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(54) OPENING ARRANGEMENT FOR PACKAGING CONTAINERS

(57) The present invention concerns an opening arrangement (16) for packaging containers (10), wherein the packaging container (10) comprises an opening region (18) which is defined by a weakening arranged in the wall material of the packaging container, along which weakening the wall material of the packaging container is arranged to break so as to form an opening (18). The opening arrangement (16) comprises a plate comprising a first and a second part which are sealed to the packaging container. The first part is sealed to a first region of the wall material which at least partially contains the opening region. The second part is sealed to a second region which runs around the first region. The two parts are connected via a first hinge, and on application of force, the first part is arranged to pivot away from the second part in the direction away from the wall material towards the plate, which breaks the wall material along the weakening such that said opening (18) is created in the packaging container (10).

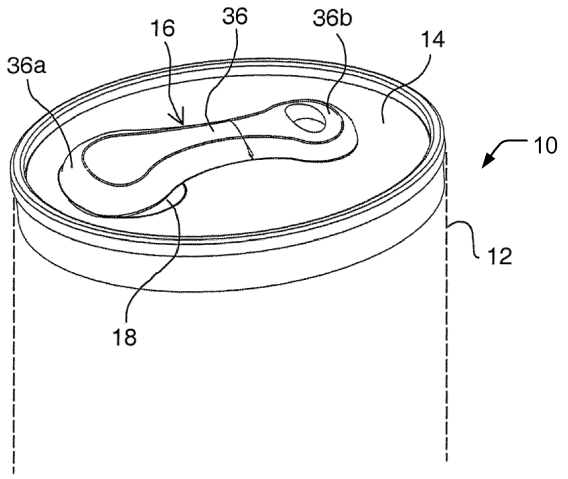

Fig. 1

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Description

TECHNICAL FIELD

[0001] The present invention concerns an opening arrangement for a packaging container, and a related packaging container.

BACKGROUND

[0002] Many packaging containers of the type which contain drinks, such as soft drinks, juices, beer etc., are gas-tight in unopened state and comprise an opening arrangement which, on opening, is able to form a pouring and/or drinking opening by penetrating the packaging container wall. A group of packaging containers in which this type of opening arrangement is used is those made from packaging laminate comprising at least one core layer of cardboard or paper. In many cases, the packaging laminate comprises an opening region which is defined by a weakening in the laminate. The weakening is usually made in that at least one core layer is punched or perforated, and one or more inner layers, such as for example barrier or fluid-tight layers, are left intact. EP 0363528A1 describes an opening arrangement comprising a lever arm which has a penetration part with which the weakening is initially punctured in the direction inward towards the packaging container. With a lever arm, the packaging laminate is then pulled away through the opening region so that an opening is formed. A connecting part stiffens the region around the opening region and allows the formation of a clear edge which defines the opening. Another group of packaging containers is those for pressurised filling products. Carbonated drinks, such as for example beer, sparkling wine and soft drinks, contain gas, such as e.g. CO2, which creates a pressure in the packaging container used. The pressure imposes extra requirements on the opening arrangement which, in addition to being easy to open for the consumer, must also resist the pressure from the filling product. It is usual to pack pressurised filling products in cans made of metal, such as aluminium cans. An opening arrangement for such cans is described for example in US 5,711,448. Said opening arrangement is based on the principle of a lever arm which has a fulcrum, wherein a first longer part on one side of the fulcrum constitutes a gripping part, and a second shorter part on the other side of the fulcrum constitutes a pressure part. On the start of twisting of the lever arm under the action of the gripper part, the pressure part first creates a hole in the packaging container so that the pressure can escape. The hole is created at a point in a weakening line which runs almost all the way round and delimits an opening region. On continued twisting of the lever arm, the pressure part is pressed down against said opening region. Force is applied on the opening region so that a shearing of material begins along the weakening line. The line does not run all the way round, which means that part is not broken away from the packaging container but remains in place and is bent down into the packaging container through the pouring and drinking opening which is formed.

SUMMARY OF THE INVENTION

[0003] The aim of the present invention is to achieve an opening arrangement which is easy for the consumer to open and which is still sufficiently strong to resist the forces which may act on the packaging container. Similarly, an object is to achieve an opening arrangement which allows its use on a packaging laminate comprising at least a core layer of cardboard or paper. A further object of the present invention is to achieve an opening arrangement which can resist the pressure from a pressurised filling product, such as for example carbonated soft drinks and beer. This object has been achieved by an opening arrangement for packaging containers according to the claims.

[0004] The invention concerns an opening arrangement for packaging containers, wherein the packaging container comprises an opening region which is defined by a weakening arranged in the wall material of the packaging container, along which weakening the wall material of the packaging container is arranged to break so as to form an opening. The opening arrangement comprises a plate comprising a first and a second part, wherein the plate is arranged on a surface of the wall material of the packaging container, wherein the first part is sealed to a first region of the wall material which at least partially contains the opening region, wherein the second part is sealed to a second region which runs around the first region, wherein the first and second parts are connected together via a first hinge, wherein the first part is arranged on application of force to pivot away from the second part in the direction away from the wall material towards the plate, which breaks the wall material along the weakening and delaminates the wall material such that said opening is created in the packaging container. In order for the packaging container to be as easy to open as possible, the weakening along the opening region is made with the minimum possible strength. However, a low-strength weakening may also give a packaging container which runs an increased risk of leaking when damaged for example by knocks and impacts. Usually, the aim is to achieve the best compromise between ease of opening and adequate strength. With the present opening arrangement, no compromise need be made between strength and ease of opening. Instead, a packaging is achieved which is very easy to open, wherein the weakening is protected by seals at the first and second regions and can therefore be made with little strength. This is particularly advantageous for pressurised filling products since the packaging material is exposed to pressure forces on the inside which result in a bulge in the material, which gives rise to stresses. The weakening may be protected in that the stresses can propagate away from the region around the opening via the seals to the packaging

material, i.e. the wall material, inside the opening region and vice versa. The form of the opening arrangement with a two-part plate may be particularly advantageous for use on packaging material comprising cardboard and paper layers. The two parts help achieve an even and controlled opening edge in that they reinforce the opening region.

[0005] In one example, the first hinge is pivotable between a first position, in which the first part is arranged to be situated substantially in the same plane as the second part, and a second position, in which the first part has pivoted such that the two parts form an angle α between them. Because the wall material inside the opening region is sealed to the first part, and said part is pivoted away from the second part to form an opening, the advantage is achieved that there is no need to create a separate, i.e. loose, waste portion of packaging material.

[0006] In a further example, the force is applied by means of a lever arm which is connected to the first part of the plate. With a lever arm, the force which the consumer must apply to open the packaging container can be reduced. The first hinge may furthermore be bistable and have three balance position, wherein said first and second positions constitute stable balance positions while a third position between these constitutes an unstable balance position. In this way, the consumer need not apply force throughout the entire pivoting process, but only enough for the first part to move past the unstable balance position, from which it more or less snaps into the second position. The second position may therefore be a position in which the first part has an angle α relative to the second part such that it does not obstruct the opening but is concealed in the packaging container. Similarly, it is an advantage that the first part can retain its first or second position without beginning to move under very little force. When the consumer drinks directly from the opening, the first part may therefore remain in its second open position, and the consumer does not risk the packaging container closing again e.g. because of the effect of the filling product on the first part or because of tilting of the packaging container.

[0007] In one example, the opening arrangement comprises a bistability function wherein said first and second positions constitute stable balance positions while a third position between them constitutes an unstable balance position, wherein the opening arrangement has a geometric plane which is substantially parallel to the second part of the plate and which runs through an edge of the opening, wherein said bistability function is achieved in that the first hinge has a rotation axis which is shifted along said plane by a distance *d* from the edge of the opening; in that a lever arm is fixed to the first part of the plate; in that the geometry is such that on pivoting of the first part between the first and second positions, a point of the lever arm is situated at a distance A from the rotation axis of the hinge, wherein distance A is measured along said plane; in that a position of the first part of the plate and hence the lever arm is unloaded when A>d, and that when A≤d, a position is loaded with a force which is proportional to the angle α between the first and second parts. Because the bistability function does not lie in the hinge but in the geometry of the opening arrangement, the first part can tolerate significantly greater forces before being pushed out of its first or second position.

[0008] In one example, the first part at its periphery is provided with an annular rim which is adapted to overlap an inner edge region of the second part of the plate. In this way, the opening arrangement can be adapted for pressurised filling product. The overlap between the first and second parts can absorb pressure acting on the first part and transfer it to the second part, which eliminates the risk that the first part is pushed in the direction outward from the packaging container.

[0009] In one example, the surface of the wall material of the packaging container against which the plate is arranged faces towards the interior of the packaging container, wherein the first hinge is situated inside the packaging container. The first part can then be concealed inside the packaging container after opening. For example, the lever arm may be arranged such that in the first position it has an extension substantially along an outer surface of the packaging container, wherein the lever arm comprises a penetration part and a manoeuvring part, wherein at a point between the penetration part and the manoeuvring part, the lever arm is fixed to the first part of the plate, wherein a free end of the penetration part is arranged above or in contact with the opening region so that it breaks the weakening when a force is applied to the manoeuvring part. With a lever arm of this type, the force which the consumer must apply to open the packaging container can be reduced.

[0010] The first part may be sealed to a first region of the wall material which is larger than the opening region and encloses the opening region with an overlap. With such an overlap, a seal is achieved with a further improved strength and reliability. An internal pressure directed outward may be absorbed by the surfaces of the overlap and in such a way increase the sealing force between the surfaces. The overlap may be at its greatest in a region closest to the first hinge. In this way, the breakage of the weakening can be controlled, and by for example placing the penetration part against a region with smaller overlap, the force required to initially puncture the weakness can be minimised.

[0011] In one example, the first and second parts are produced of one piece in a heat-sealable material, preferably a thermoplastic. This gives a very simple and cheap opening arrangement. The thermoplastic may comprise a material selected from a group comprising polyolefins, polyesters, polyamides, polycarbonates, polyacetates, ionomers and ethylacryl copolymers.

[0012] In one example, the thermoplastic comprises polyester. Polyester is an easily available and cheap plastic with adequate strength.

[0013] In one example, in the second position, a part of the manoeuvring part of the lever arm extends through

and out of the opening on the outside of the packaging container, and a second hinge is arranged at the separating line between said part and the remaining part of the lever arm, which allows said part to pivot in the direction downward against the outer surface of the packaging container and form an angle γ with the remaining part of the lever arm. In this way, no part of the manoeuvring part need form an obstruction for drinking or pouring from the opening arrangement.

[0014] The invention also concerns a packaging container which comprises an opening arrangement according to any of the examples described above.

[0015] The invention concerns a packaging container which comprises an opening arrangement, wherein the packaging container comprises an opening region which is defined by a weakening arranged in the wall material of the packaging container, along which weakening the wall material of the packaging container is arranged to break so as to form an opening, wherein the opening arrangement comprises a plate comprising a first and a second part, wherein the plate is arranged on a surface of the wall material of the packaging container, wherein the first part is sealed to a first region of the wall material which at least partially contains the opening region, wherein the second part is sealed to a second region which runs around the first region, wherein the first and second parts are connected together via a first hinge, wherein the first part is arranged on application of force to pivot away from the second part in the direction away from the wall material towards the plate, which breaks the wall material along the weakening and delaminates the wall material such that said opening is created in the packaging container.

[0016] The invention also concerns an opening arrangement for packaging containers, wherein the packaging container comprises an opening region in a wall material, and wherein the opening region is arranged to be opened by delamination of the wall material. The opening arrangement comprises an outer part adapted to be arranged on an outside of the packaging container, and an oblong opening element arranged to be fixed to the outer part and on an inside of the packaging container, wherein the oblong opening element is adapted to extend through the wall material through a sealed opening therein, wherein by application of force on the outer part, the oblong opening element is adapted to puncture the wall material along a defined track so as to achieve said delamination.

[0017] The invention also concerns a packaging container which comprises an opening arrangement according to any of the examples described above.

[0018] The invention concerns a packaging container comprising an opening region in a wall material, and an opening arrangement, wherein the opening arrangement comprises an outer part arranged on an outside of the packaging container, an oblong opening element fixed on the outer part and on an inside of the packaging container, wherein the oblong opening element extends through the wall material through a sealed opening therein, wherein by application of force on the outer part, the oblong opening element is adapted to puncture the wall material along a defined track so as to achieve said delamination.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] Embodiments are described below in detail with reference to the attached drawings in which:

Fig. 1 shows diagrammatically an end part of a packaging container provided with an opening arrangement according to one example,

Fig. 2 shows diagrammatically the opening region in the wall material of the packaging container according to one example,

Fig. 3 shows diagrammatically an example of the plate of the opening arrangement with a first and a second part,

Fig. 4 shows diagrammatically the first and second regions and the first and second parts of the plate according to one example,

Fig. 5a shows diagrammatically a cross-section through a packaging container in which the plate is sealed to the wall material of the disc in the first and second regions according to one example,

Fig. 5b shows an enlarged view of the cross-section in figure 5a,

Fig. 6 shows diagrammatically three views illustrating the function of the hinge according to the example,

Fig. 7 shows diagrammatically a perspective cross-section of an initial step in opening the packaging container by means of the opening arrangement according to one example,

Fig. 8 shows diagrammatically a view similar to that of figure 7, but in a position in which opening has been achieved, i.e. when the weakening has been broken and when the wall material in the overlap has been delaminated, and/or the seal at the overlap has been broken, according to one example,

Fig. 9 shows diagrammatically a view similar to that of figures 7 - 8, but in which the first and second parts of the plate are in the second position according to one example, and

Fig. 10 shows diagrammatically a view similar to that of figures 7 - 9, but in a position in which the end part of the manoeuvring part is bent down against the disc, according to one example;

Fig. 11a-b show diagrammatically an opening arrangement in a side view and in a top view of the packaging container on which the opening arrangement is mounted, according to one example, before the start of opening of the packaging container;

Fig. 11c-d show diagrammatically corresponding views to those of figures 11a-b, but in which the opening arrangement according to one example has par-

tially opened the packaging container;

Fig. 11e-f show diagrammatically corresponding views to those of figures 11c-d, but in which the opening arrangement according to one example has fully opened the packaging container;

Fig. 12 shows diagrammatically the opening arrangement in a side view folded down inside the packaging container, according to one example;

Fig. 13 shows diagrammatically the opening arrangement in a side view folded down inside the packaging container, and in which an opening element has been removed, according to one example; and

Fig. 14 shows diagrammatically a part of an opening arrangement in a side view, according to one example.

DETAILED DESCRIPTION

[0020] The opening arrangement according to the invention, as described above, allows the use on packaging containers for both pressurised and non-pressurised filling products, such as for example carbonated soft drinks, beer, juice and fruit syrup. In the example described here, the opening arrangement is used on a packaging container which as a whole is designated with reference sign 10, and which is partly shown in figure 1.

[0021] The packaging container is made from a sleeve 12. In figure 1, only an end part of this sleeve 12 is shown, the extension of which is indicated with dotted lines, and said end part is sealed with a disc 14. Both the disc 14 and the sleeve 12 may be made of a packaging laminate which at least comprises a core layer, a gas barrier layer and outer fluid-tight heat-sealing layers. The heat-sealing layers are the outer layers and therefore the core layer and barrier layer lie between the heat-sealing layers, and the packaging laminate is oriented so that the barrier layer faces the filling product. The core layer may comprise paper or cardboard while the heat-sealing layers may comprise a thermoplastic such as for example a polyester (PET). The barrier layer may comprise a metal layer such as aluminium film which also has heat-seal-promoting properties. The latter term means that the layer can be activated by means of external energy supply to emit heat for warming an adjacent layer, for example the sealing layer, so that this can be brought to fuse together with other similar layers. The aluminium film allows the use of induction sealing techniques. Sealing by induction is known to the person skilled in the art and the technique will not be described in more detail. The term sealing means that the material welds together in the outer layer. The opening arrangement, which as a whole is designated 16, is arranged on the disc 14 and its purpose is to ensure that a pouring and/or drinking opening 18 can be formed in the packaging container 10 when the filling product is to be consumed. The arrangement 16 is formed such that the packaging container 10 can be opened without having to break or weaken in advance the barrier layer or another layer important for the conservation of the filling product in the packaging laminate.

[0022] The packaging container 10 comprises an opening region 18, see figure 2, which is defined by a weakening 20 arranged in the wall material of the packaging container, i.e. in the disc 14, along which weakening the wall material of the packaging container is arranged to break in order to form the opening 18. For the sake of simplicity, the opening region and the opening carry the same reference sign. The weakening 20 runs around the opening region 18 and may be produced by fully or partially punching or perforating the core layer and in some cases also the outer heat-sealing layer, while the barrier layer and the inner fluid-tight sealing layer remain intact. In the example, the opening arrangement 16 is placed on the top of the packaging container and it is therefore the disc 14 which is provided with the weakening 20. The weakening 20 may be produced by laser perforation of the wall material 14 or another perforation technique. Said weakening 20 thus defines an opening region 18, and after opening of the packaging container 10 constitutes an edge of the opening 18. The form of the opening 18 is selected so that it is suitable for drinking and/or pouring from. The opening may for example be elliptical, circular, triangular, quadrilateral, rectangular, polygonal, or have a form which is a combination thereof. In the example illustrated, the region has a form similar to a bean, i.e. a form which resembles an oval, see figure 2. The bean shape is formed by a substantially straight side 20a, an opposite curved side which has a radius substantially concentric with the radius of the disc, and in between two short curved sides with radii which lie substantially tangential to the large radius. In the example, the opening region 18 is placed in the vicinity of the periphery of the disc, i.e. its central point is shifted slightly from the central point of the disc. Other locations are also conceivable. The substantially straight side 20a or edge in the example is located closest to the centre of the disc 14.

[0023] The opening arrangement 16 comprises a plate 22, see figure 3. The plate 22 may be made from a heat-sealable material such as a thermoplastic. The thermoplastic may contain a material selected from the group comprising polyolefins, polyesters, polyamides, polycarbonates, polyacetates, ionomers and ethylacryl copolymers. In one example, the thermoplastic comprises a polyester. The plate 22, which is arranged to act as a stiffening, comprises a first and a second part 22a, 22b and is arranged on a surface of the wall material of the packaging container. The plate may be arranged on the surface of the disc 14 which faces inward to the interior of the packaging container, as shown in the example in figures 5a-b. The first part 22a is sealed to the first region 24 of the wall material 14 which comprises or encloses the opening region 18 at least partially or for a large part thereof. Also, as shown e.g. in figure 4, the first part 22a may be sealed to a first region 24 which is larger than the opening region 18 and encloses the latter with an

overlap, so that in one example, it is possible that the opening region 18 extends outside the first region 24 to which the first part 22a is sealed. Furthermore, to simplify the description, it is assumed that the part of the wall material to which the first part 22a is sealed constitutes the first region 24. In other words, the form of the first part 22a corresponds to that of the first region 24. It is also understood that the proportion of the surface of the first part 22a which is fixed or sealed or otherwise secured in the first region 24 may vary. This means it is possible that part of the surface of the first part 22a is located opposite the wall material 14 without being sealed or otherwise secured to the wall material 14. In the example in figure 4, the extension of the first region 24 is shown with closely spaced sloping lines. The separating line between the first and second parts 22a, 22b of the plate 22 is shown in a solid line (which also shows the first region 24) and the weakening 20 which defines the opening region 18 is shown with a dotted line in said figure. The second part 22b of the plate 22 is sealed to the second region 26 which runs round the first region 24 and is shown with widely spaced lines in figure 4.

[0024] The first part 22a and hence also the first region 24 may have a substantially oval form. It is also possible that the first region 24 has a different form such as more circular (e.g. less varying or constant radius), or oval in the vertical direction in figure 4, or rectangular or another polygonal form, for optimisation to the specific packaging application. Also, the opening may comprise these forms. As stated, the first region 24 may be larger than the opening region 18 so as to enclose the opening region 18 with an overlap. In the example of figure 4, the first region 24 is not placed concentrically relative to the opening region 18. This means that the overlap has varying size. In figure 4, the overlap is at its greatest at the substantially straight side 20a of the oval form, which in this example is similar to a bean shape described above. The overlap at the substantially straight side 20a may be of the order of around 2/3 larger than the overlap at the opposite curved side. The significance of this will be described later.

[0025] With reference to figure 5b which is an enlarged view of figure 5a, the seal between the first part 22a and the first region 24 may, in one example, be arranged such that at least an overlap 27 of the first region 24 and an edge region 31 at the opening region 18 is sealed to the first part 22a. Such a seal is shown in figure 5b with sloping lines. Note that this marking however also contains the seal between the second part 22b and the second region 26 which will be described below. Alternatively, the entire surface of the opening region 18 may be sealed to the first part 22a. The seal may be made such that the entire first region 24, shown with the closely spaced sloping lines in figure 4, is sealed to the first part 22a. The seal may be created for example by means of induction sealing. The second part 22b has an inner periphery 29 or edge which has a shape which substantially corresponds to the outer periphery or edge of the first part 22a. In the case that the first part 22a has an overlap with the opening 18, as shown for example in figure 5a and in the enlarged section in figure 5b, the inner periphery 29 runs at a distance from the weakening 20 which substantially corresponds to the overlap. Figures 5a and 5b show examples in which the first and second parts 22a, 22b have been placed together, and the two parts 22a, 22b are sealed to the wall material 14, i.e. angle α is 0 degrees, as illustrated in figure 6, view I. Figure 3 shows an example in which the first and second parts 22a, 22b are separated so that the angle α is 180°.

[0026] The outer periphery of the second part 22b may have different forms. This second part 22b may for example be substantially annular as shown in the example of figure 3.

[0027] In one example, the packaging container 10 is formed such that the disc 14 is sealed into a ring 28 which runs around an edge part of the disc 14. The ring 28 is in turn sealed to the sleeve 12, either directly or via a second ring which is sealed to the first. The first ring 28 has a surface which, when the ring 28 is arranged on the sleeve 12, faces away from the interior of the packaging container, i.e. outward. The disc 14 may be sealed on this surface with its barrier layer facing towards the interior of the packaging container. The seal may for example be created by means of induction sealing. In one example, the second part 22b of the plate 22 may be an integral part of the ring 28, i.e. the ring 28 and the second part 22b sit together in one piece. Figure 3 shows such a form, and the second part 22b of the plate 22 forms an extension of the surface 30 against which the disc 14 (not shown) is sealed. The extension may have the form of a tongue 30 which extends in the radial direction towards the centre of the disc, i.e. also the centre of the ring. Figure 3 also shows the first part 22a as an extension of the tongue 30. The first and second parts 22a, 22b of the plate 22, and the ring 28, may be produced as one piece, for example by injection moulding. Figure 3 shows an example of how such a piece may appear. As stated above, figures 5a-b instead show the case where the angle α is 0°, i.e. the first part 22a of the plate is surrounded by the second part 22b of the plate, and is located in the same plane when sealed to the disc or wall material 14. Furthermore, the first part 22a may, at its periphery and on its side facing inward towards the packaging container, be provided with an annular rim 32 which is adapted to overlap the inner edge 29 of the second part 22b, i.e. the rim 32 has an extension against the second part 22b and overlaps an edge region 29 thereof, as shown in figures 5a-b. The overlap may be substantially concentric and the size of the overlap may be selected such that any pressure forces from a pressurised filling product press the first part 22a against the second part 22b without the forces reaching the weakening 20. Almost the entire surface of the second part 22b may be sealed to the disc 14 in order to further improve the structural integrity and resistance against internal pressure.

[0028] The first and second parts 22a, 22b of the plate are connected to each other via a first hinge 34. The

hinge 34 is formed such that the first part 22a, on application of force, is arranged to pivot away from the second part 22b in the direction away from the wall material, i.e. the disc 14, towards the plate 22. The hinge 34 may be placed at the end of the second part 22b which is situated substantially closest to the centre of the disc 14, i.e. in the vicinity of the straight edge 20a of the opening region 18. In one example, the hinge 34 comprises two articulated parts placed at a distance from each other. Alternatively, the hinge 34 may consist of only one centrally located part.

[0029] The rotation axis of the first end 34 lies in a plane substantially parallel to the plane of the disc. Said rotation axis may also be placed substantially parallel to a straight side 20a of the opening region 18, as shown in the example in figure 3. Each of the two articulated parts may be formed of one piece, and the one end may be fixedly connected to the other part 22b of the plate and the second end fixedly connected to the rim 32 of the first part 22a of the plate, in order for the first and second parts 22a, 22b to be able to lie in a common plane at least before opening. The hinge 34 is pivotable between a first position, in which the first part 22a is arranged to be situated substantially in the same plane as the second part 22b, see figures 5a-b and figure 6 (view I) (angle $\alpha = 0°$), and a second position in which the first part 22a has been pivoted such that the two parts form a larger angle α to each other, as shown in view II of figure 6 (and also a third position as shown in view III of figure 6). On opening of the packaging container 10, said hinge pivots from the first position to the second position such that the wall material is broken along the weakening 20 and the wall material is delaminated. In conjunction with this, it is also possible that the wall material is not only broken along the weakening. The wall material may also be torn in the overlap, which is found at the overlap of the first part 22b with the wall material 14, radially outward against the sleeve 12 from the weakening 20 in figure 5b. This will be described in more detail below. Similarly, the type of hinge will be described in more detail below.

[0030] To open the packaging container 10, the consumer applies a force and this force may for example be applied by means of a lever arm 36 which is connected to the first part 22a of the plate, see for example figure 7. The lever arm 36 in the first position extends substantially along the outer surface of the packaging container 10, see figure 1. It is possible that the disc 14 may be bent outward slightly if the packaging container 10 contains a pressurised filling product. The lever arm 36 may have an arched surface facing the disc 14 in order to allow better contact in these cases. The arching may thus prevent the lever arm 36 from being directed outward when the disc 14 begins to bulge under the pressure. The lever arm 36 may comprise a penetration part 36a and a manoeuvring part 36b, wherein at a point between the penetration part 36a and the manoeuvring part 36b, the lever arm 36 is fixed to the first part 22a of the plate 22, e.g. by fixing element 38 as shown in figure 7. The manoeuvring part 36b may be several times longer than the penetration part 36a in order to give an increased moment and reduce the force required from the consumer to break the opening 18. As stated, the lever arm 36 is connected to the first part 22a of the plate 22. This may be achieved by the lever arm 36 being fixed to the first part 22a by a fixing element 38, as shown for example in figure 7. The fixing element 38 may comprise a plug or pin element 38 which extends through a hole arranged for this purpose in the wall material inside the opening region 18 and in the first part 22a. The fixing element 38 may furthermore be sealed to the side of the first part 22a facing inward towards the packaging container. The hole 38', in which e.g. a plug element 38 is fixed in the first part 22a, is illustrated in figure 3. The seal may for example be achieved by heating and subsequently compressing the end so that it is widened and brought to cover the edge of the hole. The technique may be compared to riveting. The fixing of the lever arm 36, i.e. the location of the plug element, may be optimised e.g. in the case of a non-concentric overlap between the first region 24 and the opening region 18. The fixing of the lever arm in the first part 22a and the opening region 18 may be placed closest to the small overlap, i.e. in the vicinity of the curved side of the bean shape and close to the weakening 20, in order to facilitate opening.

[0031] In one example, the penetration part 36a lies against the opening region 18 only at its free end, e.g. in this case, the lever arm is arched. In this region, the penetration part 36a may have a form which substantially follows the form of the weakening 20 and which is placed inside the opening region 18 very close to the weakening 20, as shown for example in figure 1, in order to further facilitate opening of the packaging container.

[0032] The manoeuvring part 36b of the lever arm 36 may at its other end be provided with a ring-shaped region 40 intended for fingers to grip in when the packaging container 10 is to be opened using the opening arrangement 16. When the first part 22a is in the second position, part of the manoeuvring part 36b of the lever arm extends through and out of the opening 18 on the outside of the packaging container, as illustrated in figure 9. To reduce the risk of this part forming an obstruction when the consumer wishes to drink directly out of the packaging container, a second hinge 42 may be arranged at the separating line between said part and the remaining part of the lever arm 36, which allows the manoeuvring part 36b to be pivoted down in the direction towards the outer surface of the packaging container and form an angle γ with the remaining part of the lever arm 36, see view II in figure 6 and figure 10. The outer surface in this case is the disc 14, and the pivoting takes place in the direction away from the opening 18 over the straight edge 20a.

[0033] In the opening arrangement 16, the lever arm 36, like the plate 22, may be made of a heat-sealable material such as a thermoplastic. The thermoplastic may comprise a material selected from the group containing polyolefins, polyesters, polyamides, polycarbonates,

polyacetates, ionomers and ethylacryl copolymers. In one example, the thermoplastic is a polyester.

[0034] In the description below, the first hinge 34 will be described further with reference to figure 6. The opening arrangement 16 may comprise a bistability function in which said first and second positions constitute stable balance positions as illustrated in figure 6 view I and II, while a third position between them constitutes an unstable balance position, see figure 6 view III. In this way, when opening the packaging container 10, the consumer can easily cause the first part 22a of the plate 22 to snap into its second position. This bistability function is achieved by selecting a hinge of a bistable type. In the example described however, another alternative is shown in which the form of the opening arrangement constitutes a bistability function and the hinge 34 itself need not be bistable.

[0035] The opening arrangement 16 has a geometric plane P which is substantially parallel to the second part 22b of the plate 22 and which runs through the straight side 20a of the opening 18. The rotation axis of said first hinge 34 is shifted along the geometric plane P. The shift is indicated as a distance *d* from the straight edge 20a of the opening 18. View I of figure 6 shows distance *d*, the hinge 34, the first part 22a and the lever arm 36 in the first position, i.e. a stable balance position of the opening arrangement 16. The lever arm 36 is on the outside of the packaging container 10, and the first part 22a of the plate lies in line with the second part 22b, i.e. the opening 18 is closed. The second part 22b has not been shown in the views, but it should be clear that the second part 22b lies in the plane P. View II of figure 6 shows the same parts but in the second position, which is also a stable balance position of the opening arrangement 16. In this position, the first part 22a of the plate has been pivoted away from the second part 22b, and a large part of the lever arm 36 is situated inside the packaging container 10. The part of the manoeuvring part 36b of the lever arm 36 which protrudes from the opening 18 has been folded back against the outside of the disc by means of the second hinge 42. View III in figure 6 is intended to illustrate how the opening arrangement 10 behaves between the first and second positions, including in the third position which is an unstable balance position. The lever arm 36, as stated above, is attached with an angle β against the first part 22a. The fixing may be torque-stiff, which means that when force is applied on the lever arm 36, said angle β may change slightly due to the flexibility in the material. When pivoting between the first and second positions, the lower surface (e.g. arched or straight) of the lever arm may move around the straight edge 20a of the opening. This may be described as, on pivoting of the first part 22a between the first and second positions, a point of the lever arm 36 is located at a distance *A* from the rotation axis of the hinge 34, wherein distance *A* is measured along the above-mentioned geometric plane P, i.e. the plane along which distance *d* is also measured. The bistability function is given by the geometry of the opening arrangement 16. A position is obtained for the first part 22a of the plate 22 and hence also the lever arm 36, when $A>d$, which is unloaded. No force then acts on the lever arm 36 from the straight edge 20a of the opening 18, and hence a stable balance position is reached. This situation corresponds to the view in figure 6, view I. A position is also obtained, when $A\leq d$, which is loaded with a force which is proportional to the angle α between the first and second parts 22a, 22b, see figure 6, view III. For the figure to be clear, it is the complementary angle (α) which is drawn in figure 6, view III. The lower surface (e.g. arched or straight) of the lever arm then has contact with the straight edge 20a of the opening 18. When distance *A* is less than distance *d*, the angle β may be widened slightly so that the lever arm 36 is able to pivot further. However, this remains an unstable balance position which can easily be passed in order to reach the position in figure 6, view II, under action on the lever arm 36. In this situation, it can be assumed that the lever arm 36 is always so long that a distance *A* exists. Furthermore, in this discussion, the thickness of the material is disregarded. It is assumed that the material thickness only makes a negligible difference from the theoretical situation. It is also possible that the first hinge 34 has a spring mechanism which is arranged such that the first part 22a can be snapped out of the first and into the second position.

[0036] When an opening arrangement 16 according to the invention, which is mounted on the packaging container 10 of the type which has briefly been described, is used to break through the packaging laminate and form an opening 18, the consumer grips the manoeuvring part 36b and lifts this in the direction of the arrow, see figure 7. In the case where the manoeuvring part 36b is longer than the penetration part 36a, a force exerted on the manoeuvring part 36b is amplified so that the end of the penetration part 36a lying against the disc 14 is pressed downward against the packaging laminate with increased force. Since the force is directed against a region lying close to the weakening 20, and since the second part 22b prevents the surrounding region of the disc 14 from being pressed downward with it, the force is concentrated on the weakening 20 and the seal is broken or punctured. In the example with overlap between the first part 22a of the plate and the weakening 20, the overlap can be optimised to facilitate opening further by reducing the overlap, at the same time as the overlap retains the possibility of an improved seal. Initially, the breakage occurs along a small part of the weakening 20 in the vicinity of the end of the penetration part, and the first part 22a of the plate is bent down slightly in the direction towards the interior of the packaging container as illustrated in the example in figure 7. Thus the pressure can be balanced before the remaining breakage of the opening 18 is performed. When the consumer continues to pull the manoeuvring part 36b in the direction of the arrow, the remaining part of the seal and the weakening 20 can be broken. The opening region 18, i.e. the part of the material

inside the weakening 20, and the first part 22a of the plate 22 sealed thereto, is twisted around the first hinge 34 out of the first position into the second position, see also figures 8 - 9. On breakage, first and foremost the wall material is broken along the weakening. With an overlap as stated above, also a rupture may occur in the form of delamination of the wall material and/or breakage of the seal at the overlap. The delamination may occur such that most of the core layer remains intact at the disc 14 and forms a stable edge of the opening 18. In the second position, the first part 22a of the plate forms an angle α against the second part 22b. The angle α may lie in the range of 90 to 180 degrees, and in the embodiment shown the angle is around 170 degrees. On twisting, the lever arm 36 also moves down into the packaging container 10 through the newly formed opening 18, and the underside of the manoeuvring part 36b is able to slide along the straight edge 20a of the opening. When the first part 22a reaches the second position, an end part of the manoeuvring part 36b protrudes out of the opening 18. As described earlier, this part can be folded down against the disc 14 by means of the second hinge 42, see figure 10.

[0037] In one example, the opening arrangement 16 according to the invention may be reclosed. In one example, reclosure may be achieved by pulling the piece of material with the first part 22a back into the opening 18, in order to prevent large particles from entering the packaging container 10 during consumption of the filling product. For reclosure, the consumer can pull the manoeuvring part 36b in the upward direction away from the opening 18, see the dotted arrow in figure 9.

[0038] Although the invention has been described with the above example, it should be understood that the invention is not restricted to this but that many variants and modifications are conceivable within the scope of the attached claims. For example, the opening arrangement 16 has been described in conjunction with a packaging container 10 for a pressurised filling product, but it should be understood that the filling product need not be pressurised. Similarly, only one type of packaging container 10 has been described. There are however many other types of packaging container on which an opening arrangement 16 according to the invention may be applied.

[0039] Only the laminate layer necessary to illustrate the above example of the invention has been described. Other types of packaging laminate may however be used for different types of filling product, so that the sleeve 12 and disc 14 - insofar as the packaging container 10 contains these - may be made from a packaging laminate with a structure different from that described. For some filling products, it may be useful to omit the gas barrier layer for example. Similarly, the packaging laminate need not contain the layer of paper or cardboard but may be constructed for example from a plastic layer. Similarly, the packaging material may comprise only one type of polymer, i.e. it need not be constructed from layers.

[0040] The example has been described in which the opening arrangement 16 is opened with a lever arm 36. Force may however be applied with other types of arrangements. One alternative is for example that the consumer presses the first part 22a of the plate 22 down with a finger. As just stated, the first part 22a is pivoted into the packaging container 10. An embodiment is also conceivable in which the first hinge 34 and plate 22 are located on the outside of the packaging container 10. In another example, the first part 22a may be pivoted out from the packaging container 10 instead, e.g. with a lever arm. The lever arm 36 is replaced by another type of manoeuvring arrangement.

[0041] The first part 22a of the plate need not necessarily have the shape of a plate 22 but may be annular, in some cases with a tongue for anchoring the plug element 38.

[0042] In one example, the opening 18 is bean-shaped or oval. The opening may for example also be elliptical, circular, triangular, quadrilateral, rectangular, polygonal, or have a form which is a combination thereof.

[0043] Figures 11a and 11b show an opening arrangement 100 for packaging containers. The packaging container 200 comprises an opening region 101 in a wall material 102. The opening region 101 is arranged to be opened by delamination of the wall material 102. Figure 11a shows a side view of the opening arrangement 100 when placed on the wall material 102, which in this example is shown as a substantially circular cover on an upper part of the packaging container 200. The packaging container 200 is not therefore shown in its entirety in this example. The side view in figure 11a shows a perspective view of said cover from obliquely below, wherein the underside of the cover is placed against an inside of the packaging container 200, while figure 11b shows the cover and opening arrangement 100 in a top view, i.e. from the side of the cover which constitutes the outside of the packaging container 200. The opening arrangement 100 comprises an outer part 103 which is adapted to be arranged on an outside 104 of the packaging container 200, and an oblong opening element 105 arranged to be fixed on the outer part 103 and on an inside 106 of the packaging container 200. The oblong opening element 105 is adapted to extend through the wall material 102 through a sealed opening 107 therein. The oblong opening element 105 is adapted to puncture the wall material 102 along a defined track 108 in order to achieve said delamination, by application of force on the outer part 103. Figure 11b shows a diagrammatic example of how the oblong opening element 105 extends in a circular track 108 on the inside 106, i.e. the underside of the cover, where it is secured. The oblong opening 105 is sealed to the wall material 102 where it extends through same, at the sealed opening 107, so that the content of the packaging container 200 cannot pass through the opening 107. By applying a force on the outer part 103, the oblong opening element 105 is pulled through the wall material 102 along said track 108, as shown diagrammatically in figures 11c and 11d. This therefore gives an

opening arrangement 100 which facilitates opening of different packaging containers, at the same time as the risk of accidental opening can be minimised. The oblong opening element 105 allows the force applied on the outer part 103, which is adapted to be gripped with the fingers, to be effectively transferred to the wall material 102 with an increased pressure against this for effective delamination, without the need for any pre-perforation or similar weakening in the wall material 102. The cross-section of the oblong opening element 105 may be adapted such that the force is transferred to a desired cross-section of the wall material 102 in order to achieve the desired pressure against this. This may for example be advantageous with a thread-like opening element 105 of relatively small cross-section, as shown in figures 11a-f, in order to facilitate opening further. The sealed opening 107 may thus assume a compact cross-section which maximises the strength of the wall material 102, since the opening 107 constitutes the only opening or weakening in the wall material 102. This is particularly advantageous when the packaging container is used for carbonated drinks which create an internal pressure on the wall material 102. The oblong opening element 105 and the opening 107 may have a minimum cross-section with a diameter of less than 1 mm, such as e.g. 0.4 mm, in order to achieve a particularly advantageous opening arrangement 100 which is easy to open and which is secure. The opening 107 may be sealed with a material which creates a seal against the passage of fluid and gas (with carbonated content) from the inside 106 and from the outside 104. Since the hole 107 constitutes the only weakening in the wall material 102 and may have the dimensions specified above, this sealing is further facilitated.

[0044] The opening arrangement 100 with the characteristic described above may also be formed so as to be particularly compact, since the oblong opening element 105 is attached to the inside 106 and the sealed opening 107 takes up a space corresponding to the cross-section of the oblong opening element 105. Traditional opening mechanisms on e.g. aluminium cans often have a pre-punched region around the opening, which takes up space on the surface forming the cover. The opening arrangement 100 therefore allows a more effective use of the space for e.g. decoration or other product information.

[0045] Figure 11e shows an example in which the oblong opening element 105 has cut an opening region 101 by puncturing the wall material 102 along a substantially circular track 108. It is however conceivable that the track 108 may assume several different forms, such as oval, rectangular, triangular, or other forms which are suitable for obtaining a desirable, defined opening region 101. In the example shown in figures 11e and 11f, the oblong opening element 105 and the cut-out part of the wall material 102 may be removed from the packaging container 200. It is however possible that the oblong opening element 105 and/or the cut-out part of the wall material 102 may remain fixed to the packaging after it has been opened, as described further in the text below.

[0046] The oblong opening element 105 may thus comprise a thread 105 which allows an effective transfer of force to the wall material 102 and therefore simple perforation thereof. The thread 105 is attached on the inside 106 of the packaging container 200, such as e.g. the inside 106 of the wall material 102 which forms a cover for the packaging container 200. The thread 105 is fixed on the inside 106 so that it is held with a force which is sufficient to resist the opposingly directed force applied by the outer part 103 on opening of the packaging container 200, so that the thread 105 can tear the wall material 102 along the track 108 as shown in the example in figures 11a-f. The thread 105 may be made of a material comprising a polymer, a metal, or other material which can be formed with a cross-section and necessary strength, and which allows effective opening. The thread may e.g. comprise a carbon-fibre material such as Kevlar thread, and/or Spectra fibre (ultrahigh molecular weight polyethylene, UHMWPE). The thread 105 may be covered with a material which reduces the friction on puncturing the wall material 102, which may reduce the force required for opening the packaging container 200. Such a material may e.g. comprise wax or another material which reduces this friction.

[0047] The opening arrangement 100 may comprise an opening guide 109 arranged to be fixed to the wall material 102 on the inside 106 of the packaging container 200. The opening guide 109 may be fixed on the inside 106 of the wall material 102 which forms the cover of the packaging container 200, as shown for example in figure 11a. The opening guide 109 comprises a form 110 which defines an extension of said track 108 along which the oblong opening element 105 is arranged to puncture the wall material 102. The opening guide 109 may therefore be adapted to guide or steer the oblong opening element 105 along the track 108 which follows the form 110 of the opening guide 109. The packaging container 200 may thus be opened effectively along a defined track 108. Figure 11a shows an example in which the oblong opening element 105 is arranged along a surface of the opening guide 109. When a traction force is applied to the oblong opening element 105, as shown in figure 11c and 11d, this surface of the opening guide 109 may exert a counterforce on the oblong opening element 105 so that it is forced to follow said track 108 and puncture the wall material 102 along this track 108. In the case where the oblong opening element 105 comprises a thread 105, as illustrated in figures 11a-f, the thread 105 may be positioned along the opening guide 109 e.g. by following the circular form 110 of the opening guide 109, as shown in the example in figures 11c and 11d. The opening guide 109 may thus assume different forms for steering the thread 105 along the desired track 108, as described above.

[0048] The oblong opening element 105, e.g. the thread 105, they therefore be arranged to be positioned at least partly along said form 110 so that the oblong

opening element 105 moves along said track 108 on application of force on the outer part 103 for delamination along the track 108. It is understood that e.g. the thread 105 need not follow the entire circumference of the opening guide 109 in the case where this constitutes a circle, but that it is possible that part of the wall material 102 remains intact along part of the circle of the opening guide 109 in order to create a tab of the wall material 102 in the opening region 101. The same applies in the case where the opening guide 109 defines tracks 108 which have different forms 110. In the example shown in figures 11e and 11f, the thread 105 runs around the entire circle form of the opening guide 109, in order thus to allow the wall material 102 in the opening region 101 to be removed in its entirety from the packaging container 200. The opening guide 109, which in this case is attached to the part of the wall material 102, is also removed. Figures 12 and 13, which are described in more detail below, show an example in which the wall material 102 in the opening region 101 and the opening guide 109 remain attached to the cover of the packaging container 200 after this has been opened. The oblong opening element 105 may be fixed to the opening guide 109. It is also possible that the oblong opening element 105 is fixed in another part on the inside 106 of the packaging container 200, but at the same time it is positioned along a guiding surface of the opening guide 109 to allow its guidance as described above.

[0049] As stated, the thread 105 may be adapted to be positioned at least partially along said form 110 of the opening guide 109. Furthermore, the thread 105 may be wound around a circular or oval form of the opening guide 109. The opening guide 109 generally allows a well-defined opening to be created in the wall material 102 along a defined track 108, free from wall material residue, in particular in combination with a thread 105 which has an optimised cross-section with regard to both dimension and form so as to tear through the wall material 102 when a traction force is applied on the outer part 103.

[0050] In one example, the thread 105 may be fastened to a surface of the opening guide 109 with an adhesive material. This allows a further improvement by securing the position of the thread 105 in relation to the opening guide 109, and hence ensuring that the thread 105 can follow the defined track 108 when the packaging container 200 is opened. The adhesive material fixes the thread 105 suitably against the opening guide 109 which a force which still allows the thread 105 to be pulled along the track 108 with a suitable force without hindering the opening of the packaging container 200.

[0051] The oblong opening element 105, which may comprise e.g. a thread 105, may be fixed to the outer part 103 such that there is no risk of separation when a traction force is applied to the outer part 103 when the packaging container 200 is opened. The oblong opening element 105 may be fixed thereto by an adhesive material or by die-casting the oblong opening element 105 and the outer part 103, so as to produce a more or less integrated unit of these parts. The outer part 103 and the oblong opening element 105 may be formed as separate units, but by e.g. die-casting they can be integrated by application of pressure and/or heat. Similarly, the opening guide 109 may be fixed to the wall material 102 or moulded so that the opening guide 109 is integrated with the wall element 102, or die-cast together with further components which are adapted to be fixed to the wall material 102, such as the part which constitutes the cover to the packaging container 200, which will be described in more detail in connection with figure 14. The oblong opening element 105 may then be guided through the wall material 102 at the opening 107. The opening element 105, such as the thread 105, may then be fixed to the opening guide 109 by use of an adhesive material or by another adhesion process, e.g. by heating the thread 105 and/or the opening guide 109 e.g. by laser welding. The thread 105 may then be placed along the opening guide 109 and the surface of the opening guide which defines the track 108 along which the wall material 102 is delaminated. The thread 105 may e.g. be at least partially wound around an opening guide 109 as shown in figures 11a-f, and in some cases fixed on the opening guide 109 with an adhesive material. The outer part 103 may then be fixed to the outside 104 of the packaging container 200. A sealing material may be applied to the opening 107 from the inside 106 and/or the outside 104.

[0052] The opening arrangement 100 may comprise a spring element 111 arranged at the opening guide 109. The spring element 111 is adapted to exert a force on the opening guide 109 and/or the opening region 101, directed towards the inside 106 of the packaging container 200, so that the opening guide 109 and/or the opening region 101 is folded inward in the direction against the inside 106 of the packaging container 200 when the oblong opening element 105 has delaminated the wall material 102. This is shown diagrammatically in the example in figure 12. The spring element 111 thus allows the opening guide 109 and/or the opening region 101 to be folded inward into the packaging container 200, which may be an advantage in some packaging containers in which it is desirable to avoid protruding or separate parts of the opening arrangement 100 or packaging container 200.

[0053] The oblong opening element 105 may be adapted to activate the spring element 111 from an inactive state, in which the spring element 111 does not exert any force on the opening guide 109 and/or the opening region 101, to an active state in which the spring element 111 does exert said force. The spring element 111 may therefore be activated with e.g. thread 105 when the wall material is delaminated around the track 108, so that the opening guide 109 and/or the opening region 101 is thereafter folded inward into the packaging container 200.

[0054] The opening arrangement 100 may comprise a spring element 111' adapted to exert a force on the oblong opening element 105, e.g. the thread 105, so that

the oblong opening element 105 is pulled in the direction towards the inside 106 of the packaging container after said delamination. As a result, the oblong element 105 or at least part thereof need not protrude outside the packaging container 200 when this is opened, which may be an advantage in certain applications and packaging types.

[0055] The oblong opening element 105 may be arranged to exert a force on the opening guide 109 and/or the opening region 101 so that the opening guide 109 and/or the opening region 101 is pulled in the direction towards the inside 106 of the packaging container after delamination along said track 108. It is therefore possible to pull the opening guide 109 and/or the opening region 101 into the packaging container 200 by pulling e.g. the thread 105. This may take place after the wall material 102 has been delaminated along the track 108, but it is also conceivable that the opening guide 109 and/or the opening region 101 is gradually pulled into the packaging container 200 as the thread is pulled around the track 108. Said spring element 111 may cooperate with this mechanism in order to facilitate the folding of the opening guide 109 and/or opening region 101.

[0056] In one example, the thread 105 may be fixed in the opening guide 109 with a temporary fixing 117 which is adapted to release the thread 105 from the opening guide 109 when a sufficiently great traction force is applied on the thread 105. Figure 13 shows diagrammatically how the thread 105 may be released by the temporary fixing 117, e.g. after the opening region 101 and/or the opening guide 109 has been folded down inside the packaging container 200.

[0057] The opening guide 109 may comprise a first locking structure 112 which is arranged to run along a periphery 113 of the wall material 102 when the wall material 102 is formed as a cover 114 for the packaging container 200. The locking structure 112 may thus be adapted to engage in a corresponding second locking structure 115 fixed to the inside of a tubular wall surface 116 of the packaging container 200, as illustrated in figure 14. The first and second locking structures 112, 115 are adapted to absorb forces from inside the packaging container 200 which may result from pressure exerted against the inside 106 by carbonated filling product. It is therefore possible to integrate the opening guide 109 with structures which fix the cover 114 relative to the other walls 116 of the packaging container 200. This may allow a simplified production method for the opening arrangement 100 as there is no need for a separate opening guide 109.

[0058] The present invention also concerns a packaging container 200 which comprises an opening arrangement 100 as described above in relation to figures 11 - 14. The packaging container 200 thus achieves the advantages described above in relation to the opening arrangement 100 and figures 11 - 14.

[0059] The packaging container 200 thus comprises an opening region 101 in a wall material 102, and an opening arrangement 100, wherein the opening arrangement 100 comprises an outer part 103 arranged on an outside 104 of the packaging container 200, and an oblong opening element 105 fixed to the outer part 103 and to an inside 106 of the packaging container 200. The oblong opening element 105 extends through the wall material 102, through a sealed opening 107 therein, wherein by application of force on the outer part 103, the oblong opening element 105 is adapted to puncture the wall material 102 along a defined track 108 in order to achieve said delamination.

[0060] The opening arrangement 100 on the packaging container 200 may comprise an opening guide 109 fixed on the wall material 102 on the inside 106 of the packaging container 200. The opening guide 109 may comprise a form 110 which defines an extension of said track 108 along which the oblong opening element 105 is arranged to puncture the wall material 102. The opening guide 109 may comprise a first locking structure 112 which runs along a periphery 113 of the wall material 102, where the wall material is formed as a cover 114 for the packaging container 200. The locking structure 112 may be adapted to engage in a corresponding second locking structure 115 fixed on the inside 106 of a tubular wall surface 116 of the packaging container 200. In one example, the first and second locking structures 112, 115 are adapted to absorb forces from inside the packaging container 200 which may be created by pressure exerted against the inside 106 by carbonated filling product.

Claims

1. Opening arrangement (16) for packaging containers (10), wherein the packaging container (10) comprises an opening region (18) which is defined by a weakening (20) arranged in the wall material (14) of the packaging container, along which weakening the wall material of the packaging container is arranged to break so as to form an opening (18), wherein the opening arrangement (16) comprises a plate (22) comprising a first and a second part (22a, 22b), wherein the plate (22) is arranged on a surface of the wall material of the packaging container, wherein the first part (22a) is sealed to a first region (24) of the wall material which at least partially contains the opening region (18), wherein the second part (22b) is sealed to a second region (26) which runs around the first region (24), wherein the first and second parts (22a, 22b) are connected together via a first hinge (34), wherein the first part (22a) is arranged on application of force to pivot away from the second part (22b) in the direction away from the wall material towards the plate (22), which breaks the wall material along the weakening (20) and delaminates the wall material such that said opening (18) is created in the packaging container (10).

2. Opening arrangement (16) according to claim 1, wherein the first hinge (34) is pivotable between a first position in which the first part (22a) is arranged to be situated substantially in the same plane as the second part (22b), and a second position in which the first part (22a) has pivoted such that the two parts (22a, 22b) form an angle α between them.

3. Opening arrangement (16) according to one of the preceding claims, wherein the force is applied by means of a lever arm (36) which is connected to the first part (22a) of the plate (22).

4. Opening arrangement (16) according to claim 2, wherein the first hinge (34) is bistable and has three balance positions, wherein said first and second positions constitute stable balance positions while a third position between them constitutes an unstable balance position.

5. Opening arrangement (16) according to claim 2, comprising a bistability function in which said first and second positions constitute stable balance positions while a third position between them constitutes an unstable balance position, wherein the opening arrangement (16) has a geometric plane (P) which is substantially parallel to the second part (22b) of the plate (22) and which runs through an edge (20a) of the opening (18), wherein said bistability function is achieved in that the first hinge (34) has a rotation axis which is shifted along said plane (P) by a distance *d* from the edge (20a) of the opening (18), in that a lever arm (36) is fixed to the first part (22a) of the plate (22), in that on pivoting of the first part (22a) between the first and second positions, a point of the lever arm (36) is situated at a distance *A* from the rotation axis of the hinge, wherein distance *A* is measured along said plane (P), in that a position of the first part (22a) of the plate and hence the lever arm (36) is unloaded when $A>d$, and when $A \leq d$, a position is loaded with a force which is proportional to the angle α between the first and second parts (22a, 22b).

6. Opening arrangement (16) according to any of the preceding claims, wherein the first part (22a) at its periphery is provided with an annular rim (32) which is adapted to overlap an inner edge region of the second part (22b) of the plate (22).

7. Opening arrangement (16) according to any of the preceding claims, wherein the surface of the wall material of the packaging container against which the plate (22) is arranged faces towards the interior of the packaging container, wherein the first hinge (34) is situated inside the packaging container (10).

8. Opening arrangement (16) according to any of the preceding claims 3 - 7, wherein the lever arm (36) is arranged such that in the first position, it extends substantially along an outer surface of the packaging container (10), wherein the lever arm (36) comprises a penetration part (36a) and a manoeuvring part (36b), wherein at a point between the penetration part (36a) and the manoeuvring part (36b), the lever arm (36) is fixed to the first part (22a) of the plate (22), wherein a free end of the penetration part (36a) is arranged above or in contact with the opening region (18) so that it breaks the weakening when a force is applied to on the manoeuvring part (36b).

9. Opening arrangement (16) according to any of the preceding claims, wherein the first part (22a) is sealed to a first region (24) of the wall material which is larger than the opening region (18) and encloses this with an overlap.

10. Opening arrangement (16) according to claim 9, wherein the overlap is at its greatest in a region closest to the first hinge (34).

11. Opening arrangement (16) according to any of the preceding claims, wherein the first and second parts (22a, 22b) are produced as one piece from a heat-sealable material, preferably a thermoplastic.

12. Opening arrangement (16) according to claim 11, wherein the thermoplastic is selected from a group comprising polyolefins, polyesters, polyamides, polycarbonates, polyacetates, ionomers and ethyl-acryl copolymers.

13. Opening arrangement (16) according to claim 12, wherein thermoplastic is polyester.

14. Opening arrangement (16) according to claim 8, wherein in the second position, a part of the manoeuvring part (36b) of the lever arm extends through and out of the opening (18) on the outside of the packaging container, and wherein a second hinge (42) is arranged at the separating line between said part and the remaining part of the lever arm (36), which allows said part to pivot in the direction downward against the outer surface of the packaging container and form an angle γ with the remaining part of the lever arm (36).

15. Packaging container (10) which comprises an opening arrangement (16) according to any of claims 1 - 14.

16. Packaging container (10) which comprises an opening arrangement (16), wherein the packaging container (10) comprises an opening region (18) which is defined by a weakening (20) arranged in the wall material (14) of the packaging container, along which

weakening the wall material of the packaging container is arranged to break so as to form an opening (18), wherein the opening arrangement (16) comprises a plate (22) comprising a first and a second part (22a, 22b), wherein the plate (22) is arranged on a surface of the wall material of the packaging container, wherein the first part (22a) is sealed to a first region (24) of the wall material which at least partially contains the opening region (18), wherein the second part (22b) is sealed to a second region (26) which runs around the first region (24), wherein the first and second parts (22a, 22b) are connected together via a first hinge (34), wherein the first part (22a) is arranged on application of force to pivot away from the second part (22b) in the direction away from the wall material towards the plate (22), which breaks the wall material along the weakening (20) and delaminates the wall material such that said opening (18) is created in the packaging container (10).

17. Opening arrangement (100) for packaging containers, wherein the packaging container comprises an opening region (101) in a wall material (102), wherein the opening region is arranged to be opened by delamination of the wall material, the opening arrangement comprising
an outer part (103) adapted to be arranged on an outside (104) of the packaging container,
an oblong opening element (105) arranged to be fixed on the outer part and on an inside (106) of the packaging container, wherein the oblong opening element is adapted to extend through the wall material through a sealed opening (107) therein, wherein by application of force on the outer part, the oblong opening element is adapted to puncture the wall material along a defined track (108) so as to achieve said delamination.

18. Opening arrangement according to claim 17, wherein the oblong opening element comprises a thread (105).

19. Opening arrangement according to claim 17 or 18, comprising
an opening guide (109) arranged to be fixed to the wall material on the inside of the packaging container, wherein the opening guide comprises a form (110) which defines an extension of said track along which the oblong opening element is arranged to puncture the wall material.

20. Opening arrangement according to claim 19, wherein the oblong opening element is arranged to be positioned at least partly along said form so that the oblong opening element moves along said track on application of force on the outer part in order to ensure delamination along the track.

21. Opening element according to claim 18 and 20, wherein the thread is adapted to be positioned at least partially along said form of the opening guide.

22. Opening arrangement according to claim 21, wherein the thread is wrapped around a circular or oval form of the opening guide.

23. Opening arrangement according to any of claims 17 - 22, comprising a spring element (111) arranged at the opening guide, wherein the spring element is adapted to exert a force on the opening guide and/or the opening region, directed towards the inside of the packaging container, so that the opening guide and/or the opening region is folded inward in the direction towards the inside of the packaging container when the oblong opening element has delaminated the wall material.

24. Opening arrangement according to claim 23, wherein the oblong opening element is adapted to actuate the spring element from an inactive state, in which the spring element does not exert a force on the opening guide and/or opening region, to an active state in which the spring element does exert said force.

25. Opening arrangement according to any of claims 17 - 24, comprising a spring element (111') adapted to exert a force on the oblong opening element so that the oblong opening element is pulled in the direction towards the inside of the packaging container after said delamination.

26. Opening arrangement according to any of claims 19 - 25, wherein the oblong opening element is arranged to exert a force on the opening guide and/or opening region so that the opening guide and/or opening region is pulled in the direction towards the inside of the packaging container after delamination along said track.

27. Opening arrangement according to any of claims 19 - 26, wherein the opening guide comprises a first locking structure (112) which is arranged to run along a periphery (113) of the wall material, wherein the wall material is formed as a cover (114) for the packaging container, wherein the locking structure is adapted to engage in a corresponding second locking structure (115) fixed to the inside of a tubular wall surface (116) of the packaging container, wherein the first and second locking structures are adapted to absorb forces from the inside of the packaging container.

28. Packaging container (200) comprising an opening arrangement (100) according to any of claims 17 - 27.

29. Packaging container (200) comprising an opening region (101) in a wall material (102), and an opening arrangement (100), wherein the opening arrangement comprises
an outer part (103) adapted to be arranged on an outside (104) of the packaging container,
an oblong opening element (105) fixed on the outer part and on an inside (106) of the packaging container, wherein the oblong opening element extends through the wall material through a sealed opening (107) therein, wherein by application of force on the outer part, the oblong opening element is adapted to puncture the wall material along a defined track (108) so as to achieve said delamination.

30. Packaging container (200) according to claim 29, wherein the opening arrangement comprises an opening guide (109) fixed to the wall material on the inside of the packaging container, wherein the opening guide comprises a form (110) which defines an extension of said track along which the oblong opening element is arranged to puncture the wall material, wherein the opening guide comprises a first locking structure (112) which runs along a periphery (113) of the wall material, wherein the wall material is formed as a cover (114) for the packaging container, wherein the locking structure is adapted to engage in a corresponding second locking structure (115) fixed to the inside of a tubular wall surface (116) of the packaging container, wherein the first and second locking structures are adapted to absorb forces from the inside of the packaging container.

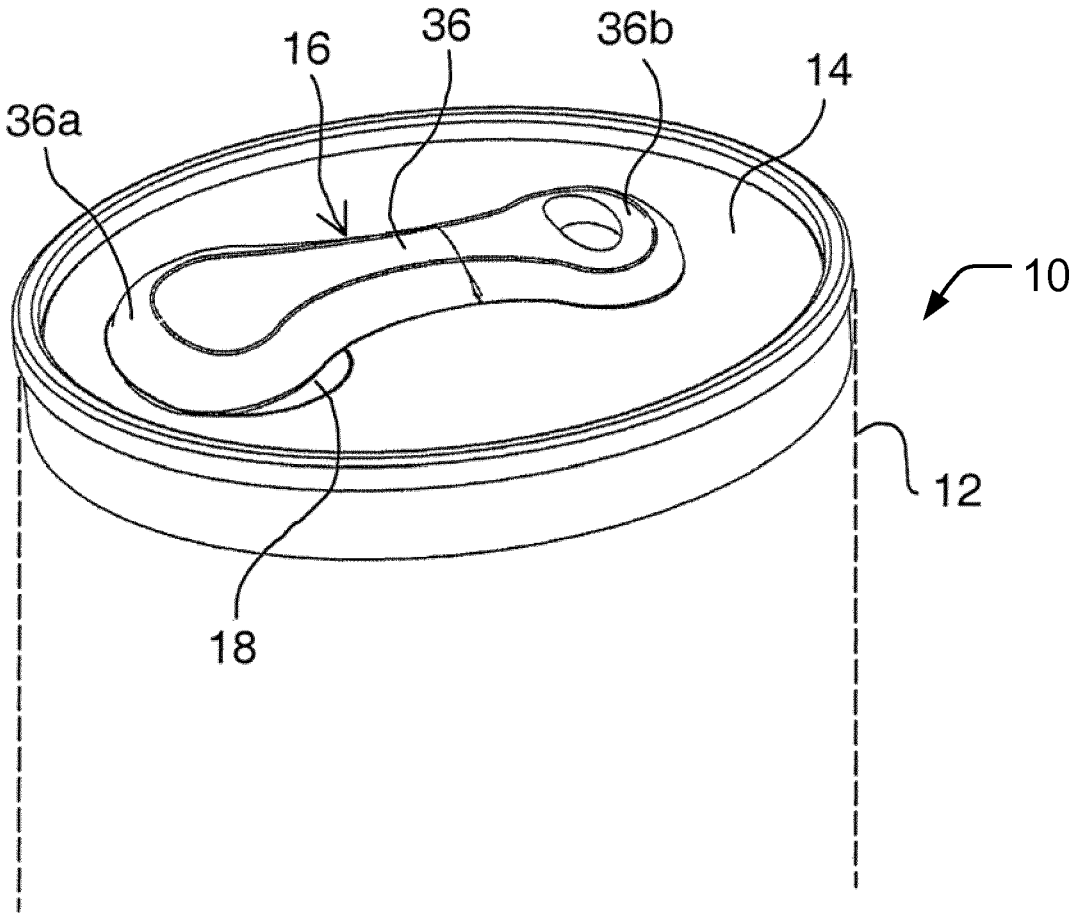


Fig. 1

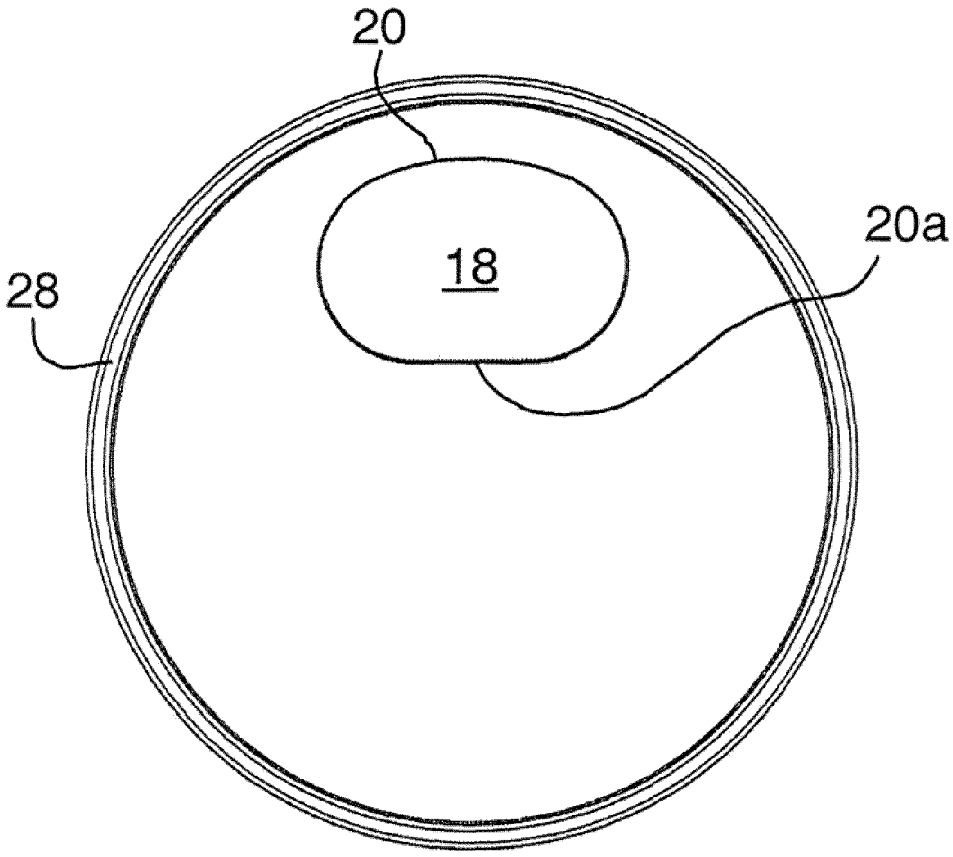


Fig. 2

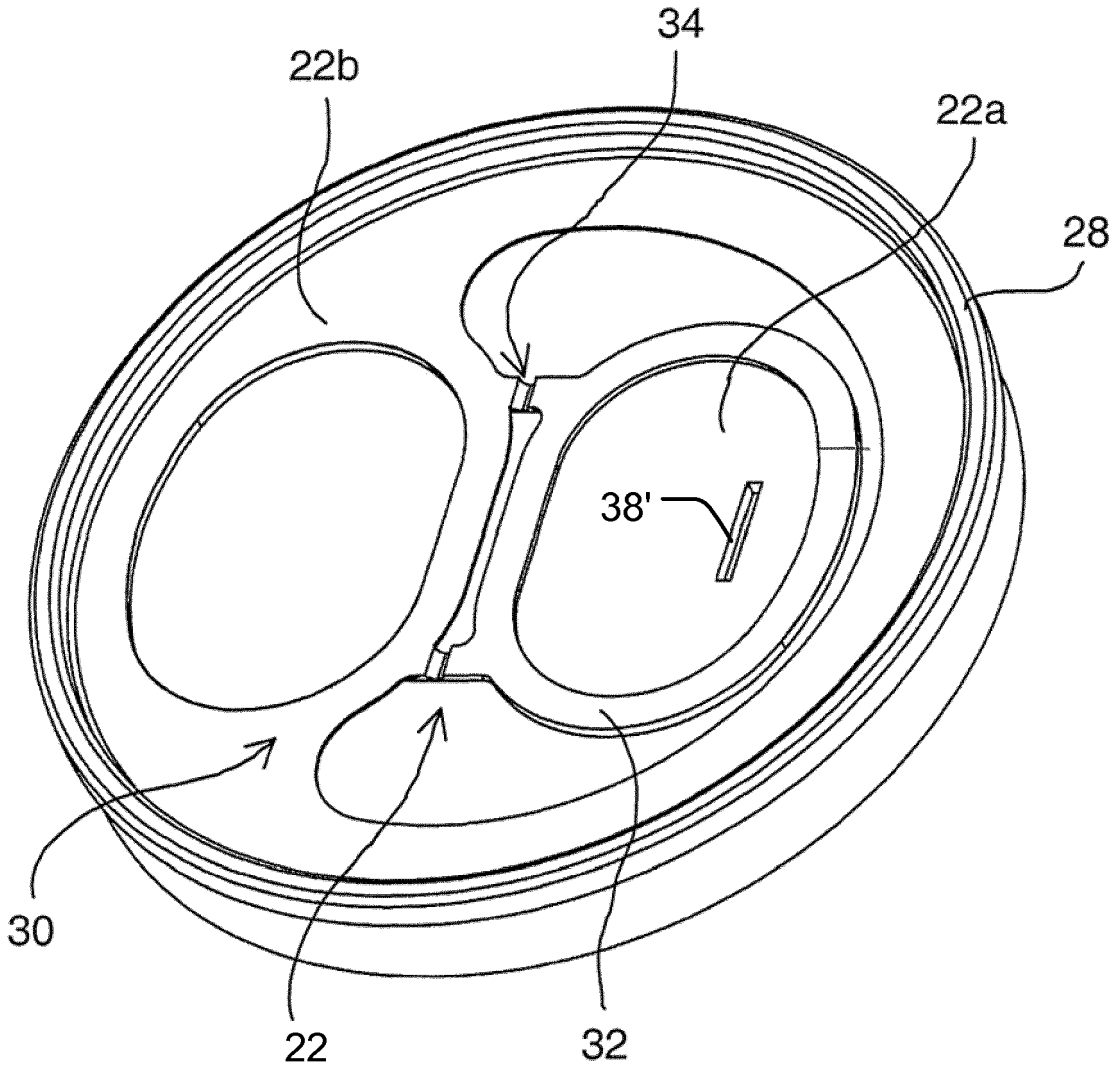


Fig. 3

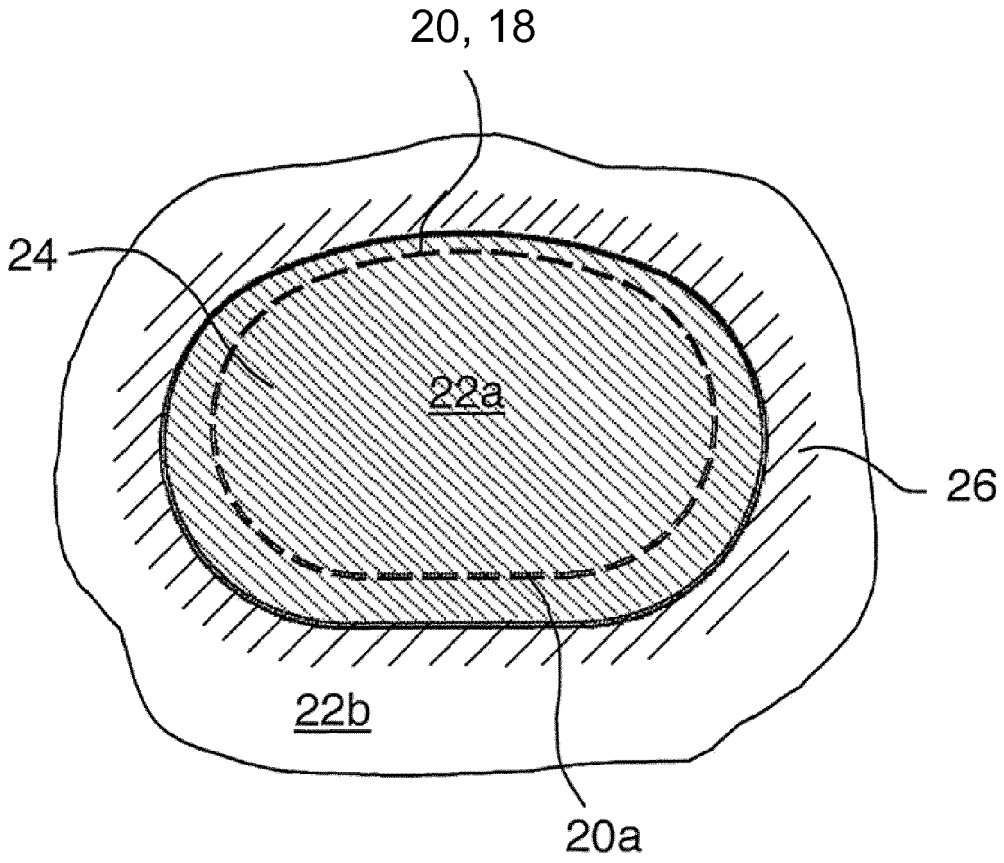


Fig. 4

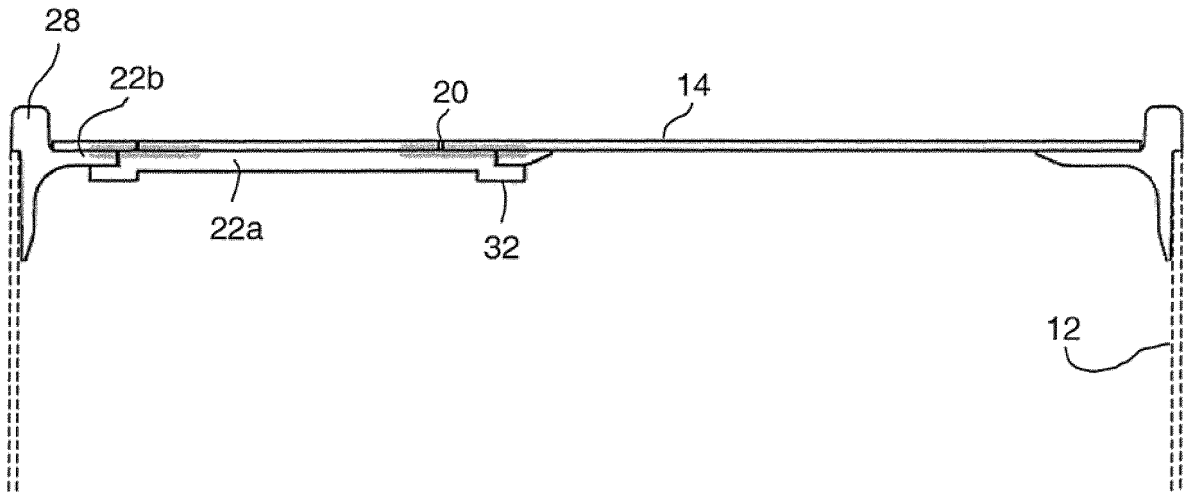


Fig. 5a

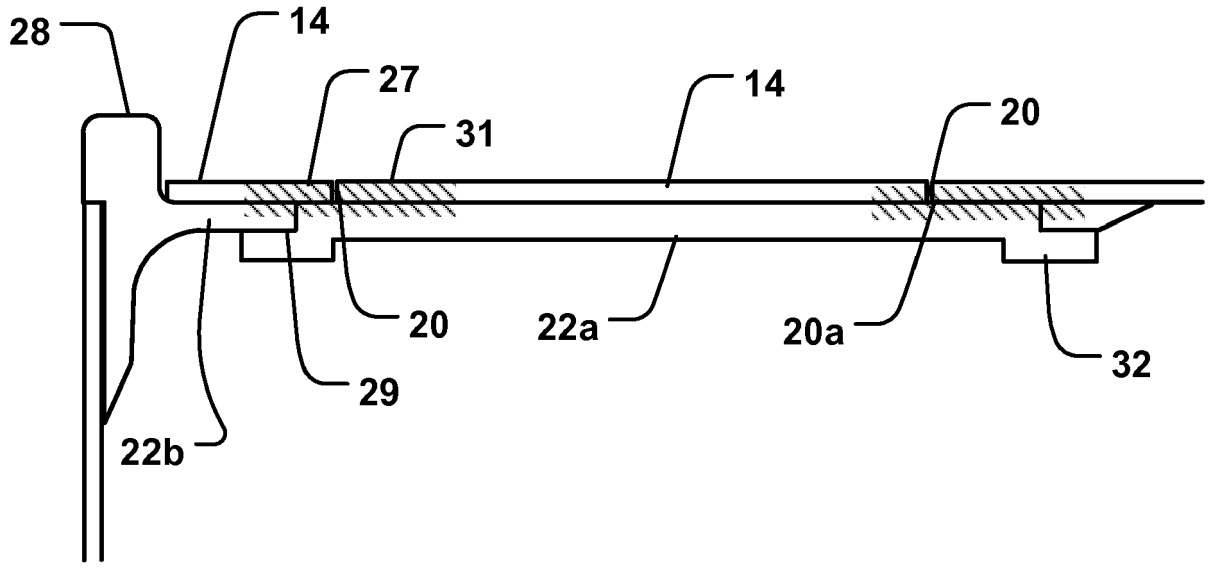
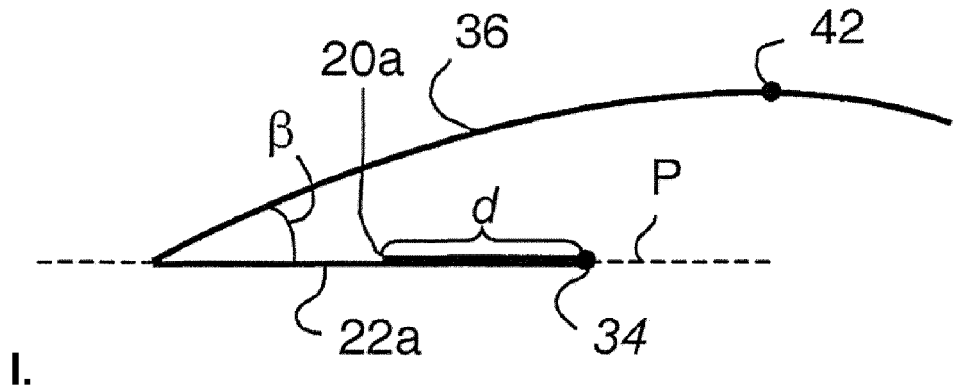


Fig. 5b



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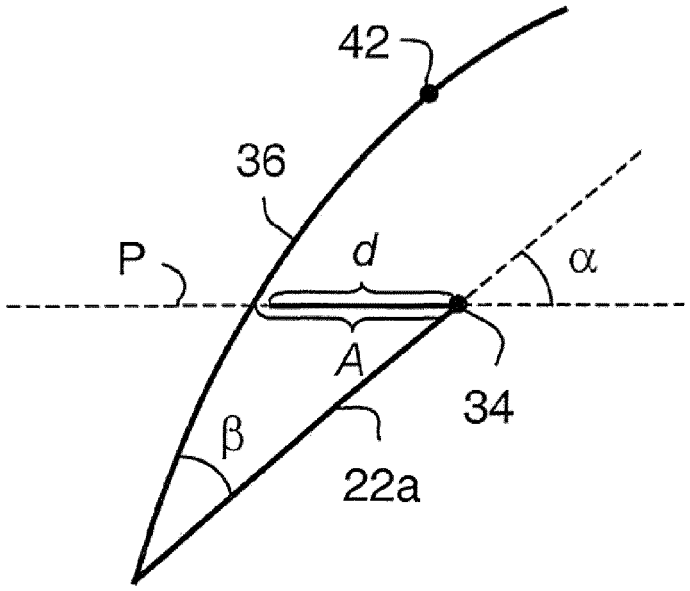
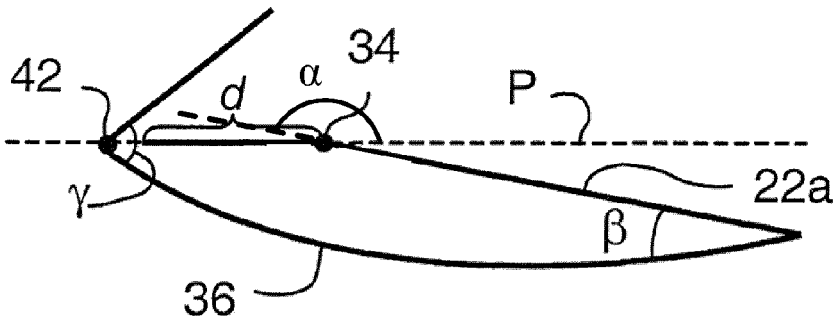


III.



II.

Fig. 6

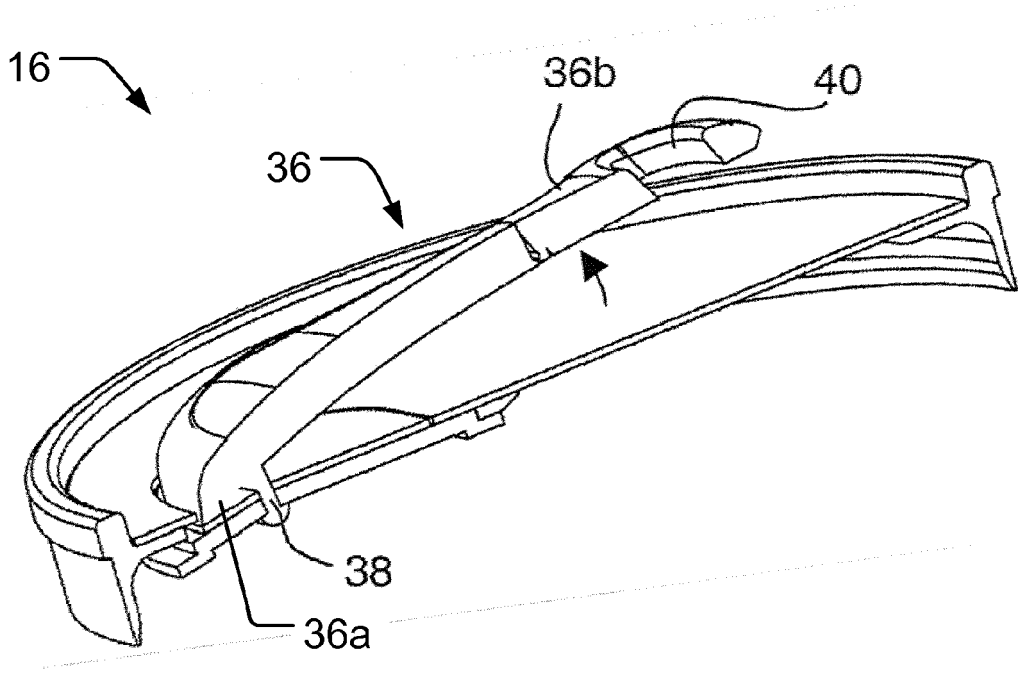


Fig. 7

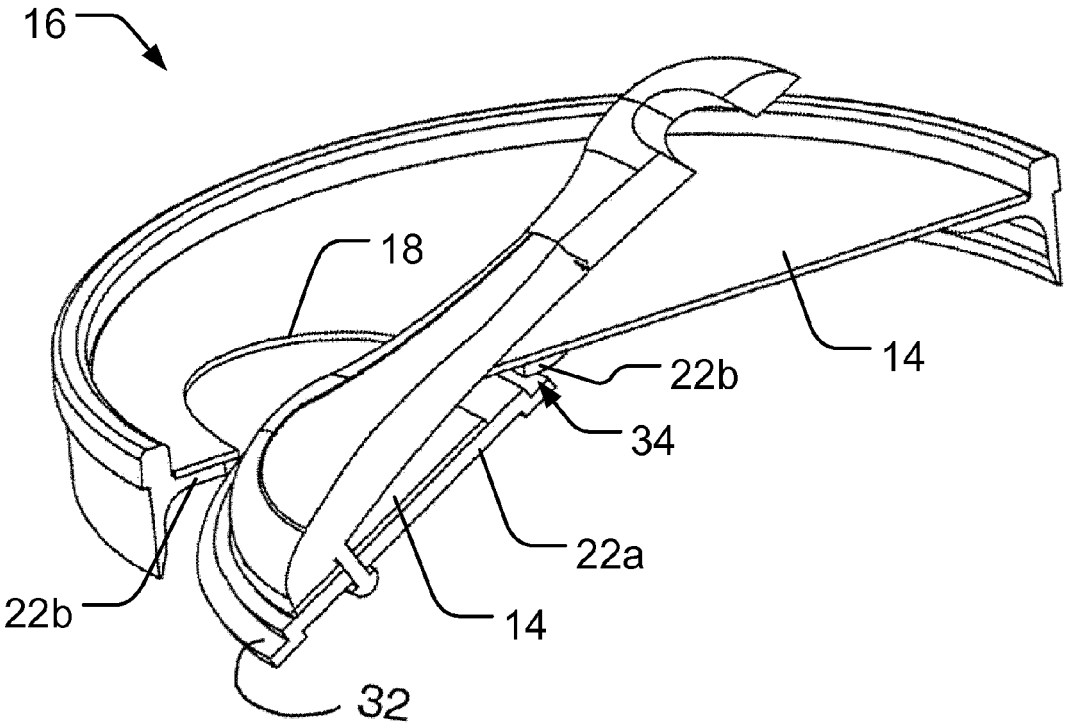


Fig. 8

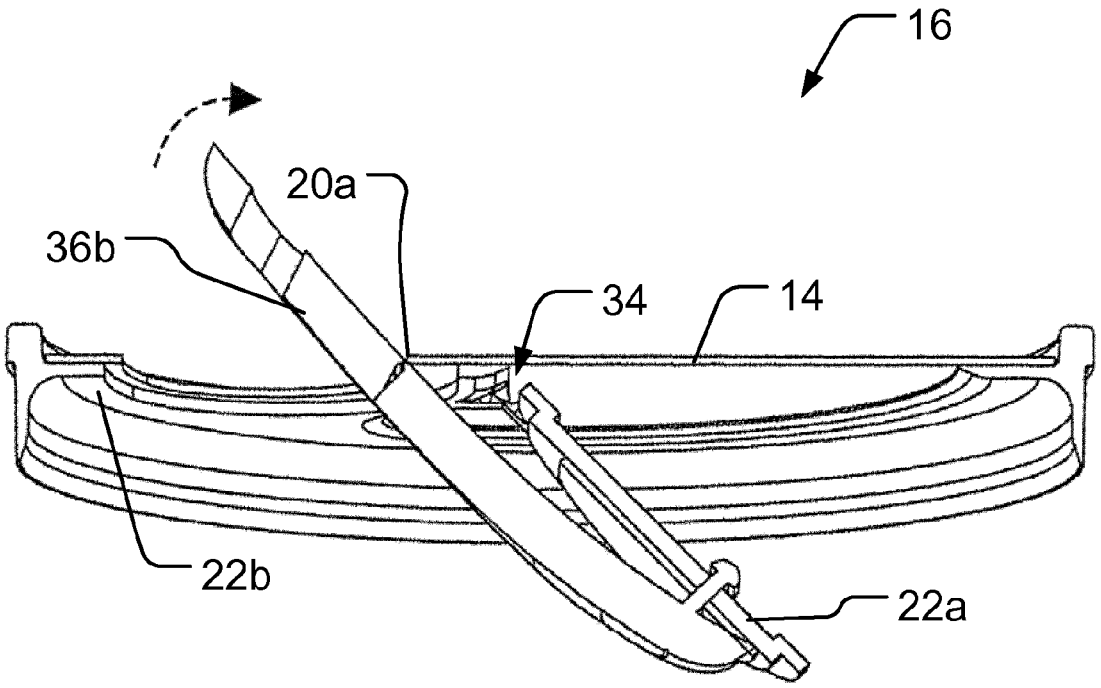


Fig. 9

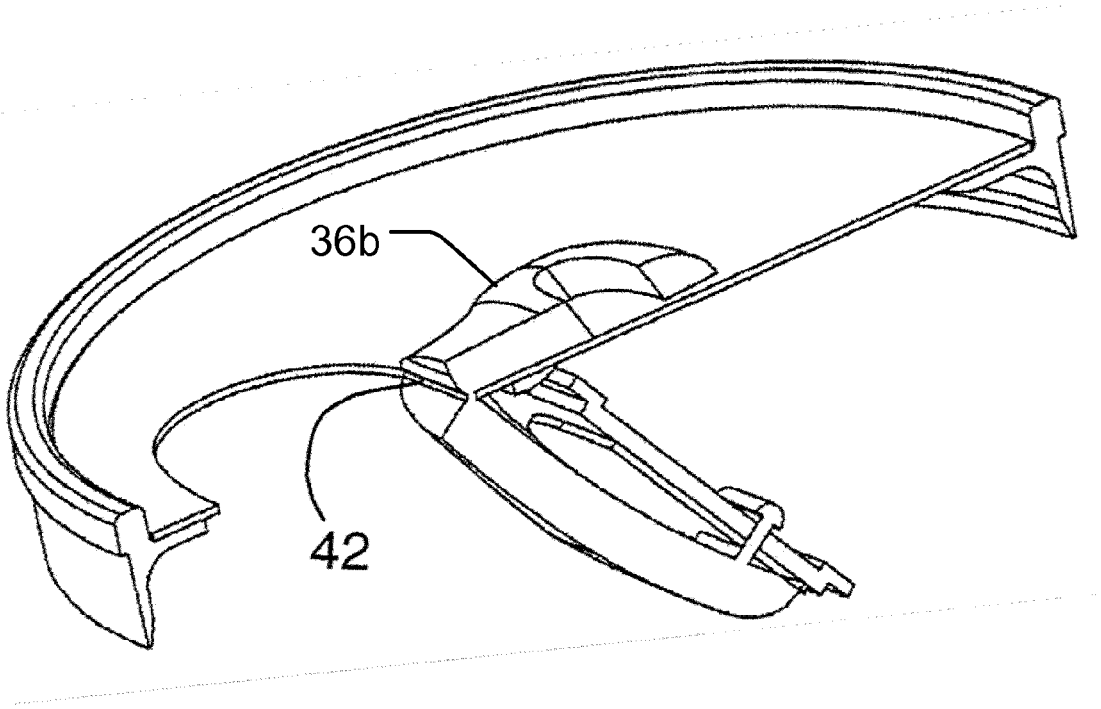


Fig. 10

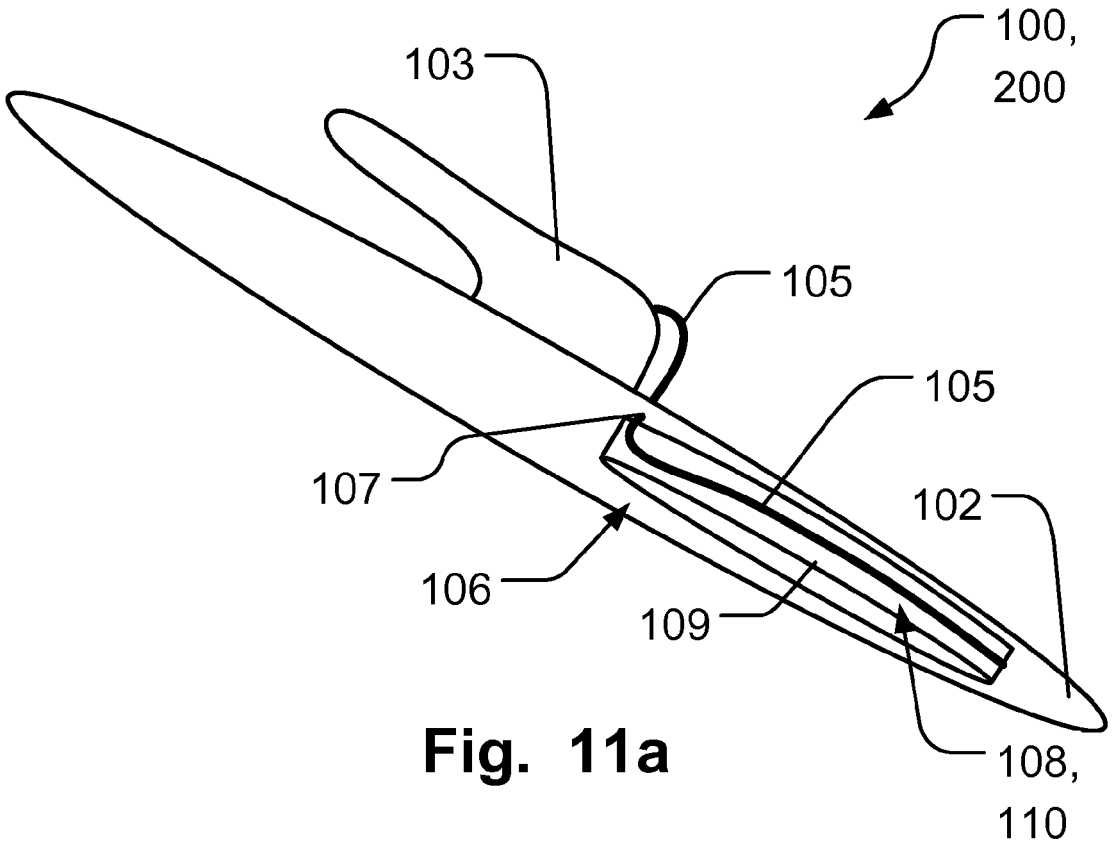


Fig. 11a

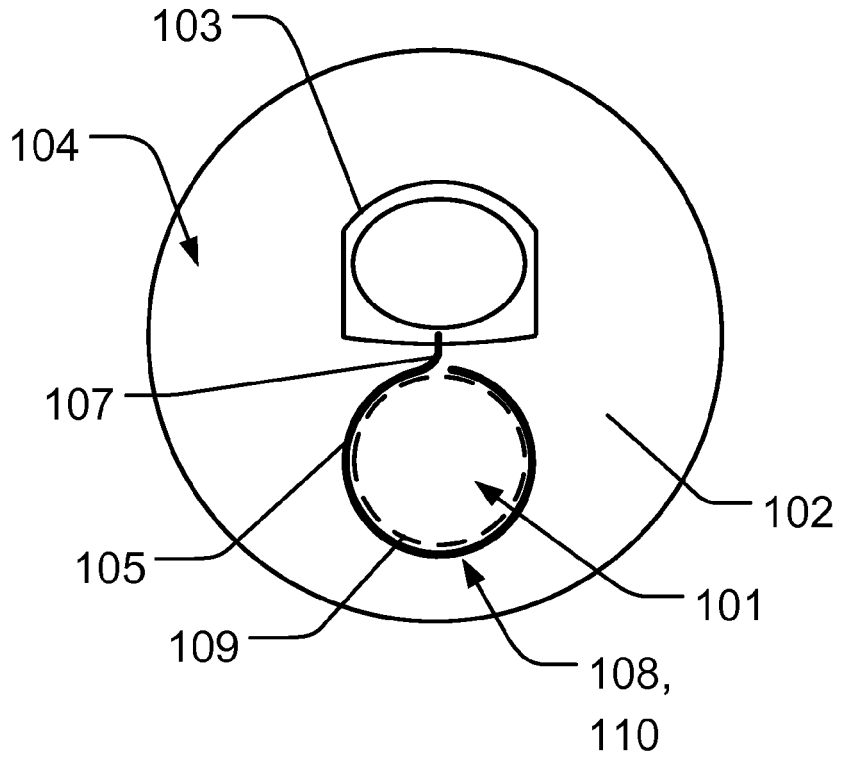


Fig. 11b

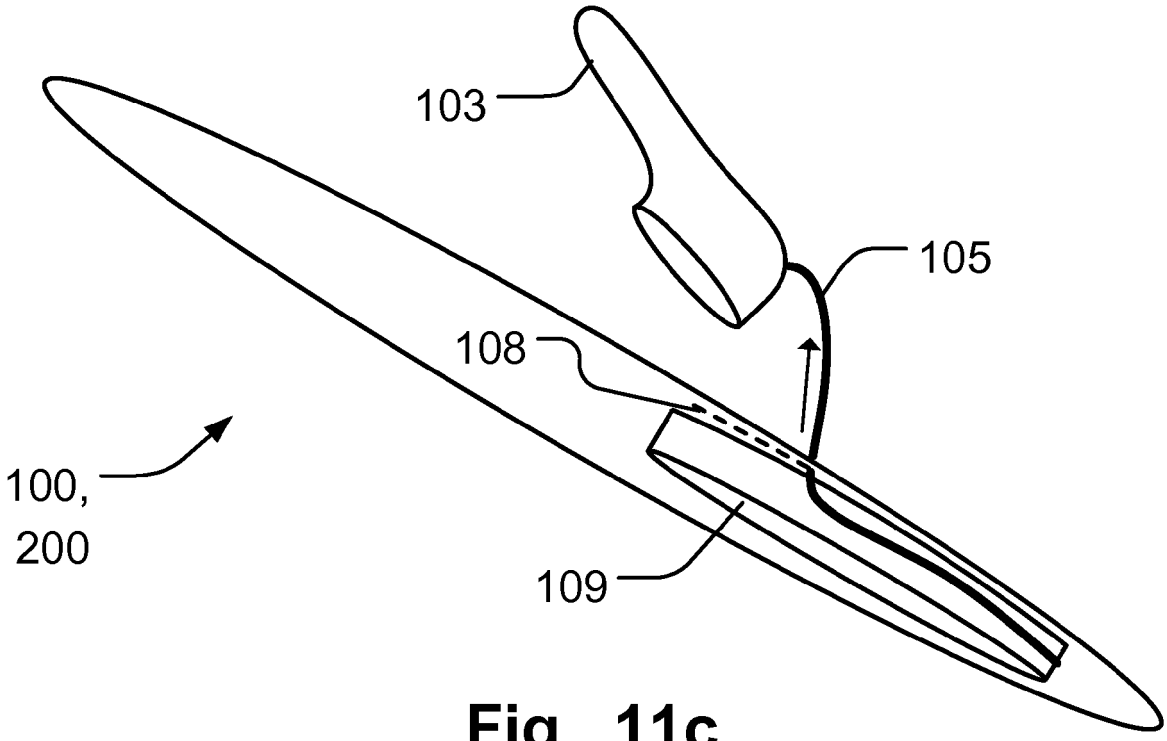


Fig. 11c

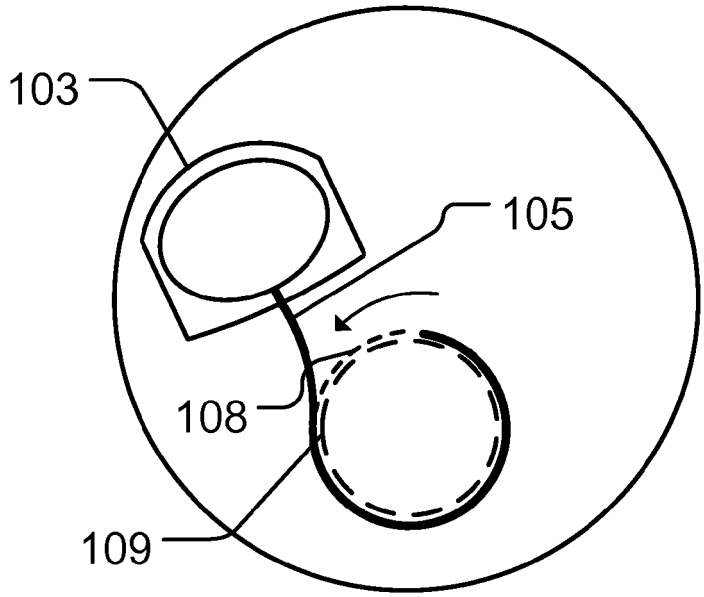


Fig. 11d

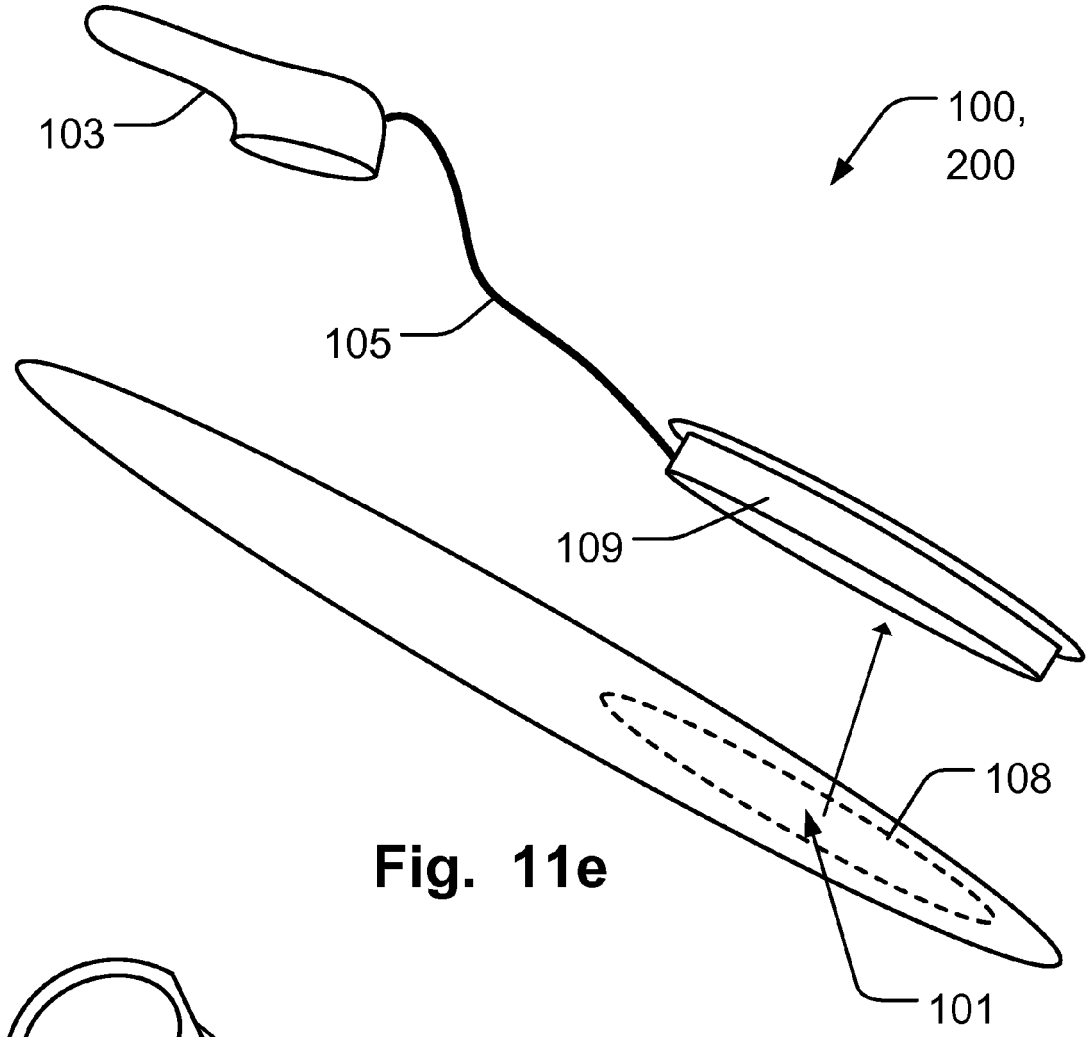


Fig. 11e

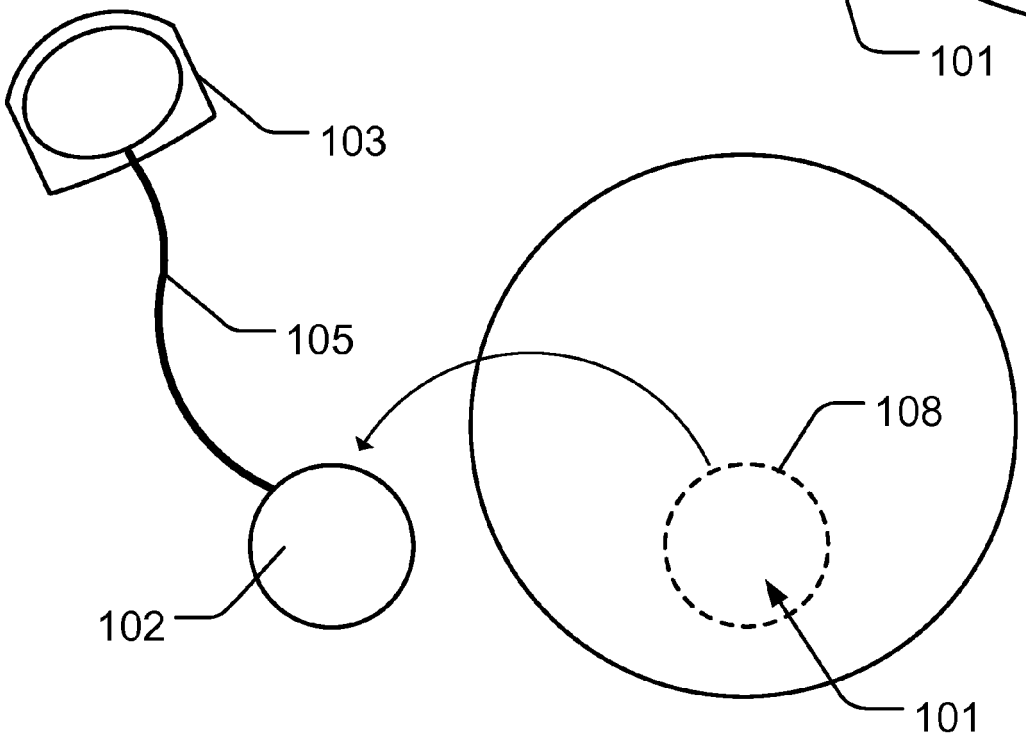


Fig. 11f

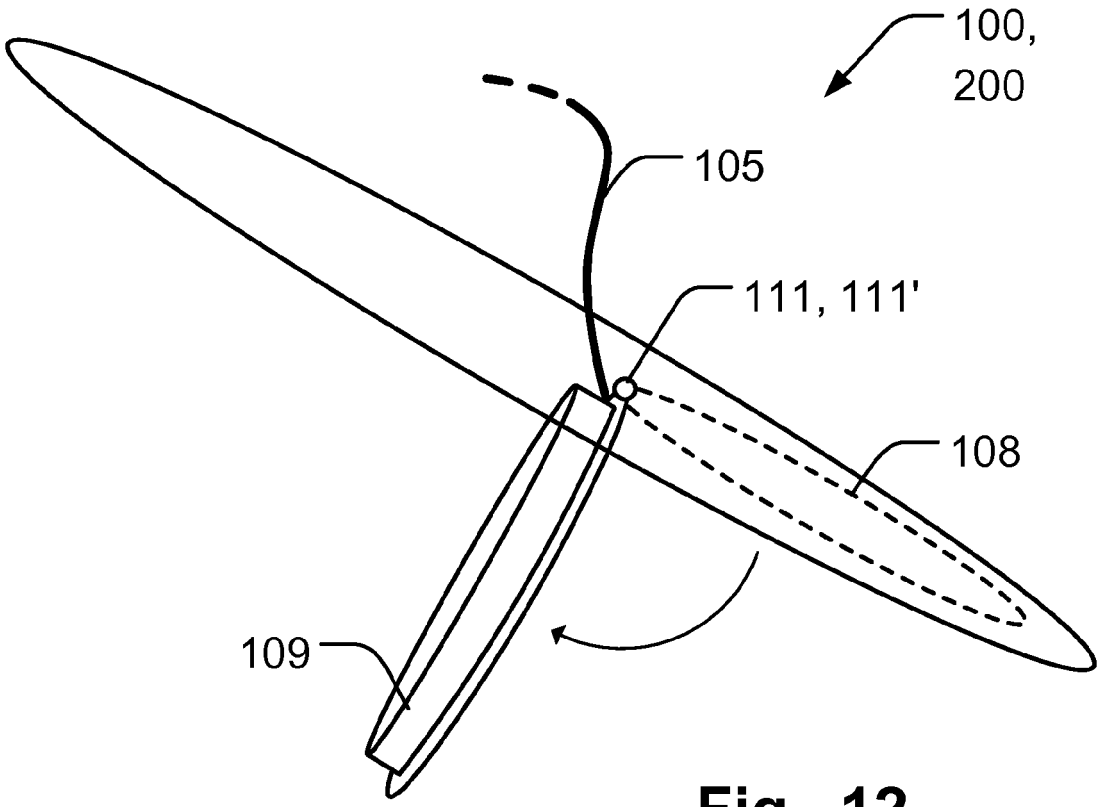


Fig. 12

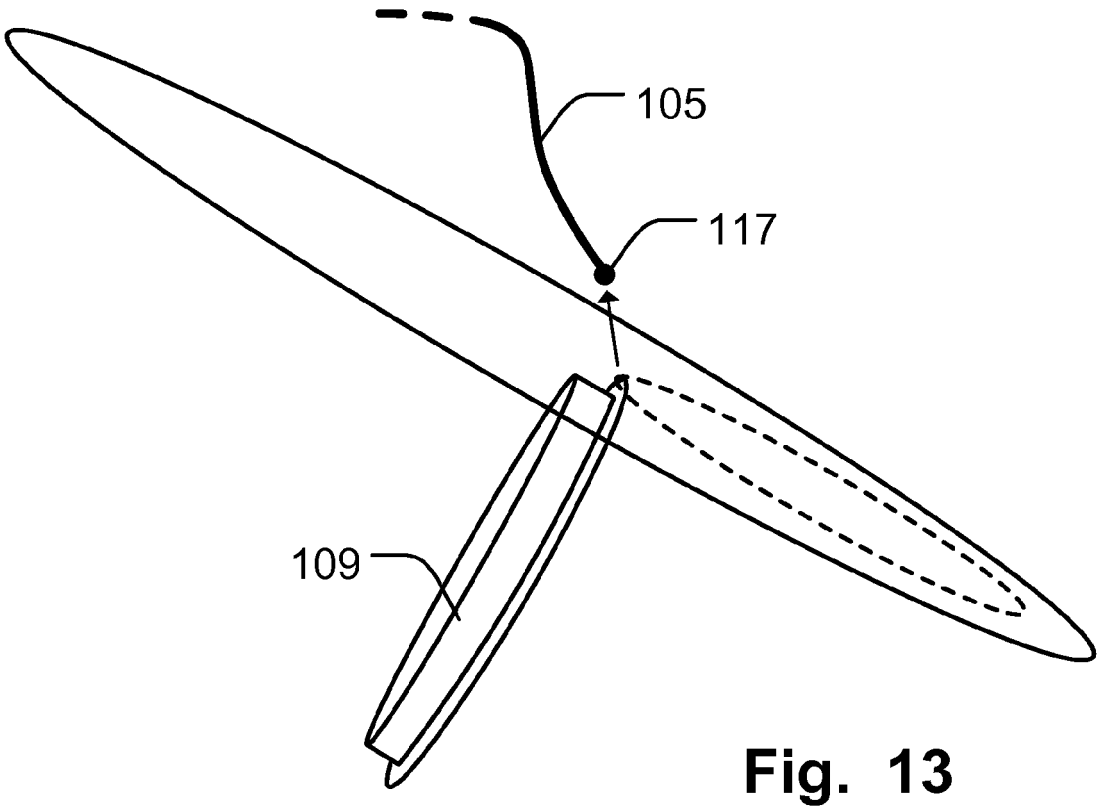


Fig. 13

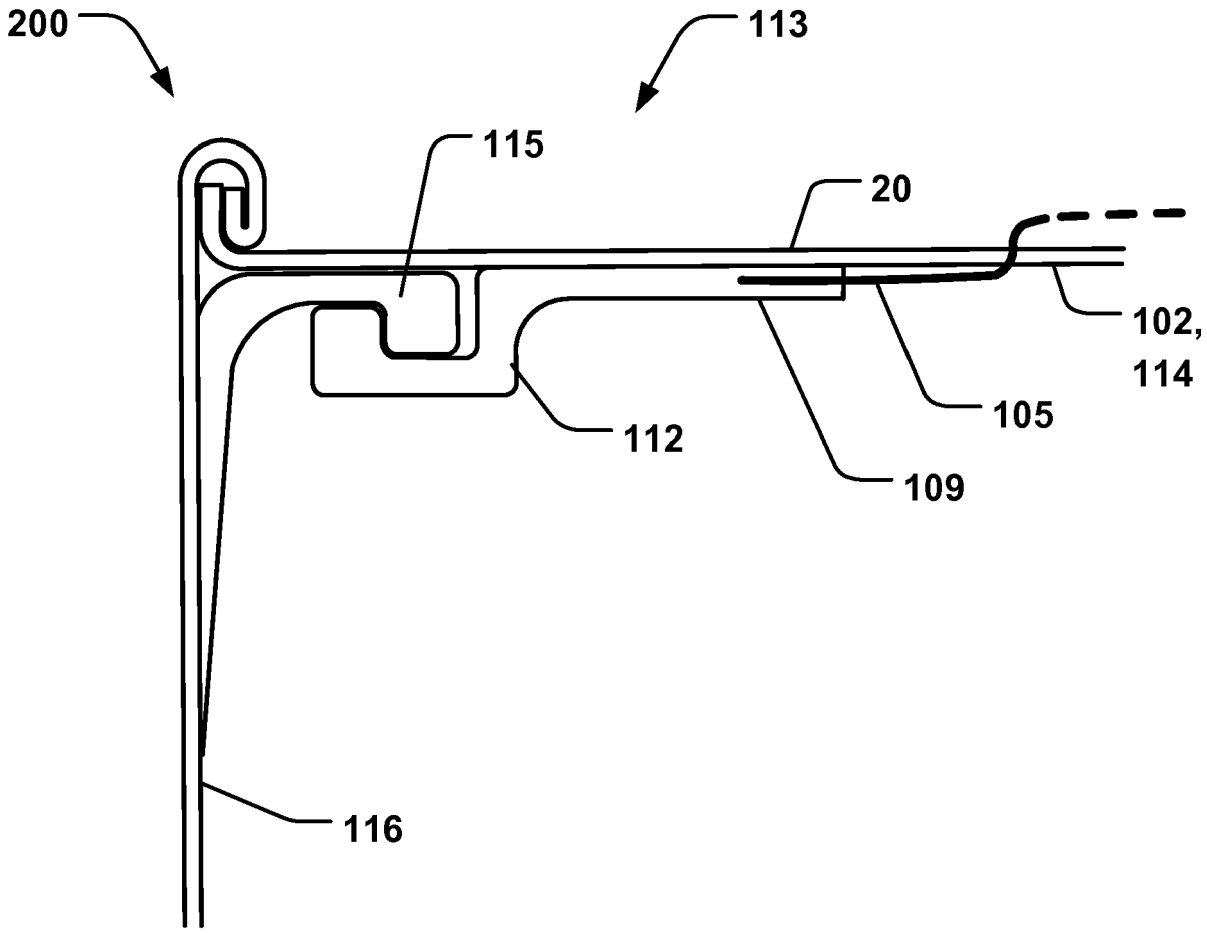


Fig. 14

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 0363528 A1 **[0002]**
- US 5711448 A **[0002]**