(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 795 493 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
**24.03.2021 Bulletin 2021/12**

(51) Int Cl.:
***B65D 43/02*** *(2006.01)*

(21) Application number: **19198159.6**

(22) Date of filing: **18.09.2019**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
**BA ME**
Designated Validation States:
**KH MA MD TN**

(71) Applicant: **Groasis IP B.V.**
**4651 PV Steenbergen (NL)**

(72) Inventor: **HOFF, Petrus Mattheus Maria**
**4651 PV STEENBERGEN (NL)**

(74) Representative: **Hoyng Rokh Monegier B.V.**
**Rembrandt Tower, 30st Floor**
**Amstelplein 1**
**1096 HA Amsterdam (NL)**

(54) **LID FOR A CONTAINER**

(57) The invention relates to a lid (1) for covering a container (60), preferably a drinking cup or a food container, said lid (1) comprising an upper surface (2) and a downwardly oriented flange (3) at the periphery (II) of the upper surface (2) in a flat plane (I), wherein the lid (1) is manufactured from cellulose or paper material and wherein the upper surface (2) is provided with radially extending corrugations (4) and wherein the flange (3) is further preferably provided with means (70) to releasably connect the lid (1) to the container (60). The invention also relates to a process for the manufacture of the lid (1) using a pulp molding process and to an assembly of a paper container and a paper lid, which are integrally recyclable.

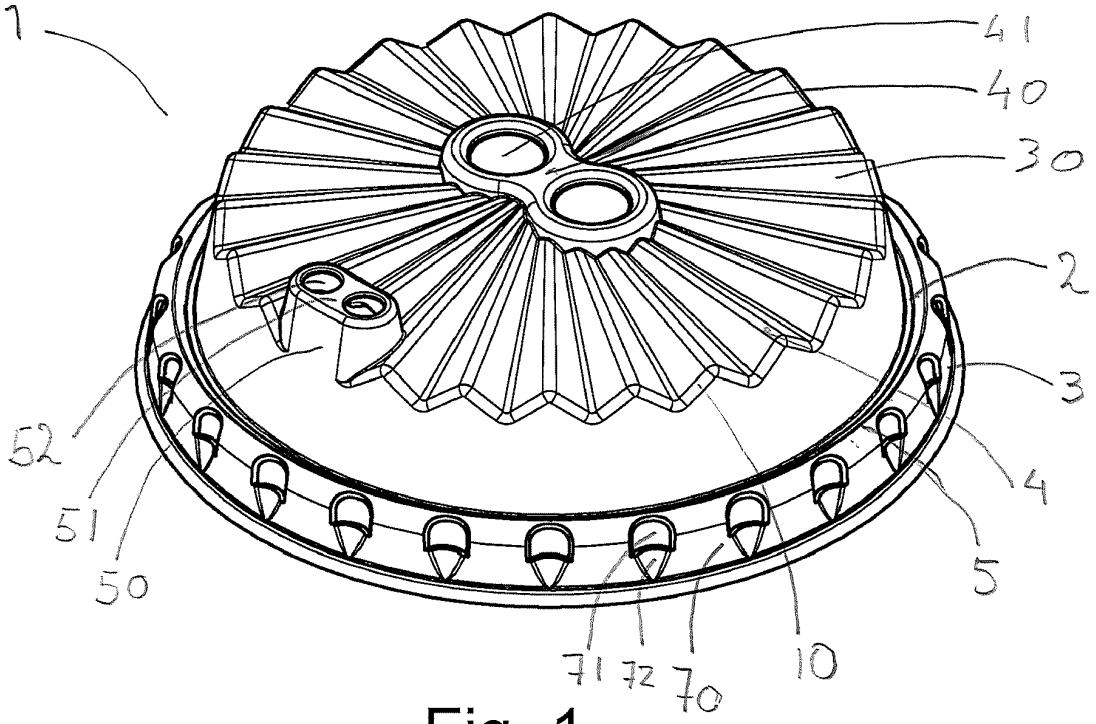


Fig. 1

EP 3 795 493 A1

## Description

**[0001]** The invention relates to a lid for a container, typically a drinking cup or a food container, said lid comprising an upper surface and a downwardly oriented flange at the peripheral edge of the upper surface, said peripheral edge being in a flat plane for engaging a top edge of the container.

## Background of the invention

**[0002]** Containers are commonly used to package foods, both solid and liquid, especially for carryout and endpoint serving, such as coffee cups or fast food cups. Such containers are often made from plastic, but in view of recyclability and use of renewable resources, the containers are preferably manufactured from cellulose or paper material, typically sheet paper, treated or saturated with wax or a combination of wax and plastic, or from sheet paper laminated to thin plastic which serves as the interior of the container. Alternately, the containers may be post-treated with a coating, or a saturated coating, of wax or of a combination of wax and plastic.

**[0003]** The lid for such a container, should be easy to apply to or remove from the container, but on the other hand should provide a sufficiently strong connection with the container, have sufficient water resistance, mechanical strength and should come at a low price, in particular because the container and lid are disposables. Also, the lids should be shaped such that they stack and nest easily and compactly. These objectives are difficult to achieve and therefore, as opposed to the containers themselves, the lids are mostly made from plastic in a relatively simple thermo pressing process. However, plastic lids are becoming increasingly undesirable because of the plastic pollution of the environment. Separating plastic lids and paper containers is laborious and therefore recycling is not sufficiently done.

**[0004]** Therefore, in view of the desire to use renewable and recyclable materials it is desired to provide paper-based containers with lids that are also biodegradable, renewable and recyclable, preferably paper-based. Paper based lids are known in the art, but presently are not often used, apparently because it is difficult to achieve the desired properties in a paper-based lid in an easy and inexpensive process.

**[0005]** US2014048552 describes paper lids made with a paper pulp process that has as substantially flat upper surface provided with an elevated ring with a drinking opening and a flange with buckling projections to clamp with the rim of the cup. The process comprises use of a blank forming mould with filtering screen to form a blank paper pulp lid by vacuum adsorption moulding, subsequent transferring to a transfer mould, bake the blank to contract and increase the strength and then apply high pressure to achieve high density and strength of the lid. A problem is to remove the blank paper pulp lid from the mould because buckling projections in the flange require deformation of the material, which can result in failure (tearing or irreversible deformation of the blank lid). The process is complicated and expensive.

**[0006]** EP3133028 describes a manufacturing method for a lid in which plant-fiber is used for material, involving pulp-shaping and heat-pressure and further processing to mold a ring of outer covering edge that protrudes from inside to the outside on the periphery of the semi-finished product. It is difficult to cover the filtering screen mould evenly when the shape of the mould has angles bending outward from the axial direction (seen from the bottom view) as is for example in case of protrusions to clamp the lid to the rim of the cup. The recess for engaging the rim of the cup will be irregularly shaped causing leakage. In EP3133028 a separate shaping step is used to shape the protrusions in the flange of the lid that clamp to the rim of the cup. This process is also complicated and expensive.

**[0007]** Higher strength and reduced risk of failure could be obtained by higher wall thickness of the lid, but that is not only more expensive, it also leads to slower drying, lower production capacity, higher price and a less attractive product. The objective of the invention therefore is to provide a lid that that can be manufactured with relatively easy manufacturing processes at relatively low wall thicknesses and attractive appearance.

## Brief description of the invention

**[0008]** According to the invention there is provided a lid for covering a container, preferably a drinking cup or a food container, said lid comprising an upper surface and a downwardly oriented flange at the peripheral edge of the upper surface, said peripheral edge being in a flat plane for engaging the top edge of the container, wherein the lid is manufactured from cellulose or paper material and wherein the upper surface is provided with radially extending corrugations.

**[0009]** It was found that the radial corrugations provide a significant improvement of the strength of the lid. As a result, it is possible to achieve good results at relatively low wall thickness of the lid also in simple shaping processes. Paper lids are currently being made with a thickness of 0.7 mm. It was found possible according to the invention to make lids with a thickness between 0.25 and 0.5 mm. Preferably, the wall thickness of the lid is between 0.1 and 0.7 mm, preferably between 0.15 and 0.6 mm, more preferably between 0.25 and 0.5 mm.

**[0010]** Although an accordion shaped surface is larger than a flat surface in terms of surface area, the possibility of using a thinner wall means that the paper gain is cheaper to produce: less paper is required, fewer additives are required, production processes can be faster and less drying time is needed.

**[0011]** A further advantage of the paper-based lid of the invention is that it can easily be printed with text or images and the base paper material can be colored. This is not possible and not done for plastic lids. This possi-

bility provides great versatility not only for providing information but also for customizing the lid for each different customer or user of the lid and provide colors, text, trademarks or logos of the customer on the lid. In certain preferred embodiments of the lid of the invention the shape is chosen in view of this printing possibility.

## Detailed description of the invention

**[0012]** The lid preferably is a cover for a drinking cup comprising one or more drinking openings and preferably an opening for to let air in when liquid is drunk from the container. Typically, the container and the lid have circular shape. The lid can also be a cover for a food container, so an oval or substantially square or rectangular shape with rounded corners is also conceivable.

**[0013]** The container comprises an upwardly extending sidewall comprising outwardly extending protrusions. Preferably, the protrusion on the container is a rolled-lip or a tongue protrusion along the circumference at the upper edge of the upward extending exterior side wall. Typically, the side walls taper out upward such that the containers are nestable in a stack. The top edge of the upward extending wall of the container is in a flat plane and therefore the peripheral edge of the upper surface of the lid is also in a flat plane for closely and completely engaging the top edge of the container wall in a liquid-proof manner. This flat plane of the lid defines the horizontal plane and horizontal direction of the lid and the axial upward direction is defined as the direction from the open side of the lid towards the closed side of the lid.

**[0014]** The radially extending corrugations preferably have a waved or zigzag cross-sectional shape, more preferably a zig-zag shape (also referred to as accordion shape) which preferably extend over the entire circumference of the lid and preferably cover the majority of the surface area of the lid. Preferably at least 60, 70 or even 90 % of the surface area as seen from top view is covered by the radially extending corrugations. Preferably the number of corrugations over the circumference of the lid is at least 8, preferably at least 12, more preferably at least 16 or even at least 20. The height of the corrugations preferably is between 1 and 10 mm, preferably between 2 and 8 mm for a normal size cup with diameter between 40 and 150 mm.

**[0015]** Preferably, the upper surface comprises a part at the peripheral edge of the upper surface for engaging the top edge of the container, preferably this part is in an inverted U-shaped profile, because this provides a better and stronger grip and connection between the lid and the top edge of the container. The U-shaped profile can be shaped to make a close and strong fit with the protrusion on the container, so can be rounded in case of a round rolled lip protrusion.

**[0016]** Preferably, the surface part comprising the radially extending corrugations is elevated from the flat plane of the lid by an upward extending wall part, wherein the elevated preferably has a height (hp) in axial direction from the flat plane between 0.2 and 15 mm. The upward extending wall part is set at a small radial distance from the peripheral edge. An advantage the upward extending wall part is to avoid spillage.

**[0017]** Preferably, the radially extending corrugations extend to the edge of the upward extending wall part forming in the upward extending wall part the cross-sectional shape of the radially extending corrugations, preferably waved or zigzag. This provides additional strength to the lid. The height of the elevated wall part is at least the height of the corrugations when the corrugations end at the upward extending wall part to form the corrugated pattern in the extending wall part. Preferably the height of the upward extending wall part is at least 2mm higher than the height of the corrugations to provide an area for printing text or images.

**[0018]** In the embodiment having the elevated radially corrugated area, the radially extending corrugations preferably slope down radially outward, preferably at an angle ($\alpha$) between 1 and 20 degrees, preferably between 2 and 15 degrees with the flat plane of the lid. Furthermore, it is also preferred that the upward extending wall part is at an angle ($\gamma$) between 1 and 20 degrees, preferably between 5 and 15 degrees with the vertical direction of the lid in view of easy release from the pulp shaping mould.

**[0019]** In one embodiment, the upper surface in the center comprises a substantially horizontal surface from which the corrugations run radially outward. In this surface it is preferred to provide one or more openings in the lid for air-inlet or for a drinking straw. Preferably, a double opening is provided, preferably in a dumbbell shaped substantially horizontal surface area. This provides further strength to the lid.

**[0020]** For a drinking cup, the lid comprises an opening for drinking. Thus, the lid preferably comprises at the perimeter of the upper surface near the flange, preferably positioned in the radially corrugated part of the upper surface, an upwardly extending protuberance as a drinking mouthpiece having a top surface provided with one or more openings for drinking. It is preferred to have more than one smaller opening than one big opening because one big opening makes the paper-based lid weaker. A tangentially elongated upward extending protuberance comprising two or more openings is preferred. Preferably, the upwardly extending protuberance has a height between 5 and 20 mm, and a height (hm1) from the plat plane substantially equal or higher than the height (ht) of the top of the lid. The advantage of this is that the chance of spilling liquid through the drinking openings is lower. In view of stacking the height is preferably equal.

**[0021]** In a particularly preferred embodiment, the lid comprises a flange that is provided with connection means to releasably connect the lid to the container. An advantage of such connection means is that a stronger connection with the container is achieved and/or that the required strength and wall thickness can be lower.

**[0022]** Such connection means are known in the art as

described above, for example inward bend protuberances on the flange for engaging below the protruding rim of the container.

**[0023]** In an embodiment the lid covers a container, the container comprising an upwardly extending wall and the lid comprises a downwardly oriented flange at the peripheral edge of the upper surface of the lid, for receiving the top edge of the wall of the container, the downwardly oriented flange and the upwardly extending wall comprising corresponding protrusions and openings for receiving the protrusions. The protrusions may be on the flange and the openings on the container, or vice versa, or the different protrusions may be provided on the flange and the container respectively and corresponding openings vice versa on the container and the flange.

**[0024]** When the protrusions extend to the openings they secure the upper surface to the container. The openings may contain detents for detaining the protrusions in the openings, e.g. an edge of the lower side of an opening on the flange may extend below a protrusion on the container, or an edge of the lower side of an opening on the container may extend above a protrusion on the flange Similarly, the protrusions may form detents for detaining the protrusions in the openings

**[0025]** In a preferred embodiment, the flange comprises a plurality of openings to receive a protrusion at the top edge of the container or a plurality of detents to releasably hold the protrusion or combinations thereof.

**[0026]** The openings and detents are evenly distributed, preferably equidistantly spaced, around the perimeter of the lid to provide for a close and strong connection. Typically, at least 8, preferably at least 12, 16 or 24 openings or detents are provided for a strong and uniform connection that can be made without substantial deformation of the lid and low risk of leaking.

**[0027]** In a further preferred embodiment, even better connection is achieved when the detents are provided below the openings. These are preferably formed by an inwardly staggered part of the flange forming a supporting element for detaining a protrusion of the container in the opening.

**[0028]** Most preferably, the lid comprises an inverted U-profile at the peripheral edge of the upper surface for receiving a protrusion at the top edge of the container, said inverted U-profile comprising an upper part and an inner downward part and the flange as the outer downward part of the inverted U-profile.

**[0029]** In this embodiment it is preferred that wherein said openings comprise a lower edge and an upper edge and detents are provided at the lower edge of the openings in the flange, wherein preferably the upper edge of the openings extends into the upper part of the inverted U-profile and the lower edge of the detent does not extend in a horizontal direction beyond the upper edge of the openings, thus leaving a clearing distance (D) greater than zero. In this way, it is possible to have a detent in the flange which does not cause a problem when releasing the shaped lid from the mould.

**[0030]** In view of mould release, but also in view of nesting it is preferred that the flange has a flange angle ($\beta$) of at least about 5, 7, 10, 12 or even 15 degrees to a vertical reference line perpendicular to the flat plane of the lid. The connection means provide good connection and allow a wider angle of the vertical wall part than one would allow without such connection means, which makes that the lids can be more easily nested in a large stack and after transport can be more easily removed.

**[0031]** According to the invention, the lid is manufactured from paper or cellulose material and therefore is biodegradable, recyclable and from a renewable resource. Preferably, the lid is made from paper pulp in a paper pulp shaping process. Preferably the paper pulp comprises an additive for providing water resistance, preferably a wax or water dispersible polymer material, preferably recyclable and safe as food additive. The type and amount are chosen in view of the envisaged end-use requirements. Typical amounts are between 0.01 and 10 wt.% relative to the dry weight of the lid. As described above water resistance of the lid can also be achieved by coating, such as dip or spray coating with the additive. Such water resistance additives avoid a possible undesired need for high wall thickness. The paper material can optionally further comprise pigments, dyes or other additives. The lid may comprise printed text or images, preferably on the upward wall part, for example for customizing, advertising or user information.

**[0032]** The invention also relates to an assembly comprising a container comprising an upwardly extending exterior sidewall comprising outwardly extending protrusions at an upper edge of the sidewall and a lid according to the invention as described above wherein preferably the protrusion on the container is a rolled-lip or a tongue protrusion along the circumference of the upper edge.

**[0033]** The invention also relates to a process for the manufacture of the lid according to the invention, using a pulp molding process, preferably a paper pump molding thermo-forming process. Such pulp molding process are known in the art.

## Detailed description of certain embodiments of the invention

**[0034]** By way of example only, embodiments of the present invention will now be described with reference to the accompanying figures in which

Fig. 1 shows a schematic perspective view of a lid according to the invention;

Fig. 2 shows a schematic top view of a lid according to the invention;

Fig. 3a shows a schematic side view of a lid according to the invention and Fig 3b shows the same side view rotated 45 degrees to show the mouthpiece for drinking;

Fig. 4 shows a schematic perspective cross sectional view of an assembled container and a lid according

to the invention;

Fig. 5 shows a schematic perspective view of the flange of the lid with openings and detents under the opening connections means;

Fig. 6a shows a schematic cross-sectional view of the lid of Fig. 1,

Fig. 6b shows schematic the clamping connection between the openings and detents in the flange of the lid and the rolled-lip protrusion of the container.

Fig. 6c shows the same schematic cross-sectional of Fig 6b, defining a space D between the edge of the detent and the upper edge of the opening.

**[0035]** It is noted that the figures show merely preferred embodiments according to the invention. In the figures, the same reference numbers refer to equal or corresponding parts.

**[0036]** Figure 1 shows a lid (1) for covering a container (60: see Fig. 4 and 6), said lid comprising an upper surface (2) and a downwardly oriented flange (3) at the peripheral edge (II) of the upper surface, said peripheral edge (II) being in a flat plane (I) for engaging the top edge (61) of the container (60), wherein the upper surface is provided with radially extending corrugations (4) (see Fig 2 for indication of peripheral edge (II) of the upper surface and the flat plane (I) of the lid). The radially extending corrugations (4) have a zigzag cross-sectional shape (10) extending over the entire circumference of the lid creating a corrugated surface (30).

**[0037]** The surface part (30) comprising the radially extending corrugations is elevated from the flat plane (I) of the lid by an upward extending wall part (20), wherein the radially extending corrugations extend to the edge of the upward extending wall part (20) forming in the upward extending wall part the cross-sectional zig-zag shape (10) of the radially extending corrugations (4).

**[0038]** The lid comprises in the upper surface (2) a part (5) at the peripheral edge (II) of the upper surface for engaging the top edge (61) of the container (60) in the form of an inverted U shaped profile.

**[0039]** The flange is provided with connection means (70) to releasably connect the lid to the container in the form of a plurality of openings (71) to receive a protrusion (63) at the top edge (61) of the container (60) and a plurality of detents (72) to releasably hold the protrusion (63). Figure 5 and 6 more clearly describe the openings and detents.

**[0040]** The lid comprises at the perimeter of the upper surface near the flange an upwardly extending tangentially elongated upward extending protuberance with a top surface (51) comprising two or more openings (52). The lid comprises in the center of the upper surface a dumbbell shaped substantially horizontal surface (40) for providing two openings (41) in the lid for straws or air inlet.

**[0041]** Figure 2 provides a top view showing that indeed the majority of the surface area of the lid is covered with the radially extending corrugations.

**[0042]** Figure 3a and 3b provide side views showing the flat plane I, the edge II of the upper surface, the height ht of the lid, the height hm1 of the mouthpiece and the height hm2 of the mouthpiece relative to the flat plan I. The upwardly extending protuberance has a height (hm2) from the flat plane (I) equal to the height (hm2) of the top of the lid. The upward extending wall (20) has a height (hp) in axial direction from the flat plane. Figure 3a shows the radially extending corrugations (4) slope down at an angle ($\alpha$) with the flat plane (I), the flange has a flange angle ($\beta$) to a line perpendicular to the flat plane (I) of the lid and the upward extending wall is at an angle ($\alpha$) has a flange angle ($\gamma$) to a line perpendicular to the flat plane (I) of the lid.

**[0043]** Figure 4 provides a cross sectional view of an assembly of a container (60) comprising an upwardly extending sidewall (62) comprising outwardly extending protrusions (63) at a top edge of the sidewall and a lid according to the invention, wherein the protrusion is a rolled-lip protrusion along the circumference of the upper edge.

**[0044]** Figure 5 provides a side view of the flange comprising connection means (70) with openings and detents under the opening connections means as illustrated in more detail in the following Figures.

**[0045]** Fig. 6a shows a schematic cross-sectional detailed view of the lid (1) of Fig. 1 and Fig. 6b shows schematic the clamping connection between the lid and the container. Fig.6a shows the wall thickness (T) of the lid. The lid comprises and inverted U-profile (5) comprising an upper part (6) and an inner downward part (7) and the flange (3) as the outer downward part of the inverted U-profile. The rolled lip protrusion (63) on the container is contained in the inverted U-profile (5) and extends into the openings (71). Detents (72) are provided below the openings (71) and are formed by an inwardly staggered part of the flange at the lower substantially straight edge of the opening to form a supporting detent to fit below and hold the protrusion (63). The openings (71) comprise a lower edge (73) and an upper edge (74) and detents (72) are provided at the lower edge (73) of the openings (71) in the flange, such that the upper edge (74) of the openings extends into the upper part (6) of the inverted U-profile and the lower edge (73) of the detent does not extend in a horizontal direction beyond the upper edge (74) of the openings (71), leaving a clearing distance (D) greater than zero. Fig. 6c shows the same schematic cross-sectional of Fig 6b, defining a space D between the edge of the detent and the upper edge of the opening.

**[0046]** Other such variants will be apparent for the person skilled in the art and are considered to fall within the scope of the invention as defined in the following claims. For the purpose of clarity and a concise description features are described herein as part of the same or separate embodiments. However, it will be appreciated that the scope of the invention may include embodiments having combinations of all or some of the features described.

## Claims

1. A lid (1) for covering a container (60), preferably a drinking cup or a food container, said lid comprising an upper surface (2) and a downwardly oriented flange (3) at the peripheral edge (II) of the upper surface, said peripheral edge (II) being in a flat plane (I) for engaging the top edge (61) of the container (60), wherein the lid is manufactured from cellulose or paper material and wherein the upper surface is provided with radially extending corrugations (4).

2. The lid according to claim 1, wherein the radially extending corrugations (4) have a waved or zigzag cross-sectional shape (10), more preferably a zigzag shape, preferably over the entire circumference of the lid.

3. The lid according to claim 1 or 2, wherein the wall thickness (T) of the lid is between 0.1 and 0.7 mm, preferably between 0.15 and 0.6 mm., more preferably between 0.25 and 0.5 mm.

4. The lid according to anyone of claims 1 - 3, wherein the upper surface (2) comprises a part (5) at the peripheral edge (II) of the upper surface for engaging the top edge (61) of the container (60), preferably an inverted U shaped profile, and a surface part (30) comprising the radially extending corrugations, wherein preferably the surface part (30) comprising the radially extending corrugations is elevated from the flat plane (I) of the lid by an upward extending wall part (20), wherein the radially extending corrugations preferably extend to the edge of the upward extending wall part (20) forming in the upward extending wall part the cross-sectional shape (10) of the radially extending corrugations (4), preferably waved or zigzag, wherein the elevated preferably has a height (hp) in axial direction from the flat plane between 0.2 and 15 mm.

5. The lid according to claim 4, wherein the radially extending corrugations (4) slope down, at an angle ($\alpha$) between 1 and 10 degrees with the flat plane (I).

6. The lid according to anyone of claims 1 - 5, wherein the upper surface in the center comprises a substantially horizontal surface (40) for providing an opening (41) in the lid, preferably a double opening in a dumbbell shaped substantially horizontal surface.

7. The lid according to anyone of claims 1 - 6, comprising at the perimeter of the upper surface near the flange an upwardly extending protuberance (50) with a top surface (51) provided with one or more drinking openings (52), preferably a tangentially elongated upward extending protuberance comprising two or more openings, wherein preferably the upwardly extending protuberance has a height (hm1) between 5 and 20 mm and preferably a height (hm2) from the flat plane (I) about equal to the height (hm2) of the top of the lid.

8. The lid according to anyone of claims 1 - 7, wherein the flange is provided with connection means (70) to releasably connect the lid to the container, preferably comprising a plurality of openings (71) to receive a protrusion (63) at the top edge (61) of the container (60) or comprising a plurality of detents (72) to releasably hold the protrusion (63) or a combinations thereof.

9. The lid according to anyone of claim 8, wherein the detents (72) are provided below the openings (71) and are preferably formed by an inwardly staggered part of the flange forming a supporting element.

10. The lid according to anyone of claims 8 - 9, comprising an inverted U-profile (5) at the peripheral edge (I) of the upper surface for receiving a protrusion (63) at the top edge of the container (60), said inverted U-profile comprising an upper part (6) and an inner downward part (7) and the flange (3) as the outer downward part of the inverted U-profile.

11. The lid according to anyone of claims 10, wherein said openings (71) comprise a lower edge (73) and an upper edge (74) and detents (72) are provided at the lower edge (73) of the openings (71) in the flange, wherein preferably the upper edge (74) of the openings extends into the upper part (6) of the inverted U-profile and the lower edge (73) of the detent does not extend in a horizontal direction beyond the upper edge (74) of the openings (71), leaving a clearing distance (D) greater than zero.

12. The lid according to anyone of claims 1 - 11, wherein the flange has a flange angle ($\beta$) of at least about 5, 7, 10, 12 or even 15 degrees to a line perpendicular to the flat plane (I) of the lid.

13. The lid according to anyone of claims 1 - 12, wherein the lid is manufactured from biodegradable material selected from paper or cellulose material, preferably from paper pulp and preferably comprises an additive for providing water resistance, preferably a wax or water dispersable polymer material, preferably in an amount between 0.1 and 10 wt.% relative to the dry weight of the lid, which material can optionally further comprise pigments, dyes or other additives and the lid may comprise printed text or images, preferably on the flange.

14. An assembly comprising a container (60) comprising an upwardly extending sidewall (62) comprising outwardly extending protrusions (63) at a top edge of

the sidewall and a lid according to anyone of claims 1 - 13, wherein preferably the protrusion on the container is a rolled-lip or a tongue protrusion along the circumference of the upper edge.

**15.** A process for the manufacture of the lid of claims 1 - 13, using a pulp molding process, preferably a paper pump molding thermo-forming process.

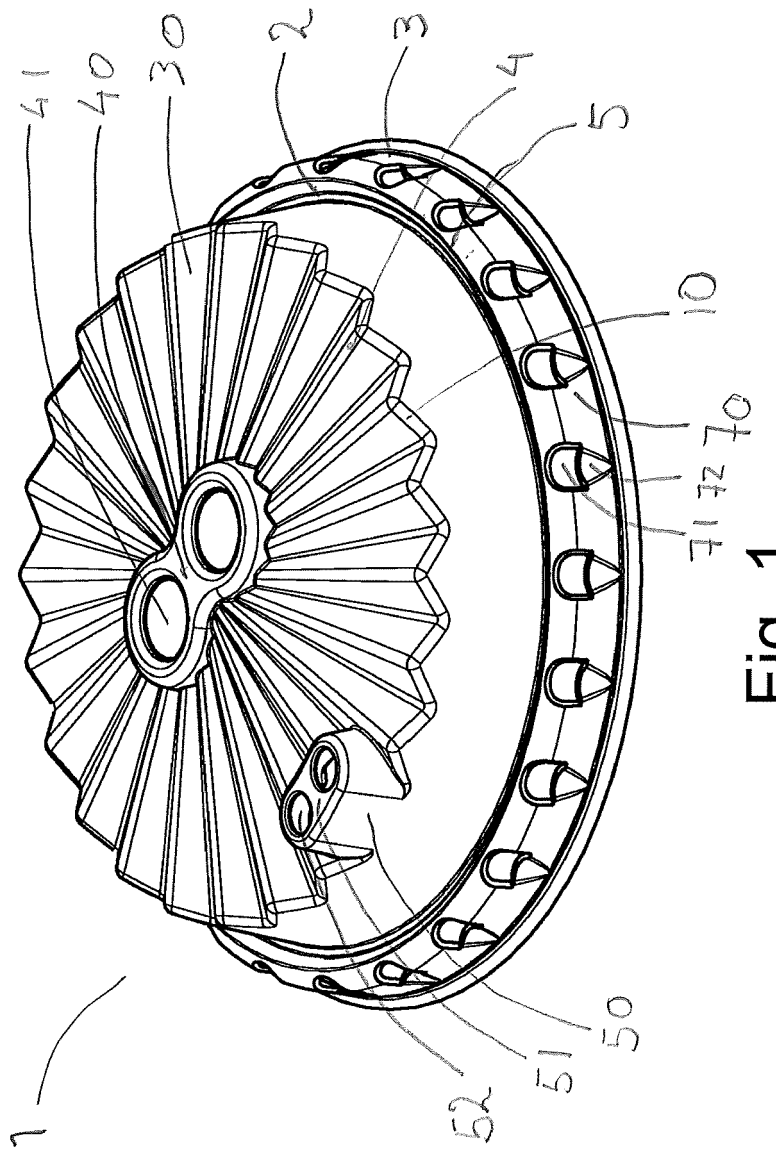


Fig. 1

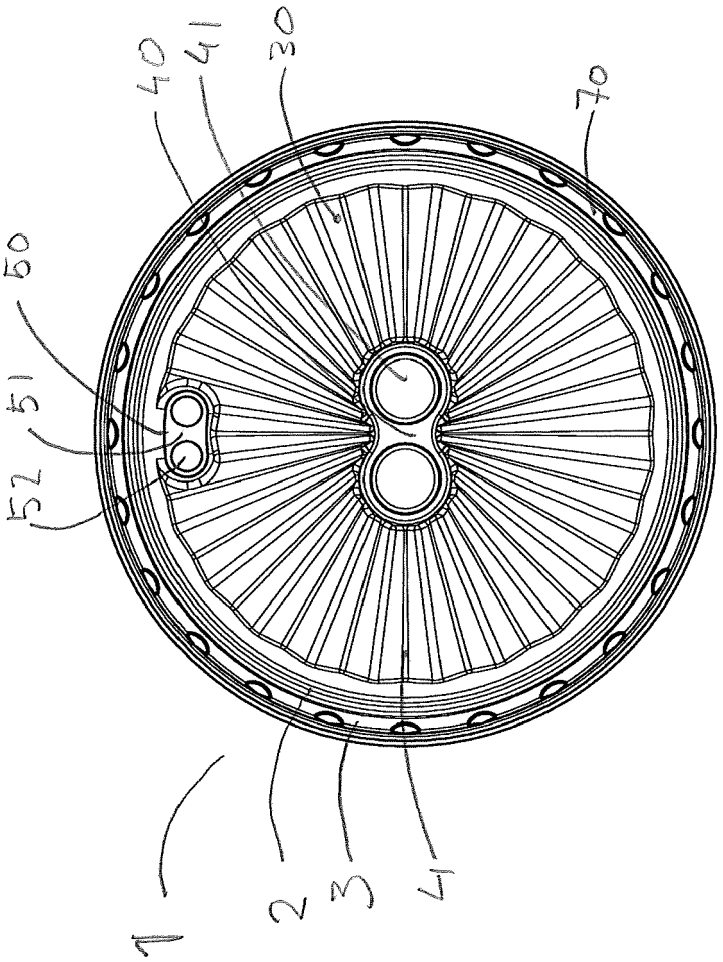


Fig. 2

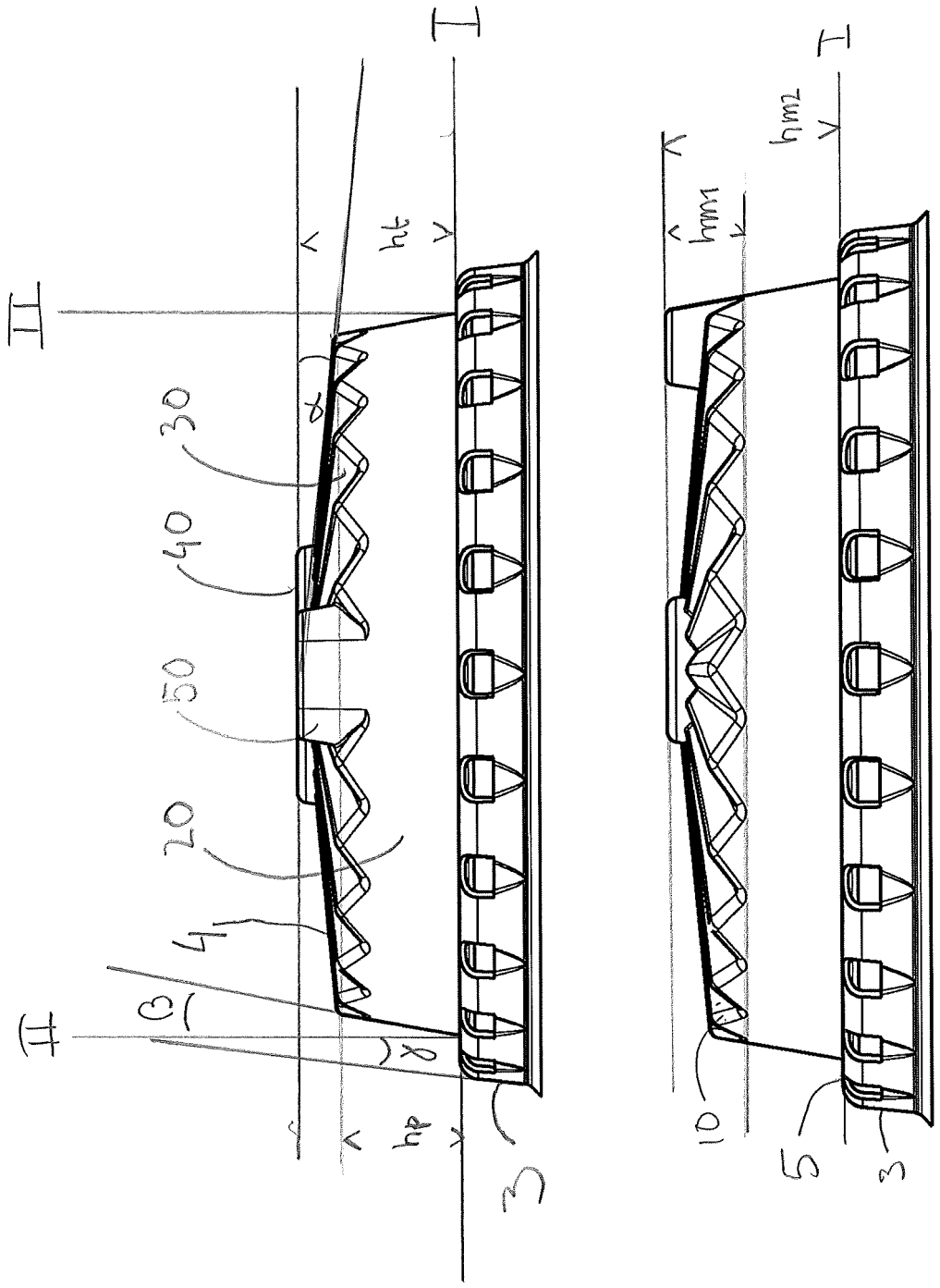


Fig. 3a, 3b

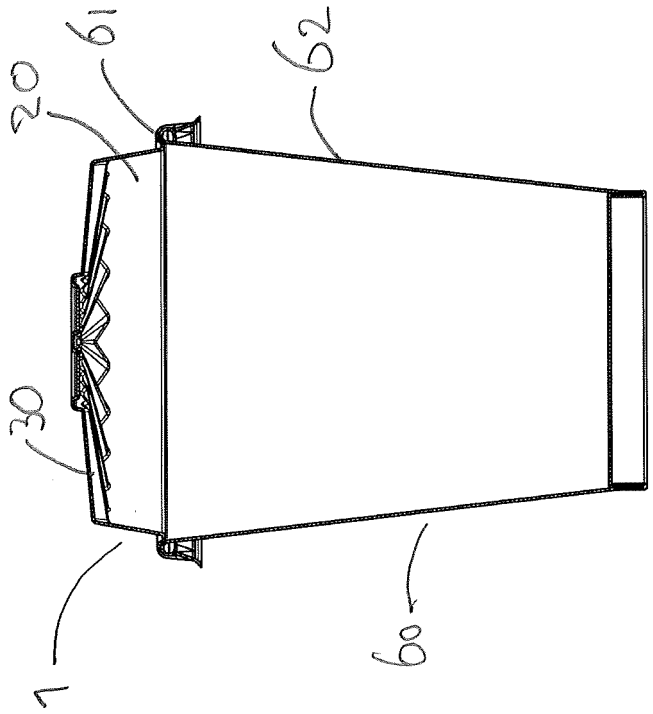


Fig. 4

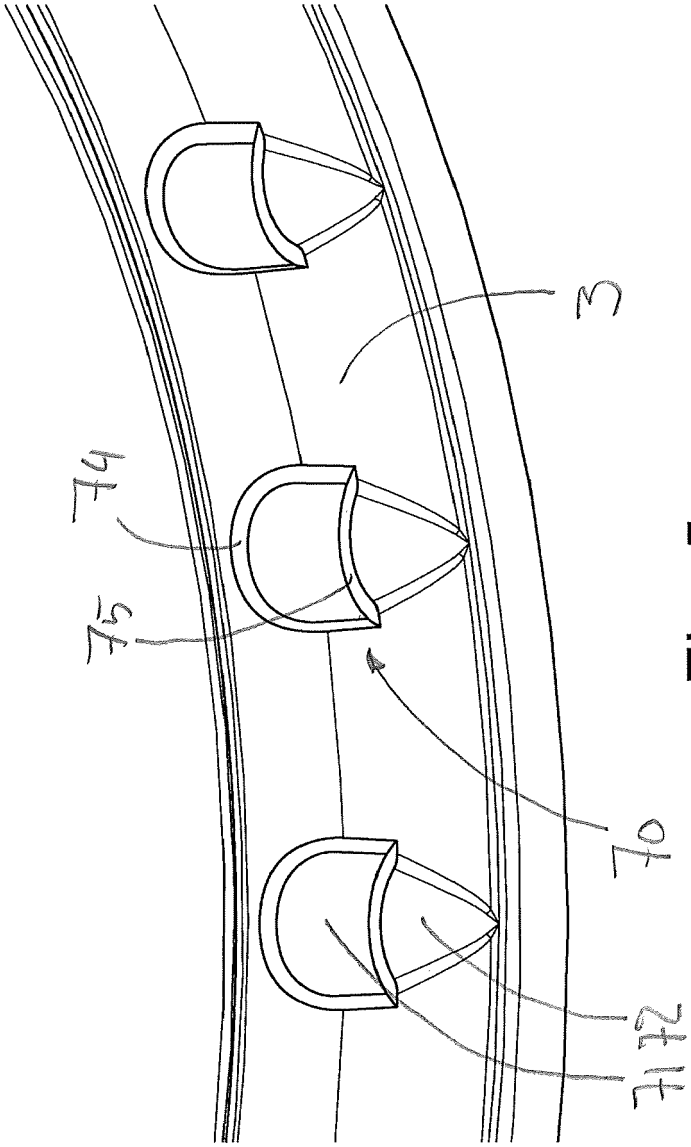


Fig. 5

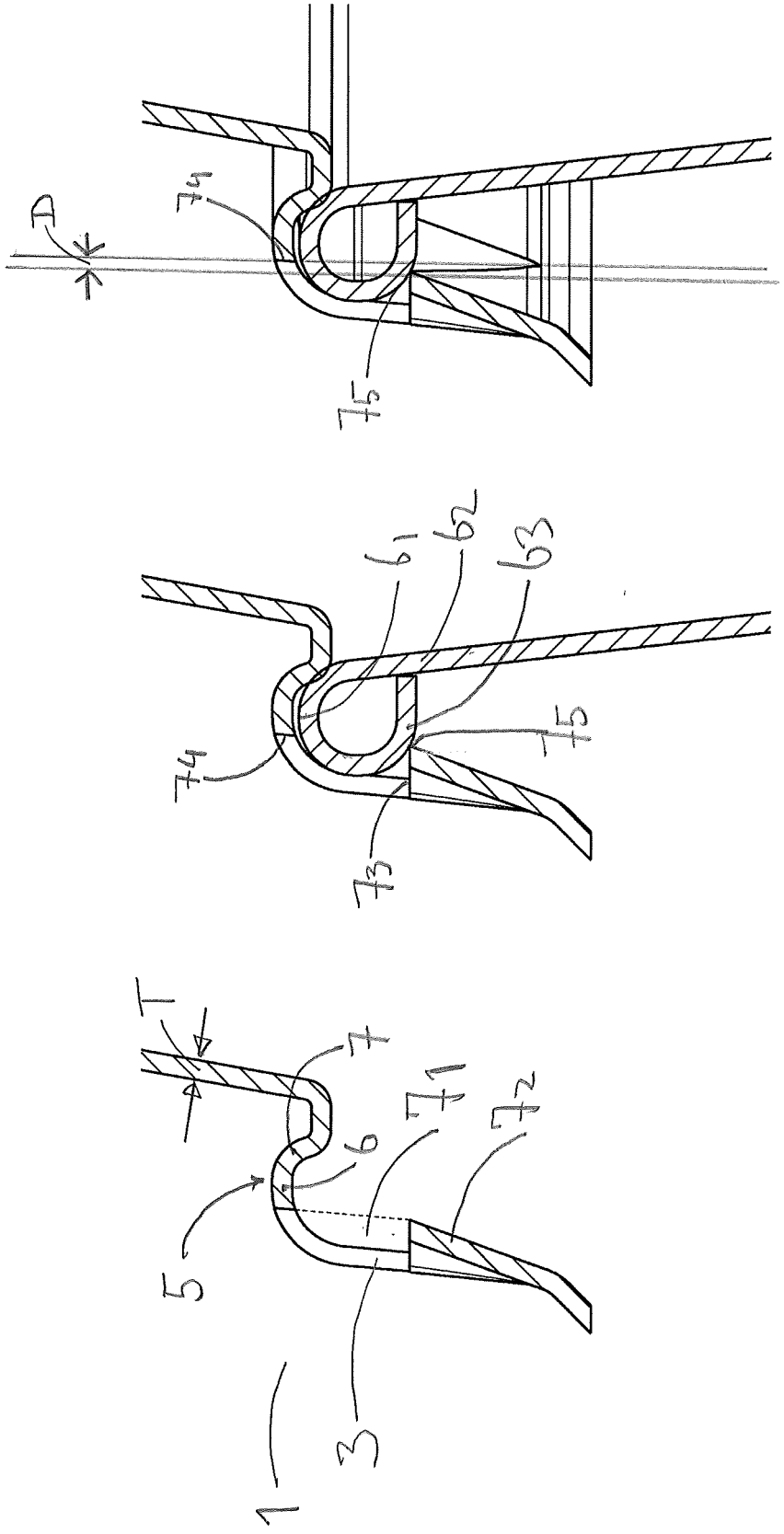


Fig. 6a, 6b, 6c

Europäisches Patentamt
European Patent Office
Office européen des brevets

# EUROPEAN SEARCH REPORT

Application Number
EP 19 19 8159

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| X<br>Y<br>A | US 2 233 489 A (REIFSNYDER JAMES D)<br>4 March 1941 (1941-03-04)<br>* figures 1,2 *<br>* column 2, line 15 - line 17 *<br>----- | 1,3-5,8,<br>10,13-15<br>6,7,12<br>2,9,11 | INV.<br>B65D43/02 |
| Y | US 2005/230406 A1 (MARAVICH MILAN C [US] ET AL) 20 October 2005 (2005-10-20)<br>* figures 1-3 *<br>* paragraph [0026] *<br>----- | 6 | |
| Y<br>A | US 10 336 506 B2 (HOEKSTRA AAD [NL]; SHARMA RAIMANGAT [NO] ET AL.)<br>2 July 2019 (2019-07-02)<br>* column 1, line 20 - line 39 *<br>* figures 1,2 *<br>----- | 7<br>9,11 | |
| Y | BE 867 025 A (HENKEL KGAA)<br>13 November 1978 (1978-11-13)<br>* figure 5 *<br>* page 1, line 1 - line 3 *<br>----- | 12 | |
| A | US 4 117 950 A (ALLEN DAVID O)<br>3 October 1978 (1978-10-03)<br>* figure 5 *<br>* column 1, line 19 - line 25 *<br>* column 1, line 26 - line 30 *<br>* column 2, line 2 - line 6 *<br>* column 6, line 9 - line 18 *<br>----- | 12 | TECHNICAL FIELDS SEARCHED (IPC)<br>B65D |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 27 March 2020 | Le Bihan, Nicolas |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 19 8159

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

27-03-2020

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US 2233489 A | 04-03-1941 | NONE | |
| US 2005230406 A1 | 20-10-2005 | AT 513755 T | 15-07-2011 |
| | | CN 1942370 A | 04-04-2007 |
| | | EP 1755974 A1 | 28-02-2007 |
| | | US 2005230406 A1 | 20-10-2005 |
| | | US 2006113313 A1 | 01-06-2006 |
| | | WO 2005105595 A1 | 10-11-2005 |
| US 10336506 B2 | 02-07-2019 | CA 2807553 A1 | 07-06-2012 |
| | | DE 102010062194 A1 | 31-05-2012 |
| | | DK 2646334 T3 | 31-07-2017 |
| | | EP 2646334 A1 | 09-10-2013 |
| | | ES 2621916 T3 | 05-07-2017 |
| | | PL 2646334 T3 | 29-09-2017 |
| | | PT 2646334 T | 10-07-2017 |
| | | US 2013248481 A1 | 26-09-2013 |
| | | WO 2012072638 A1 | 07-06-2012 |
| BE 867025 A | 13-11-1978 | BE 867025 A | 13-11-1978 |
| | | DE 7715489 U1 | 02-03-1978 |
| | | ES 235996 U | 01-08-1978 |
| | | FR 2390343 A1 | 08-12-1978 |
| | | IT 1095129 B | 10-08-1985 |
| | | NL 7804300 A | 16-11-1978 |
| US 4117950 A | 03-10-1978 | NONE | |

EPO FORM P0459

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

## REFERENCES CITED IN THE DESCRIPTION

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

### Patent documents cited in the description


- US 2014048552 A **[0005]**
- EP 3133028 A **[0006]**