initial placement of the lid around the container neck, to cause, without excessive force on behalf of the user, one or more local plastic deformations around the skirt during the first opening of the lid. This(these) plastic deformation(s) have the advantage of being irreversible, which leaves well visible traces around the skirt, which may be easily spotted by the user.

[0009] In this spirit, according to a first embodiment, with the invention, provision is made for maintaining a first "<traditional>" break line except for the difference that it is associated with one or more breakable bridges more resistant to breakage than the remainder of the line on the one hand and, for making at least one second break line, less extended than the first along the periphery of the skirt on the other hand so that this second line is designated herein by the expression "<break segment>: this or each break segment when it is considered that the axis of the skirt is vertical with its non-removable portion directed downwards, is located vertically above or below, as well as laterally on either side of the aforementioned breakable bridge or one of them associated with the main break line. When the lid according to the invention is opened for the first time, the break line in a first phase breaks except for its aforementioned breakable bridge(s) which however resist(s) without being driven upwards by the removable skirt portion because the non-removable skirt portion is retained around the neck of the container. The upward movement of the removable skirt portion, under the action of the user, causes plastic deformation of the strand interposed between the break line and the break segment, more specifically deformation of at least one of the two side arms of this strand, laid out on either side of the associated breakable bridge, by sufficiently moving the edges of the break segment away from each other. By continuing the upward movement of the removable skirt portion, the opening of the lid passes into a second phase, in which the breakable bridge(s) of the break line is(are) in turn broken, thereby allowing this removable skirt portion to be totally cleared facing the non-removable skirt portion retained around the neck. Subsequently, if the lid is again closed, i.e. if the removable skirt portion is repositioned around the container neck in its initial position of before the first opening, it is impossible to reposition the strand(s) as initially because of its(their) irreversible plastic deformation. This(these) strand(s) is(are) again found at least partly protruding facing the remainder of the skirt, which provides a clear indication, therefore easy and rapid to observe for the user.

[0010] According to a second embodiment, with the invention provision is made for maintaining a first "<traditional>" break line, except that at the axial level of this break line, the skirt includes one or more non-breakable portions, which will not break during breakage of the break line on the one hand and, for making at least one second break line less extended than the first along the periphery of the skirt on the other hand, so that this second line is designated herein by the expression "<break segment>". According to the invention, this or each break segment is located, when it is considered that the axis of the skirt is vertical, vertically above or below the aforementioned non-breakable skirt portions or one of them, extending laterally on either side of this non-breakable skirt portion. In this way, the material strand, located vertically between the break line and the break segment, has a running portion which extends along the aforementioned non-breakable skirt portion, while the peripheral ends of this strand are breakably connected, through two opposite ad hoc bridges, to the removable or non-removable skirt portion, in which the second break segment is delimited. Upon opening the lid according to the invention for the first time, the break line in a first phase is broken while at the same time, the aforementioned breakable bridges are proportioned so as to resist, while each being subject to a plastic deformation stress related to the relative driving movement between the removable skirt portion and the non-removable skirt portion retained around the neck. During this first phase, the running portion of the aforementioned strand remains firmly attached to the removable or non-removable skirt portion, in which the break segment is not delimited, by means of the non-breakable skirt portion.
mentioned above. By continuing the relative separation movement between the removable and non-removable skirt portions, the opening of the lid passes into a second phase in which the breakable bridges located at the peripheral ends of the strap are in turn broken, whereby the removable skirt portion may be totally cleared facing the non-removable skirt portion retained around the neck. At the same time, the running portion of the strap gives a notched shape to the skirt portion to which this running portion is connected in a non-breakable way. Subsequently, if the lid is again closed, i.e. if the removable skirt portion is repositioned around the container neck in a position close to its initial position before the first opening, it is impossible to reposition the strap(s) as initially because of the irreversible plastic deformation of their peripheral ends; these peripheral ends are again found at least partially protruding facing the remainder of the skirt, which provides a clear indication, therefore easy and rapid to observe for the user. Further, during the re-closing, the presence of the deformed strap ends prevents the notched shape mentioned above from being found strictly in vertical coincidence with the break segment or one of them, so that it becomes impossible to continuously reposition the removable and non-removable skirt portions. Moreover, the fact that before the first opening of the lid according to the invention, the strap(s) is(are) connected in a non-breakable way over the whole of their running portion to the removable or non-removable skirt portion, in which the corresponding break segment is not delimited, provides the break line and the break segment with satisfactory global resistance, utilized during the handlings of the lid before its first opening, in particular when it is placed around the neck of the container. Thus, the lid according to the invention may be handled reliably and in a performing way before its first opening, and may then provide during this first opening an indication of clear opening, without however increasing the opening force to be applied by the user.

[0011] The clear opening indication provided by the invention has a major benefit when the non-removable portion of the skirt remains totally immobile relatively to the neck after breakage of any connection with the removable skirt portion. This is notably the case for lids, the non-removable skirt portion of which has a large axial dimension, inducing immobilization interference with the neck.

[0012] In practice, the break line and the break segment of the lid according to the invention may both be made by cutting or by molding. In both cases, the making of the break segment is simple and rapid, in particular when this segment is provided in that of the removable and non-removable skirt portions, which has a non-negligible axial dimension. Further, in the case of manufacturing by cutting, it is possible to rapidly and easily pass from a manufacturing of existing lids with a single break line to the manufacturing of lids according to the invention, by adding or removing the required layouts for making the break segment, thereby providing great production facility for different lids.

[0013] Advantageous characteristics of the lid according to the invention, taken individually or according to all the technically possible combinations, are specified in the dependent claims 2 to 15.

[0014] The invention will be better understood upon reading the description which follows, given only as an example and made with reference to the drawings wherein:

[0015] FIG. 1 is a schematic elevational view of a first embodiment of a lid according to the invention, illustrating this lid placed around a container neck and before its first opening;

[0016] FIG. 2 is a longitudinal sectional view of the lid of FIG. 1 before its first opening, the left and right halves of these figures illustrating this lid before and after its placement around the container neck, respectively;

[0017] FIGS. 3 and 4 are sectional views along the planes III-III and IV-IV of FIG. 2 respectively, illustrating the lid before its placement around the container neck;

[0018] FIGS. 5 to 8 are views at a larger scale of the framed detail 9 in FIG. 1, FIGS. 5 to 7 illustrating three successive conditions of the first opening of the lid while FIG. 8 illustrates the closing of the lid;

[0019] FIGS. 9 to 11 are similar views to the framed detail V in FIG. 1, respectively illustrating three alternative embodiments of the lid according to the invention;

[0020] FIG. 12 is a schematic elevational view of a second embodiment of the lid according to the invention, illustrating this lid placed around a container neck and before its first opening;

[0021] FIG. 13 is a longitudinal sectional view of the lid of FIG. 12 before its first opening, the left and right halves of these figures illustrating this lid before and after its placement around the container neck respectively;

[0022] FIGS. 14 and 15 are sectional views along the XIX-XIV and XV-XV planes of FIG. 13, respectively illustrating the lid before its placement around the container neck; and

[0023] FIGS. 16 to 19 are views at a larger scale of the framed detail XVI in FIG. 12.

[0024] FIGS. 16 to 18 illustrating three successive conditions of the first opening of the lid while

[0025] FIG. 19 illustrates the closing of the lid.

[0026] In FIGS. 1 to 8, is illustrated a lid 1 adapted so as to be removably attached on a neck 2 of a container. The lid 1 considered here as an illustration, is a lid attached on the neck by screwing. In practice, the neck 2 is either made in the same material with the remainder of the container, notably when the latter is a glass or plastic bottle as illustrated in FIG. 1, or adapted so as to be firmly attached permanently on a wall of the container, at an opening crossing this wall.

[0027] The lid 1 and the neck 2 have globally tubular respective shapes, the central longitudinal axes of which substantially coincide, under reference X-X, when the lid is screwed onto the neck. For convenience, the following of the description is oriented by considering that the terms of <<upper>>, and <<top>> correspond to a direction globally parallel to the axis X-X and from the body of the container towards its neck 2, i.e. a direction directed towards the top portion of FIGS. 1, 2 and 5, while the terms of <<lower>> and <<bottom>> correspond to an opposite direction.

[0028] The neck 2 includes a globally cylindrical body 4 with a circular base of axis X-X. At its top end, this body 4 delimits a pouring rim 3 at which the liquid contained in the container is intended to be poured out. As illustrated in the right portion of FIG. 4, on the outer face of the body 4, the neck 2 successively from its lip 3 includes a threading 5 and a boss 6, which both extend radially outwards from the body.

[0029] The lid 1, considered as screwed onto the neck 2, is open at its lower end and closed at its upper end with a bottom wall 10, at the outer periphery of which a tubular skirt 12 centered on the axis X-X and with a circular base extends axially downwards.
The lid advantageously includes here a lip 14 which extends axially downwards from the bottom wall 10, in a centered way on the axis X-X, inside the external skirt 12. When the lid is screwed onto the neck 2, the bottom wall 10 extends above and through this neck, while the skirt 12 exteriorly surrounds the body 4 and the lip 14 is sealably pressed against the inner face of this body. As alternatives not shown, other layouts aiming at sealing the obturation of the neck 2 with the lid 1 may be contemplated, for example by means of an additional gasket.

The skirt 12 is provided with an inner threading 16 which extends radially towards the inside of the main wall of the skirt, so as to mate the threading 5 of the neck 2. By cooperation of the threadings 5 and 16, it is possible to screw and unscrew the skirt 12 around the neck.

Advantageously, in order to facilitate the movement of the skirt 12 around the axis X-X driven by the user, the outer face of this skirt may be provided with elongated ribs 18 which extend parallel to the axis X-X. These ribs 18 allow the user to grip the lid 1 more easily. Of course, other embodiments, not shown, are possible with view to facilitating the holding of the lid 1 by the user.

During the first unscrewing of the lid 1, the skirt 12 is adapted so as to separate into two distinct portions, i.e. an upper portion 12a, made with the bottom wall 10 in the same material, and a lower portion 12b, initially connected to the upper portion 12a, at a peripheral break line 20 axially located in the running portion of the skirt. The skirt portion 12a is intended to be totally cleared of the neck 2, so that this portion 12a, interiorly bears the threading 16 for screwing and exteriorly the ribs 18. The skirt portion 12a, as for it is intended to remain around the neck 2. For this purpose this portion 12a is interiorly provided with rings 22 which extend radially protruding towards the inside from the inner surface of the skirt 12 and which are globally located in a plane perpendicular to the axis X-X, while being distributed over the whole periphery of the skirt. When the lid is assembled to the neck 12 these pallets extending axially below the boss 6 and are adapted, when the lid is lifted for the first time, for axially abutting against this boss.

As this is well visible in FIG. 3, the break line 20 appears in the exemplary embodiment considered here, in the form of a peripheral slot 24, which is globally included in a plane perpendicular to the axis X-X and which radially crosses right through the wall of the skirt 12. The slot 24 does not extend over the whole periphery of the skirt but on the contrary is interrupted by a breakable bridge 26 connecting, before breakage, the skirt portions 12a and 12b. Thus, this breakable bridge 26 is located, along the axis X-X at the same level as the break line 20. This breakable bridge 26 extends around the axis X-X over an angle $\alpha_{26}$ which in practice has a value of a few degrees.

The skirt 12 further comprises a peripheral break segment 28 distinct from the break line 20. As this is well visible in FIG. 4, this break segment 28 in the exemplary embodiment considered here appears in the form of a peripheral slot 30 which is included in a plane perpendicular to the axis X-X and which radially crosses right through the wall of the removable skirt portion 12b.

In this way, as illustrated in FIGS. 1 and 2, a material strand 32 consisting of a peripheral fragment of the wall of the skirt 12 and belonging to the removable skirt portion 12b, is interposed along the direction of the axis X-X between the break line 20 and the break segment 28.

As this is well visible in FIGS. 1 and 2, the break segment 28 is proportioned and positioned specifically facing the breakable bridge 26. More specifically, the break segment 28 extends around the axis X-X, over an angle $\beta_{28}$, the value of which is greater, preferably strictly greater than that of the angle $\alpha_{26}$ of the breakable bridge 26. Further, the angular positioning, around the axis X-X, of the break segment 28 is provided so that both of its peripheral ends 28a and 28b are located, along the periphery of the skirt 12, at least vertically below the peripheral ends of the breakable bridge 26, or even preferably on either side of this breakable bridge 26.

In this way, as noted in FIGS. 1 and 2, the strand 32 includes a running portion 32, connected over the whole of its peripheral dimension to the non-removable skirt portion 12a, through the breakable bridge 26, and two side arms 32a and 32b, which are respectively disconnected both from the non-removable skirt portion 12a, because of the slot 24, and from the remainder of the removable skirt portion 12b, because of the slot 30, except at the peripheral ends 32a and 32b of the strand 32, which are made in the same material with the remainder of the skirt portion 12a, in a non-breakable way.

Further, in order to obtain a non-homogeneous behavior of the strand 32, notably between its side arms 32a and 32b, along the periphery of the skirt 12, for reasons explained later on, the breakable bridge 26 and the break segment 28 are not centered on each other but on the contrary the breakable bridge 26 is located, along the periphery of the skirt, closer to the end 28a than to the end 28b of the break segment 28. This amounts to stating that the peripheral dimension of the side arm 32a is strictly smaller than that of the side arms 32a of the strand 32.

When the user opens for the first time the lid 1 by driving the skirt portion 12a into rotation around the axis X-X in order to unscrew it from the neck 2, the skirt portion 12a is retained, along the direction of the axis X-X, around this neck by the boss 6 while the skirt portion 12a is moved away from the skirt portion 12b upwards. To do this, the break line 20 and the break segment 28 are jointly stressed as gradually illustrated in FIGS. 5 to 7.

More specifically, during a first opening phase illustrated by FIGS. 5 and 6, the edges of the slot 24 move away from each other along the direction of the axis X-X while the breakable bridge 26 withstands the breakage, so that this bridge immobilizes relatively to the skirt portion 12a, the running portion 32, of the strand 32. At the same time, the side arms 32a and 32b of this strand deform along their length, by the free relative separation movement of the edges of the slot 24 as well that of the edges of the slot 30. The side arms 32a and 32b of the strand 32 are thus deployed over the whole of their length relatively to the remainder of the skirt portion 12a, and relatively to the skirt portion 12b; these arms 32a and 32b then deform plastically, gradually passing from a substantially horizontal extended configuration to an extended configuration inclined relatively to the horizontal, as this is well visible upon comparing FIGS. 1, 5 and 6.

Further, because of the difference in length in the arms 32a 32b, the shorter arm 32b is subject to a higher deformation stress density than the longer arm 32a, leading to more marked plastic deformation for the arm 32a. In particular, as shown in FIG. 6, the cross-section of the arm 32a tends to decrease by stretching of the material.

By continuing the unscrewing of the skirt portion 12a, the first opening phase ends to the benefit of a second opening phase, during which the breakable bridge 26 breaks,
as illustrated in FIG. 7. The skirt portions 12 and 12, are then totally separated from each other and the unscrewing of the skirt portion 12 may be continued until complete disengagement of the threadings 5 and 16.

In practice, it will be noted that the breaking of the breakable bridge 26 may both leave the running portion 32 of the strand 32, entire, as shown in FIG. 7 and lead to the breaking of this running portion 32, thereby totally separating the side arms 32, and 32, from each other.

Subsequently, assuming that the removable skirt portion 12, is put back into place around the neck 28, by fully screwing around this neck, the appearance of the lid is that shown in FIG. 8: even if the skirt portions 12, and 12, are placed substantially contiguously, as they were before the first opening of the lid 1, it is impossible to reposition the strand 32 into its initial configuration, because of its plastic deformation, in particular the plastic deformation of its arms 32 and 32, most particularly of its shortest arm 32. The result of this is that a significant portion of the strand 32 hangs in space, protruding from the outer face of the skirt 12. Advantageously, a portion of the body 4 of the container neck 2 is directly observable through the space which the arms 32 and 32, in particular the arm 32, occupied initially: by selecting contrasted colors for the skirt 12 and the body 4 of the neck 2, a more visual indication is available as to the fact that the lid 1 has already been opened a first time.

In order to make the lid 1, notably in plastic material, it is possible to equally use a molding and then cutting method, or exclusively a molding method. In the first case, after molding the skirt 12, the cutting blades are used for preferably concomitantly producing the break line 20 and the break segment 28, by moving the skirt 12 and those rotary cutting blades relatively to each other around the axis X-X. In the second case, notably with the use of molding drawers, the skirt 12 is molded by integrating the presence of the break line 20 and of the break segment 28.

In FIGS. 9 to 11 are illustrated three alternative embodiments of the lid 1, referenced 100, 200 and 300, respectively. The lids 100, 200 and 300 only differ from the lid 1 by the positioning and/or the profile of their break segments, referenced as 128, 228 and 328, respectively. The components of the lids 100, 200 and 300 which are identical with those of the lid 1, bear the same alphanumeric references.

As shown in FIG. 9, the break segment 128 is centered, along the periphery of the skirt 12, on the breakable bridge 26. In other words, this breakable bridge 26 is located, along the periphery of the skirt, substantially in the middle of the break segment 128. The side walls 132 and 132, of the strand 132 interposed between the break line 20 and the break segment 128 then have a same peripheral dimension.

In this case, the plastic deformations to which the arms 132 and 132, are subject, are homogeneous along the periphery of the skirt 12.

In FIGS. 10 and 11, the break segments 228 and 328 do not extend rectilinearly along the periphery of the skirt 12, like the break segments 28 and 128, but the break segment 228 forms a V-pattern pointing towards the break line 20 and the break segment 328 extends in a curved way, while being convex towards the break line 20. In this way, the side arms 232, and 232, and 332, and 332, of each strand 232, 332 interposed between the break line 20 and the break segment 228 and the break segment 328 respectively have, along the direction of the axis X-X, smaller thickness at their peripheral end turned towards the breakable bridge 26 than at their peripher-

eral end made in the same material with the remainder of the removal skirt portion 12. During the first opening of the lids 200 and 300, the plastic deformation of the strands 232 and 332 is thus more marked, by stretching of their material, in proximity to the breakable bridge 26.

Various layouts and alternatives to the lids 1, 100, 200 and 300, as well as to the method for making them, as described above, may moreover be contemplated. As examples:

- the break line 20 may include several breakable bridges 26 respectively associated with break segments 28, 128, 228 or 328, notably by being distributed substantially uniformly around the skirt 12;

- rather than being interrupted along the periphery of the skirt 12, the slot 24 of the loosening line 20 may be interrupted by more or more breakable bridges, connecting the skirt portions 12, and 12, to each other before the first opening of the lid, it being specified that this(s) additional breakable bridge(s) has(are) significantly less breakage resistance than that of the breakable bridge(s) 26, so as to break, notably by shearing from the start of the first phase for opening the lids, before the failure of the breakable bridge(s) 26 which themselves essentially operate in traction-compression; such breakable bridges allow reinforcement of the global strength of the break line 20 upon removing the mold and upon assembling the lid around the neck of the container;

- in the same way, rather than being interrupted along the periphery of the skirt 12, the slot 30 of the break segment 28 may be interrupted by one or more breakable bridges connecting the strand 32 to the remainder of the removable skirt portion 12, before the first opening of the lid; such breakable bridges allow reinforcement of the global strength of the break segment 28 upon removing the mold and upon assembling the lid around the container neck;

- rather than being made in the removable skirt portion 12, the break segment 28 may be delimited in the non-removable skirt portion 12;

- it is recalled that the removable attachment of the lid 1, 100, 200 or 300 on the neck of the container 2 may be provided in a way other than by screwing, notably by clipping, the skirt portion 12, then being interiorly provided with a clipping strip, optionally fragmented into several distinct clips, able to be engaged with a protruding outer edge, provided at the upper end of the neck; and/or

- permanent retention of the skirt portion 12 around the neck 2 may be obtained with embodiments other than the pallets 22.

In FIGS. 12 to 20 is illustrated a lid 1000 adapted so as to be removably attached onto a skirt 2 of a container. The lid 1000 is considered here as an illustration is a lid attached onto the neck by screwing. In practice, the neck 2 is either made in the same material with the remainder of the container, notably when the latter is a glass or plastic bottle as illustrated in FIG. 12, or adapted so as to be permanently secured onto a wall of the container at an opening crossing this wall.

The lid 1000 and the neck 2 have globally tubular respective shapes, the central longitudinal axes of which substantially coincide, under reference X-X, when the lid is screwed onto the neck. For convenience, the subsequent description is oriented by considering that the terms of
correspond to a direction globally parallel to the axis X-X and from the body of the container towards its neck 2, i.e. a direction directed towards the top portion of FIGS. 12, 13 and 16, while the terms of <<lower>> and <<bottom>> correspond to an opposite direction.

The neck 2 includes a globally cylindrical body 4 with a circular base of axis X-X. At its top end, this body 4 delimits a pouring rim 3 at which the liquid contained in the container is intended to be poured out. As illustrated in the right portion of FIG. 15, on the outer face of the body 4, the neck 2 successively includes from its pouring rim 3, a threading 5 and a boss 6, which both extend radially outwards from the body.

The lid 1000, considered as screwed onto the neck 2, is open at its lower end and closed at its upper end with a bottom wall 1010, at the outer periphery of which extends axially downwards a tubular skirt 1012 centered on the axis X-X and with a circular base.

The lid 1000 advantageously includes here a lip 1014 which extends axially downwards from the bottom wall 1010, in a centered way on the axis X-X, inside the external skirt 1012. When the lid is screwed onto the neck 2, the bottom wall 1010 extends above and through this neck, while the skirt 1012 exteriorly surrounds the body 4 and the lip 1014 is sealably pressed against the inner face of this body. As alternatives shown, other layouts aiming at sealing the obturation of the neck 2 with the lid 1000 may be contemplated, for example by means of an added gasket.

The skirt 1012 is provided with an inner threading 1016 which extends radially towards the inside of the main wall of the skirt, so as to mate the threading 5 of the neck 2. The cooperation of the threadings 5 and 1016 allows the skirt 1012 to be screwed and unscrewed around the neck.

Advantageously, in order to facilitate the movement of the skirt 1012 around the axis X-X by the user, the outer face of this skirt may be provided with elongated ribs 1018 which extend parallel to the axis X-X. These ribs 1018 allow the user to grip the lid 1000 more easily. Of course, other embodiments not shown are possible with view to facilitating the handling of the lid 1000 by the user.

During the first unscrewing of the lid 1000, the skirt 1012 is adapted so as to separate into two distinct portions, i.e. an upper portion 1012., made in the same material with the bottom wall 1010, and a lower portion 1012., initially connected to the upper portion 1012., at a peripheral break line 1020 axially located in the running portion of the skirt. The skirt portion 1012., is intended to be totally cleared from the neck 2, so that this portion 1012., interiorly bears the screwing threading 1016 and exteriorly the ribs 1018. The skirt portion 1012., is, as for it, intended to remain around the neck 2. For this purpose, this portion 1012., is interiorly provided with rings 1022 which extend radially protruding inwards from the inner surface of the skirt 1012 and which are globally located in a same plane perpendicular to the axis X-X, while being distributed over the whole periphery of the skirt. When the lid is assembled to the neck 2, these rings extend axially below the boss 6 and are adapted, when the lid is lifted for the first time, for axially abutting against this boss.

As this is well visible in FIG. 14, the break line 1020 appears in the exemplary embodiment considered here, in the form of a peripheral slot 1024, which is globally included in a plane perpendicular to the axis X-X and which radially crosses right through the wall of the skirt 1012. The slot 1024 extends over a large periphery of the skirt, but not on its entirety: a non-breakable peripheral portion 1025 of the skirt 1012 interrupts the slot 1024 along the periphery of the skirt. In practice, this non-breakable skirt portion 1025 has the same structure, notably the same thickness than the remainder of the skirt 1012, at the axial level of which the slot 1024 is made. The non-breakable skirt portion 1025 extends, around the axis X-X over an angle α1025 which in practice has a value of a few degrees.

Advantageously, as in the exemplary embodiment considered in the figures, the slot 1024 is interrupted with several breakable bridges 1026 connecting the skirt portions 1012, and 1012, to each other before the first opening of the lid. These breakable bridges 1026 are distributed substantially regularly along the slot 1024, along the periphery of the skirt 1012.

The skirt 1012 further comprises a peripheral break segment 1028 distinct from the break line 1020. As this is well visible in FIG. 15, this break segment 1028 appears, in the exemplary embodiment considered herein, in the form of a peripheral slot 1030 which is included in a plane perpendicular to the axis X-X and which radially crosses right through the wall of the removable skirt portion 1012,.

In this way, as illustrated in FIGS. 12 and 13, a material strand 1032, consisting of an elongated peripheral fragment of the wall of the skirt 1012 and essentially belonging to the non-removable skirt portion 1012, is interposed along the direction of the axis X-X between the break line 1020 and the break segment 1028.

As this is well visible in FIGS. 12 and 13, the break segment 1028 is dimensioned and positioned specifically facing the non-breakable skirt portion 1025 located at the axial level of the break line 1020. More specifically, the break segment 1028 extends around the axis X-X over an angle β1025, the value of which is greater, preferably strictly greater than that of the angle α1025 of the non-breakable skirt portion 1025. Further, the angular positioning around the axis X-X of the break segment 1028 is provided so that both of its peripheral ends 1028A and 1028B are located along the periphery of the skirt 1012, at least vertically below the peripheral ends of the non-breakable skirt portion 1025, or even preferably on either side of this non-breakable skirt portion 1025.

In this way, as noted in FIGS. 12 and 13, the strand 1032 includes a running portion 1032, connected over the whole of its peripheral dimension, to the non-breakable skirt portion 1012, through the non-breakable skirt portion 1025, while being made in the same material, without interruption of the wall of the skirt 1012, with this non-removable skirt portion 1012,.

Further, the strand 1032 includes two opposite peripheral ends 1032 and 1032, which along the periphery of the skirt 1012 are connected to the removable skirt portion 1012, through respective breakable bridges 1034 on the one hand and which, along the direction of the axis X-X, are respectively disconnected both from the remainder of the removable skirt portion 1012, because of the slot 1030, and from the remainder of the non-removable skirt portion 1012, because of the slot 1024 on the other hand.

The aforementioned breakable bridges 1034 are designed, by means of adequate proportioning, in order to have a strictly greater breakage resistance than that of the breakable bridges 1026, as explained in detail later on. Further, in order to obtain a homogeneous behavior of the strand 1032 along the periphery of the skirt 1012, notably for its ends 1032 and 1032, the break segment 1028 and the non-breakable skirt portion 1025 are centered on each other around the
axis X-X. This amounts to stating that the peripheral ends 1032 and 1032 of the strand 1032 have respective peripheral dimensions equal to each other.

When the user opens for the first time the lid 1000 by driving into rotation the skirt portion 1012, around the axis X-X for unscrewing it from the neck 2, the skirt portion 1012 is retained, along the direction of the axis X-X, by the boss 6 while the skirt portion 1012, is moved away from the skirt portion 1012, upwards. To do this, the break line 1020 and the break segment 1028 are stressed together as gradually illustrated in FIGS. 16 to 18.

More specifically, during a first opening phase illustrated by FIGS. 16 and 17, the edges of the slot 1024 move away from each other along the direction of the axis X-X, inducing breakage of the breakable bridges 1026, while at the same time, the non-breakable skirt portion 1025 withstands the breakage so that this non-breakable portion 1025 immobilizes, relatively to the non-removable skirt portion 1012, the running portion 1032, of the strand 1032. The result of this is that, insofar that the edges of the slot 1024 move away from each other and the edges of the slot 1030 also move away from each other, the peripheral ends 1032 and 1032, of the strand 1032 plastically deform, while gradually passing from their initial configuration to a plastically stretched configuration as this is well visible by comparing FIGS. 12, 16 and 17. In other words, the breakable bridges 1034, connecting the strand ends 1032 and 1032, to the removable skirt portion 1012, are subject to plastic deformation stresses, without however breaking. In particular, as shown in FIG. 17, the cross section of the bridges 1034 tends to decrease, by stretching of the material.

Thus, it is understood that during this first opening phase, the breakable bridges 1026 are broken while the breakable bridges 1034 plastically deform without breaking. This is in particular due to the fact that, upon unscrewing of the skirt portion 1012, the stresses applied to these bridges 1026 and to these bridges 1034 are essentially not of the same nature: the bridges 1026 essentially are subject to shearing stresses, which, considering their design, rapidly leads to their failure as soon as a sufficient torque is applied between the removable 1012 and non-removable 1012, skirt portions, while the bridges 1034 essentially operate in traction-compression, which, considering their design, leads to their gradual plastic deformation as the skirt portions 1012 and 1012, gradually move away from each other along the direction of the axis X-X. For the user, the force required for gradual plastic deformation of the bridges 1034 is limited, or even negligible, comparatively with the global force which he/she has to produce in order to drive the removable skirt portion 1012, into rotation. This is all the more the case when, advantageously, the peripheral dimension of the ends 1032 and 1032, of the strand 1032 is limited relatively to that of the entire of the strand 1032. According to corresponding advantageous proportioning, the peripheral extent of each strand end 1032, 1032, has a value of less than 10% of the total peripheral extent of the strand 1032, which amounts to stating that the peripheral extent of the non-breakable skirt portion 1025 has at least a value of 80% of the peripheral extent of the break segment 1028.

The fact that the bridges 104 are designed in order to operate in traction-compression and thereby further resist failure than the bridges 1026 operating with shearing, has another benefit: indeed, during the handlings of the lid 1000 before its first opening, in particular during its manufacturing, as well as during its initial placement, notably by screwing, around the container neck 2, the bridges 1034 reinforce the resistance to breakage of the break line 1020, which increases the global mechanical strength of this break line and of the break segment 1028, thereby avoiding that this line and this segment begin to break, which would alter their subsequent indication performance during the first opening of the lid. In particular, the bridges 1034 somewhat allow protection of the integrity of the breakable bridges 1026 upon manufacturing and initial placement of the lid 1000.

By continuing the unscrewing of the removable skirt portion 1012, the first opening phase ends to the benefit of a second opening phase, during which the bridges 1034 are broken, as illustrated in FIG. 18. The skirt portions 1012 and 1012, are then totally separated from each other and the unscrewing of the skirt portion 1012, may be continued until complete disengagement of the threadings 5 and 1016. As an alternative application, by means of adequate proportioning of the threadings 5 and 1016, the latter may be completely disengaged from each other without however again totally breaking the bridges 1034: in this case, the bridges 1034 may be used as hinges for pivoting the skirt portion 1012, relatively to the skirt portion 1012, being understood that, considering their breakability, the bridges 1034 are then easily broken by the hand of the user, notably with view to closing the neck 2, by repositioning the skirt portion 1012, around this neck by screwing.

Subsequently, assuming that the removable skirt portion 1012, is put back into place around the neck 2, by completely screwing it around this neck, the appearance of the lid 1000 is the one shown in FIG. 19: it is impossible to reposition the strand 1032 in its initial configuration, because of the plastic deformation of its peripheral ends 1032 and 1032. The result of this is that a portion of the strand 1032 then hangs in space, protruding from the outer face of the skirt 1012. Further, considering the notch shape of the non-removable skirt portion 1012, related to the permanent presence of the running portion 1032, of the strand 1032, the skirt portions 1012 and 1012, can no longer be placed substantially continuously, as they were before the first opening of the lid 1000, in particular because of the interposition of one, or even both deformed ends 1032 and 1032, of the strand 1032, as illustrated in FIG. 19.

Advantageously, a portion of the body 4 of the neck 2 is then directly observable, vertically below the break segment 1028 on the one hand and between the non-contiguous skirt portions 1012 and 1012, by selecting contrasted colors for the skirt 1012 and the body 4 of the neck 2, better visual indication is available as to whether the lid 1000 has already been opened once.

In order to manufacture the lid 1000, notably in plastic material, it is equally possible to use a molding and then a cutting method, or exclusively a molding method. In the first case, after molding the skirt 1012, cutting blades are used for preferably concomitantly making the break line 1020 with the breakable bridges 1026, and the break segment 1028, by driving the skirt 1012 and these cutting blades in rotation around the axis X-X relatively to each other. In the second case, by means of the use of molding drawers, the skirt 1012 is molded by integrating the presence of the break line 1020 and of the break segment 28.

Various layouts and alternatives to the lid 1000, as well as to the methods for making it, as described above, may moreover be contemplated. As examples:
several non-breakable skirt portions 1025 may be provided at the axial level of the break line 1020, while being distributed substantially uniformly around the skirt 1012 and being respectively associated with as many break segments 1028.

rather than being interrupted along the periphery of the skirt 1012 by the breakable bridges 1026, the slot 1024 of the break line 1020 may be uninterrupted;

conversely, rather than being uninterrupted along the periphery of the skirt 1012, the slot 1030 of the break segment 1028 may be interrupted by one or more breakable bridges connecting the running portion 1032, of the strand 1032 to the remainder of the removable portion 1012, before the first opening of the lid 1000; such breakable bridges allow reinforcement of the global strength of the break segment 1028 upon removing the mold and assembling the lid around the container neck 2;

rather than being made in the removable skirt portion 1012, the break segment 1028 may be delimited in the non-removable skirt portion 1012, which amounts to stating that according to the orientation of FIGS. 12 and 13, the break segment is no longer positioned above the break line 1020, but below the latter; in this case, the running portion of the strand is bound in a non-breakable way to the removable skirt portion, while the peripheral ends of this strand are each connected to the non-removable skirt portion through respective breakable bridges, functionally similar to the bridges 1034;

as explained above, the embodiment of the invention corresponding to the lid 1000, is of most particular interest for screwed-on lids; however the invention may be applied to lids having other types of removable attachment on the container neck 2, such as an attachment by clamping, the skirt portion 1012, then being interiorly provided with a clamping strip, optionally fragmented into several distinct clips, so as to be engaged with a protruding outer edge, provided at the upper end of the neck; and/or

permanent retention of the skirt portion 1012 around the neck 2 may be obtained by embodiments other than the rings 1022.

1. A lid for a container neck, including a tubular skirt capable of surrounding the neck, and provided with a peripheral break line, which is adapted to be broken during the first opening of the lid and which, before this first opening, connects along the direction of the axis of the skirt, a non-removable portion of the skirt, provided with means for permanently retaining around the neck, and a removable portion of the skirt, provided with means for removable attachment to the neck, and at least one break segment, which is delimited distinctly from the break line so as to form, between the break line and the break segment along the direction of the axis of the skirt, a strand extending along the periphery of the skirt,

wherein either each of both peripheral ends, or the running portion of said strand, is bound in a non-breakable way to a first of the removable and non-removable skirt portions, while, respectively either the running portion, or each of both peripheral ends of said strand is connected to the second of the skirt portion through an breakable bridge which is adapted, during the first opening of the lid, for successively resisting to failure while the break line is already broken, and for then breaking after plastic deformation of the strand and for thus separating the removable and non-removable skirt portions from each other.

2. The lid according to claim 1, wherein the breakable bridge is further adapted for reinforcing the resistance to failure of the break line during handlings of the lid before its first opening, notably during its placement around the container neck.

3. The lid according to claim 1, wherein each of both peripheral ends of the break segment is located, along the periphery of the skirt, outside the peripheral portion of the skirt, in which the running portion of the strand is either breakably connected to the second of the removable and non-removable skirt portions, or non-breakably connected to the first of the removable and non-removable skirt portions.

4. The lid according to claim 3, wherein the peripheral extent of the peripheral portion of the skirt, in which the running portion of the strand is either breakably bound to the second of the removable and non-removable skirt portions, or non-breakably bound to the first of the removable and non-removable skirt portions, has the value of at least 80% of the peripheral extent of the break segment.

5. The lid according to claim 1, wherein, in the case when the breakable bridge is provided between the running portion of the strand and the second of the removable and non-removable skirt portions, the breakable bridge is located, along the periphery of the skirt, closer to one of both peripheral ends of the break segment than to the other peripheral end.

6. The lid according to claim 1, wherein, in the case when the breakable bridge is provided between the running portion of the strand and the second of the removable and non-removable skirt portions, the breakable bridge is located at the same axial level as the break line.

7. The lid according to claim 1, wherein, in the case when the breakable bridge is provided between the running portion of the strand and the second of the removable and non-removable skirt portions, the breakable bridge is located at the same axial level as the break line.

8. The lid according to claim 1, wherein the break line includes breakable small bridges, which are distributed along the periphery of the skirt, which, after the first opening of the lid, connect the removable and non-removable skirt portions to each other, and which, during the first opening of the lid, are adapted to be all broken before the breaking of the breakable bridge.

9. The lid according to claim 8, wherein the means for removable attachment to the neck comprise a threading for screwing-unscrewing around this neck, and that this threading is screwed on for the first time, for placement of the lid and unscrewed for the first opening of the lid, around the neck, the breakable bridge is designed to essentially operate in traction-compression while the breakable small bridges are designed so as to essentially operate with shearing.

10. The lid according to claim 1, wherein several break segments which are distributed along the periphery of the skirt.

11. The lid according to claim 1, wherein said at least one break segment is delimited in the removable skirt portion.

12. The lid according to claim 1, wherein said at least one break segment is delimited in the non-removable skirt portion.
13. The lid according to claim 1, wherein said at least one break segment extends rectilinearly along the periphery of the skirt.

14. The lid according to claim 1, wherein said at least one break segment forms, along the periphery of the skirt a V pattern pointing towards the break line.

15. The lid according to claim 1, wherein the break segment is curved along the periphery of the skirt, while being convex towards the break line.