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

(11) **EP 4 234 421 A1**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
30.08.2023 Bulletin 2023/35

(21) Application number: **22159072.2**

(22) Date of filing: **28.02.2022**

(51) International Patent Classification (IPC):
B65D 1/26 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B65D 1/265

(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: **SEDA INTERNATIONAL PACKAGING GROUP SPA**
80022 Arzano Napoli (IT)

(72) Inventor: **D'Amato, Gianfranco**
80022 Arzano Napoli (IT)

(74) Representative: **Grünecker Patent- und Rechtsanwälte**
PartG mbB
Leopoldstraße 4
80802 München (DE)

(54) STACK OF CUPS WITH DISTANCED WALLS

(57) The present invention relates to a stack of cups 1 comprising a first cup 2 and a second cup 3, wherein the first cup 2 and the second cup 3 are identically formed and each comprises a sidewall 4, wherein the first cup 2 is arranged below the second cup 3, wherein the sidewall 4 comprises an upper end 8 and a lower end 9, wherein the sidewall 4 forms an outer surface of the cup 2, 3 and an inner surface 7 of the cup 2, 3, wherein the sidewall 4 comprises an outward protrusion 11, wherein the protrusion of the second cup 3 rests on the inner surface 7 or substantially on the upper end 8 of the first cup, wherein at each longitudinal position below the protrusion 11 of the second cup 3, the inner surface 7 of the first cup 2, is in a distance to the outer surface 6 of the second cup 3. The invention further relates to a cup 2, 3, a method for stacking two or more cups 2, 3 and a use of a stack of cups 1 in a beverage machine.

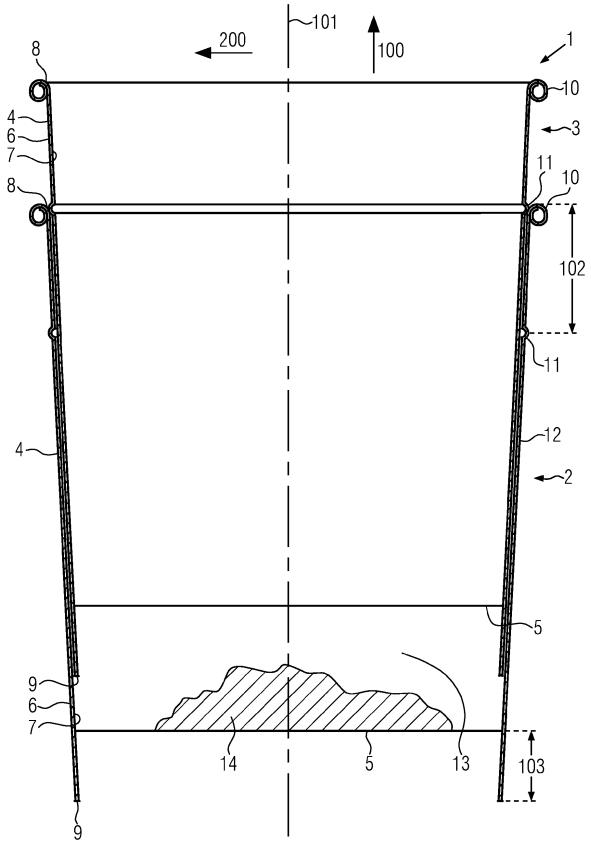

FIG. 1

EP 4 234 421 A1

Description

[0001] The present invention relates to a stack of cups, a cup, a method for stacking cups, and a use of a stack of cups.

[0002] JPS55134046A discloses a paper cup and a method for producing the same. Two cups can be stacked and can interlock with each other via concave portions formed in the sidewalls of the cups.

[0003] JPH0680616U discloses a paper cup for containing beverages. The cup has an uneven pattern formed onto the outer surface of its sidewall.

[0004] JPH0958658A discloses a synthetic resin container made for instant food that can be stacked. When in a stacked arrangement, the container rests with its bottom edge on a step portion of an adjacent container.

[0005] Further cups are known from US2503045A, JPS5767911U, JP2001002049A and JPH10278931A. A steel container with a protrusion is disclosed in US5201437.

[0006] There is a need for improving the stacking behavior of cups, in particular the unstacking of cups. There is also a need for reducing spillage of a food substrate that may be accommodated between two adjacent stacked cups.

[0007] According to a first aspect of the invention, there is provided a stack of cups comprising a first cup and a second cup. The first cup and the second cup may be substantially identically formed. Each of the first cup and the second cup comprises a sidewall. The first cup is arranged below the second cup in a longitudinal direction of the stack. The sidewall comprises an upper end and a lower end. The sidewall forms an outer surface of the cup facing the outside. The sidewall also forms an inner surface of the cup facing the inside. The sidewall comprises an outward protrusion. The outward protrusion is located at a first distance below the upper end of the sidewall. The protrusion of the second cup may rest on the inner surface of the first cup. The protrusion of the second cup may rest substantially on the upper end of the first cup. At each longitudinal position below the protrusion of the second cup, the inner surface of the first cup is in a distance to the outer surface of the second cup.

[0008] In particular, this means that the second cup may be in contact with the first cup only in the region of the protrusion of the second cup. In particular, the first cup and the second cup may not touch each other below the protrusion of the second cup. A gap may be formed between the sidewalls of the first cup and the second cup below the protrusion of the second cup. Such a configuration may allow for an easy unstacking of the cups. In particular, as the first and the second cup may not be in contact below the protrusion of the second cup, there may not be any substantial frictional forces between the first and the second cup, when the second cup is unstacked from the first cup. This configuration may enable that the second cup can be lifted from the first cup without the requirement of holding the first cup. This configuration may enable that the first cup can be easily unstacked from the second cup. The first cup may be pulled downwards away from the stack of cups without pulling the second cup along.

[0009] The sidewall may be inclined with respect to a longitudinal axis of the cup. The sidewall may be inclined with respect to a longitudinal axis of the cup by 1 degrees to 10 degrees, in particular 2 degrees to 5 degrees, in particular 2.5 degrees to 3.5 degrees. When the cup is placed on a substantially horizontal support and the opening of the cup is facing upwards, the longitudinal axis may be substantially vertical. In particular, the cup may have a conical shape. The sidewall may extend radially around the longitudinal axis of the cup. The cup may be rotationally symmetric with respect to the longitudinal axis.

[0010] The sidewall may comprise multiple layers. In such a case, the sidewall may comprise multiple inner surfaces, facing the inside, and multiple outer surfaces, facing the outside. At each longitudinal position below the protrusion of the second cup, the innermost inner surface of the second cup is in a distance to the outermost outer surface of the second cup. For sidewalls that comprise multiple layers, if not stated otherwise, inner surface refers to the innermost inner surface and outer surface refers to the outermost outer surface.

[0011] At each longitudinal position below the protrusion of the second up, the outer diameter of the second cup may be smaller than the smallest inner diameter of the first cup in the range between the longitudinal position and the upper end of the first cup.

[0012] The protrusion of the second cup may engage with the upper end of the first cup. The protrusion may prevent movement of the second cup in a downward direction. The protrusion may not prevent movement of the second cup in an upward direction, in particular opposite to the downward direction. The protrusion may prevent the first cup from interlocking with the second cup. The outward protrusion may prevent the second cup from sliding completely into the first cup, such that at each longitudinal position below the protrusion of the second cup, the inner surface of the second cup is in a distance to the outer surface of the first cup. The outward protrusion may be formed on the outer surface of the sidewall only. The protrusion may be formed through the entire sidewall, forming a groove or indentation on the inner side. This may be advantageous from a manufacturing viewpoint.

[0013] The cups may be cups for food and beverages. The cups may be used to drink out of. The cups may be used to eat out of.

[0014] The cup sidewall may be made of paper or cardboard. The use of paper or cardboard may improve sustainability. The frictional coefficient between two cups of paper may usually be higher than the frictional coefficient between two cups of a polymer material. A configuration where the sidewalls of the first cup and the second cup are not in contact with each other below the protrusion

of the second cup may be particularly relevant for cups made of paper or cardboard.

[0015] The cup may have only one layer. The cup may have multiple layers. The number of layers of the sidewall of the cup may be different from the number of layers of a bottom wall of the cup. The cup may be coated on its inner surface, which may improve the functionality of the cup. The outer surface of the cup may also be coated. The coating may be a plastic coating. The coating may be biodegradable.

[0016] The first and the second cup may each comprise a bottom wall. The bottom wall of the first cup and the bottom wall of the second cup may be arranged in a longitudinal distance to each other to form a space. This space may accommodate a food or beverage substrate, in particular coffee powder. The food or beverage substrate may be in powder or granulate form. Pouring liquid, in particular water, onto the substrate may result in a finished product that may be served to a customer. Possible applications may include but are not limited to coffee, hot chocolate, tea, soft drinks, isotonic drinks, milk shakes, protein shakes, instant soup or instant noodles. The term substrate may be understood as a precursor to beverage or food.

[0017] The distance between the bottom walls of the first cup and the second cup may be achieved by the outward protrusion, which may prevent the second cup from sliding completely into the first cup.

[0018] The ratio of the longitudinal distance between the bottom wall of the first cup and the bottom wall of the second cup to the height of the cup may be between 0.05 and 0.7, in particular between 0.1 and 0.5, in particular between 0.1 and 0.3, in particular in between 0.2 and 0.25. For example, the longitudinal distance between the bottom wall of the first cup and the bottom wall of the second cup may be between 1 millimeter and 50 millimeters, in particular between 15 millimeters and 25 millimeters, in particular between 17 millimeters and 20 millimeters. The values above refer to a configuration where the first cup and the second cup are stacked. The distance between the bottom wall of the first cup and the bottom wall of the second cup may be sufficiently large, such that a desired amount of substrate, in particular coffee powder, can be accommodated between the two adjacent bottom walls. In case the cup is used to make instant noodles, it may be advantageous if at least half of the cup can be filled with noodles.

[0019] The bottom wall may be located at a second distance away from the lower end of the sidewall. Such a configuration may provide a more robust design. In particular, the cup may only rest with the lower end of the sidewall on a substantially horizontal support, which may improve stability, compared to the case when a potentially uneven bottom plate may rest on the substantially horizontal support.

[0020] The second distance may be between 3 millimeters and 15 millimeters, in particular between 3 millimeters and 10 millimeters, in particular between 4 millimeters and 6 millimeters. The second distance may depend on the size of the cup. The ratio of the second distance to the height of the cup may be between 0.03 and 0.25, in particular between 0.04 and 0.15, in particular between 0.05 and 0.1, in particular 0.055.

[0021] The protrusion may extend circumferentially around the cup. Such a configuration may provide additional stability for the cup.

[0022] The protrusion may extend fully around the cup. Such a configuration may reduce spillage of a substrate that is accommodated in between two adjacent cups. The protrusion of the second cup may abut on the upper end or inner surface of the first cup and may thereby form a circumferential seal.

[0023] Two or more protrusions may be formed and circumferentially spaced around the cup. Such a configuration may allow air flow into the space between two adjacent cups in the stack. Additionally, it may improve unstacking of the cups.

[0024] The protrusion may have a convex shape. When the protrusion has a convex shape, the protrusion of the second cup may be in line contact with the upper end or inner surface of the first cup, which may reduce friction between the two cups and may improve unstacking. The protrusion may also have triangular shape or rectangular shape.

[0025] The height of the protrusion, or protrusion height, may be defined as the distance the protrusion protrudes from the outer surface of the sidewall. In particular, the protrusion height may be the radial distance from the outer surface of the sidewall next to the protrusion, in particular right below the protrusion, to the outer surface of the protrusion. The protrusion height may be 0.2 millimeters to 1.5 millimeters, in particular 0.5 millimeters to 1 millimeter. The protrusion height may be in between 0.5 to 3 times the thickness of the sidewall, in particular in between 1 to 2 times the thickness of the sidewall.

[0026] In order to assure that the protrusion of the second cup may rest on the upper end of the first cup, the protrusion height may be chosen depending on the first distance and the inclination of the sidewall.

[0027] The upper end of the sidewall may be curled outwards to form a rim. The rim may extend circumferentially around the cup. The upper end of the sidewall may be curled by at least 360 degrees. A curled portion of the rim may be in contact with the remaining portion of the sidewall. In particular, the outer surface of the sidewall may be in contact with the inner surface of the curled sidewall.

[0028] The rim width may be defined as the radial extension of the rim. The rim width may be 2 millimeters to 5 millimeters, in particular 3 millimeters to 4 millimeters. The rim width may depend on the size of the cup. The ratio of the rim width to the diameter of the cup at the top may be 0.01 to 0.1, in particular 0.03 to 0.05, in particular 0.045.

[0029] Alternatively to a curled rim, the upper end of

the sidewall may be bend outwards to form a rim. The rim may also have a rectangular shape.

[0030] The rim may improve stability of the cup. The rim may be facilitate drinking from the cup. The rim of the first cup may provide support for the protrusion of the second cup. The protrusion of the second cup may rest on the rim of the first cup. The rim may facilitate unstacking of the cups. Two arms, in particular robotic arms in a coffee vendor machine, may move under the rim of the second cup on two opposite sides of the second cup and lift the second cup up to unstack the second cup from the first cup.

[0031] A gap may be formed between the sidewall of the second cup below the protrusion and the sidewall of the first cup. The gap may be a result of the protrusion of the second cup resting on the upper end, in particular the curled rim, or inner surface of the first cup. The gap may facilitate unstacking of the cups. The gap may reduce friction between the sidewalls of the first cup and the second cup.

[0032] The protrusion of the second cup may reduce, preferably prevent, spillage of a food or beverage substrate out of the first cup. The protrusion of the second cup may be in contact with the upper end, in particular the curled rim, or the inner surface of the first cup, thereby sealing the space between the first cup and the second cup. The stack of cups may experience significant movements and displacements, for example during transport, which may result in spillage of a food or beverage substrate, in particular coffee powder, which is placed between the first and the second cup. The protrusion of the second cup may reduce, in particular prevent, such spillage.

[0033] The stack of cups may also comprise three or more cups. A stack of cups comprising multiple cups may be assembled, whereas a food or beverage substrate may be placed in between the bottom walls of two adjacent cups, and transported to a vending machine. The vending machine may add liquid, in particular water, to the substrate in the cup at the top of the stack and may serve the cup at the top of the stack to a customer. The vending machine may have a simple design because it may not need to provide the substrate, which may reduce manufacturing costs of the machine as well as maintenance, and may improve durability of the machine.

[0034] The cups may have a substantially circular shape. The sidewall may have a substantially cylindrical, in particular also conical, shape. The cups may have a substantially rectangular shape.

[0035] According to a second aspect of the invention, there is provided a cup adapted to form a stack of cups according to the first aspect of the invention.

[0036] According to a third aspect of the invention, there is provided a cup in particular for containing beverages or food. The cup comprises a side wall extending around a longitudinal axis. The sidewall comprises an upper end and a lower end. The sidewall forms an outer surface of the cup and an inner surface of the cup. The sidewall comprises an outward protrusion located at a first distance below the upper end. The protrusion defines a protrusion distance. The protrusion distance is defined as the radial distance between the outer surface of the protrusion and a line connecting the inner surface of the upper end and the inner surface of the lower end, at the longitudinal location of the protrusion. The outer diameter of the cup at the protrusion is larger than the inner diameter of the cup at the upper end. At each longitudinal position below the protrusion, the radial distance between the outer surface of the sidewall and the line connecting the inner surface of the upper end and the inner surface of the lower end is smaller than the protrusion distance. The protrusion distance may be substantially equivalent to the protrusion height plus the thickness of the sidewall.

[0037] The protrusion distance may be 0.5 millimeters to 2 millimeters, in particular 1 millimeter to 1.5 millimeters. The protrusion distance may be in between 1.5 to 4 times the thickness of the sidewall, in particular in between 2 to 3 times the thickness of the sidewall.

[0038] The cup may be made of paper or cardboard. The ratio of the first distance to the height of the cup may be between 0.05 and 0.5, in particular between 0.1 and 0.3, in particular in between 0.2 and 0.25. The first distance may be between 1 millimeter and 50 millimeters, in particular between 15 millimeters and 25 millimeters, in particular between 17 millimeters and 20 millimeters.

[0039] A bottom wall of the cup may be located in a second distance above the lower end of the sidewall. The second distance may be between 3 millimeters and 15 millimeters, in particular between 3 millimeters and 10 millimeters, in particular between 4 millimeters and 6 millimeters. The second distance may depend on the size of the cup. The ratio of the second distance to the height of the cup may be between 0.03 and 0.25, in particular between 0.04 and 0.15, in particular between 0.05 and 0.1, in particular 0.055.

[0040] The protrusion may have a convex shape. The protrusion may extend in a circumferential direction around the cup. The protrusion may extend fully around the cup. Two or more protrusions may be circumferentially spaced around the cup.

[0041] The upper end of the sidewall may be curled outwards to form a rim.

[0042] According to a fourth aspect of the invention, there is provided a method for stacking two or more cups, in particular according to the second or third aspect of the invention. The method comprises the following steps. A beverage or food substrate, in particular coffee powder, is poured into a first cup. A second cup is inserted inside the first cup, such that an outward protrusion of the second cup rests substantially on an upper end or inner surface of the first cup. The space between a bottom wall of the first cup and a bottom wall of the second cup may accommodate the beverage or food substrate.

[0043] The outward protrusion may prevent the second cup from sliding into the first cup. The outward protrusion

may help forming a space between the bottom wall of the first cup and the bottom wall of the second cup. A gap may be provided between the sidewall of the first cup and the sidewall of the second cup below the protrusion. The outward protrusion may form the gap. The gap may reduce friction between the first cup and the second cup and may facilitate unstacking of the cups.

[0044] According to a fifth aspect of the invention, there is provided a use of a stack of cups, in particular to the first aspect of the invention, in a beverage machine, in particular a coffee vending machine. An outward protrusion formed on a sidewall of each cup rests substantially on an upper end or inner surface of the cup below. The stack of cups is used to store a beverage substrate, in particular coffee powder, inside spaces between two adjacent cups, in particular between two bottom walls of adjacent cups, and in a cup at the top of the stack. The cup at the bottom of the stack is unstacked from the stack of cups. Liquid, in particular hot water, is poured into the unstacked cup, and the unstacked cup is served to a customer. The cups forming the stack of cups may be made of paper or cardboard.

[0045] Possible applications may include but are not limited to coffee, hot chocolate, tea, soft drinks, isotonic drinks, milk shakes, protein shakes, instant soup or instant noodles.

[0046] According to a sixth aspect of the invention, there is provided a use of a stack of cups, in particular to the first aspect of the invention, in a beverage machine, in particular a coffee vending machine. An outward protrusion formed on a sidewall of each cup rests substantially on an upper end or inner surface of the cup below. The stack of cups is used to store a beverage substrate, in particular coffee powder, inside spaces between two adjacent cups, in particular between two bottom walls of adjacent cups, and in a cup at the top of the stack. Liquid, in particular hot water, is poured into the cup at the top of the stack, and the cup at the top of the stack is served to a customer. The vending machine may hold the cup at the bottom of the stack at a curled rim formed at the upper end of the sidewall. The cups forming the stack of cups may be made of paper or cardboard.

[0047] The stack of cups according to the first aspect of the invention may comprise cups according to the second or third aspect of the invention, may be assembled according to the method of the fourth aspect of the invention, and may be used according to the fifth or sixth aspect of the invention. The cup according to the second or third aspect of the invention may be form part of a stack according to the first aspect of the invention that may be assembled according to the method of the fourth aspect of the invention. The cup according to the second or third aspect of the invention may form part of a stack of cups that is used according to the fifth or sixth aspect of the invention. The use of the fifth or sixth aspect of the invention may be performed with a stack of cups according to the first aspect of the invention, which may comprise cups according to the second or third aspect of the invention and has been stacked with the method according to the fourth aspect of the invention.

[0048] Embodiments of the invention will now be further described with reference to the figures.

Fig. 1 shows a cross-sectional view of a stack of cups according to an embodiment.

Fig. 2 shows a partial cross-sectional view of the stack of cups of Fig. 1.

Fig. 3 shows a cross-sectional view of a cup according to an embodiment.

Fig. 4 shows a partial cross-sectional view of the cup of Fig. 3.

[0049] A stack of cups 1 according to an embodiment of the invention is shown in Fig. 1. The stack of cups comprises a first cup 2 and a second cup 3. The second cup 3 is placed inside the first cup 2. The first cup 2 and the second cup 3 are identically formed. Each of the cups 2, 3 comprises a sidewall 4, extending radially around a longitudinal axis 101 of the cups 2, 3, and a bottom wall 5, extending substantially orthogonal to the longitudinal axis 101. The longitudinal axis 101 extends in a longitudinal direction 100. The sidewall 4 is inclined with respect to the longitudinal axis 101. The sidewall 4 forms an outer surface 6 and inner surface 7 of the cup 2, 3.

[0050] The sidewall 4 has an upper end 8 and a lower end 9. The upper end 8 is curled outwards to form a rim 10. An outward protrusion 11 is formed on the sidewall 4 located at a first longitudinal distance 102 below the upper end 8 of the sidewall 4. The protrusion 11 is formed through the entire thickness of the sidewall 4. This means that a protrusion is formed on the outer surface 6 and an indent or groove is formed the inner surface 7 of the sidewall 4. The protrusion 11 of the second cup 3 rest on the upper end 8, in particular the rim 10, of the first cup 2. A gap 12 is formed between the sidewall 4 of the first cup 2 and the sidewall 4 of the second cup 3.

[0051] The bottom wall 5 is arranged in a second longitudinal distance 103 above the lower end 9. The bottom wall 5 of the second cup 3 is arranged in a longitudinal distance above the bottom wall 5 of the first cup 2. A space 13 is provided between the bottom wall 5 of the first cup 2 and the bottom wall 5 of the second cup 3. A food or beverage substrate 14 is accommodated in the space 13 between the bottom wall 5 of the first cup 2 and the bottom wall 5 of the second cup 3.

[0052] Fig. 2 shows a partial view of Fig. 1. The definition of the protrusion height 201, the rim width 202 and the protrusion distance 203 are shown in Fig. 2. The protrusion height 201, the rim width 202 and the protrusion distance 203 are defined along the radial direction 200, which is substantially orthogonal to the longitudinal direction 100. The protrusion distance 203 is substantially equivalent to the protrusion height 201 plus the thickness of the sidewall 4.

[0053] A cup 2, 3 according to an embodiment of the invention is shown in Fig. 3. The cup 2, 3 comprises a

sidewall 4, extending radially around a longitudinal axis 101 of the cup 2, 3, and a bottom wall 5, extending substantially orthogonal to the longitudinal axis 101. The longitudinal axis 101 extends in a longitudinal direction 100. The sidewall 4 is inclined with respect to the longitudinal axis 101. The sidewall 4 forms an outer surface 6 and inner surface 7 of the cup 2, 3.

[0054] The sidewall 4 has an upper end 8 and a lower end 9. The upper end 8 is curled outwards to form a rim 10. The rim 10 has a rim width 202 in a radial direction 200. An outward protrusion 11 is formed on the sidewall 4 located at a first longitudinal distance 102 below the upper end 8 of the sidewall 4. The protrusion 11 has a protrusion height 201, which is the radial distance from the outer surface 6 of the sidewall 4 next to the protrusion 11, in particular right below the protrusion 11, to the outer surface 6 at the protrusion 11. The protrusion distance 203 is also shown in Fig. 3. The protrusion distance 203 is defined as the radial distance between the outer surface 6 of the protrusion 11 and a line connecting the inner surface 7 of the upper end 8 and the inner surface 7 of the lower end 9. The protrusion 11 is formed through the entire thickness of the sidewall 4. The bottom wall 5 is arranged in a second longitudinal distance 103 above the lower end 9.

[0055] The outer diameter of the cup 2, 3 at the protrusion 11 is larger than the inner diameter of the cup 2, 3 at the upper end 8. The inner diameter of the cup 2, 3 is defined from the inner surface 7 on one side of the cup 2, 3 to the inner surface 7 on the opposite side of the cup 2, 3 in the radial direction 200. The outer diameter of the cup 2, 3 is defined from the outer surface 6 on one side of the cup 2, 3 to the outer surface 6 on the opposite side of the cup 2, 3 in the radial direction 200.

[0056] Fig. 3 shows that at every location below the protrusion 11, the radial distance between the outer surface 6 to a line connecting the inner surface of the upper end 8 and the inner surface of the lower end 9 is smaller than the protrusion distance 203. The definition of the protrusion height 201, the rim width 202 and the protrusion distance 203 are also shown in Fig. 4.

Claims

1. A stack of cups (1) comprising a first cup (2) and a second cup (3);

wherein the first cup (2) and the second cup (3) are identically formed and each comprises a sidewall (4);
wherein the first cup (2) is arranged below the second cup (3) in a longitudinal direction (100) of the stack (1);
wherein the sidewall (4) comprises an upper end (8) and a lower end (9);
wherein the sidewall (4) forms an outer surface (6) of the cup (2, 3) facing the outside and an inner surface (7) of the cup (2, 3) facing the inside;
wherein the sidewall (4) comprises an outward protrusion (11) located at a first distance (102) below the upper end (8);
wherein the protrusion (11) of the second cup (3) rests on the inner surface (7) or substantially on the upper end (8) of the first cup (2);
wherein at each longitudinal position below the protrusion (11) of the second cup (3), the inner surface (7) of the first cup (2) is in a distance to the outer surface (6) of the second cup (3).

2. A stack of cups according to claim 1, wherein the cup sidewall (4) is made of paper or cardboard.

3. A stack of cups according to claim 1 or 2,

wherein the first and the second cup (2, 3) each comprise a bottom wall (5);
wherein the bottom wall (5) of the first cup (2) and the bottom wall (5) of the second cup (3) are arranged in a longitudinal distance to each other to form a space (13);
wherein said space (13) preferably accommodates a food or beverage substrate (14), in particular coffee powder.

4. A stack of cups according to any of the preceding claims, wherein the ratio of the longitudinal distance between the bottom wall (5) of the first cup (2) and the bottom wall (5) of the second cup (3) to the height of the cup (2, 3) may be between 0.05 and 0.7, in particular between 0.1 and 0.5, in particular between 0.1 and 0.3, in particular in between 0.2 and 0.25.

5. A stack of cups according to any of the preceding claims, wherein the bottom wall (5) is located a second distance (103) above the lower end (9) of the sidewall (4).

6. A stack of cups according to any of the preceding claims, wherein the protrusion (11) extends in a circumferential direction around the cup (2, 3).

7. A stack of cups according to claim 6, wherein the protrusion (11) extends fully around the cup (2, 3).

8. A stack of cups according to any of the preceding claims, wherein the upper end (8) of the sidewall (4) is curled outwards to form a rim (10).

9. A stack of cups according to any of the preceding

claims,
wherein a gap (12) is formed between the sidewall (4) of the second cup (3) below the protrusion (11) and the sidewall (4) of the first cup (2).

10. A stack of cups according to any of the preceding claims,
wherein the protrusion (11) of the second cup (3) reduces, preferably prevents, spillage of the food or beverage substrate (14) out of the first cup (2).

11. A stack of cups according to any of the preceding claims, comprising three or more cups.

12. A cup (2, 3) adapted to form a cup of the stack of cups (1) according to any of the preceding claims.

13. A cup (2, 3), in particular for containing beverages or food, the cup (2, 3) comprising:

a sidewall (4) extending around a longitudinal axis (101);
wherein the sidewall (4) comprises an upper end (8) and a lower end (9);
wherein the sidewall (4) forms an outer surface (6) of the cup (2, 3) facing the outside and an inner surface (7) of the cup (2, 3) facing the inside;
wherein the sidewall (4) comprises an outward protrusion (11) located at a first distance (102) below the upper end (8);
wherein the protrusion (11) defines a protrusion distance (203), the protrusion distance (203) being defined as the radial distance between the outer surface (6) of the protrusion (11) and a line connecting the inner surface (7) of the upper end (8) and the inner surface (7) of the lower end (9), at the longitudinal location of the protrusion (11),
wherein the outer diameter of the cup (2, 3) at the protrusion (11) is larger than the inner diameter of the cup (2, 3) at the upper end (8).
wherein, at each longitudinal position below the protrusion (11), the radial distance between the outer surface (6) of the sidewall (4) and the line connecting the inner surface (7) of the upper end (8) and the inner surface (7) of the lower end (9) is smaller than the protrusion distance (203).

14. A method for stacking two or more cups (2, 3), in particular according to any of claims 12 or 13, the method comprising the following steps:

pouring a beverage or food substrate (14), in particular coffee powder, into a first cup (2); and inserting a second cup (3) inside the first cup (2), such that an outward protrusion (11) of the second cup (3) rests substantially on an upper end (8) or inner surface (7) of the first cup (2);
wherein a space (12) between a bottom wall (5) of the first cup (2) and a bottom wall (5) of the second cup (3) accommodates the beverage or food substrate (14).

15. Use of a stack of cups (1), in particular according to any of claims 1 to 11, in a beverage machine, in particular a coffee vending machine,

wherein an outward protrusion (11) formed on a sidewall (4) of each cup (2, 3) rests substantially on an upper end (8) or inner surface (7) of the cup (2, 3) below,
to store a beverage substrate (14), in particular coffee powder, inside spaces (13) between two adjacent cups (2, 3), in particular between two bottom walls (5) of two adjacent cups (2, 3), and in a cup (3) at the top of the stack (1),
unstack the cup (2) at the bottom of the stack (1) from the stack (1),
pour a liquid, in particular hot water, into the unstacked cup (2) and serve the unstacked cup (2) to a customer.

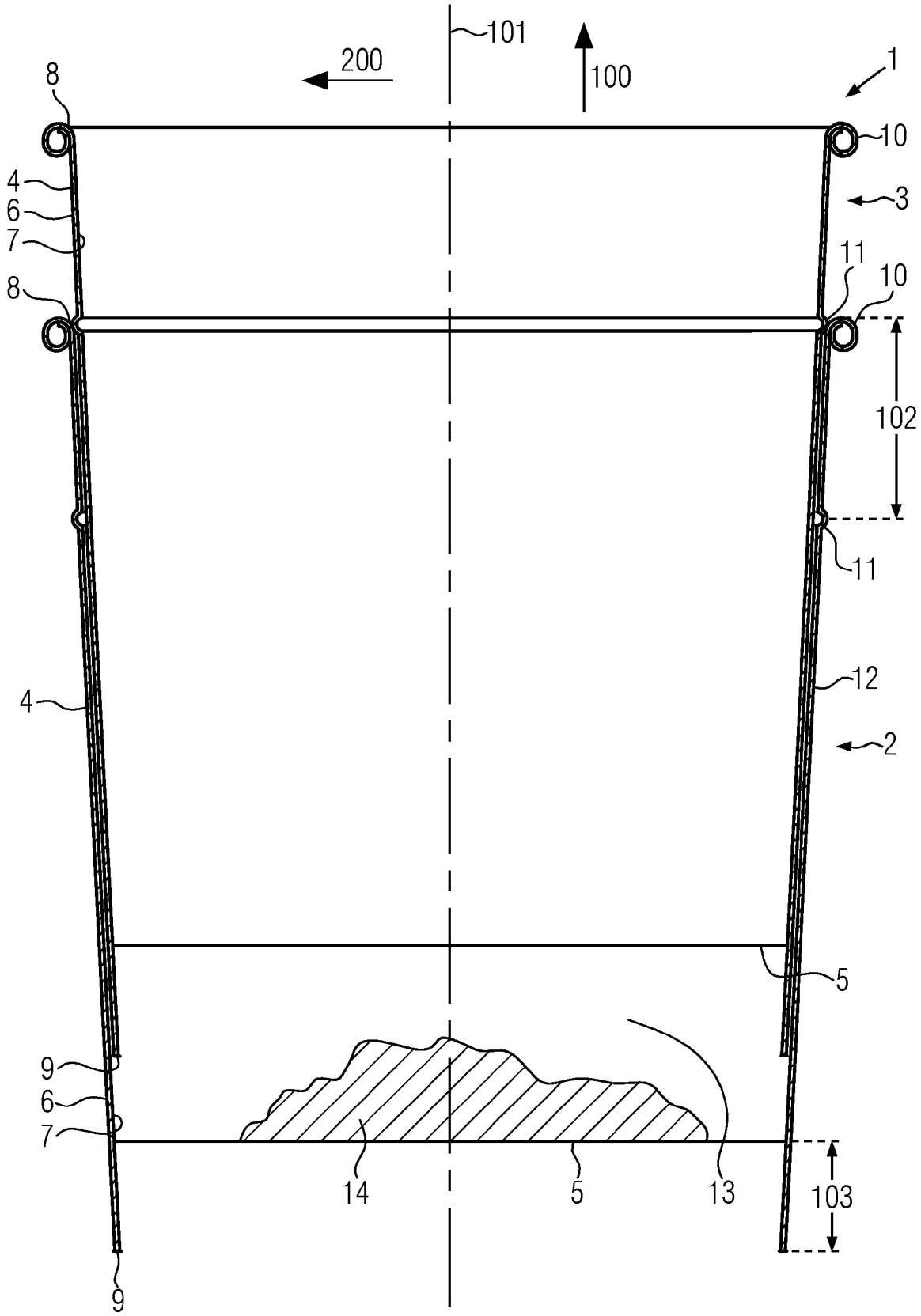

FIG. 1

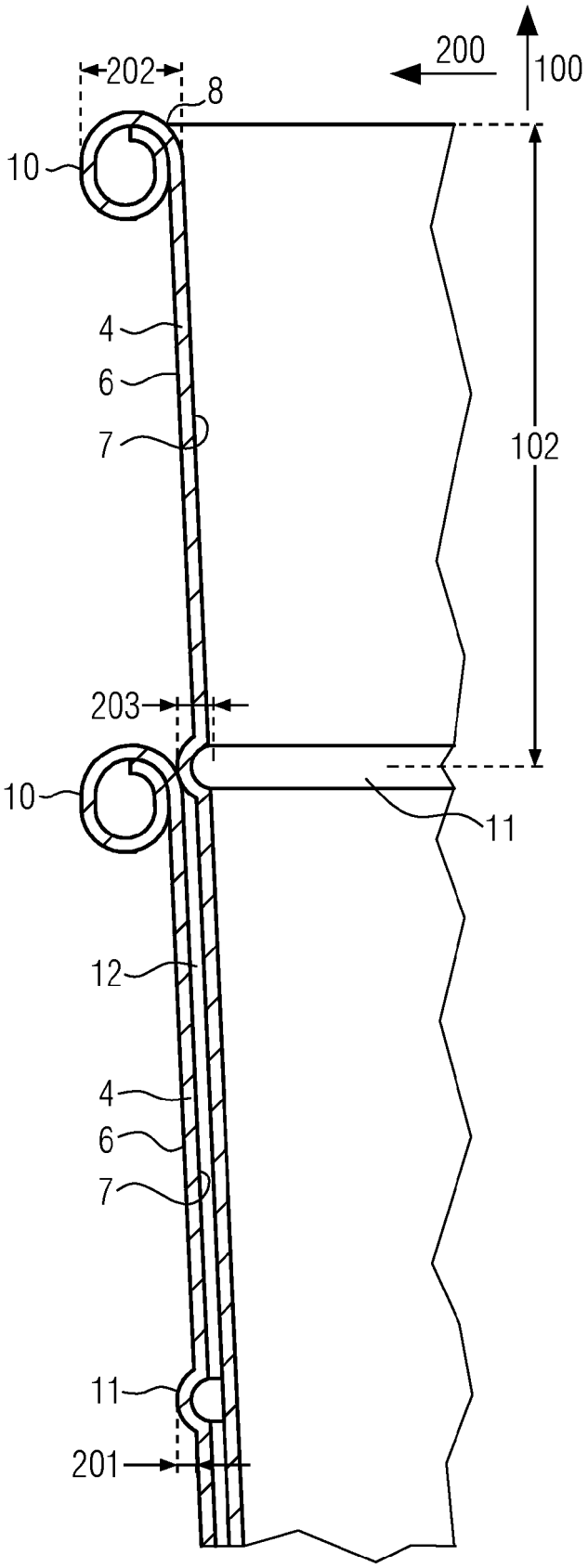

FIG. 2

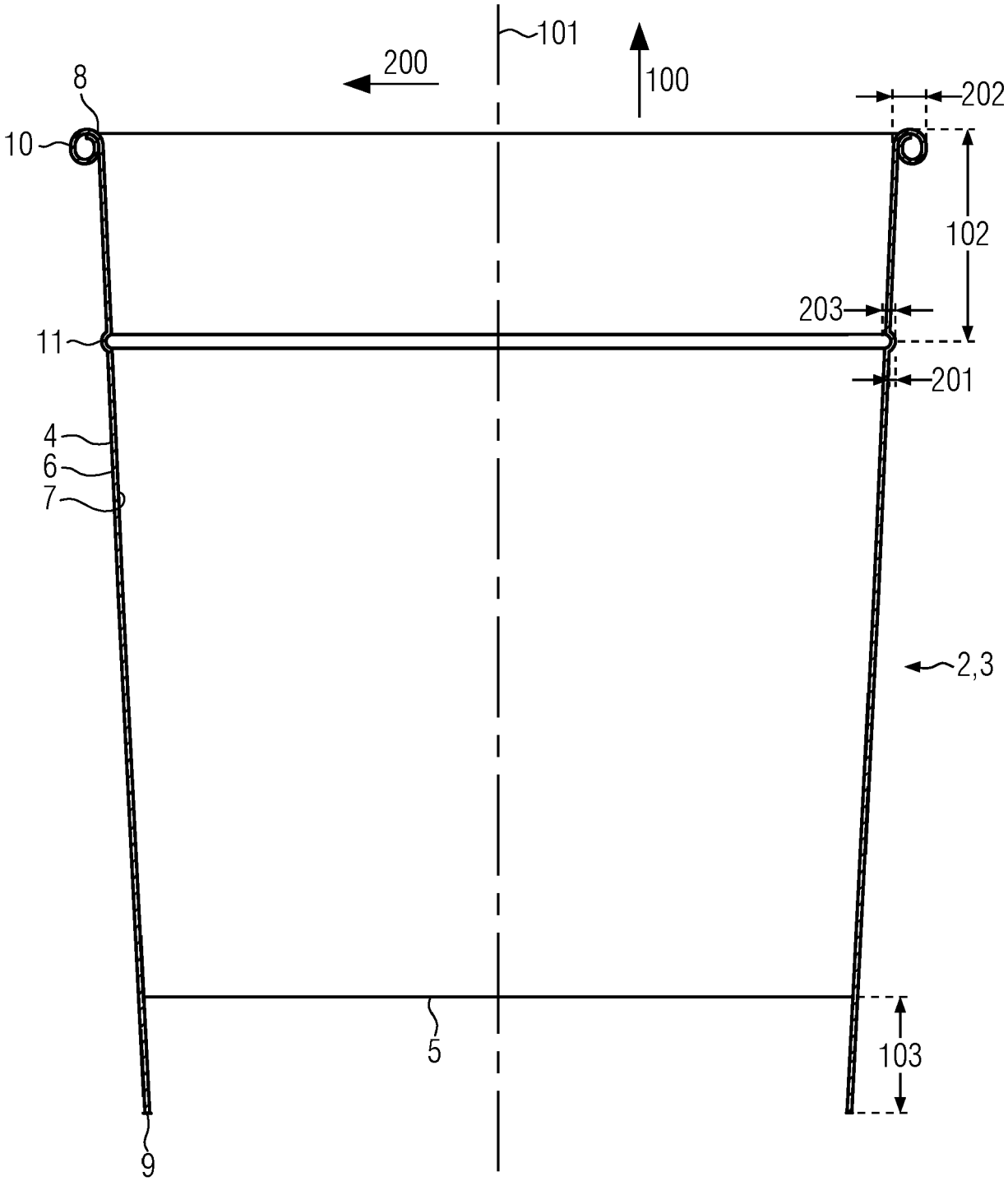

FIG. 3

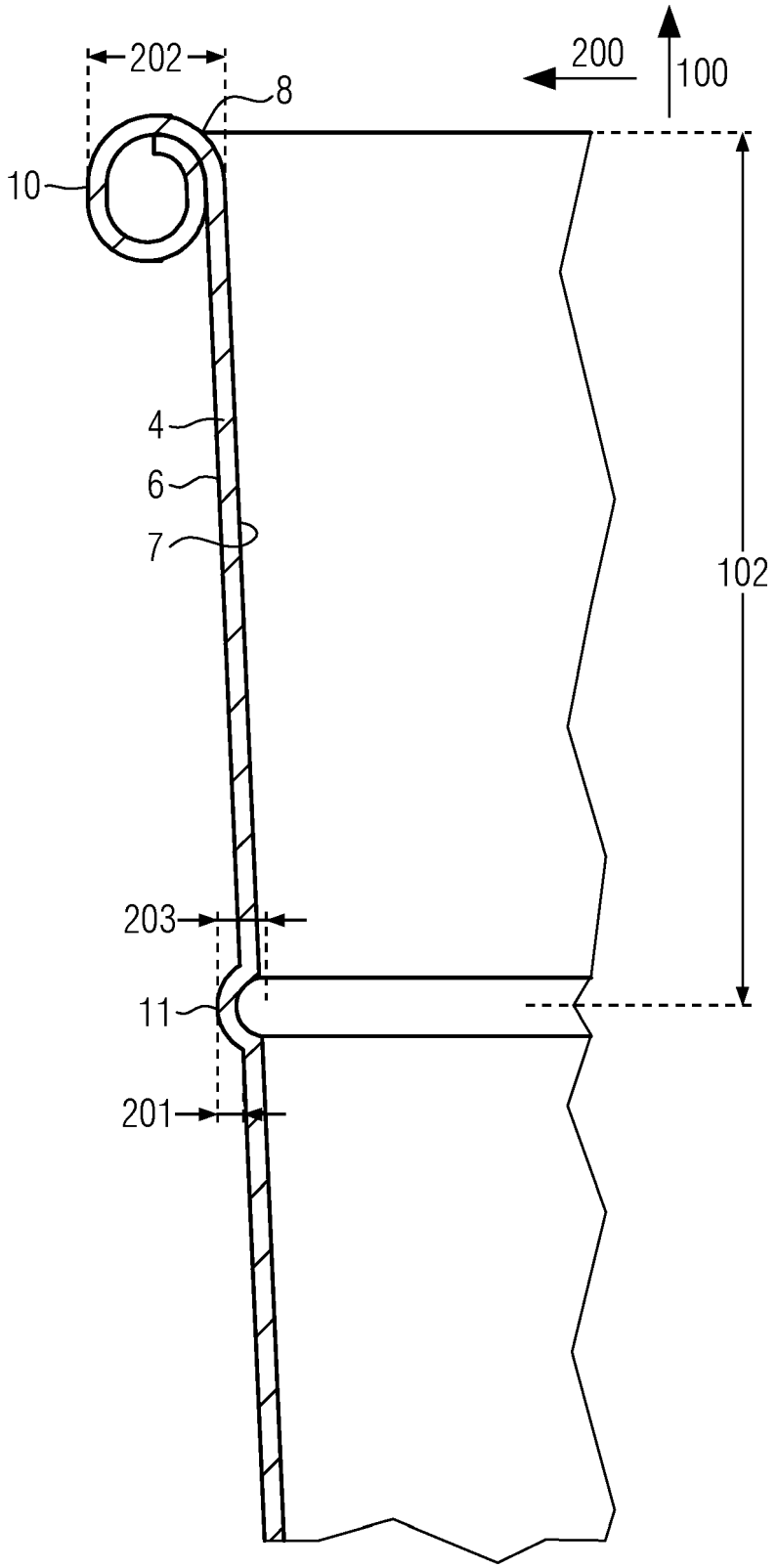

FIG. 4

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 22 15 9072

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	BE 824 054 A (UNKNOWN) 2 July 1975 (1975-07-02)	1,3,6-9, 12,13	INV. B65D1/26
Y	* figure 5 *	2,4,10	
X	US 3 648 888 A (CHELADZE GEORGE ANDRE) 14 March 1972 (1972-03-14)	1,3,5-9, 11-13	
Y	* figures 2, 3 *	2,4,10	
X	US 3 208 631 A (BRYANT EDWARDS) 28 September 1965 (1965-09-28) * figures 1, 2 *	1,3,6-9, 12	
Y	US 4 832 202 A (NEWMAN ALEC T [GB] ET AL) 23 May 1989 (1989-05-23)	4,10	
A	* column 3, line 65 - column 4, line 20; figure 1 *	14,15	
Y	GB 2 157 153 A (BELLAPLAST GMBH) 23 October 1985 (1985-10-23)	4,10	
A	* column 3, lines 79-94; figures 1, 2 *	14,15	
Y	EP 0 090 639 A2 (LIN PAC PLASTIC CONTAINERS [GB]) 5 October 1983 (1983-10-05)	2,4,10	
A	* pages 3-4; figures 1-6 *	14,15	

TECHNICAL FIELDS SEARCHED (IPC)

B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	5 August 2022	Dominois, Hugo

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 22 15 9072

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.

05-08-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
BE 824054 A	02-07-1975	BE 824054 A	02-07-1975
		DE 2461683 A1	17-07-1975
		ES 224581 U	16-01-1977
		FR 2256874 A1	01-08-1975
		IT 1027237 B	20-11-1978
		LU 71587 A1	09-12-1975
		NL 7416847 A	08-07-1975
US 3648888 A	14-03-1972	CA 924252 A	10-04-1973
		DE 2104469 A1	23-09-1971
		FR 2081610 A1	10-12-1971
		GB 1321745 A	27-06-1973
		US 3648888 A	14-03-1972
US 3208631 A	28-09-1965	NONE	
US 4832202 A	23-05-1989	DE 3787405 T2	13-01-1994
		EP 0250100 A2	23-12-1987
		US 4832202 A	23-05-1989
GB 2157153 A	23-10-1985	CH 667058 A5	15-09-1988
		DE 3418849 A1	29-08-1985
		DK 47785 A	25-08-1985
		FR 2560154 A1	30-08-1985
		GB 2157153 A	23-10-1985
		NL 8500353 A	16-09-1985
		SE 460516 B	23-10-1989
EP 0090639 A2	05-10-1983	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

- JP S55134046 A **[0002]**
- JP H0680616 U **[0003]**
- JP H0958658 A **[0004]**
- US 2503045 A **[0005]**
- JP S5767911 U **[0005]**
- JP 2001002049 A **[0005]**
- JP H10278931 A **[0005]**
- US 5201437 A **[0005]**