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(54) Title: SHEET PACKAGING MATERIAL FOR PRODUCING SEALED PACKAGES OF POURABLE FOOD PRODUCTS

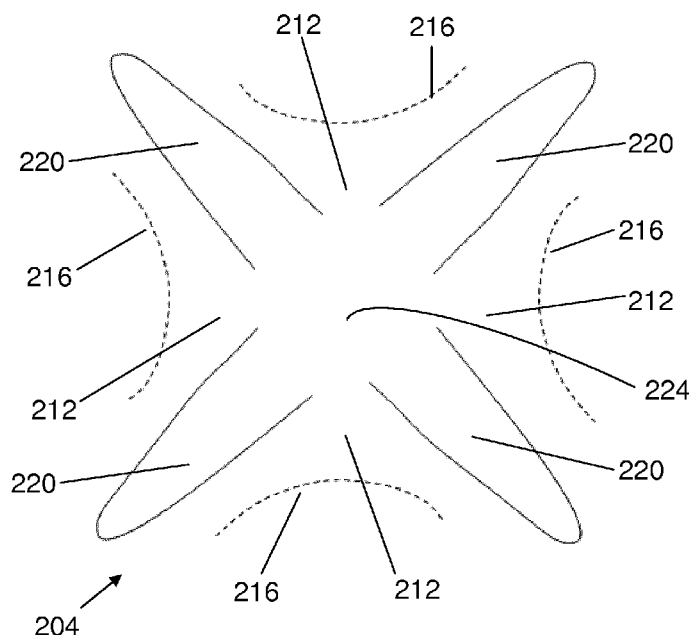


Figure 3A

(57) Abstract: A sheet packaging material (200) for producing a sealed package (100) of a pourable food product is disclosed. The packaging material (200) comprises at least one base layer (230) for imparting stiffness to the sheet packaging material (200), at least one lamination layer (234, 238, 242, 246) applied to and covering said base layer (230), and a partially laminated opening zone (204, 234). The opening zone (204, 234) comprises a laminated cutting area (220, 224) having at least three longitudinal portions (220) extending between the centre and the periphery of the opening zone (204, 234), and at least three removable portions (212) adjacent to the laminated cutting area (220, 224), each removable portion (212) being located between two longitudinal portions (220) and having a folding zone (216) adjacent to the periphery of the opening zone (204, 234). In use the removable portions (212) are partly detached from the packaging material (200) by penetration of the laminated cutting area (220, 224) prior to being folded at the folding zone (216)



SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
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to form an opening in the packaging material (200) for pouring a food product from the package (100). A sealed package (100) formed by folding and sealing the sheet packaging material is also disclosed.

**SHEET PACKAGING MATERIAL FOR PRODUCING SEALED PACKAGES
OF POURABLE FOOD PRODUCTS**

TECHNICAL FIELD

5 The present invention relates to a sheet packaging material for producing sealed packages of pourable food products.

BACKGROUND

10 Many pourable food products, such as fruit juice, UHT (ultra-high-temperature treated) milk, wine, tomato sauce, etc., are sold in packages made of sterilized packaging material.

 The packaging material has a multilayer structure
15 comprising a base layer, e.g. paper, covered on both sides with layers of heat-seal plastic material, e.g. polyethylene. In the case of aseptic packages for long-storage products the packaging material also comprises a layer of oxygen-barrier material, e.g. aluminium foil,
20 which is superimposed on a layer of heat-seal plastic material, and is in turn covered with another layer of heat-seal plastic material forming the inner face of the package eventually contacting the food product.

 Existing packages are normally provided with a
25 detachable portion for opening the package. Using an opening device this portion is partly detached from the rest of the packaging material to free a pour opening through which the product is poured out. The detachable

portion is formed on the packaging material prior to folding and sealing the packaging material to form the finished package. The detachable portion normally comprises a prelaminated hole. To form a prelaminated
5 hole a circular hole is first formed solely through the base layer of the packaging material. The circular hole is then covered during lamination of the material with the layers of heat-seal plastic material and barrier material which adhere to one another at the hole thereby
10 forming the prelaminated hole.

Previous efforts have focused on devising an effective, consistent method of opening prelaminated holes that achieves a clean cut about the edge of the pour-out opening without fraying to impair smooth pour-
15 out of the food product.

WO 2011/020634 discloses a sheet packaging material for a sealed package comprising a food pour opening that is formed in use by cutting of an arc-shaped prelaminated strip located around the periphery of a
20 foldable area of packaging material.

Nevertheless, there remains a need to provide improved packaging materials with pour openings that are cheaper to produce and easy to open while maintaining sufficient sealing of the food within the package prior
25 to consumption.

SUMMARY OF THE INVENTION

According to one aspect of the present invention,

there is provided a sheet packaging material for producing a sealed package of a pourable food product as claimed in claim 1.

According to another aspect of the present
5 invention, there is provided a sealed package for a pourable food product as claimed in claim 6.

BRIEF DESCRIPTION OF THE DRAWINGS

Some preferred, non-limiting embodiments of the
10 present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a partially exploded perspective view of a sealed package in accordance with an embodiment of the present invention;

15 Figure 2A depicts a sheet packaging material for producing the sealed package in figure 1;

Figure 2B is a cross-sectional side view of the sheet packaging material in figure 2A along A-A showing its multilayer structure;

20 Figure 3A illustrates the a partially laminated opening zone on the sealed package in figure 1 and the sheet packaging material in figure 2A-2B;

Figure 3B illustrates an alternative partially laminated opening zone suitable for the sealed package
25 in figure 1 and the sheet packaging material in figure 2A-2B;

Figure 4A shows a penetrator according to one embodiment of the invention for use with the partially

laminated opening zone in figure 3A; and

Figure 4B shows a penetrator according to another embodiment of the invention for use with the partially laminated opening zone in figure 3A.

5

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Figure 1 illustrates a sealed package 100 for a pourable food product. The sealed package 100 is formed by folding and sealing a sheet packaging material 200 shown in figures 2A and 2B. Sealed package 100 comprises a quadrilateral top wall 104, a quadrilateral bottom wall 108, and four lateral walls 112 extending between top wall 104 and bottom wall 108. The top, bottom, and lateral walls 104, 108, and 112 may have a rectangular or square shape. After the sealed package is filled with a food product, folded, and sealed there is formed a top transverse sealing band 116 crossing top wall 104 along a centre line thereof, a bottom transverse sealing band 120 crossing bottom wall 108 and a longitudinal sealing band 124 extending perpendicularly between the top transverse sealing band 116 and the bottom transverse sealing band 120 along respective portions of the top and bottom walls 104 and 108 and along one of the lateral walls 112.

25 The package 100 also has a partially laminated opening zone 204 that will be described further below in regard to figures 3A and 3B as well as a reclosable opening device 300 on top wall 104.

The reclosable opening device 300 comprises a frame 304 fitted about the partially laminated opening zone 204. The frame 304 has a pouring spout 308. A removable threaded cap 312 is screwable on and off the frame 304 to close and open the pouring spout 308 respectively, as desired. The opening device 300 also comprises a penetrator 340 located within the interior of the pouring spout 308. The penetrator 340 will be described further below with respect to figure 4A.

10 The reclosable opening device 300 is made of plastic. The frame 304 is applied to the package 100 by conventional fastening systems such as adhesives, micro-flame, electric-current-induction, ultrasound, laser, or other heat-sealing techniques.

15 Figure 2A depicts a sheet packaging material 200 for producing the sealed package 100 in figure 1 by folding of the material 200 about the crease lines 208. The crease lines 208 define in a known manner the top, bottom, and lateral walls 104, 108, and 112 of sealed package 100. Other suitable crease line patterns for use in the present invention are disclosed in WO 2011/020634 and WO 2015/169656 for example.

25 The packaging material 200 from which sealed package 100 is made has a multilayer structure as illustrated in figure 2B comprising a base layer 230, e.g. of paper, for stiffness, and a number of lamination layers 234, 238, 242, and 246 covering both sides of base layer 230. The lamination layers 234, 238, 242, and

246 comprise a layer 242 of oxygen-barrier material, e.g. an aluminum foil, and a number of layers 234, 238, and 246 of heat-seal plastic material covering both sides of both base layer 230 and oxygen barrier layer 242. Layer 246 eventually forms the inside of package 100. Next to the innermost layer 246 is the oxygen barrier material 242 and next to layer 242 is another layer of heat-seal plastic material 238. The base layer 230 is covered by heat-seal plastic material layers 238 and 234. The innermost layer 246 of heat-seal plastic material contacting the food product, in use, may, for example, be made of strong, in particular, high-stretch, metallocene-catalyzed, low-linear-density (LLD) polyethylene. Layers 234, 238, and 246 of heat-seal plastic material are preferably laminated on the base layer 230 in a melted state, with successive cooling.

The base layer 230 may e.g. be carton, paper, paperboard, cardboard, foam, or any other cellulose-based layer suitable for forming a bulk or core layer of a laminated packaging material. The outer layer 234 is intended to protect the base layer towards liquids and dirt, as well as to provide heat sealability properties in a subsequent filling and packaging process. An inner side of the base layer 230 is covered with a similar bonding layer 238 of a thermoplastic polymer, such as conventionally LDPE which is used to laminate, i.e. bind together, a thin, sensitive, layer comprising a gas barrier material, such as for example a thin foil of

aluminium 242, to the bulk layer 230. In order to avoid contact between the enclosed product and the barrier material or the aluminium foil 242, the aluminium foil is covered by a polymer layer 246.

5 In a package formed using a laminated packaging material 200 that includes one of the film laminate 234, 246 embodiments described above, the polymer film 246 of the film laminate is closer to the food product than the substrate, or oxygen barrier material 242. In other
10 words, the polymer film 246 forms the inner side of the package. The polymer film 246 thus needs to be sealable in order to allow heat sealing of two adjacent portions of a laminated packaging material 200. The polymer film 246 also needs to be liquid-tight for ensuring stiffness
15 and rigidity of a bulk layer 230 of the laminated packaging material 200.

Hence, an innermost layer 246 of the laminated packaging material 200 is a heat-sealable layer. An example of a heat-sealable layer is a heat-sealable
20 polyolefin polymer which is applied as a layer to be directed towards the inside of the package, i.e. in direct contact with the food product. The innermost layer may suitably be a heat-sealable polymer such as a polyethylene (PE) polymer of the low density type,
25 selected from the group consisting of LDPE, linear LDPE (LLDPE), Very Low Density PE (VLDPE), Ultra Low Density PE (ULDPE) or metallocene catalyst manufactured LLDPE (mLLDPE) and blends of two or more thereof. Depending on

the type of packaging containers produced from the laminated packaging material, heat-sealable innermost layers of high density polyethylene (HDPE), polypropylene (PP) or propylene co- or ter-polymers are also conceivable, as long as they are compatible with and achieve the desired effect in combination with other components of the laminated packaging material.

Suitable examples to be used as innermost layers are blends between LDPE and mLLDPE (e.g. 50/50, 40/60, 60/40, 30/70, 70/30, 20/80, 80/20, 10/90, 90/10, 0/100, 100/0 weight% blend ratios), such as LDPE of extrusion grade, for example having a melt flow index (as determined in accordance with ASTM D1238, 190 °C/2.16 kg) of 2-20, such as 2-12, such as 2-7, such as 2-6 and a density (as determined in accordance with ISO 1183, method D) of 914-922 kg/m³, such as 915-920 kg/m³. Examples of mLLDPEs suitable for use in aspects and embodiments described herein have a density less than 0.922 kg/cm³ and a melt flow index (MFI) of 15-25 at 190°C and 2.16 kg (ASTM 1278). A thickness of the innermost layer 246 of the laminated packaging material is for example between 5 µm-50 µm, such as 10 µm-30 µm, such as 15 µm-25 µm, such as 17 µm-25 µm.

A portion is cut or punched out of the base layer 230 during manufacture of the packaging material 200 to provide a slot 250. Lamination layers 234 and 238 which extend along opposite faces of base layer 230 are sealed together during lamination through slot 250 to provide

the laminated cutting area 220 of opening zone 204 which will be described further below.

Figures 3A and 3B illustrate partially laminated opening zones 204 and 204' for use on the packaging material 200 and sealed package 100.

The partially laminated opening zone 204 in figure 3A comprises a laminated cutting area 220, 224 and four removable portions 212. The laminated cutting area 220, 224 has a circular portion 224 located in the centre of the opening zone 204 and four longitudinal portions 220 extending between the circular portion 224 and the periphery of the opening zone 204. However, it is not necessary to include the circular portion 224 and in that case the four longitudinal portions 220 extend between the centre and the periphery of the opening zone 204. Further, the portion 224 may not be arranged centrally but instead radially offset within the opening zone 204. Additionally the shape of the portion 224 may not necessarily be circular; other shapes such as rectangular, triangular, elliptic, etc. are also possible.

The four longitudinal portions 220 are spaced apart from each other at optionally equal angles about the centre of the partially laminated opening zone 204. Each removable portion 212 is located between two longitudinal portions 220 in a position opposing another removable portion 212. The removable portions 212 have a folding zone 216 adjacent to the periphery of the

opening zone 204 about which the removable portions 212 are folded towards the interior of the sealed package 100 upon opening as will be described below.

Figure 3B shows an alternative partially laminated opening zone 204'. The opening zone 204' has a laminated cutting area comprising three longitudinal portions 220 extending between the centre and the periphery of the opening zone 204' as well as three removable portions 212 located in between the longitudinal portions 220. Again, the removable portions have a folding zone 216 adjacent to the periphery of the opening zone 234. As for the embodiment described with reference to figure 3A the longitudinal portions 220 may meet in a central portion, which for some embodiments not necessarily need to be provided at the center of the opening zone 204'.

Figures 4A and 4B depict penetrators 340 and 320 respectively that are located within the pouring spout 308 of opening device 300. Both penetrators 320 and 340 are suitable for use with the partially laminated opening zone 204 in figure 3A. Each penetrator 320, 340 has four penetrating members 332, 352 which are located proximally to the partially laminated opening zone 204 prior to opening of package 100. In this proximal location the penetrating members 332, 352 extend between the centre and the periphery of the opening zone 204 to correspond or align with the laminated cutting area 220, 224. The penetrating members 332, 352 are triangular-shaped plates each having a slanted edge 360, 364

between the peripheral cylinder 328, 348 and the central shaft 336, 356. As illustrated in figure 4A, edge 360 slants proximally towards the partially laminated opening zone (not shown) from the cylinder 348 to the shaft 356. In contrast, and as depicted in figure 4B, edge 364 slants distally from the partially laminated opening zone from the cylinder 328 to the shaft 336.

Each penetrator 320 and 340 also has a cylinder 328, 348 extending distally from the penetrating members 332, 352 and around the periphery of the penetrators 320, 340. A shaft 336, 356 also extends distally from the penetrating members 332, 352 but along the central longitudinal axis of the penetrators 320, 340. As is evident from figures 4A and 4B, the penetrating members 332, 352 are spaced apart from each other at equal angles about the axis of the shaft 336, 356. The penetrators 320 and 340 have an annular flange 324, 344 at the end of the cylinder 328, 348 distal to the penetrating members 332, 352. The distal direction as used above is intended to mean extending further away from the opening zone 204 and the package 100.

Penetrators 320 and 340 are made from plastic and preferably in one piece by injection molding.

The sealed package 100 is opened as follows. During manufacturing of a filled package, the frame 304 is attached to the package thus covering, or extending away from, the sealed opening zone 204. As explained above the frame 204 is preferably provided with external

threads for guiding the cap 312 during assembly.

The cap 312, having corresponding internal threads, is subsequently engaged with the frame 304 by a screwing action. The penetrator 320, 340 is arranged within the cap 312 and is allowed to rotate relative the cap 312 during the screwing action. However, the penetrator 320, 340 is guided in its axial direction relative the cap 312. For this the penetrator 320, 340 may have external threads engaging with internal threads of the frame 304.

10 The threads of the penetrator 320, 340 and the frame 304 may preferably be configured in an opposite direction compared to the threads of the cap 312 such that when screwing the cap 312 onto the frame 304 the penetrator 320, 340 will be lifted upwards. This means that when

15 the cap 312 is screwed onto the frame 302 the penetrator 320, 340 will move axially away from the opening zone 204, but remain in its angular position relative the laminated cutting area 220, 224. For this purpose alignment of the penetrating members 332, 352 relative

20 the laminated cutting area 220, 224 may be performed prior to engaging the cap 312 with the frame 204.

When screwing the cap 312 onto the frame 304, which is preferably made automatically during package manufacturing, the penetrator 320, 340 will be

25 positioned away from the laminated cutting area 220, 224. The package will thus be sealed.

When the package is opened, the cap 312 is unscrewed from the frame 304. Upon this the penetrator

320, 340 will exhibit an axial pressure downwards to push penetrating members 332, 352 through the laminated cutting area 220, 224. This is due to the fact that the penetrator 320, 340 will move axially downwards when the cap 312 moves axially upwards. Penetrating the laminated cutting area 220, 224 also partly detaches removable portions 212 from the packaging material 200. Application of pressure is continued after the laminated cutting area 220, 224 has been pierced by penetrating members 332, 352 so that the cylinder 328, 348 comes into contact with, and inwardly folds, the removable portions 212 about the folding zones 216. The applied pressure is then discontinued upon finishing unscrewing the cap 312. A large proportion of the penetrator 320, 340 is then contained below top wall 104 within the interior of the package 100. The annular flange 324, 344 not only imparts strength to the penetrator 320, 340 but also sits on or slightly above the top wall 104 to prevent the penetrator 320, 340 from completely falling into the food product within the package 100.

The penetrator 320, 340 stays in its position upon removing the unscrewed cap 312. Hence the penetrator 320, 340 will be disengaged from the cap 312 and remain its position relative the frame 304 such that the penetrator 320, 340 is fixed to the frame 304 along with the removal of the cap 312.

The food product may then be poured, optionally through channels roughly bounded by the penetrating

members 332, 352 and the partly detached removable portions 212. If desired, the cap 312 may be screwed back onto the frame 304 to close the pouring spout 308 so that the food product can be kept in the package 100 for consumption later.

The opening action described above is called a one-step opening, since penetration is performed simultaneously as the cap 312 is unscrewed.

In another embodiment the penetrator 320, 340 may be separated from the interior of the cap 312, however still enclosed within the cap 312. Upon unscrewing the cap 312 the customer will have access to the penetrator 320, 340. The penetrator 320, 340 is thereafter manually pushed through the laminated cutting area 220, 224 in order to open the package. This opening action is usually called a two-step opening since unscrewing of the cap 312 and penetration are two separate and consecutive steps. The two-step opening may in some cases be preferred since the user may inspect the laminated cutting area 220, 224 before penetration, thus ensuring seal integrity.

The laminated cutting area 220, 224 of packaging material 200 has a smaller surface area than existing circular or round laminated areas which allows for a reduction in the amount of material that is cut or punched out of the base layer 230 during manufacturing. This decreases the production losses (less base layer 230 to discard) and lowers the manufacturing cost while

the package 100 remains easy to open with no detrimental impact on the food preservation and pouring efficiency. The relatively small laminated area of the partially laminated opening zone 204, 234 also results in a
5 package 100 with a lower oxygen transmission rate (OTR) as less of the package interior is potentially exposed to the outer environment.

The penetrator 320, 340 allows for fast and efficient opening of the package 100 in one swift
10 vertical movement via penetration of laminated cutting area 220, 224 and folding of removable portions 212.

CLAIMS

1) A sheet packaging material (200) for producing a sealed package (100) of a pourable food product, the packaging material (200) comprising:

5 at least one base layer (230) for imparting stiffness to the sheet packaging material (200);

 at least one lamination layer (234, 238, 242, 246) applied to and covering the base layer (230); and

 a partially laminated opening zone (204, 234) comprising:

 a laminated cutting area (220, 224) having at least three longitudinal portions (220) extending from a central portion towards the periphery of the opening zone (204, 234); and

15 at least three removable portions (212) adjacent to the laminated cutting area (220, 224), each removable portion (212) being located between two longitudinal portions (220) and having a folding zone (216) adjacent to the periphery of the opening zone (204, 234);

20 wherein in use the removable portions (212) are partly detached from the packaging material (200) by penetration of the laminated cutting area (220, 224) prior to being folded at the folding zone (216) to form an opening in the packaging material (200) for pouring a
25 food product from the package (100).

2) The sheet packaging material (200) as claimed in claim 1, wherein the laminated cutting area (220, 224)

has at least four longitudinal portions (220).

3) The sheet packaging material (200) as claimed in claim 1 or 2, wherein the laminated cutting area (220, 224) further comprises a circular portion (224) located in the centre of the opening zone (204, 234), such that the at least three longitudinal portions (220) extend between the circular portion (224) and the periphery of the opening zone (204, 234).

10

4) The sheet packaging material (200) as claimed in any one of the preceding claims, wherein the at least three or four longitudinal portions (220) are spaced apart from each other at equal angles about the centre of the partially laminated opening zone (204, 234).

15

5) The sheet packaging material (200) as claimed in any one of the preceding claims, further comprising a plurality of fold lines (208).

20

6) A sealed package (100) for a pourable food product, the sealed package (100) being formed by folding and sealing a sheet packaging material (200) as claimed in any one of the preceding claims, the sealed package (100) comprising:

25

a reclosable opening device (300) further comprising:

a frame (304) fitted about the partially laminated

opening zone (204, 234) and having a pouring spout (308);

a removable threaded cap (312) that screws onto the frame (304) to close the pouring spout (308); and

5 a penetrator (320, 340) located within the interior of the pouring spout (308), the penetrator (320, 340) comprising:

at least three penetrating members (332, 352) located proximally to the partially laminated opening
10 zone (204, 234), the penetrating members (332, 352) extending from a central portion and towards the periphery of the opening zone (204, 234) to correspond with the laminated cutting area (220, 224);

a cylinder (328, 348) extending distally from
15 the penetrating members (332, 352) around the periphery of the penetrator (320, 340); and

a shaft (336, 356) extending distally from the penetrating members (332, 352) at the centre of the penetrator (320, 340);

20 wherein during use pressure is applied to the shaft (336, 356) in order that the penetrating members (332, 352) penetrate the laminated cutting area (220, 224) and the cylinder (328, 348) folds the removable portions (212) to open the package (100).

25

7) The sealed package (100) as claimed in claim 6, comprising at least four penetrating members (332, 352).

8) The sealed package (100) as claimed in claim 6 or 7, wherein the penetrating members (352) are triangular-shaped plates having a slanted edge between the cylinder (348) and the shaft (356), the edge
5 slanting proximally to the partially laminated opening zone (204, 234) from the cylinder (348) to the shaft (356).

9) The sealed package (100) as claimed in claim 6
10 or 7, wherein the penetrating members (332) are triangular-shaped plates having a slanted edge between the cylinder (328) and the shaft (336), the edge slanting distally from the partially laminated opening zone (204, 234) from the cylinder (328) to the shaft
15 (336).

10) The sealed package (100) as claimed in any one of claims 6 to 9, wherein the at least three or four penetrating members (332, 352) are spaced apart from
20 each other at equal angles about the shaft (336, 356).

11) The sealed package (100) as claimed in any one of claims 6 to 10, wherein the penetrator (320, 340) further comprises an annular flange (324, 344) at the
25 end of the cylinder (328, 348) distal to the penetrating members (332, 352).

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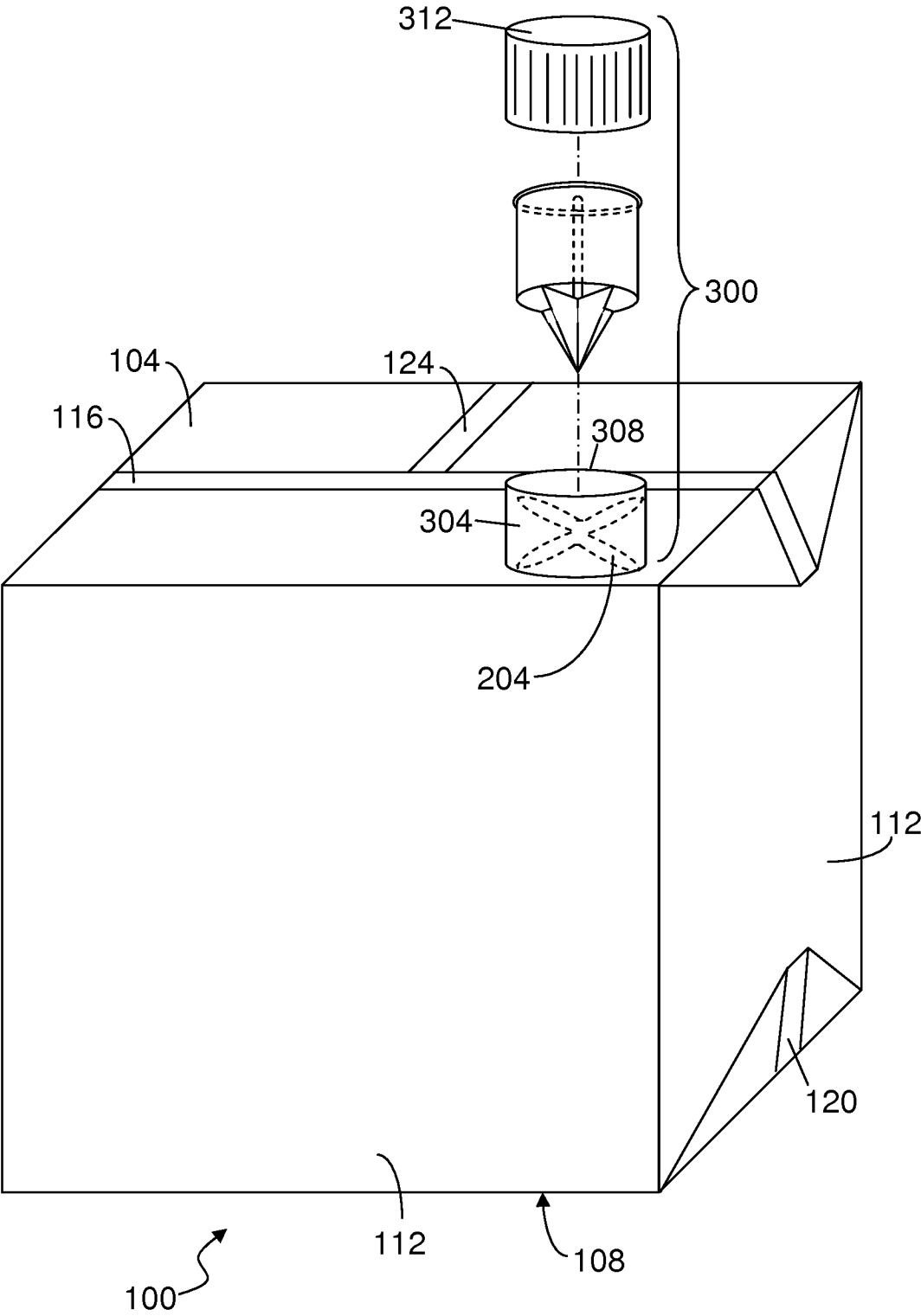


Figure 1

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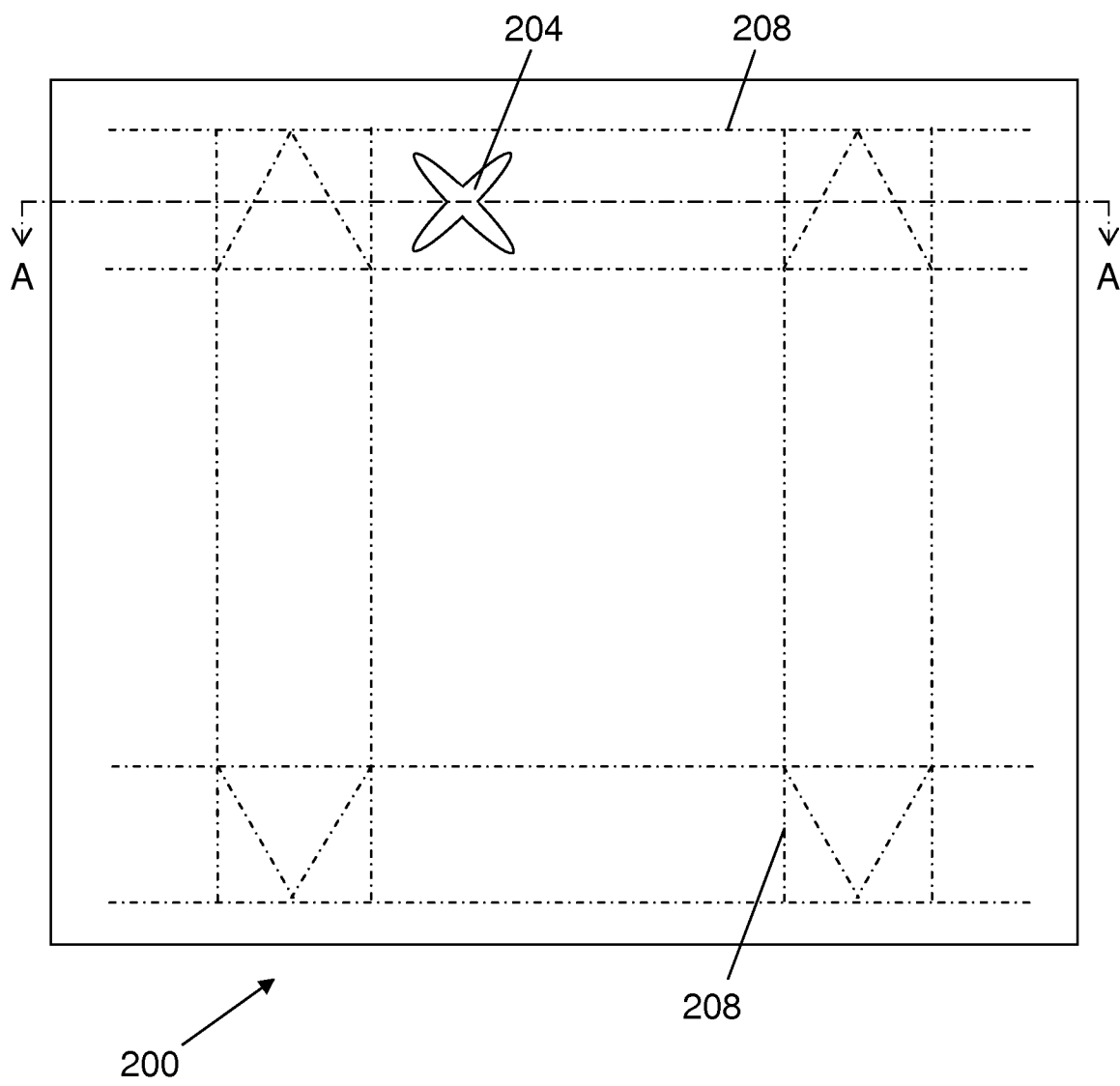


Figure 2A

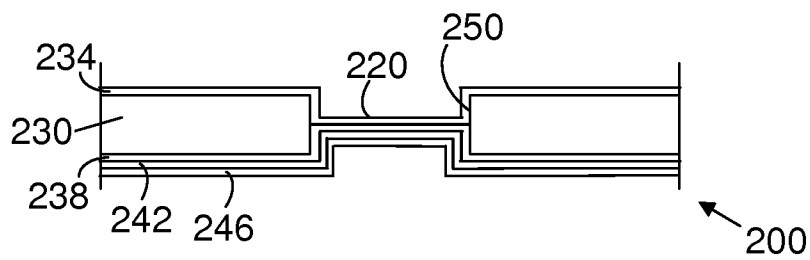


Figure 2B

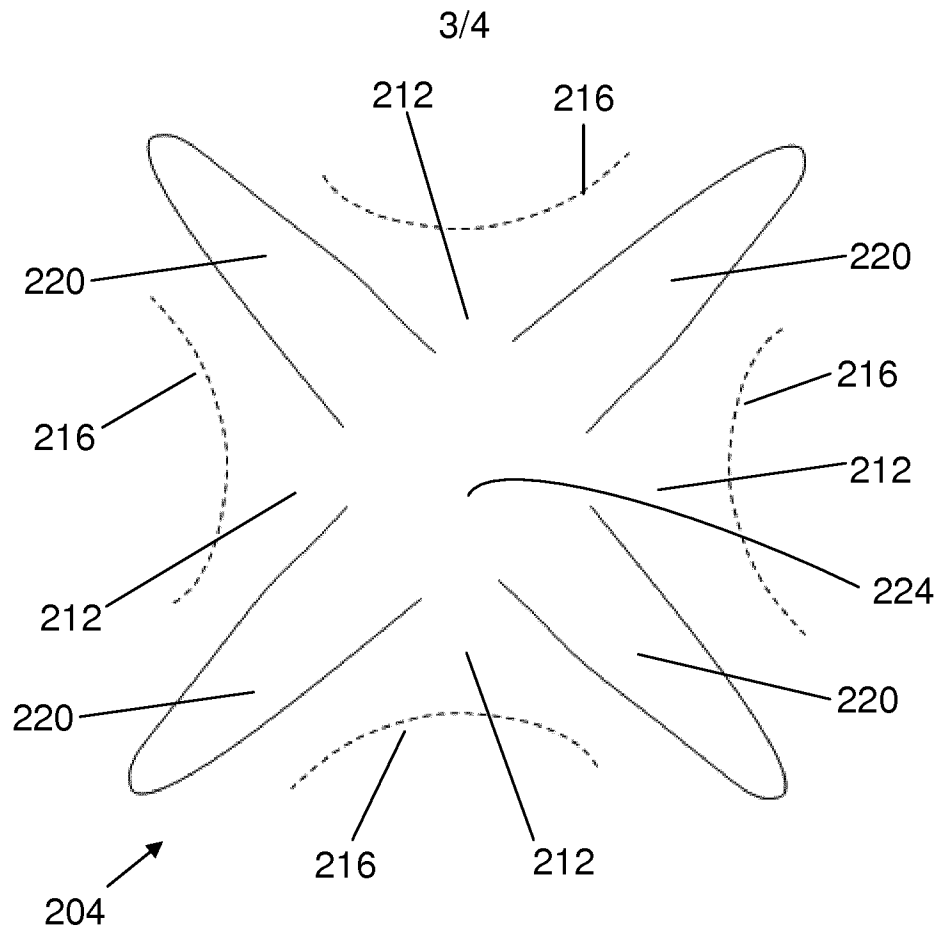


Figure 3A

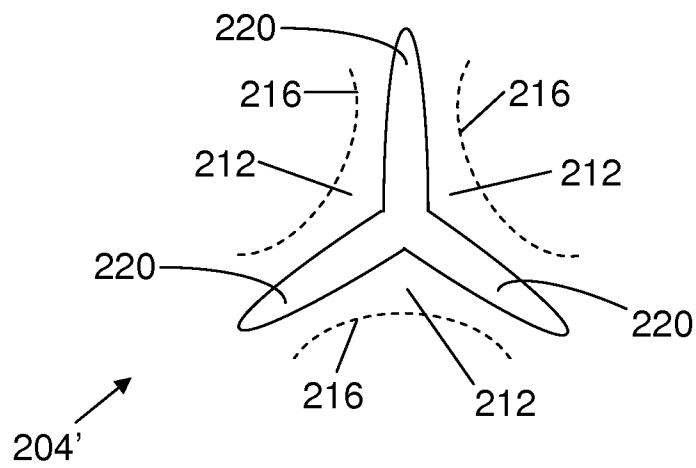


Figure 3B

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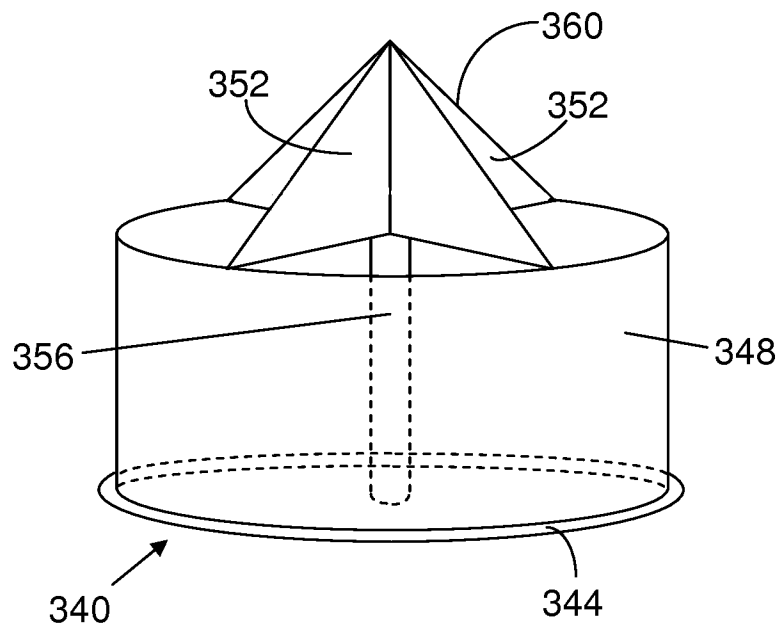


Figure 4A

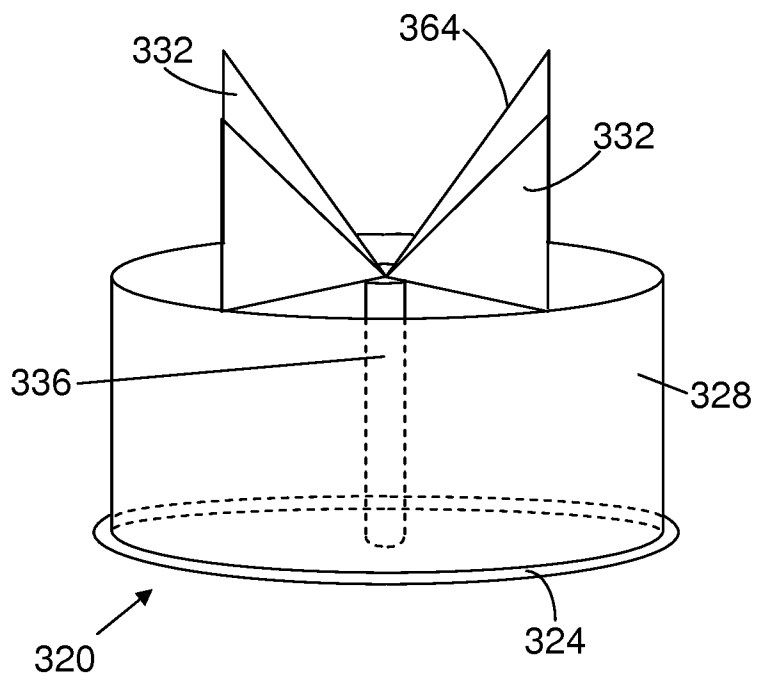


Figure 4B

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/065308

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D5/74 B65D5/06
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 577 867 A1 (PROCTER & GAMBLE [US]) 12 January 1994 (1994-01-12) the whole document -----	1-11
A	EP 1 088 764 A1 (TETRA LAVAL HOLDINGS & FINANCE [CH]) 4 April 2001 (2001-04-04) the whole document -----	1-11
A	WO 2015/079416 A1 (IPI SRL [IT]) 4 June 2015 (2015-06-04) the whole document -----	1-11
A	WO 2011/020634 A1 (TETRA LAVAL HOLDINGS & FINANCE [CH]; BENKOE GABOR [SE]; SORBARA ANGELO) 24 February 2011 (2011-02-24) cited in the application the whole document -----	1-11



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

14 August 2017

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0577867	A1	12-01-1994	AT 133386 T 15-02-1996
		DE 69207897 D1 07-03-1996	
		DE 69207897 T2 05-09-1996	
		DK 0577867 T3 06-05-1996	
		EP 0577867 A1 12-01-1994	
		ES 2082284 T3 16-03-1996	
		GR 3018785 T3 30-04-1996	
EP 1088764	A1	04-04-2001	AR 025922 A1 18-12-2002
		AT 272004 T 15-08-2004	
		BR 0004583 A 29-05-2001	
		CN 1290638 A 11-04-2001	
		DE 69918993 D1 02-09-2004	
		DE 69918993 T2 11-08-2005	
		DK 1088764 T3 15-11-2004	
		EP 1088764 A1 04-04-2001	
		ES 2224589 T3 01-03-2005	
		HK 1036960 A1 10-03-2006	
		JP 2001106249 A 17-04-2001	
		MX PA00008523 A 06-08-2002	
		PT 1088764 E 29-10-2004	
		TW 474883 B 01-02-2002	
		US 6398075 B1 04-06-2002	
WO 2015079416	A1	04-06-2015	CN 105939938 A 14-09-2016
		EP 3074317 A1 05-10-2016	
		WO 2015079416 A1 04-06-2015	
WO 2011020634	A1	24-02-2011	AR 077932 A1 05-10-2011
		AT 554018 T 15-05-2012	
		AU 2010285194 A1 08-03-2012	
		AU 2014203492 A1 17-07-2014	
		BR 112012003466 A2 01-03-2016	
		CN 102481998 A 30-05-2012	
		EP 2287082 A1 23-02-2011	
		EP 2467302 A1 27-06-2012	
		EP 2623430 A1 07-08-2013	
		ES 2385859 T3 01-08-2012	
		ES 2432993 T3 05-12-2013	
		JP 6006115 B2 12-10-2016	
		JP 2013502349 A 24-01-2013	
		JP 2015171917 A 01-10-2015	
		KR 20120060846 A 12-06-2012	
		PT 2287082 E 18-06-2012	
		RU 2012110225 A 27-09-2013	
		RU 2014151786 A 10-07-2016	
		UA 108080 C2 25-03-2015	
		UA 112101 C2 25-07-2016	
		US 2012138634 A1 07-06-2012	
		US 2017021959 A1 26-01-2017	
		WO 2011020634 A1 24-02-2011	
		ZA 201201142 B 29-05-2013	