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(54) **LINER, SCREW CAP WITH A LINER, CONTAINER AND METHOD FOR PRODUCING A LINER**

(57) Liner (1) made from a substrate, the liner (1) being suitable to be attached to the upward facing rim surface of a rim that defines a pouring opening of a container (20), the liner (1) having a basic body (2) and at least two tabs (3) that extend radially outwards from the circumference of the basic body (2).

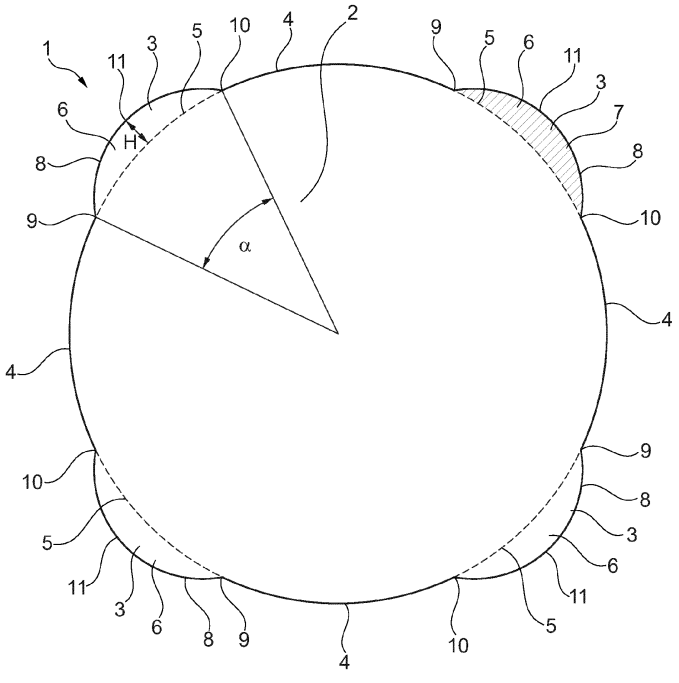

Fig. 1

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Description

[0001] The invention pertains to a liner made from a substrate. The invention also pertains to a screw cap with such a liner. The invention also pertains to a container with a neck portion The invention also pertains to a container with a threaded neck portion and a screw cap attached to the threaded neck portion. The invention also pertains to a method for producing a liner.

[0002] From everyday life containers with threaded neck portions are known, whereby the threaded neck portion ends in a rim that defines a pouring opening of the container. The rim has an upward facing rim surface. These containers often are closed by screw caps. These screw caps typically have a base portion comprising a top surface and a bottom surface and an annular portion raised from the base portion, the annular portion having an inner surface and an outer surface. The threaded portion typically is arranged on the inner surface of the annular portion. The screw caps are screwed onto the threaded neck portions of the containers to close the pouring opening of the container. From everyday life it is known, that these containers that have a screw cap screwed onto their threaded neck portion additionally have a liner made from a substrate attached to the upward facing rim surface of the rim that defines the pouring opening of the container. The attachment of such a liner to the rim surface can be a means of tamper proof. If the liner is still safely attached to the rim surface after the screw cap has been screwed from the container, this can be a proof that the fluid, e.g. the gas, liquid or powder in the container has not been tampered with. These liners also can be used to prevent certain gases from coming into contact with the fluid in the container, for example preventing oxygen from entering into the container.

[0003] From everyday life a liner is known that has a circular basic body and is made from a multi-layer substrate. The top layer of this substrate is only partially attached to the layers beneath it. This allows the top layer to be lifted and used as a tab to detach the liner from the rim surface. Such liners are sometimes referred to as "lift and peel".

[0004] From everyday life, a liner made from a multilayer substrate is known, whereby the liner has a basic body and has a tongue-shaped tab that extends radially outward from the circumference of the circular basic body.

[0005] Given this background, the problem to be solved by the invention is to suggest a liner that can be more easily produced and/or can be more easily attached to the rim surface and/or more easily detached from the rim surface.

[0006] This problem is solved by a liner according to claim 1, a screw cap according to claim 8, a container according to claim 9 and the method according to claim 11 and the use according to claim 12. Preferred embodiments are defined in the subordinate claims and the description following hereafter.

[0007] The basic concept of the invention is to provide the liner that has at least two tabs, preferably with at least three tabs, preferably with at least four tabs. It has been found out that by increasing the number of tabs the individual surface area of the individual tab can in certain embodiments be reduced, which allows more liners to be produced from the same predefined area of substrate when compared to liner designs of the prior art. The possibility of arranging more liners to be punched out from a given area of substrate reduces the amount of substrate necessary for a certain number of liners to be produced. This hence reduces the amount of waste created during the production of such liners. Furthermore it has been found out that increasing the number of tabs on the liner helps to hold such a liner in a screw cap. With an increased number of tabs, more tabs are present that could rest against the underside of a threaded portion of a screw cap and that can assist in holding the liner between the threaded portion and the top surface of the base portion of the screw cap. Improving the way the liner is held in the screw cap improves the way that the liner can be attached to the upward facing rim surface of the rim. Furthermore it has been found out that increasing the number of tabs increases the likelihood that a tab is arranged in a position that makes it easy for a person to detach the liner from the container. Certain containers by their shape are prone to be held in a certain manner by a user. A container can, for example, have a handle that typically leads to the container being held in a certain fashion by the user. Given this setting there is often a certain orientation of a tab that would make it the easiest for the user to grab the tab and to detach the liner from the rim surface of the neck. Given that the orientation with which a liner is attached to the rim surface during the attachment process is to a certain amount arbitrary increasing the number of tabs increases the likelihood that one of the tabs is in an orientation that is preferred by the user for detaching the liner from the rim surface.

[0008] The invention is directed to a liner made from a substrate. Such a liner sometimes also is referred to as a wad in the industry. The liner is a piece of substrate that is suitable to be attached to the upward facing rim surface of a rim that defines a pouring opening of a container, typically with the purpose to close the pouring opening of the container. Such liners are marketable goods in themselves. Liners can be sold to botteling factories that use the liners to close the containers that they have filled with the fluid, e.g. with a gas, liquid or powder. The liners can be attached to the output facing rim surface by means of gluing and by way of use of a glue. The substrate preferably is a single foil or a multilayer foil.

[0009] In the description of the liner that follows hereafter, elements of the liner, especially their geometric shape, their positioning relative to other elements, the description of length, distances, areas will be described for a liner that is in a state of being flat, for example in a state of being placed flatly on the top of a table. Fig. 1 of the specific embodiments described below shows such

a state of a liner, for example. Other states of the liner exist, for example the state of the liner, when the liner is placed on the neck of the container and the tabs may be arranged to be bent downwards. However, if not stated specifically to the contrary in the particular portion of the text that follows hereafter, elements of the liner, especially their geometric shape, their positioning relative to other elements, the description of length, distances, areas will be described for a liner that is in a state of being flat. Given that the liner will have a certain thickness, even if it is a small thickness, when describing geometric relationships or when defining reference planes specific reference may be made below to the upper surface of the liner, which is considered to be in one plane if the liner is in a state of being flat. If a feature of the liner is described in this description with reference to a radial line or a radial and nothing else is specified, this means that the embodiment that is being described in that particular text portion is an embodiment where the basic body of the liner is a circular body.

[0010] In a preferred embodiment the liner has a single layer of induction heat seal substrate or is made up of a multi-layer substrate of which one substrate is an induction heat seal substrate, whereby the liner is attached to the rim surface by means of induction heat sealing.

[0011] The liner according to the invention has a basic body and has at least two tabs that extend radially outwards from the circumference of the basic body. The terms "basic body" and "tab" and the description of a tab extending radially outwards from the circumference of the basic body is used in this description to describe the shape of the liner. Given that the liner is made from a substrate there is no material difference between the basic body and the tab. The material (the substrate material) from which the liner is made continues from the basic body into the tab. The terms "basic body" and "tab" and the definition that the tab extends radially outwards from the circumference of the basic body is considered to be suitable means, however, to describe the overall geometric shape of the liner made from a substrate.

[0012] The basic body is defined to have a circumference. The circumference of the basic body is, however, only visible by way of an edge in those parts of the circumference of the basic body where no tab extends radially outwards from the circumference of the basic body. In those sections of the circumference of the basic body where a tab extends radially outward from this circumference, the actual circumference of the basic body is not visible and is to be understood as that imaginary line that continues the circumference of the basic body in this section.

[0013] The invention has at least two tabs that extend radially outwards from the circumference of the basic body. In a preferred embodiment, the liner has at least three tabs that extend radially outwards from the circumference of the body. In an even more preferred embodiment, the liner has at least four tabs that extend radially outwards from the circumference of the body. In a preferred embodiment, the liner has less than 20 tabs that extend radially outwards from the circumference of the basic body. And an even more preferred embodiment, the liner has less than 15 tabs that extend radially outwards from the circumference of the basic body. In a preferred embodiment, the liner has less than 10 tabs that extend radially outwards from the circumference of the basic body. Increasing the number of tabs increases the number of sections where a user could grab a tab in order to detach the liner from the rim surface. Hence a higher number of tabs is preferable under this objective. Increasing the number of tabs does, however, increase the material necessary to produce a liner. Given the number of liners being used in the market today, reducing the amount of substrate that is used for a single liner, even if it is a small amount, will prove to be a substantial saving in the manufacturing of the millions of liners that are used in the market. The objective of reducing the material that is used to produce the liner speaks for reducing the number of tabs arranged on the circumference of the basic body. Additionally - given a predefined circumferential length of a basic body (predefined by the rim surface of the container) - the number of tabs has a direct influence on the surface area that a tab can sensibly have. The more tabs a liner has, the smaller that section of the circumference of the basic body that can be taken up by the individual tab. The smaller the section of the circumference of the basic body that the individual tab can take up, is, the higher the likelihood that a tab will be ripped when being pulled. Also, the smaller the section of the circumference of the basic body is that an individual tab can take up, the slimmer the individual tab will be and hence the smaller the area of the tab will be, making it more difficult for a user to pick up the individual tab. Hence also this consideration plays into choosing the best number of tabs. It has been found out that more than three tabs and less than 10 tabs provide good results for most applications of the invention.

[0014] In a preferred embodiment, the tabs are spaced equally around the circumference of the basic body. If two tabs are present, the tabs are preferably spaced apart by 180° (whereby the term "spaced apart by" relates to the angle between the respective center of the respective tabs). If three tabs are present, these tabs preferably are spaced apart by 120°. If four tabs are present, these tabs are preferably spaced apart by 90°. Spacing the tabs equally around the circumference of the basic body increases the probability that one tab is in a position on the neck of the container that is most comfortable for the user for detaching the liner from the rim surface. Embodiments under the invention are feasible, where the majority (more than 50%) and more preferably the overwhelming majority (more than 75%) of the tabs present are equally spaced around the circumference of the basic body, while at least one tab is provided that is spaced differently (and be it only in an attempt to design around this invention).

[0015] In a preferred embodiment the liner is mirror symmetrical about a plane that runs perpendicular to the

plane (flat) upper surface of the liner. In a preferred embodiment, the liner is designed mirror symmetrical about at least the same number of planes that are perpendicular to the plane upper surface of the basic body as the number of tabs. If four tabs are present, the liner preferably is designed mirror symmetrical about at least four planes that are perpendicular to a plane (flat) upper surface of the basic body, for example.

[0016] In a preferred embodiment, the basic body is a circular body. Pouring openings of most containers are circular in cross section. Hence the rim that defines the pouring opening of a container typically has an upward facing rim surface that has the shape of a circular ring. It is preferred, that the basic body is a circular body. Alternative shapes of the basic body, for example quadratic, rectangular, polygonal or elliptical shapes are also feasible and depend very much on the shape of the upward facing rim surface of the rim of the container that defines the pouring opening of the container to which the liner is to be attached.

[0017] In a preferred embodiment, the liner has two tabs that each have a surface area of at least 10mm^2, preferably of at least 12mm^2, preferably of at least 15mm^2. In a preferred embodiment, the liner has two tabs that each have a surface area of less than 45 mm^2, preferably of less than 40 mm^2, preferably of less than 35 mm^2, preferably of less than 30 mm^2. It has been found that a surface area of this size is sufficiently large to be picked up by a user when the user wants to detach the liner from the rim surface.

[0018] In a preferred embodiment the majority (more than 50%) and in an even more preferred embodiment the overwhelming majority (more than 75%) of the tabs that extend radially outward from the circumference of the basic body have a surface area that is at least 10mm^2, preferably at least 12mm^2, preferably at least 15mm^2. In a preferred embodiment the majority (more than 50%) and in an even more preferred embodiment the overwhelming majority (more than 75%) of the tabs that extend radially outward from the circumference of the basic body have a surface area that is less than 45 mm^2, preferably less than 40 mm^2, preferably less than 35 mm^2, preferably less than 30 mm^2. In a preferred embodiment, all tabs have the same surface area.

[0019] In a preferred embodiment the basic body is a circular basic body that only has tabs that extend radially outwards from the circumference of the basic body, whereby all tabs have a surface area that is at least 10mm^2, preferably at least 12mm^2, preferably at least 15mm^2 and have a surface area that is less than 45 mm^2, preferably less than 40 mm^2, preferably less than 35 mm^2, preferably less than 30 mm^2.

[0020] In a preferred embodiment, at least one tab of the tabs that extend radially outwards from the circumference of the basic body has a tip, whereby the tip is the point of the tab that is located the furthest radially outward from the basic body, whereby the tip is distanced in the radial direction by at least 1,0 mm, preferably by at least 1,6 mm, preferably by at least 2,0 mm from the circumference of the basic body. In a preferred embodiment, the majority (more than 50%) and in an even more preferred embodiment the overwhelming majority (more than 75%) of the tabs that extend radially outward from the circumference of the basic body have a tip, whereby the tip is the point of the respective tab that is located the furthest radially outward from the basic body, whereby the tip is distanced in the radial direction by at least 1,0 mm, preferably by at least 1,6 mm, preferably by at least 2,0 mm from the circumference of the basic body.

[0021] In a preferred embodiment, at least one tab of the tabs that extend radially outwards from the circumference of the basic body has a tip, whereby the tip is the point of the tab that is located the furthest radially outward from the basic body, whereby the tip is distanced in the radial direction by less than 6,0 mm, preferably by less than 4,0 mm, preferably by less than 3,4 mm, preferably by less than 2,8 mm from the circumference of the basic body. In a preferred embodiment, the majority (more than 50%) and in an even more preferred embodiment the overwhelming majority (more than 75%) of the tabs that extend radially outward from the circumference of the basic body have a tip, whereby the tip is the point of the respective tab that is located the furthest radially outward from the basic body, whereby the tip is distanced in the radial direction by less than 6,0 mm, preferably by less than 4,0 mm, preferably by less than 3,4 mm, preferably by less than 2,8 mm from the circumference of the basic body.

[0022] In a preferred embodiment, at least one tab, more preferably the majority (more than 50%) of the tabs, more preferably the overwhelming majority (more than 75%) of the tabs and even more preferably all tabs are designed to be mirror symmetrical about plane that is perpendicular to the plane (flat) upper surface of the basic body and which extends radially through the tip of the tab.

[0023] In a preferred embodiment, at least one of the tabs of the liner, more preferably the majority (more than 50%) of the tabs, more preferably the overwhelming majority (more than 75%) of the tabs and even more preferably all tabs have an edge that defines the shape of the tab, whereby the edge runs from a starting point to an end point, the starting point being the point where the tab starts to extend from the circumference of the basic body and the end point being the point where the tab ends to extend from the circumference, the edge departing from the circumference of the basic body at the starting point and the edge rejoining the circumference of the basic body at the end point.

[0024] In a preferred embodiment, for at least one of the tabs of the liner, more preferably for the majority (more than 50%) of the tabs, more preferably for the overwhelming majority (more than 75%) of the tabs and even more preferably for all tabs the angle between a radial line that crosses the starting point and a radial line that crosses the endpoint is more than 20°, preferably more than 25°, preferably more than 30°. In a preferred em-

bodiment, for at least one of the tabs of the liner, more preferably for the majority (more than 50%) of the tabs, more preferably for the overwhelming majority (more than 75%) of the tabs and even more preferably for all tabs the angle between a radial line that crosses the starting point and a radial line that crosses the endpoint is less than 65°, preferably less than 60°, preferably less than 55°, preferably less than 50°.

[0025] In a preferred embodiment for at least one of the tabs of the liner, more preferably for the majority (more than 50%) of the tabs, more preferably for the overwhelming majority (more than 75%) of the tabs and even more preferably for all tabs the edge that defines the shape of the tab in the section of the tab that is arranged immediately next to the starting point extends into a direction, which is called the starting direction in this description. In a preferred embodiment, the free angle between the circumferential direction of the circumference of the basic body at the starting point and the starting direction is more than 90°, preferably more than 100°, preferably more than 110°. In a preferred embodiment, it is intended that the angle at which the edge of the tab extends away from the circumference of the basic body is a flat angle. The flatter the angle is, the less likelihood that the tab will tear at the starting point. The "free angle" is understood to be the angle that when it is drawn is not drawn through the material of the liner as has been shown in Fig. 4 for example.

[0026] In a preferred embodiment for at least one of the tabs of the liner, more preferably for the majority (more than 50%) of the tabs, more preferably for the overwhelming majority (more than 75%) of the tabs and even more preferably for all tabs the edge that defines the shape of the tab in the section of the tab that is arranged immediately next to the end point extends into a direction, which is called the final direction in this description. In a preferred embodiment, the free angle between the circumferential direction of the circumference of the basic body at the end point and the final direction is more than 90°, preferably more than 100°, preferably more than 110°. In a preferred embodiment, it is intended that the angle at which the edge of the tab extends away from the circumference of the basic body is a flat angle. The flatter the angle is, the less likelihood that the tab will tear at the starting point.

[0027] In a preferred embodiment, the edge has the shape of a portion of the circumference of a circle or a portion of the circumference of an ellipse.

[0028] In a preferred embodiment the liner is made from a single layer substrate. In a preferred embodiment, this single layer substrate is a heat seal substrate. In a preferred embodiment, the heat seal substrate is an aluminum foil with material that can be heat-activated attached to it in the surface areas, where the contact with the rim surface will take place, for example material that can be heat-activated printed to the aluminum foil in the surface areas, where the contact with the rim surface will take place.

[0029] In a preferred embodiment, the substrate is a multi-layer substrate. In a preferred embodiment, the number of layers in the substrate is more than one, more preferably at least two, more preferably at least three, more preferably at least four. In a preferred embodiment, one of the layers of the substrate is an aluminum substrate that is laminated to the other materials in order to attract heat in the form of induction heat, conduction heat, ultrasonic heat or radiant heat. In a preferred embodiment, one of the layers of the substrate is a foam, preferably a Polyolefin foam. In a preferred embodiment, one of the layers of the substrate is PET film. In a preferred embodiment, one of these layers can be utilized as a carrier for a printed artwork for the purposes of consumer instruction or brand promotion. The printed artwork can be on the outward facing surface of the topmost layer. However, the printed artwork can also be on an inward facing surface of a layer, for example in order to protect the printed artwork.

[0030] In a preferred embodiment, each layer of the multilayer-substrate is individually extruded to the desired thickness. In an alternative, some layers are extruded individually, some layers are co-extruded. The layers that are to make up the multilayer-substrate preferably are laminated together into what is considered a 'mother reel' or 'master reel'. This reel can be slitted to the desired width to suit the machine which will eventually be used to create the liner, for example to punch the liner from, during or prior to cap manufacture.

[0031] In a preferred embodiment, the thickness of the liner when it is made from a multilayer-substrate is between 50 - 230 micron (50 to 230 micrometer), preferably is between 100 - 200 micron (100 to 200 micrometer), is between 120 - 1700 micron (1200 to 1700 micrometer).

[0032] In a preferred embodiment, a letter or a number or a series of letters and/or numbers is printed on one of the surfaces of the liner. The Printing can be obtained by offset printing, lithographic printing, flexo printing, inkjet printing or digital printing.

[0033] In a preferred embodiment the basic body and/or the tabs are solid elements and free from holes.

[0034] The screw cap according to the invention is intended to be used with containers with a threaded neck portion. The screw cap according to the invention comprises a base portion comprising a top surface and a bottom surface. This screw cap further comprises an annular portion raised from the base portion, whereby the annular portion has an inner surface and an outer surface. The screw cap has a threaded portion that is arranged on the inner surface of the annular portion. The top surface of the base portion is that surface of the base portion that points into the same direction as the annular portion. The bottom surface is considered to be the surface of the base portion that is on the outside of the screw cap.

[0035] According to the invention a liner according to the invention is provided with the basic body of the liner being arranged between the threaded portion and the

top surface of the base portion with at least one tab being arranged between the threaded portion and the top surface of the base portion.

[0036] Such a screw cap with a liner arranged inside it is a marketable good. Such screw caps can be sold to bottling companies, which screw the screw cap onto the containers that they have filled with fluid, e.g. gas, liquid or powder.

[0037] In a preferred embodiment of the screw cap, the threaded portion has at least one thread that extends along the inner surface of the annular portion in a helical manner. In a preferred embodiment, the threaded portion has more than one thread. In a preferred embodiment, one thread has one section that is arranged closest to the top surface of the base portion or if several threads are provided, each of the threads that make up the threaded portion has one section respectively that is arranged closest to the top surface of the base portion. In a preferred embodiment, this respective section is arranged distance from the top surface. In a preferred embodiment the one thread or the threads that make up the threaded portion do not end in a manner that they contact the top surface of the base portion. This allows for room between the threaded portion and the top surface for the liner to be arranged in this room.

[0038] In a preferred embodiment, at least one tab rests with its edge against a thread of the threaded portion, preferably with its tip. In a preferred embodiment, the majority (more than 50%) of the tabs, in a more preferred the overwhelming majority (more than 75%) of the tabs rest with their respective edges, preferably with their respective tips against a thread or against one of the threads that make up the threaded portion. Having several tabs rest against the threads/the thread of the threaded portion with their edges provides means for holding the liner inbetween the threaded portion and the top surface of the base portion. This mechanism hence prevents a liner from falling out of the screw tab while being transported.

[0039] In a preferred embodiment, at least one, preferably only one tab does not rest against a thread of the threaded portion with its tip. In a preferred embodiment, at least one, preferably only one tab does not rest against a thread of the threaded portion with its edge.

[0040] In a preferred embodiment, the majority (more than 50%), even more preferred the overwhelming majority (more than 75%) and in an even more preferred embodiment all tabs are arranged to be bent out of the plane of a plane upper surface of the basic body of the liner and are more preferably bent away from this plane in the same direction, when the liner is arranged between the threaded portion and the top surface of the base portion. In a preferred embodiment, the angle between the direction, in which the tabs extend and the plane of the plane upper surface of the basic body is between 30° and 150°, more preferably between 45° and 135°, more preferably 90°.

[0041] In a preferred embodiment, no tab is arranged between the basic body and the top surface of the base portion. Especially, no tab is bent backwards between the basic body and the top surface of the base portion.

[0042] In a preferred embodiment, the liner can rotate loosely in the cap about an axis that is perpendicular to the upward facing surface of the liner.

[0043] In a preferred embodiment the cap is produced from materials High-density polyethylene (HDPE), Low-density polyethylene (LDPE), Polypropylene (PP) or Polyethylene terephthalate (PET), any of the above mentioned materials also in the alternative, where the respective material includes recycled content up to 100%. The cap can be moulded from technologies such as Continuous Compression Molding (CCM) or Injection Molding (IM) or Thermoforming (TF).

[0044] The container according to the invention has a neck portion. The neck portion ends in a rim that defines a pouring opening of the container. The rim has an upward facing rim surface. According to the invention a liner according to the invention is attached to the upward facing rim surface. In a preferred embodiment, the neck portion is a threaded neck portion. In a preferred embodiment a screw cap according to the invention is attached to the upward facing rim surface.

[0045] In a preferred embodiment, the upward facing rim surface has a shape of a circular ring. In a preferred embodiment, the circular ring has a diameter of between 25 to 45 mm, preferably of between 29 to 40 mm, preferably of between 30 to 35 mm, preferably of 31,6mm.

[0046] In a preferred embodiment, the liner is attached the upward facing rim surface by way of gluing by way of using a glue between the liner and the upward facing rim surface.

[0047] In a preferred embodiment, the liner is attached to the upward facing rim surface by means of induction heat sealing.

[0048] In the method for producing a liner according to the invention the liner is punched out of a substrate by way of punching. In a preferred embodiment, two punches, three punches or more preferably four punches or even more than four punches are provided and arranged next to each other, whereby each punch punches one liner out of the substrate. In a preferred embodiment, the punches are arranged next to each other, preferably along a line. In a preferred embodiment, the line of punches is arranged at an angle to the edge of the substrate which angle is less than 90°, preferably less than 80°, preferably less than 75°, preferably more than 10°, even more preferred more than 20°, even more preferred more than 30°.

[0049] In a preferred embodiment, the liner is punched out of a substrate by a single stage punching process. The shape of the liner according to the invention allows the liner to be punched by a single stage punching process.

[0050] The invention also pertains to the method of attaching the liner to the rim surface of the container. In this method the liner is placed on the rim surface of the

container. The liner contains an aluminum layer. The aluminum layer is heated (activated) by way of induction heat, conduction heat, ultrasonic heat or radiant heat. The heated aluminum layer either melts a surface region of the rim surface and thereby is attached to the rim surface, because a bond will be made as the region of the rim surface cools down. Alternativly additional material is present between the aluminum layer and the rim surface that is heated by the activated aluminum and leads to an attachment of the liner to the rim surface. The liner may be pressed against the rim surface by the presence of a screw cap, whereby the screw cap has been screwed onto a thread of the neck of the container with sufficient torque to create a downward pressing force on the liner.

[0051] In a preferred embodiment, the container is filled with a fluid, preferably with a liquid. In a preferred embodiment, the fluid, preferably the liquid is a food material, in a preferred embodiment a diary product.

[0052] Preferably the liner according to the invention is used for attachment to a rim of a neck portion of a container to close a pouring opening of the container defined by the rim.

[0053] In the following the invention will be described by way of reference to Fig. that only show embodiments of the invention. In the Fig.

Fig. 1 shows a schematic top view onto a liner according to the invention;

Fig. 2 shows a schematic side view of the upper part of a container according to the invention;

Fig. 3 shows a schematic perspective view onto the upper part of the container of Fig. 1;

Fig. 4 shows a schematic top view onto top right part of the liner according to Fig. 1;

Fig. 5 shows a schematic top view onto the line according to Fig. 1;

Fig. 6 shows a perspective view of cap with liner inside and

Fig. 7 shows a sectional side view of cap of Fig. 6 that shows how liner is arranged between top surface and threaded portion and how tabs contact thread with their edge.

[0054] The liner 1 shown in Fig. 1 to 3 is made from a substrate. The liner 1 has a basic body 2, which in the embodiment of Fig. 1 to 3 is a circular body. The liner 1 has four tabs 3 that extend radially outwards from the circumference of the basic body 2. The basic body 2 in those areas where there is no tab 3 has a circumferential edge 4. The broken lines 5 in Fig. 1 indicate in those areas, where there is a tab 3 extending radially outwards from the circumference of the basic body, where for the purpose of describing the shape of the liner 1 the basic body 2 is considered to end and where the respective tab 3 is considered to start.

[0055] The top view shown in Fig. 1 shows the liner 1 with the tabs 3 being orientated "in line" with the basic body 2, which is to be understood as the upper surface of the tabs 3 being in the same plane as the plane upper surface of the basic body 2. In contrast to the "in line" arrangement shown in Fig. 1, Fig. 2 and 3 shows the liner 1 in application to the threaded neck portion 21 of the container 20 and shows the tabs 3 being bent down from the basic body 2.

[0056] The surface area 6 of a tab 3 is understood to be the area highlighted by the shading 7 in Fig. 1 and is the area between the broken line 5 and the edge 8 of the respective tab 3. The surface area of the basic body 2 in the embodiment of Fig. 1 is for example XX mm2, the surface area 6 as indicated by the shading 7 is for example ZZ mm2.

[0057] Each of the tabs 3 has an edge 8 defines the shape of the tab, whereby the edge 8 runs from a starting point 9 to an end point 10. The starting point 9 is the point where the tab 3 starts to extend from the circumference of the basic body 3 and the end point 10 is the point where the tab 3 ends to extend from the circumference, the edge 8 departing from the circumference of the basic body 2 at the starting point 9 and the edge 8 rejoining the circumference of the basic body 2 at the end point 10. The edge 8 has the shape of a portion of the circumference of a circle.

[0058] Each tab 3 has a tip 11. The tip 11 is that point of the tab 3 that is the furthest radially outward. Each tab 3 has a height H, which is the distance between the tip 11 and the circumference of the basic body 2 (the broken line 5), when measured along a radial to the circular basic body 2. The height in the embodiment shown in Fig. 1 is ZZ mm.

[0059] The angle ALPHA between a radial to the circular basic body 2 that passes to the starting point 9 of a tab 3 and a radial to the circular basic body 2 that passes to the end point 10 of that tab 3 in the embodiment shown in Fig. 1 is approximately 40°.

[0060] Fig. 1 and 5 show that the four tabs 3 are spaced equally around the circumference of the basic body. The four tabs 3 are preferably spaced apart by 90° (whereby the term "spaced apart by" relates to the angle between the respective center of the respective tabs).

[0061] The liner 1 is mirror symmetrical about two planes that runs perpendicular to the plane upper surface of the liner. Fig. 5 shows two lines 12 that are to symbolize these planes.

[0062] Fig. 4 for the tab 3 that is arranged in the top right corner of Fig. 1 shows that the edge 8 that defines the shape of the tab 3 in the section of the tab that is arranged immediately next to the starting point 9 extends into a direction, which is called the starting direction C in this description. The free angle BETA between the circumferential direction A of the circumference of the basic

body 2 at the starting point 9 and the starting direction C is about 140°. Fig. 4 for the tab 3 that is arranged in the top right corner of Fig. 1 also shows that the edge 8 that defines the shape of the tab 3 in the section of the tab 3 that is arranged immediately next to the end point 10 extends into a direction, which is called the final direction D in this description. The free angle THETA between the circumferential direction B of the circumference of the basic body 2 at the end point 10 and the final direction C is about 140°.

[0063] The container 20 according to the invention has a threaded neck portion 21. The threaded neck portion 21 ends in a rim that defines a pouring opening of the container 20. The rim has an upward facing rim surface.

[0064] Fig. 2 and 3 show the container 20 with the cap already screwed off the container 20. Fig. 2 and 3 show that the liner 1 is attached to the upward facing rim surface. Fig. 2 and 3 show that the tabs 3 of the liner 1 are bent downwards from the basic body 2.

[0065] Fig. 6 and 7 show a screw cap 30 for the container 20 with the threaded neck portion 21. The screw cap 30 has a base portion 31 comprising a top surface 32 and a bottom surface 33. The screw cap 30 has an annular portion 34 raised from the base portion 31, the annular portion 34 having an inner surface 35 and an outer surface 36. The screw cap 30 has a threaded portion 37 arranged on the inner surface 35 of the annular portion 34.

[0066] The liner 1 is arranged with the basic body 2 being arranged between the threaded portion 37 and the top surface 32 of the base portion 31 and with at least one tab 3 being arranged between the threaded portion 37 and the top surface 32 of the base portion 31. The sectional view of Fig. 7 shows two tabs 3 (the left hand tab 3 that is partially sectioned and the right hand tab 3 that is partially sectioned) to rest against the thread of the threaded portion 37. The middle tab 3' of Fig. 7 does not rest against a thread of the threaded portion 37. However, given that two of the tabs 3 rest against the thread of the threaded portion, the fact that the middle tab 3' is not held back by the thread of the threaded portion can be tolerated. Even with this loose tab 3' the liner will not fall out of the cap, because it is held back by the remaining tabs 3.

Claims

1. Liner (1) made from a substrate, the liner (1) being suitable to be attached to the upward facing rim surface of a rim that defines a pouring opening of a container (20), the liner (1) having a basic body (2) and at least two tabs (3) that extend radially outwards from the circumference of the basic body (2).

2. Liner according to claim 1, **characterized in that** the liner (1) has at least four tabs (3) that extend radially outwards from the circumference of the basic body (2).

3. Liner according to claim 1 or 2, **characterized in that** two tabs (3) of the liner (1) have a surface area (6) that is at least 10mm^2 and is less than 45 mm^2.

4. Liner according to any one of claims 1 to 3, **characterized in that** at least one of the tabs (3) of the liner (1) has an edge (8) that defines the shape of the tab (3), whereby the edge (8) runs from a starting point (9) to an end point (10), the starting point (9) being the point where the tab (3) starts to extend from the circumference of the basic body (2) and the end point (10) being the point where the tab (3) ends to extend from the circumference, the edge (8) departing from the circumference of the basic body (2) at the starting point (9) and the edge (8) rejoining the circumference of the basic body (2) at the end point (10).

5. Liner according to claim 4, **characterized in that** the edge (8) has the shape of a portion of the circumference of a circle or of a portion of the circumference of an ellipse.

6. Liner according to any one of claims 1 to 5, **characterized in that** the substrate is a single-layer substrate.

7. Liner according to any one of claims 1 to 6, **characterized in that** the basic body (2) is a circular body.

8. Screw cap (30) for containers (20) with a threaded neck portion (21), the screw cap (30) comprising:

   - a base portion (31) comprising a top surface (32) and a bottom surface (33);
   - an annular portion (34) raised from the base portion (31), the annular portion (34) having an inner surface (35) and an outer surface (36);
   - a threaded portion (37) arranged on the inner surface (35) of the annular portion (34),

   characterized in that a liner (1) according to any one of claims 1 to 7 is arranged with the basic body (2) being arranged between the threaded portion (37) and the top surface (32) of the base portion (31) and with at least one tab (3) being is arranged between the threaded portion (37) and the top surface (32) of the base portion (31).

9. Container (20) with a neck portion (21), whereby the neck portion (21) ends in a rim that defines a pouring opening of the container (20), the rim having an upward facing rim surface, **characterized in that**

   - the liner (1) according to any one of claims 1 to 7 is attached to the upward facing rim surface.

10. Container (20) according to claim 9, **characterized in that** the neck portion (21) is a threaded neck portion, whereby

- a screw cap (30) according to claim 8 is screwed onto the threaded neck portion (21).

11. Method for producing a liner according to any 1 to 7, **characterized in that** the liner is punched out of a substrate by way of punching.

12. Use of a liner according to any one of claims 1 to 7 for attachment to a rim of a neck portion of a container (20) to close a pouring opening of the container (20) defined by the rim.

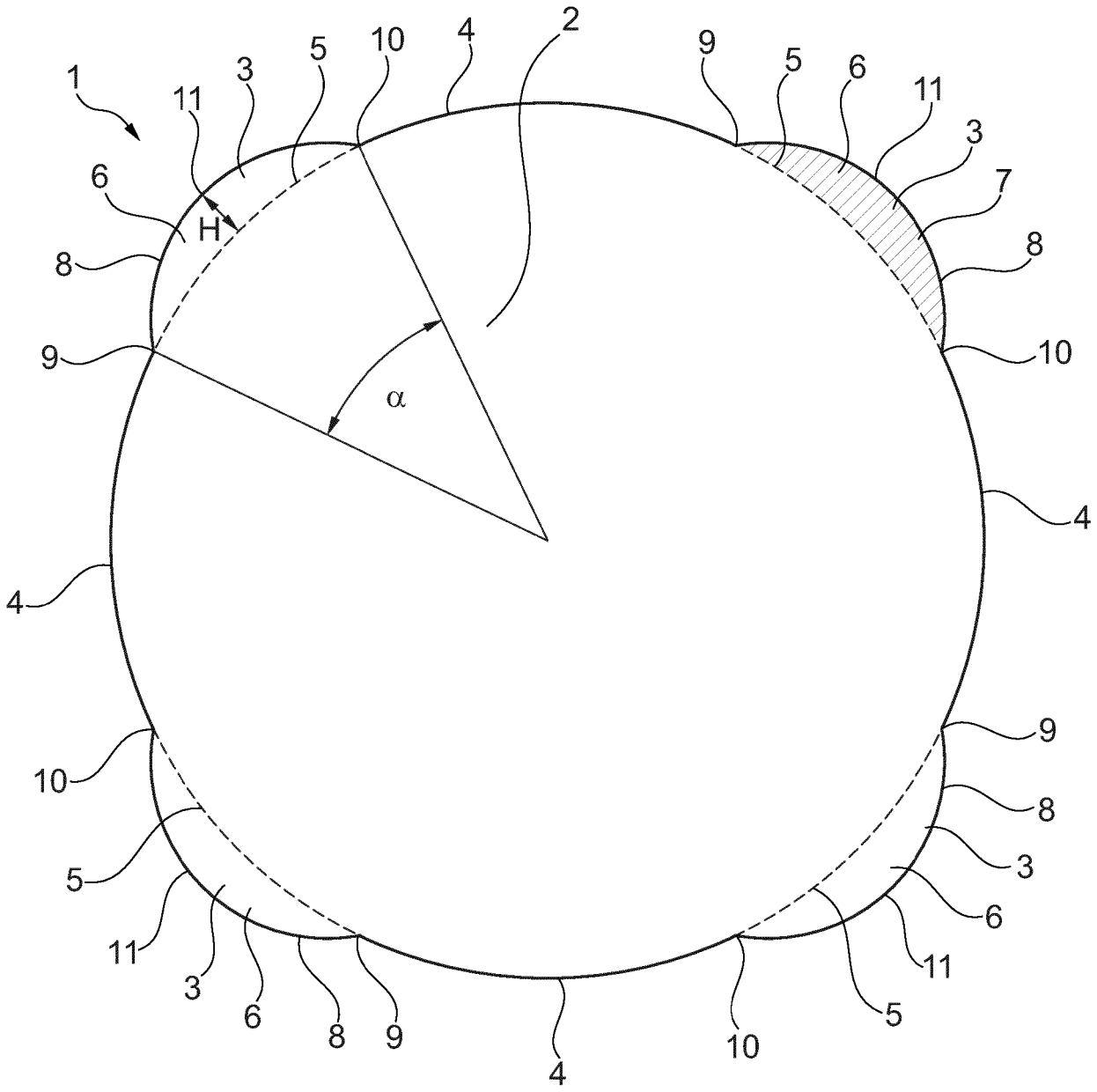
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Fig. 1

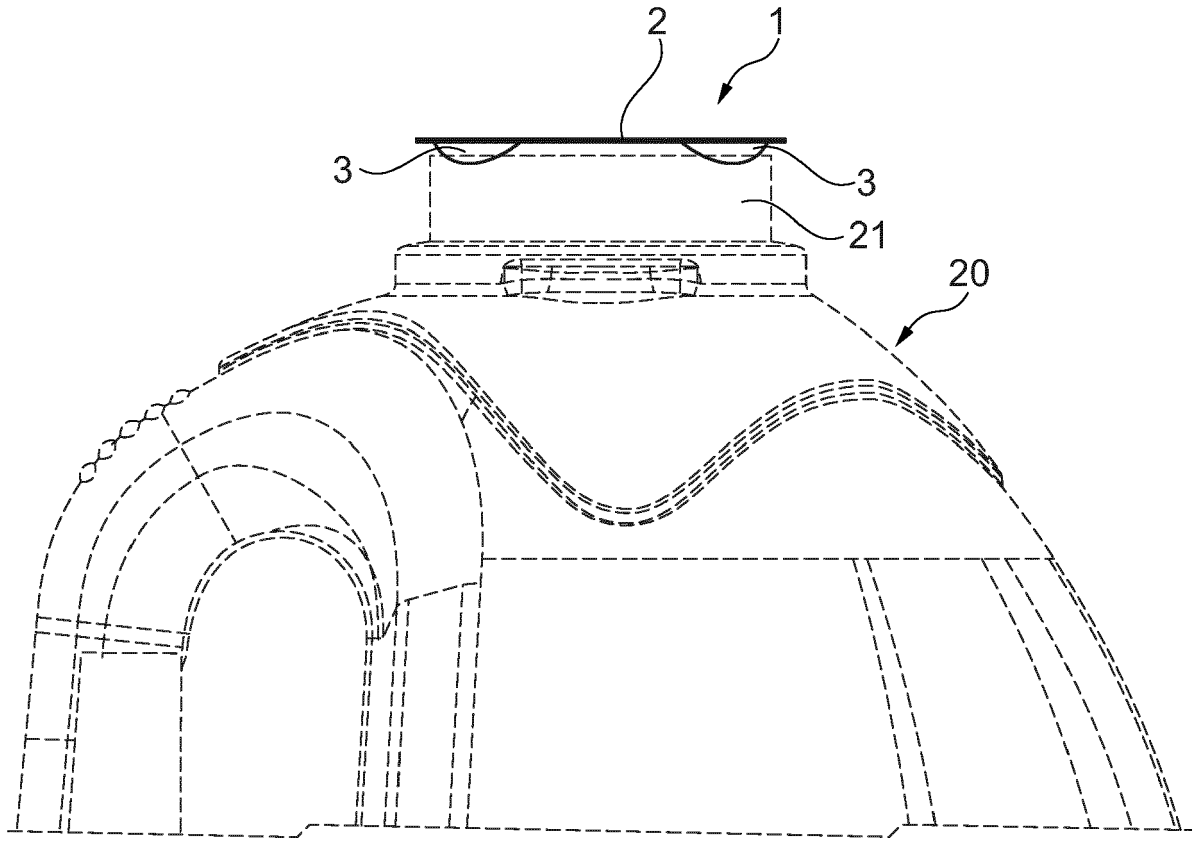

Fig. 2

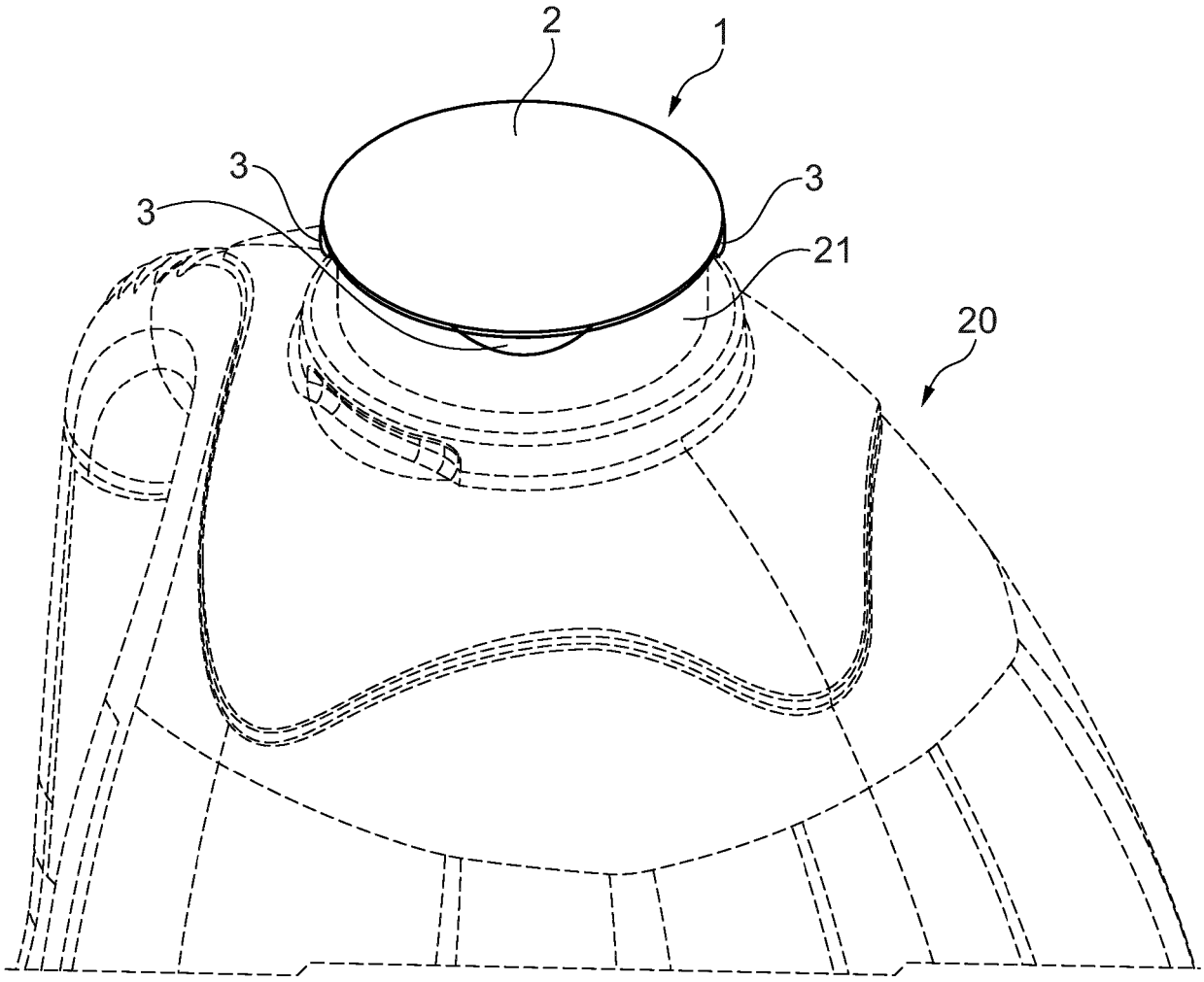

Fig. 3

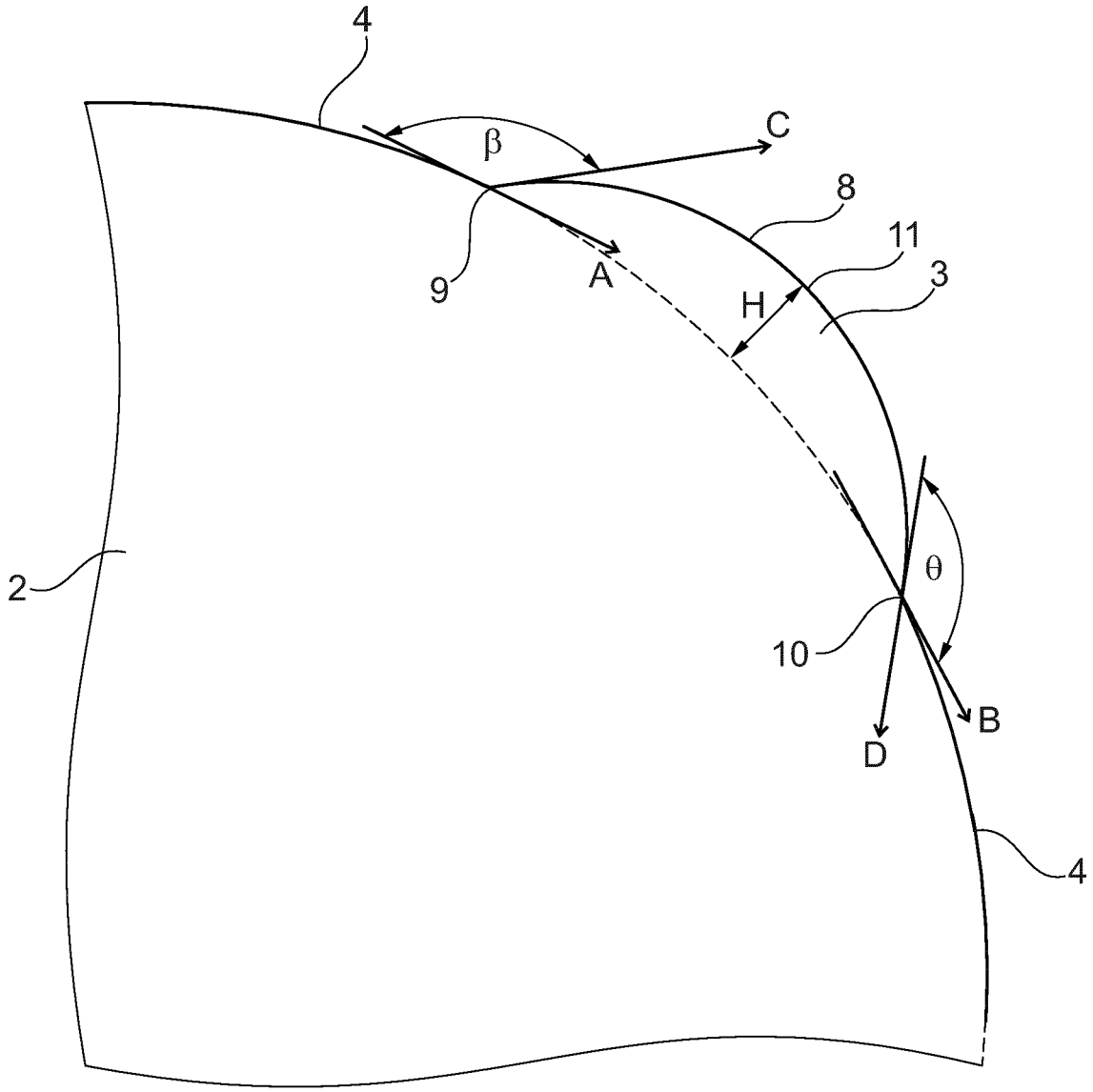

Fig. 4

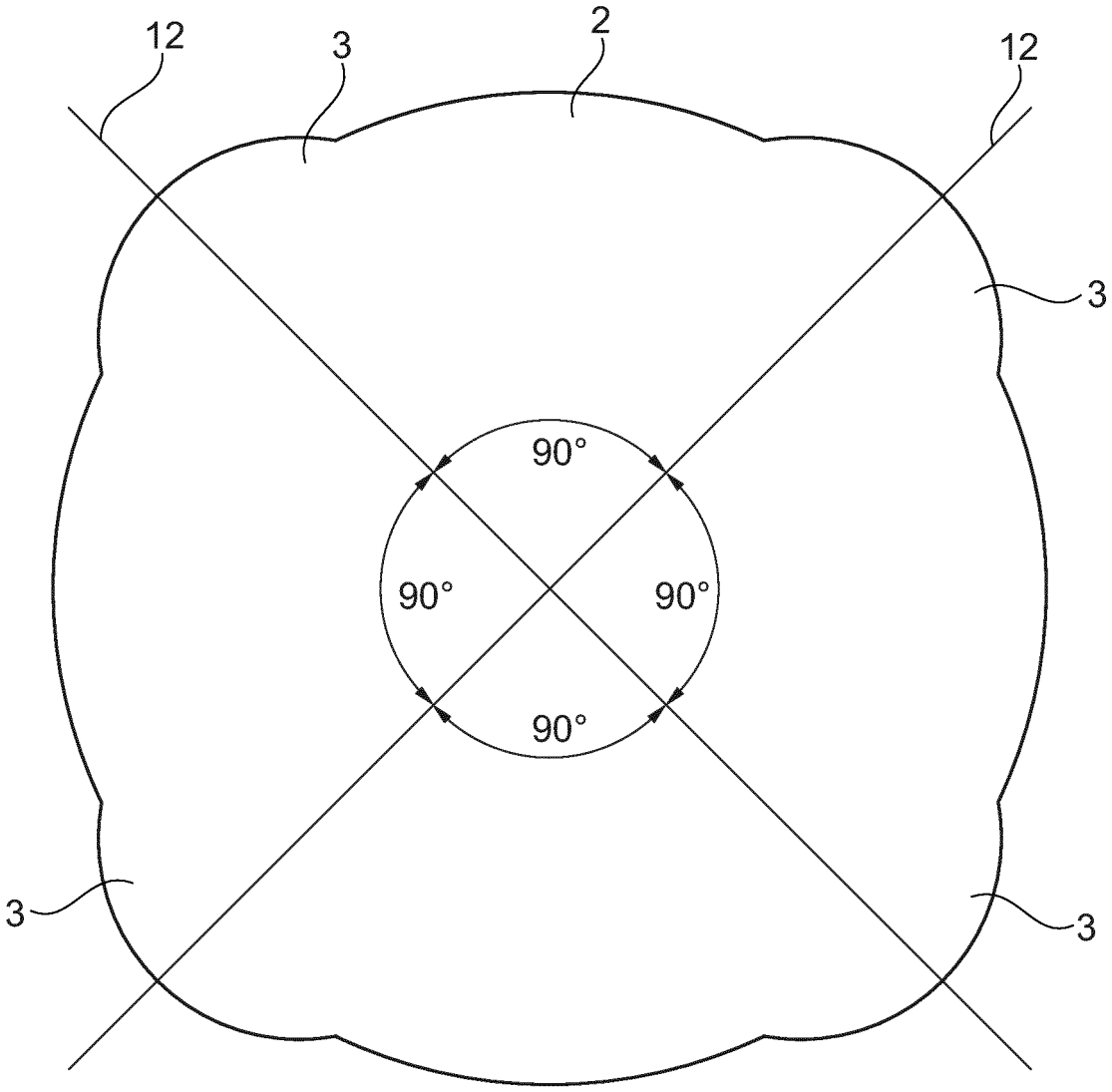

Fig. 5

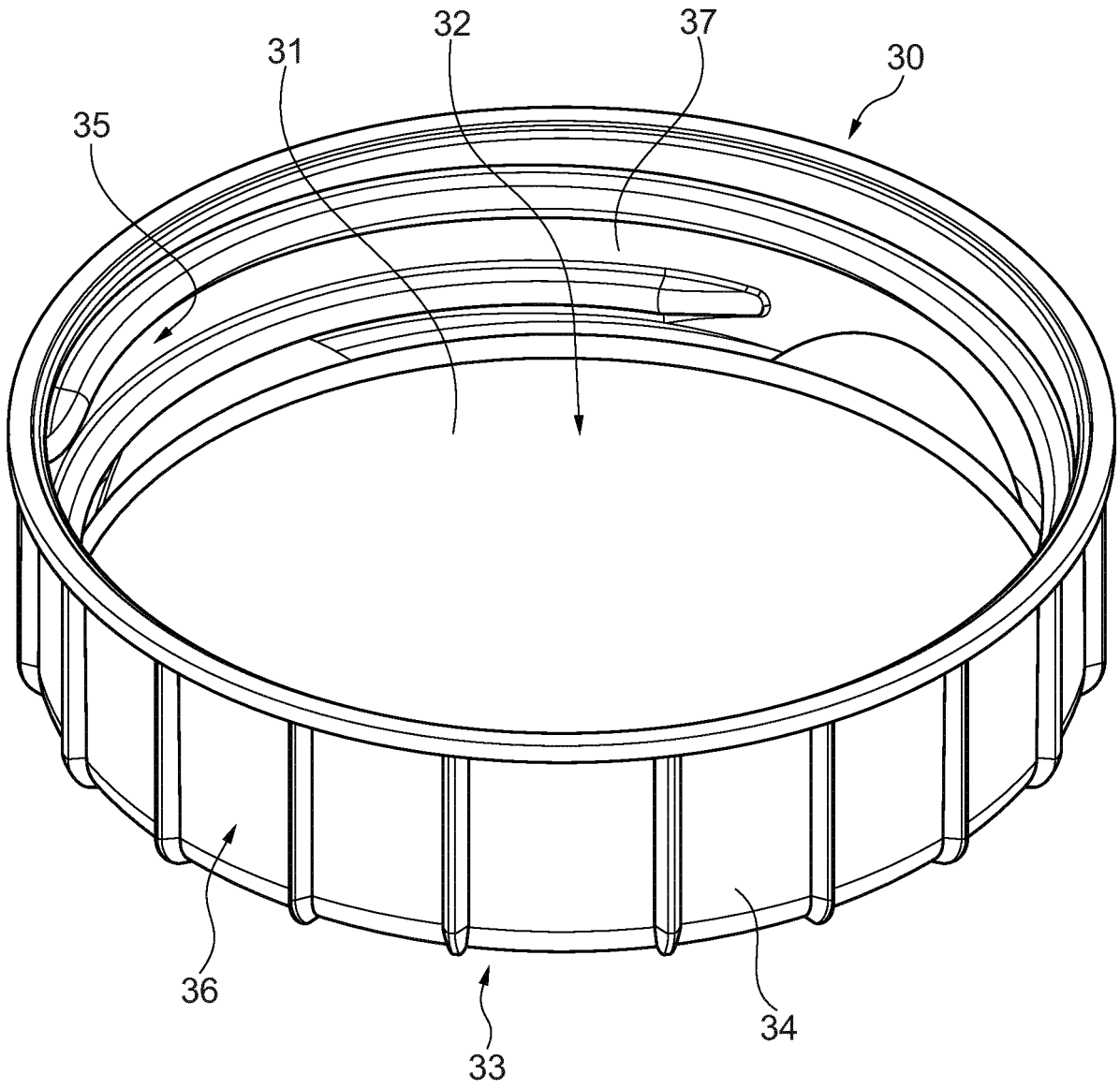

Fig. 6

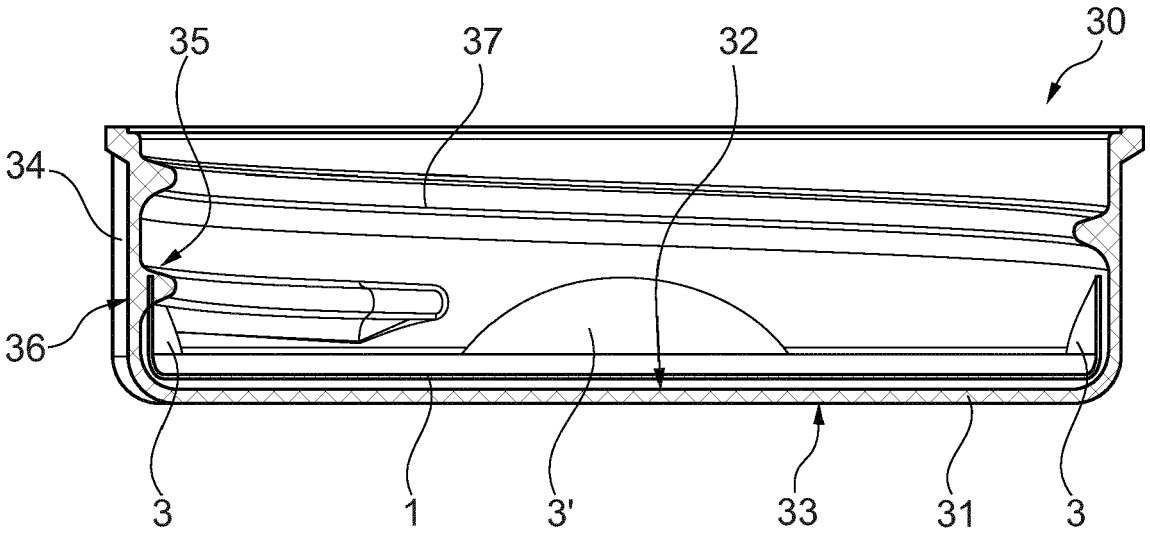

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 21 27 5030

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP H01 144357 U (N.A.) 4 October 1989 (1989-10-04) * page 4 - page 8; figures 1-5 *	1-12	INV. B65D51/20 B65D53/04
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	6 September 2021	Le Bihan, Nicolas

CATEGORY OF CITED DOCUMENTS

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