

(19) **DANMARK**



Patent- og
Varemærkestyrelsen

(12)

Oversættelse af europæisk patentskrift

(10) **DK/EP 4043356 T3**

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- (51) Int.Cl.: **B 65 D 1/18 (2006.01)** **B 65 D 1/48 (2006.01)** **B 65 D 25/34 (2006.01)**
B 65 D 43/02 (2006.01) **B 65 D 43/16 (2006.01)** **B 65 D 75/22 (2006.01)**
- (45) Oversættelsen bekendtgjort den: **2024-01-02**
- (80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2023-11-29**
- (86) Europæisk ansøgning nr.: **22155043.7**
- (86) Europæisk indleveringsdag: **2022-02-03**
- (87) Den europæiske ansøgnings publiceringsdag: **2022-08-17**
- (30) Prioritet: **2021-02-12 FR 2101346**
- (84) Designerede stater: **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**
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- (54) Benævnelse: **DOBBELTMATERIALEEMBALLAGE, FREMSTILLET UD FRA PLASTMATERIALE OG PAP ELLER ET ANDET BIOBASERET MATERIALE, MED LÅG**
- (56) Fremdragne publikationer:
EP-A1- 0 816 239
WO-A1-79/00409
FR-A1- 2 801 286
GB-A- 1 264 811
US-A1- 2017 166 363

BI-MATERIAL PACKAGING MADE FROM PLASTIC AND CARDBOARD OR ANOTHER BIO-SOURCED MATERIAL WITH COVER

Description

The present invention relates to the field of packaging, and more particularly to
5 trays and boxes, in particular intended to contain food. These packagings have a
container offering an internal space delimited by a base and lateral sides, they are
generally manufactured from plastic material, for example by thermoforming. In the
context of the invention, they are bi-material with an exterior covering made of
cardboard material and they comprise one closure means for each lid having a rib
10 interlocking in a channel of the peripheral rim of the container.

As part of the French and European strategy for reducing plastic in packaging, it is
sought to reduce the amount of plastic used in the manufacture of trays, boxes
and other containers. This is in particular the reason for the use of cardboard or
bio-sourced external coatings specific to the packaging of the invention. One of
15 their functions is to reinforce the rigidity of the packaging, and they therefore make
it possible and if need be to thin the thickness of the plastic walls and therefore to
minimize the amount of plastic that is used and needs recycling. In the remainder
of the text, the term "cardboard materials" will generally be mentioned, but bio-
sourced materials, which in this case are technical equivalents, are included in the
20 invention.

The solutions comprising a cardboard structure are less easy to manufacture, and
pose multiple problems, for example linked to the automation of the assembly lines
and to the production rates, since two materials with very different properties must
be combined. This is particularly the case when, as in the packaging configuration
25 of the invention, the part of the cardboard type is not bonded to the container
made of plastic - a solution which makes their separation and consequently their
recycling much more difficult - but is held by mechanical connection means
resulting from the shape of the plastic packaging. Such a configuration makes the
two materials easily separable manually, but in particular complicates the

manufacturing. Document GB 1 264 811 A shows a molded plastic container attached to a cardboard lid carrying printed matter.

The cardboard covering, in the form of a board surrounding at least the sides of the container, is thus retained in particular by wedging between the
5 aforementioned peripheral channel and the walls of the container, and the thermoforming of the plastic must be made in consideration of the fact that the cardboard covering is already in place in the mold. This pre-positioning and configuration of the cardboard part have impacts in manufacturing, for example in the corner regions when the packagings are polygonal. It must be taken into
10 account in the design of the packaging shape.

Furthermore, the cardboard covering placed in the mold is capable of reacting with actual thermoforming operations, which involve deformations of a plastic sheet. These deformations, which occur in multiple directions, generate forces and stresses that also apply on the cardboard type material, which must however be
15 held during the entire manufacturing in the shape that it is intended to give it relative to the molded plastic. This shape is in particular defined by the positioning given to the cardboard covering when initially positioned in the mold.

The interdependence between the manufacturing requirements and the structure of the bi-material packaging leads to an invention covering several objects: the
20 packaging itself, which has characteristics resulting from the manufacturing constraints mentioned previously, a particular method for manufacturing such packagings suitable for the existence of two materials, and finally certain aspects of the thermoforming mold making it possible to obtain these bi-material packagings.

25 The product, in sum, is a package in particular able to contain food, comprising a container made of plastic material provided with a polygonal base and a continuous peripheral wall comprising a plurality of planar faces. The upper edge of said peripheral wall delimits an opening and is provided with a polygonal peripheral rim extending radially outwards. This rim is provided with a channel able
30 to cooperate with a peripheral ring of a lid by interlocking the rib into said channel.

It further comprises an exterior covering made of cardboard or other bio-sourced material fitting at least in contact with the faces of the container and fixed between the channel and the part of said faces adjacent to the edge.

According to the invention, as disclosed in claim 1, the polygonal rib and the
5 channel match in shape in order to resiliently interlock by means of friction contact of at least one portion of their walls, except at the corners of the rib of the lid which have a free space in their inner wall, eliminating the contact with the inner wall of the channel in each corner region.

The free spaces made in the male rib at the corners or angles of the lid prevent
10 any contact and aim to eliminate any possibility of collision between them in the corner areas of the rib and the channel. These clearances are necessary for the packaging to operate correctly, since they guarantee that the operations of opening and closing the lid on the container can be carried out without obstacles.

In practice, when a cardboard covering with a polygonal base is preformed in the
15 mold, for example in the case of right angles in rectangular packagings, a sort of angular flash or tip at the corner ridge is formed in the corners where the lateral edges of the adjacent panels of the cardboard covering meet. The plastic sheet during thermoforming has trouble fitting onto this ridge over the height of the cardboard covering, but the existence of a well-marked angle may lead to the
20 formation of folds of the plastic sheet, which do not fit perfectly to the cardboard covering in these areas. In this case, if the contour of the male rib of the lid was molded to correspond to the theoretical contour of the female channel, as on the rest of the perimeter of the packaging, there would be a collision due to the obstacles formed by these folds, and the lid would be unable to close correctly.

25 This is why the corner areas of the male rib of the lid have these recesses or free spaces: in reality they make it possible to absorb the potential thermoforming defects in the corners of the box, or simply to take into account the extra thicknesses resulting from the corner configuration. According to one possibility, each recess is rounded and therefore creates a reserve space opposite each
30 surface of a corner area of the inner wall of the channel.

Furthermore, in the packaging according to the invention, the channel may have, in each straight segment between the corner regions, at least one bulge which protrudes from its inner wall, projects into the volume of the channel and fits into a correspondingly shaped recess made in the portion of the rib provided to interlock
5 therewith.

These bulges result as will be seen in more detail later on, from a configuration of the mold specifically designed to prevent the cardboard covering from folding during the thermoforming of the plastic. Thus, in particular during the suction resulting from producing a negative pressure in a part of the mold, the plastic
10 sheet deforms and exerts a force on the cardboard covering when the peripheral channel is formed in the rim of the container. The channel is in fact molded between the outside of the parts of the walls of the cardboard covering which extend beyond a cavity of the mold and the peripheral edge of said mold. The stresses applied to the cardboard covering are in fact multiple, since in addition to
15 the suction on one side of the mold, there is a positive pressure obtained by blowing compressed air on the other side.

According to one possibility, the bulge takes the form of a ramp which starts in the edge of the inner wall of the channel and extends to the base thereof, where the projection into the volume of the channel is at a maximum. It should be noted that
20 the use of a mold configuration that creates these bulges makes it possible to use a cardboard of smaller thickness, since it is provided to oppose the folding. The use of a substantially thicker cardboard covering could accommodate a mold without this specific configuration, which will be detailed below.

The second subject matter of the invention, as disclosed in claim 5, relates to the
25 method for manufacturing the packagings described above, and it comprises essentially the following steps:

- inserting the covering made of cardboard or other bio-sourced material into the cavity of a thermoforming mold comprising a recess at least partially corresponding to the shape of the container;

- positioning said covering made of cardboard or other bio-sourced material such that its peripheral upper edge protrudes from the recess by a distance equal to the depth of the channel;
- conveying a plastics film as a continuous web between the cavity and a
5 counter-mold of a thermoforming mold;
- in order to close the thermoforming mold, moving said cavity and the counter-mold towards one another and the plastics film;
- molding the plastics film after closing the cavity and the counter-mold, by moving at least one molding core from the counter-mold, and by simultaneously
10 producing a positive pressure at the counter-mold and a negative pressure at the cavity.

During the manufacturing process, the plastic sheet is in particular molded around an upper edge of the cardboard covering, which is fastened to the plastic packaging by pinching between the outer channel and the upper part of the faces
15 of the container. The upper edge of the cardboard covering is therefore used, in the invention, as an inner wall of the mold which gives a part of its shape to the plastic sheet during thermoforming. The heated plastic sheet is in fact deformed, during molding, around said peripheral upper edge of the cardboard covering, by the combined action in the mold of the movement of a movable core, of a positive
20 pressure on one side and of a negative pressure on the other side. During the operation, the plastic sheet is consequently molded on either side of a peripheral upper strip of the cardboard covering, which strip projects beyond the recess in the cavity and that the thermoformed sheet grips and pinches, consequently fastening it to the plastic packaging.

25 In practice, the rim of the recess of the cavity of the thermoforming mold comprises teeth distributed over its periphery, which teeth protrude from the recess by a distance equal to the depth of the channel, and of which teeth a first face is in the extension of the wall of the recess that it overhangs, and a second face opposite the first face is ramp-shaped starting from the upper ridge of the

tooth. The tooth consequently has a triangular cross-section of maximum thickness at its base, located at said rim of the recess.

These teeth make it possible, as mentioned, to prevent the strip of the cardboard covering that protrudes from the recess from folding during thermoforming of the plastic sheet. In fact, the plastic sheet exerts a non-negligible force on the cardboard when it fills the peripheral space between the upper edge of the cardboard that projects beyond the recess on the one hand, and the peripheral vertical edge of the mold on the other hand, at the time the channel is created. This force is actually multiple, since it is also caused by suction due to the negative pressure of the thermoforming mold on the cavity side and by the injection of compressed air under positive pressure on the other side. The existence of these teeth makes it possible to hold the upper edge of the cardboard covering fixed, a condition that would require, in the absence of teeth, the use of a cardboard that is more rigid and/or of greater thickness.

Further objects and advantages of the present invention will become apparent throughout the following description relating to embodiments which are provided only as indicative and non-limiting examples.

The understanding of this description will also be facilitated by referring to the appended drawings, which explain the features of the packaging of the invention and of its manufacture, and wherein:

Figure 1 shows a perspective view of a packaging according to the invention, with the lid closed;

Figure 2 shows, in perspective view, the packaging of the preceding figure with the lid open;

Figure 3 shows a cross-section of the same packaging;

Figure 4 shows an enlarged detail, at the lid/container interlock circled in the preceding figure;

Figure 5 shows a section C-C of Figure 3;

Figure 6 shows an enlargement of a corner of Figure 5;

Figure 7 shows a sectional view of a corner of the closed packaging;

Figure 8 shows a part of a thermoforming mold, comprising a female cavity with recesses for the container and the lid;

5 Figure 9 shows an enlarged detail, at the corner of the recess for the container;

Figure 10 repeats Figure 8 with a cardboard covering positioned in the cavity of the mold of the container; and

Figure 11 shows an enlargement equivalent to that of Figure 9, with the cavity of the mold of the container coated with the cardboard covering.

10 With reference first to Figures 1 to 7, the packaging of the invention comprises a container 1 articulated to a lid 2, the container 1 having a base 4, in this case a rectangular one, and four faces 5 forming a continuous peripheral wall and whose upper edge 6 extends radially outwards by a rim 7 provided with a peripheral channel 8. A cardboard covering 40 embraces the outer faces on the one hand of
15 the base 4 and on the other hand the side faces 5. The upper edge of the cardboard covering 40 is crimped between the channel 8 and an upper part - a strip - of the lateral faces 5.

The hinged lid 2 is able to be resiliently closed on the container 1, using homologous profiles for the channel 8 and a rib 21 of the lid 2, which clip together,
20 one being a female profile (the channel 8) and the other a male profile (the rib 21) in the sense of this closure system. This is what is more particularly apparent in the sectional view of Figure 3 and in the enlargement of Figure 4. The lid 2 and the container 1 are, in this configuration, connected by a hinge 3 formed of a single piece with these two volumes, obtained by the same thermoforming operation of
25 one plastic sheet.

On the entire periphery of the packaging, the cardboard covering 40 is therefore wedged between the channel 8 and the upper parts of the faces 5 of the container 1 (see in particular in Figure 4), which forms between them a receiving slot of

substantially constant thickness, which allows effective mechanical peripheral retention over the entire periphery of the container 1. However, this fastening mode prevents the panels of the cardboard covering 40 from covering the faces 5 having portions that overlap, at the corners, since there is only room for a single cardboard thickness. This pinching solution has multiple advantages, including that of eliminating any need for use of chemically polluting adhesive material (glue) and reducing the amount of cardboard to strictly necessary dimensions. At angles, the adjacent edges of the side panels of the cardboard covering 40 are therefore in theory in linear contact along a ridge 41.

At this inclined contact ridge 41, the thermoforming of the plastic sheet may create a few difficulties, insofar as the plastic does not necessarily very closely follow the flash formed by the inclined terminal edges of the two adjacent panels of the cardboard covering 40 that join in this line, and undesirable folds may be formed. One of the aspects of the invention makes it possible to avoid an inability to close the lid due to the existence of an extra thickness causing a collision between the rib 21 and the channel 8 in this zone, which would not occur if the rib 21 at all points had a male profile mating the female profile of the channel 8 for the resilient friction closure of the snap-fitting type which is implemented in the invention.

In the cross-section C-C appearing in Figure 5, as defined in Figure 3, showing the position of the rib 21 inside the channel 8, examining the corners (see Figure 5 and in particular in Figure 6 which shows an enlargement of the corner circled in Figure 5) shows that there is a free space 22 at the junction 41 of the edges of the lateral panels of the cardboard covering 40. The four corners of the rib 21 have this free space 22, giving the closure system an additional free space in the angles to prevent excessive friction at best, and obstacles that are prohibitive for closing at worst, in the event that folds or extra thicknesses are created during thermoforming.

The result appears in the sectional view of Figure 7, taken at a corner: there is a gap between the inner wall of the free space 22 and the outer tip of the flash formed at the upper part of the joining ridge between two adjacent lateral edges of the panels of the cardboard covering 40.

Another feature of the invention appears in the preceding figures: the channel 8 has, in the inner wall (proximal to the working volume of the container 1), each rectilinear part separating the angles, the bulges 81 being in the volume of the channel 8 (see in particular in Figure 2). These bulges 81 fit in practice in

5 corresponding recesses 23 made in the rectilinear portions of the rib 21 at equivalent locations. These reliefs actually result from a feature linked to the manufacturing, namely the existence of protuberances which are placed in the thermoforming mold to prevent the upper parts of the cardboard covering 40 from bending during the thermoforming, as mentioned above.

10 One of the two parts of the thermoforming mold is shown in the following Figures 8 to 11. This is the mold part 100 comprising the female cavity for the container 1 and the lid 2. A first recess 101 makes it possible to thermoform the container 1, and a second recess 102 makes it possible to mold the lid 2. A strip of plastic film (not shown) is therefore positioned, at the time of manufacture, above the double-
15 recess cavity 101, 102. The female part 100 of the mold is moved, in a conventional manner, toward the plastic film and toward the mold part comprising male cores (not shown), which is placed above the film and also moves in the direction opposite the direction of the strip of film and the recesses 101, 102 of the part 100. Thermoforming results from their interaction, and makes it possible to
20 deform the heated plastic strip to the shape given by said molds, so as to obtain the packaging of the preceding figures.

The cavity 100 for molding the container 1 comprises, in the edging, a peripheral shoulder 110 (see Figure 8 and 9) making it possible, as will be seen below, to mold the channel 8. The enlargement of Figure 9 shows even more clearly, and
25 highlights teeth 111 distributed along the peripheral edge joining the recess 101 and said shoulder 110.

These teeth 111 have a first face which is in the extension of the walls of the recess 101, and a second face which connects their upper edge to the shoulder 110. The base of the teeth 111 constitutes their thickest part, the cross-section of
30 the teeth 111 being of triangular shape. They therefore mold the bulges 81 of the channels 8 according to a corresponding volume: the bulge 81 substantially takes

the shape of a ramp originating in the edge of the inner wall of the channel 8, which corresponds in the mold to the upper ridge of the strip 44 of the cardboard covering 40 and to the upper ridge of the tooth 111, the ramp then extending as far as the base of the channel, at the base of the tooth 111, where the projection into
5 the volume of the channel 8 is at a maximum.

- Figures 10 and 11 are identical to the two preceding ones, except that the cardboard covering 40 is positioned in the cavity 101, and the plastic sheet is thermoformed. In this case, as is particularly clearly apparent in Figure 11, the upper part of said cardboard covering 40 protrudes from the cavity 101: an upper
10 peripheral strip 44 of the cardboard covering 40 makes a solid wall between the inner volume of the recess 101 and the shoulder 110, resulting in insulating a peripheral channel 112 making it possible to mold the channel 8. This strip 44 rests on the teeth 111 distributed at the periphery of the recess 101, and which protrudes therefrom by a height equal to said residual strip 44.
- 15 In practice, they prevent the cardboard from folding toward the flat surface of the shoulder 110, due to the forces in action during molding, and which are as mentioned of several kinds: the forces due to the plastic film which deforms, a negative pressure at the cavities of the mold 100, which sucks the plastic sheet, and finally a positive pressure at the upper counter-mold, which pushes said sheet
20 into the cavities 101, 102 and into the peripheral channel 112. In the absence of teeth 111, these forces, if not using thick cardboard, might fold the upper part forming the peripheral strip 44 of the cardboard covering 40 against the shoulder, and the channel 8 could not be molded. Their presence creates the bulges 81 in the channel 8 thermoformed from the plastic sheet.
- 25 At the edge of the recess 102 of the lid, a peripheral bead 120 is used to mold the rib 21. It comprises, at locations calculated to correspond to those of the teeth 111, notches 121 making it possible to mold the recesses 23 of the inner wall of the rib 21 of the lid 2, intended to cooperate with the bulges 81 of the channel 8, that they are in practice housed in the state of closing the lid 2 on the container 1.

The example shapes appearing in the figures are not exhaustive of the invention, which also encompasses variants, in particular but not exclusively for the channel 8 and its possible sections (same as for the rib 21), for the shape and the geometric volume of the container 1 and its lid 2, and where appropriate for the
5 shape and the number of corresponding bulges 81 and recesses 23, the free spaces 22, the teeth 111, etc.]

PATENTKRAV

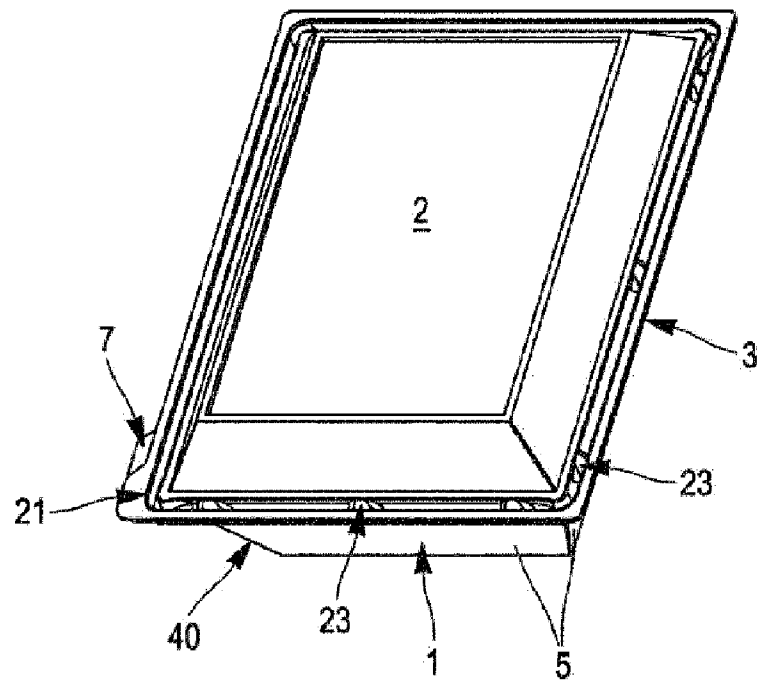
1. Emballage, der især er egnet til at indeholde fødevarer, hvilken emballage omfatter en beholder (1), der er fremstillet af plastmateriale og er hængslet til et låg (2), hvor beholderen (1) er forsynet med en polygonal bund (4) og en
5 kontinuerlig perifer væg, der omfatter en flerhed af plane flader (5), hvor den øvre kant (6) af den perifere væg afgrænser en åbning og er forsynet med en polygonal perifer rand (7), der strækker sig radialt udad og er forsynet med en kanal (8), der er egnet til at samvirke med en perifer ribbe (21) af låget (2) ved at sammenlåse ribben (21) i kanalen (8), og hvor emballagen også omfatter en ydre
10 beklædning (40), der er fremstillet af et papmateriale eller et andet biobaseret materiale, mindst passer til kontakten med beholderens (1) flader (5) og er fastgjort mellem kanalen (8) og den del af fladerne (5), der befinder sig tæt på kanten (6), hvor den polygonale ribbe (21) og kanalen (8) passer sammen i form med henblik på elastisk sammenlåsning ved hjælp af friktionskontakt med mindst
15 én del af væggene, undtagen i hjørnerne af ribben (21) i låget (2), som har et frirum (22) i indervæggen, hvilket således eliminerer kontakt med kanalens (8) indervæg i hvert hjørneområde.
2. Emballage, der er egnet til at indeholde fødevarer, ifølge krav 1,
kendetegnet ved, at frirummet (22) er afrundet.
- 20 3. Emballage, der er egnet til at indeholde fødevarer, ifølge et af de foregående krav, **kendetegnet ved, at** kanalen (8), i hvert lige segment mellem hjørneområderne, har mindst én udbuling (81), der rager frem fra indervæggen, rager ud i kanalens (8) volumen og passer ind i en tilsvarende formet reces (23), der er udført i den del af ribben (21), der er tilvejebragt med henblik på
25 sammenlåsning dermed.
4. Emballage, der er egnet til at indeholde fødevarer, ifølge det foregående krav, **kendetegnet ved, at** udbulingen (81) tager form af en rampe, der begynder i kanten af kanalens (8) indervæg og strækker sig til bunden deraf, hvor fremspringet ind i kanalens (8) volumen er maksimal.

5. Fremgangsmåde til fremstilling af emballage, der omfatter en beholder og et låg ifølge de foregående krav, **kendetegnet ved, at** fremgangsmåden omfatter følgende trin:

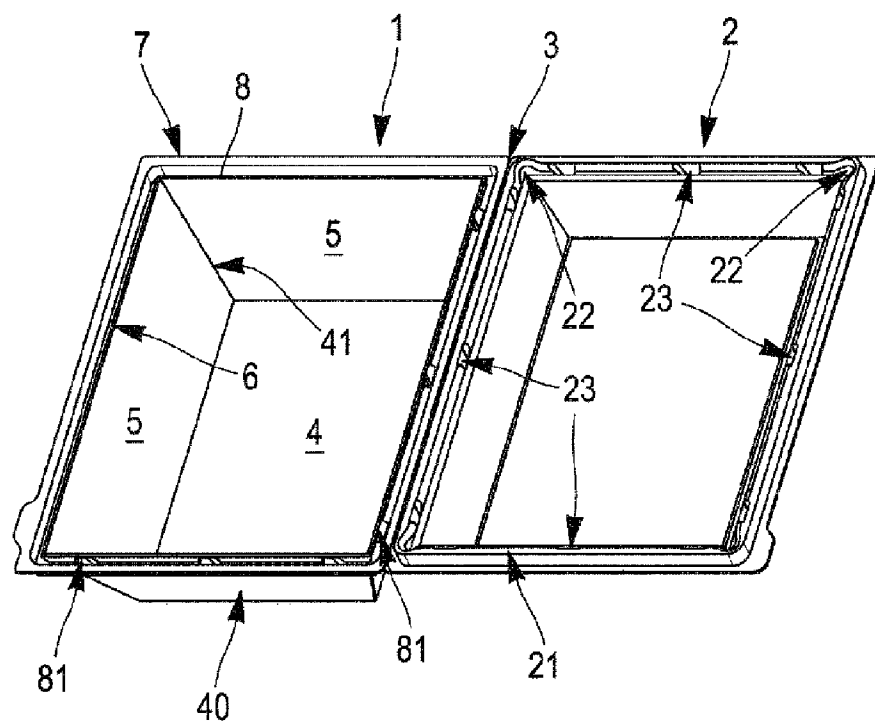
- indsættelse af beklædningen (40), der er fremstillet af pap eller et andet biobaseret materiale, i formhulrummet (100) i en termoformningsform, der omfatter en reces (101), der mindst delvist svarer til beholderens (1) form;
- positionering af beklædningen (40), der er fremstillet af pap eller et andet biobaseret materiale, således, at den perifere øvre kant rager frem fra recessen (101) i en afstand, der er lig med kanalens (8) dybde;
- 10 - fremføring af en plastfilm som en endeløs bane mellem formhulrummet (100) og en modform til en termoformningsform;
- forskydning, med henblik på at lukke termoformningsformen, af formhulrummet (100) og modformen hen imod hinanden og plastfilmen;
- formning af plastfilmen, efter lukning af formhulrummet (100) og modformen, ved forskydning af mindst én formkerne fra modformen og ved 15 samtidig frembringelse af et overtryk ved modformen og et undertryk ved formhulrummet (100).

6. Termoformningsformhulrum til implementering af fremgangsmåden ifølge det foregående krav, **kendetegnet ved, at** randen af recessen (101) i formhulrummet (100) i termoformningsformen omfatter tænder (111), der er fordelt 20 over periferien, hvilke tænder rager frem fra recessen (101) i en afstand, der er lig med kanalens (8) dybde, og af hvilke tænder en første flade er i forlængelse af den væg af recessen (101), som den hænger ud over, og en anden flade modsat den første flade er rampeformet begyndende fra den øvre kant af tanden (111).

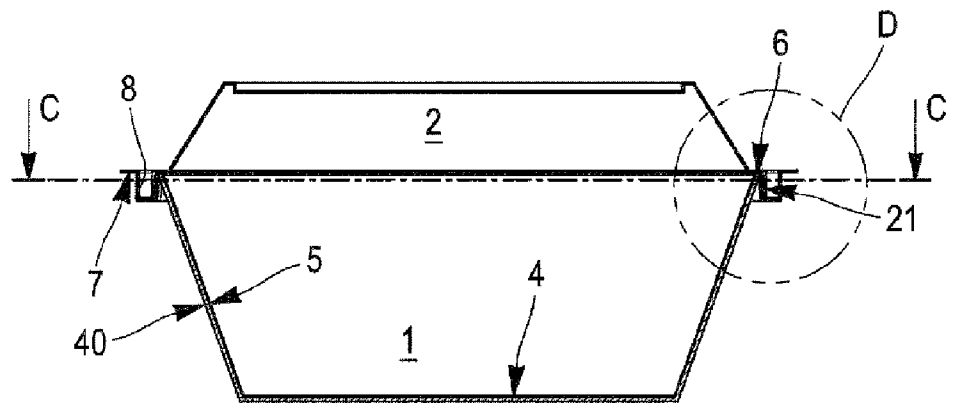
Fig. 1]



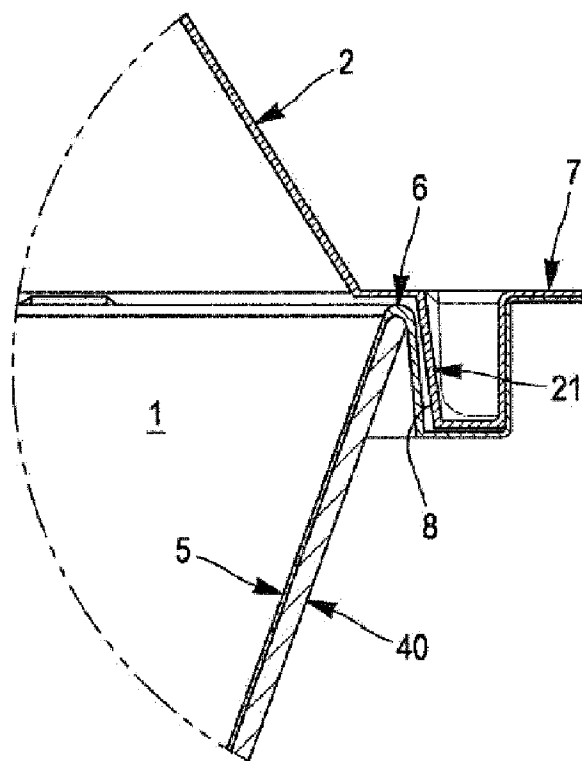
[Fig. 2]



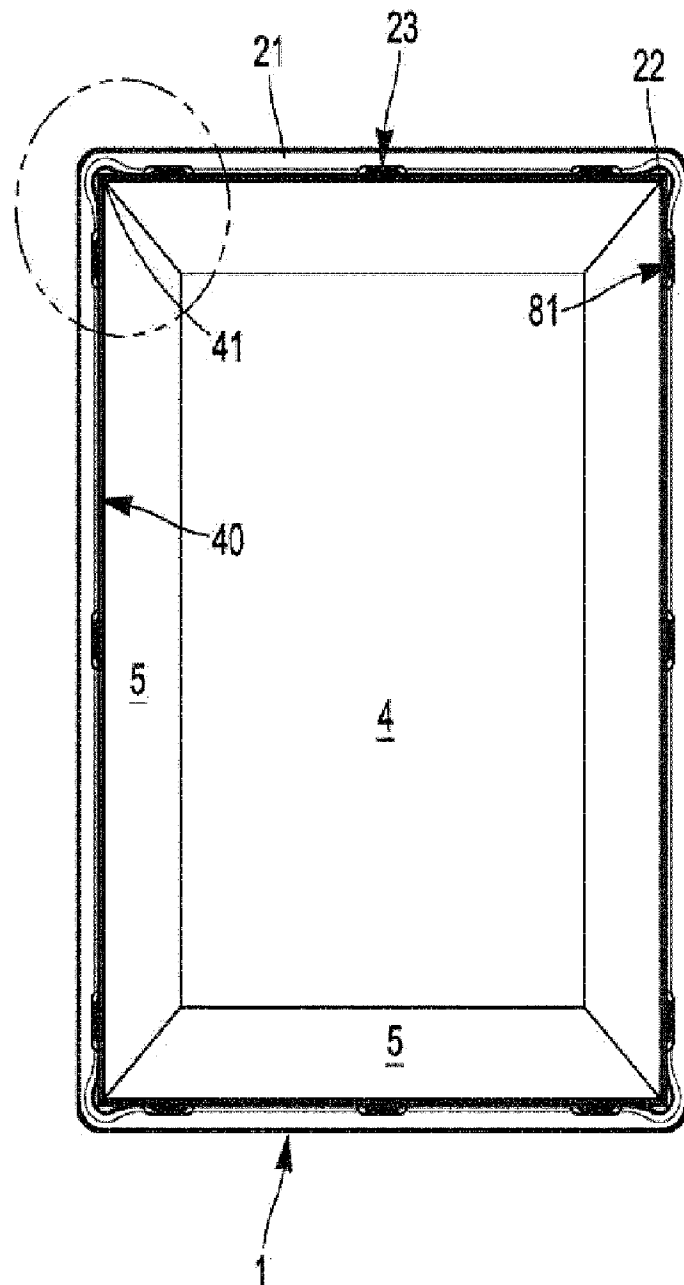
[Fig. 3]



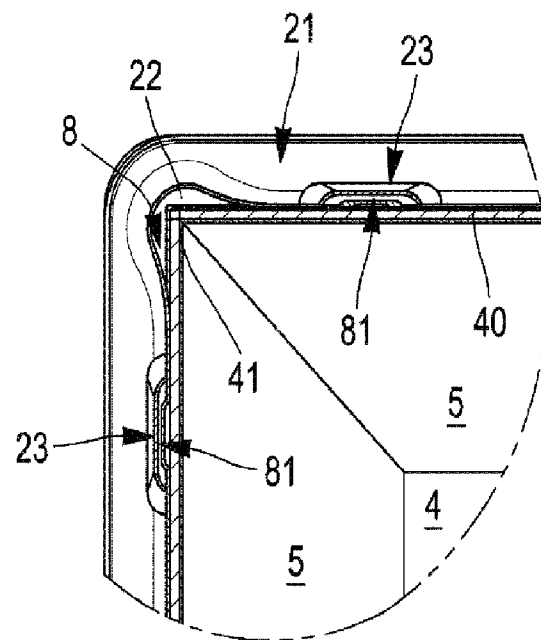
[Fig. 4]



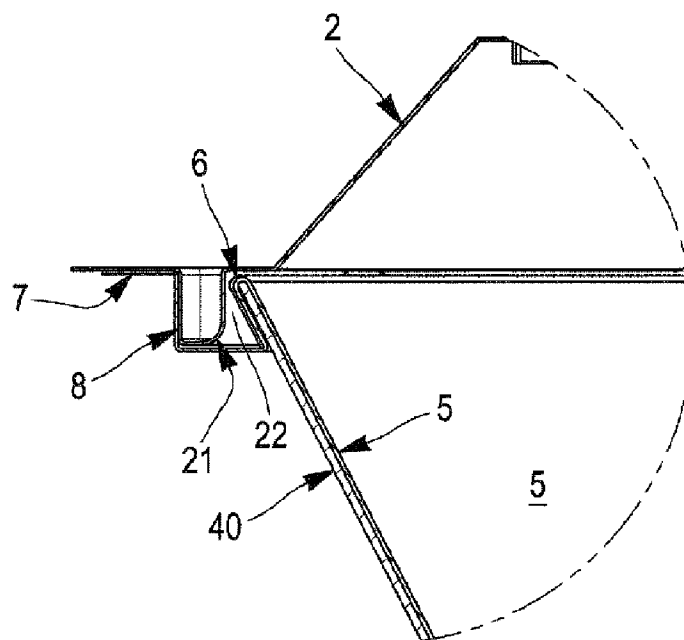
[Fig. 5]



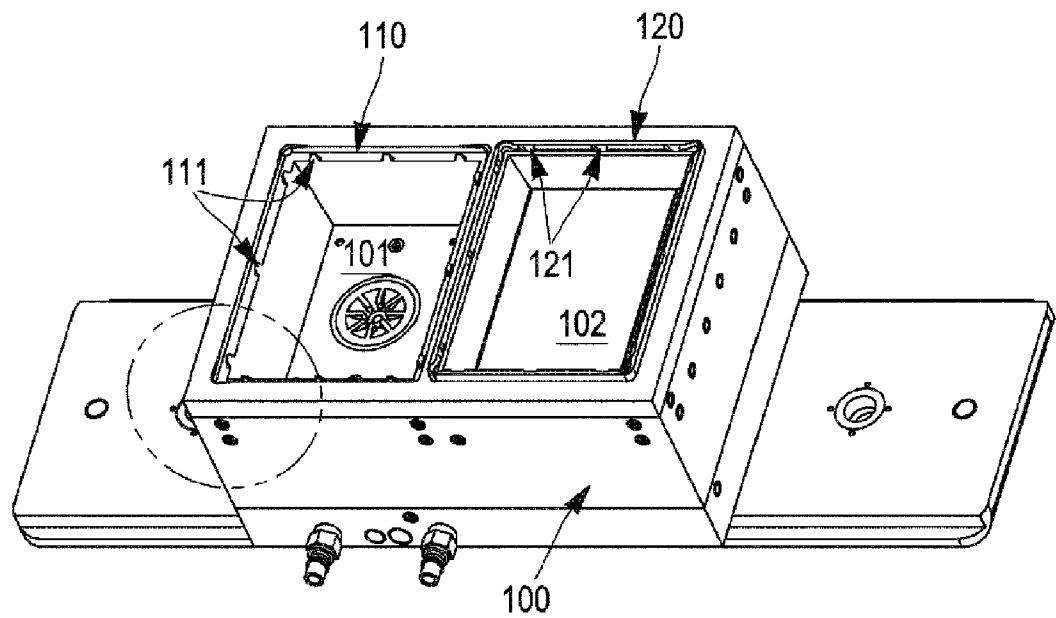
[Fig. 6]



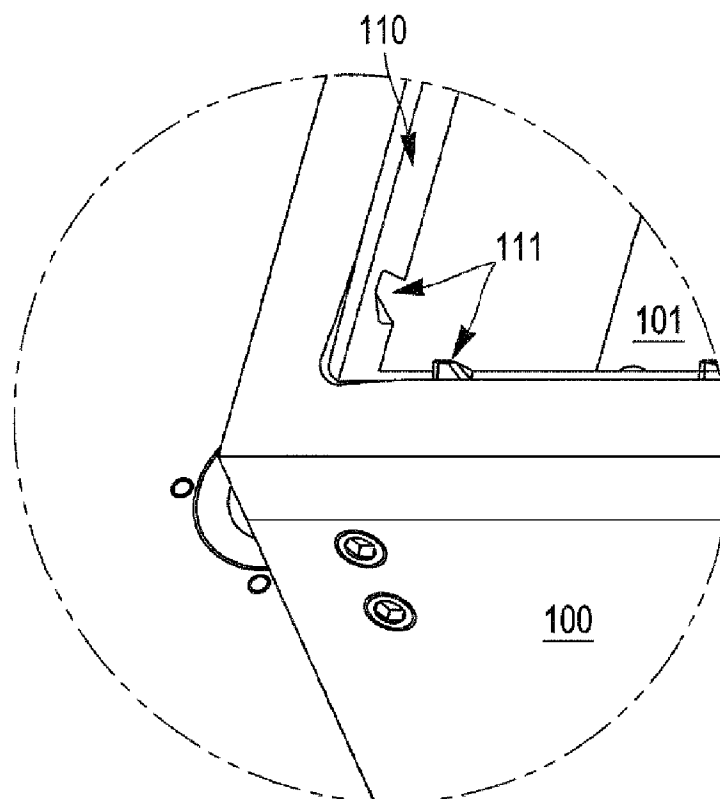
[Fig. 7]



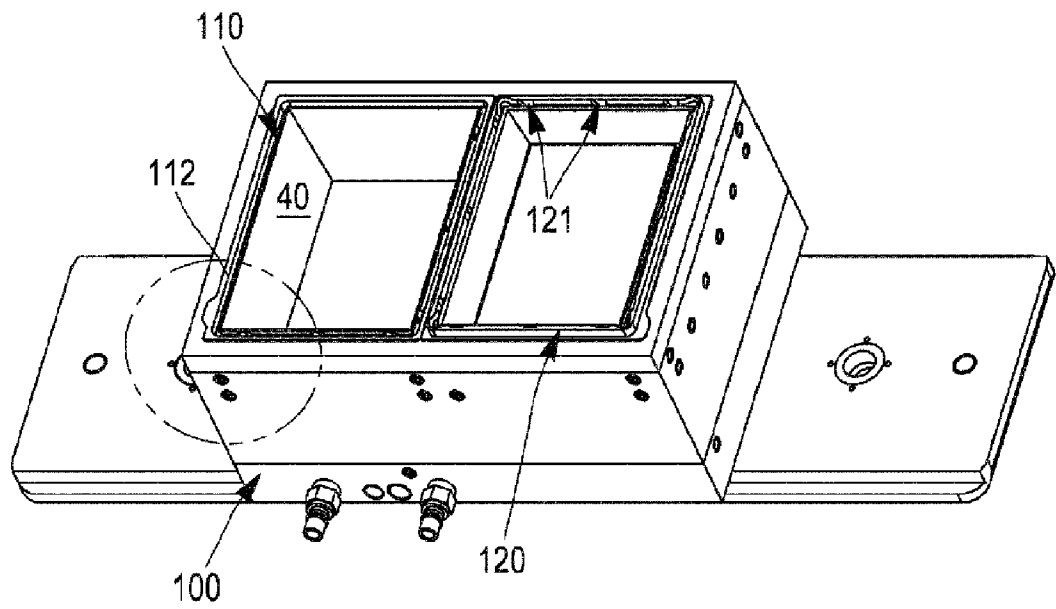
[Fig. 8]



[Fig. 9]



[Fig. 10]



[Fig. 11]

