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(71) Applicant: **Verstappen Verpakkingen B.V.**
5961 NP Horst (NL)

(72) Inventor: **Verstappen, Johannes Franciscus**
5961 NP HORST (NL)

(74) Representative: **EP&C**
P.O. Box 3241
2280 GE Rijswijk (NL)

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(54) **A plastic container for packaging food items, moulds for fabricating the same, and a method for fabricating the same**

(57) A plastic polygonal container for packaging food items comprising a box (1) and a lid (13). The box (1) is nestable with another box. Each corner of the box sidewalls is provided with a protrusion and a recess (11), wherein the protrusion (9) extends away from the cavity in order to act as a space member thereby setting the extent to which one box can be introduced into another box during nesting, wherein the recess (11) is arranged opposite to and corresponding to the respective protrusion (9). A flange (21) of the lid and a flange (25) of the box are weldable to each in one orientation and can be snapped together in another, upside-down orientation.

FIG 5

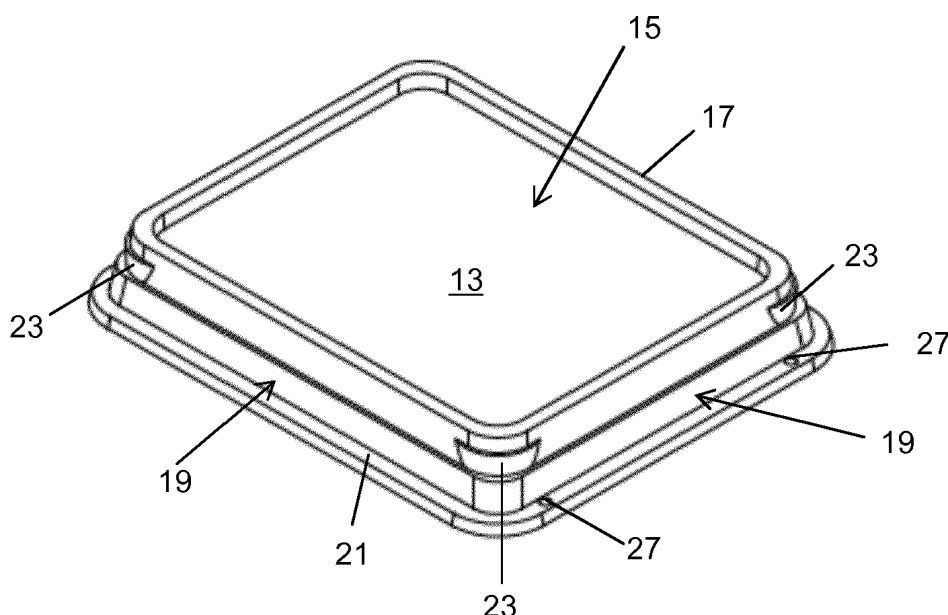


FIG 6

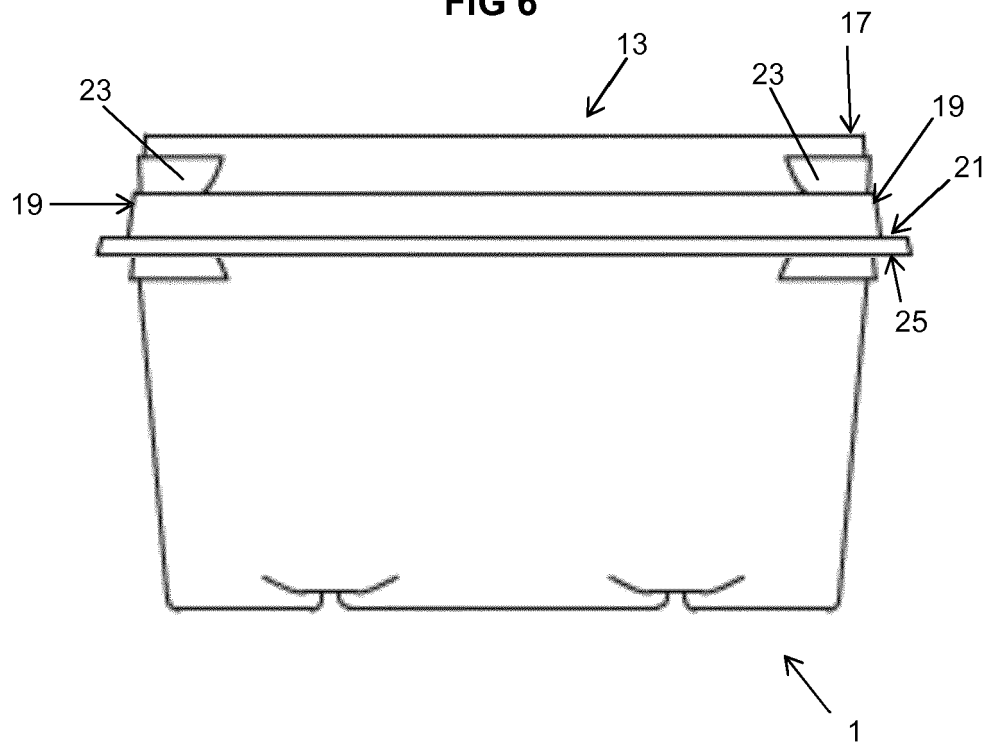
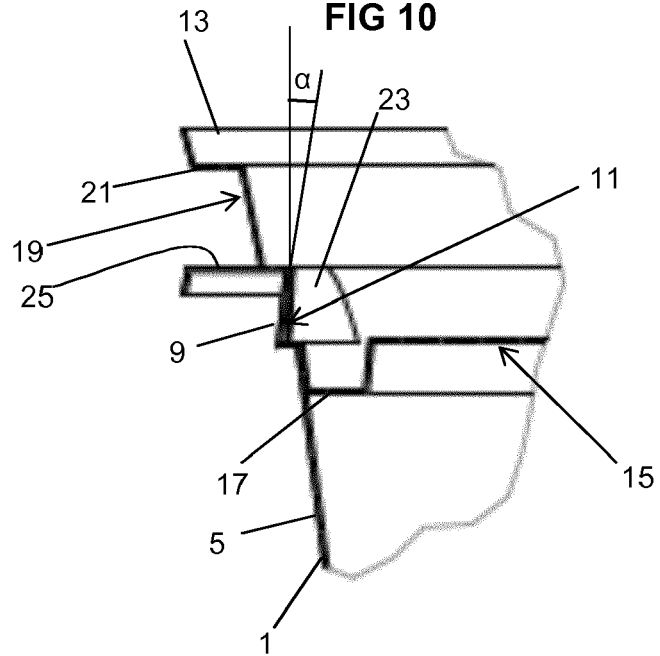


FIG 10



Description

[0001] The invention relates to a plastic container for packaging food items comprising a box and a lid, a mould for forming the box, a mould for forming the lid, and a method for forming the plastic container.

[0002] Plastic containers for packaging food items are commonly used in for instance the consumer business to package food items like mushrooms, tomatoes, etc. The plastic containers are easy to fabricate, easy to use and handle, lightweight and recyclable.

[0003] The most complex feature of such plastic containers is the connection between box and lid to close off the interior cavity. When the connection is a once-only connection, simple prior art solutions exist where the box and lid are for instance welded together at particular sites such that these connections can be broken relatively easily to get access to the content of the container. However, when the lid and box need to be reclosable, so that the container can also be used as a storage box at home to store remaining food items, the connection becomes more complex. A complex connection combined with various design restraints that may be caused by the fabrication process makes the prior art connections unsatisfactory.

[0004] It is therefor an object of the invention to improve the connection between lid and box of a plastic container for packaging food items.

[0005] This object is achieved by a plastic container for packaging food items comprising a box with a bottom and sidewalls extending upwards from the bottom to form a cavity for receiving the food items, wherein the side walls define an opening with a substantially polygon shape in plan view for accessing the cavity. The container further comprises a lid to engage with the side walls to close off the cavity of the box, wherein the lid has a similar polygon shape as the opening of the box. The box is configured such that the bottom of the box can be introduced into a cavity of another box via the opening thereof for stacking purposes. Each corner of the polygon shape of the sidewalls of the box is provided with a protrusion and a recess, wherein the protrusion extends away from the cavity in order to act as a space member thereby setting the extent to which one box can be introduced into another box during stacking of the boxes, and wherein the recess is arranged opposite to and corresponding to the respective protrusion, i.e. a recess is arranged in a sidewall of the box on the cavity side of a corresponding protrusion. The lid comprises a locking member at each corner of the polygon shape of the lid, such that the locking members are associated with respective recesses in the box, wherein each locking member of the lid and the respective recess of the box are configured to engage with each other to releasably connect the lid to the box in order to close off the cavity of the box.

[0006] The present invention is based on the insight that a feature that may be present for stacking reasons can also be used for connection purposes.

[0007] The boxes and lids are usually fabricated in distinct machines, transported to a packaging site where the boxes are filled with the respective items, e.g. food items, and subsequently the lids are connected to the boxes to close off the boxes. The filled containers are then transported to eventually be sold to the end consumer. During transport from the fabrication site to the packaging site it is preferred to stack the boxes, and preferably also the lids, to keep the occupied space to a minimum which saves transport costs, but also allows to handle the boxes and lids in a batch wise manner.

[0008] For this purpose the boxes are formed such that the bottom of one box can be introduced into the cavity of another box via the opening thereof, where it is preferred that during stacking the boxes are kept at a distance from each other to prevent the boxes from sticking together and to allow persons or machines handling the boxes to easily separate the boxes from each other. The same may apply to the lids for similar reasons.

[0009] The sidewalls of the boxes of a plastic container according to the invention are therefor provided with protrusions, which protrusions act as a space member and set the extent, i.e. the maximum extent, to which one box can be introduced into another box during stacking of the boxes.

[0010] By providing corresponding recesses on the cavity side of the sidewalls, which recesses correspond to the present protrusions, these recesses can advantageously be used to connect the lid to the box. The lid according to the present invention therefor comprises locking members that are configured to engage with corresponding recesses of the box to releasably connect the lid to the box in order to close off the cavity of the box.

[0011] Such a releasable connection using a locking member and a recess may be characterized by requiring a deformation of the lid and/or box to connect the lid to the box and/or to disconnect the lid from the box. The recesses and corresponding locking members may be in frictional engagement with each other when the lid is connected to the box, e.g. such that the lid is clamped by the sidewalls of the box. Alternatively or additionally it is possible that deformation of the box or lid is only required during connecting and disconnecting and that after connecting or disconnecting no or minimal deformation is left. The connection between lid and box may be based on form-fitting. The recesses and corresponding locking members preferably have a complementary shape.

[0012] A challenge of the container according to the invention is to design the protrusions and corresponding recesses of the box and the corresponding locking members of the lid such that two functions can be performed at the same time, namely keeping the boxes at a predetermined distance from each other during stacking and allowing to connect the lid to the box, where it may be important to set the force required for connecting or disconnecting the lid to a specific narrow range. When the required force is too small, the container may open un-

desirably during transport or use, but when the force required to disconnect the lid from the box is too large it may be difficult to open the container, especially for children, elderly people and/or disabled people.

[0013] Depending on the application of the container according to the invention, the force required to connect and disconnect the lid and box may be sufficient during use at home, but may not be sufficient to prevent the disconnection of the lid from the box during transport of the container. The box and lid are therefore configured such that an alternative connection can be made between box and lid, so that the total force to open the plastic container may be larger during transport. The alternative connection is preferably a once-only connection, so that after opening the container for the first time, thereby breaking the alternative connection, the alternative connection can no longer be used and further connections between lid and box are made using the recesses of the box and the corresponding locking members of the lid.

[0014] The word 'alternative' in this context means that the connections cannot be made simultaneously and that either the lid and box are connected using the alternative connection or the lid and box are connected using the locking members and corresponding recesses.

[0015] The alternative connection according to the invention is formed by one or more welds between the box and the lid.

[0016] To facilitate welding between the box and lid, the box and lid comprise corresponding flanges at the respective perimeters thereof to engage with each other in order to allow the lid and box to be connected to each other using a weld to close the cavity of the box.

[0017] In order to easily combine the weld connection with the recess/locking member connection as described above, the lid can be used in two different orientations with respect to the box. In a first orientation of the lid with respect to the box the flanges of the box and lid can engage with each other for the weld connection. In a second orientation of the lid with respect to the box, wherein in the second orientation the lid is upside-down compared to the first orientation, the locking members can engage with the corresponding recesses. Hence, the lid may be provided with a flange at one side and locking members at an opposite side, wherein the lid can be turned upside-down depending on the connection to be used.

[0018] An advantage of the container according to the invention is that for two functions only one component is required, which makes the design constraints less stringent and thus the design and fabrication of the container less complex.

[0019] Another advantage is that two connection configurations are possible which makes it possible to optimize each connection configuration for a specific purpose. For instance, the weld connections can be optimized for transport while the recess/locking member connection can be optimized for home use.

[0020] In an embodiment, the box has a substantially

constant wall thickness, so that formation of the protrusions automatically forms the corresponding recesses.

[0021] In an embodiment, the polygon shape is rectangular or square, where a square is considered to be a species of the genus rectangle.

[0022] The polygon shape is not limited to having straight sidewalls seen in plan view, but may have for instance concave or convex sidewalls as long as there is an abrupt transition, i.e. a corner, present between two sidewalls thereby resembling a polygon shape.

[0023] In an embodiment, the plastic material of which the container is made allows the container to be made by thermoforming. Preferably, the plastic material allows the container to be made using a deep-drawing packaging machine. Suitable plastic materials are for instance thermoplastics such as polyethylene, polypropylene, polystyrene, etc.

[0024] In an embodiment, the container is a thermoformed container, preferably a thermoformed plastic container being a rigid or semi-rigid plastic film structure with relatively sturdy walls, more preferably of the type intended for long-term use by the consumer.

[0025] The box may alternatively be referred to as a tray.

[0026] The protrusions of the box acting as space members between two stacked boxes are preferably provided at an upper side of the sidewalls, more preferably near the top of the sidewalls.

[0027] In an embodiment, the protrusions of the box acting as space members between two stacked boxes are provided at a level such that when the protrusions of one box engage with the other box, sideways movement of said one box relative to said other box is prevented at the same time, so that stacked boxes form a rigid or semi-rigid stack that can easily be handled.

[0028] In an embodiment, the lid is shaped such that lids can easily be stacked. Preferably, it is possible to stack the lids such that the occupied space is minimized, and more preferably such that sideways movement of one lid relative to another lid is prevented or minimized to form a rigid or semi-rigid stack that can easily be handled.

[0029] In the second orientation of the lid and box, the flanges are preferably spaced apart when the lid and box are connected to each other. This allows to use the space in between the flanges to easily engage with the flange of the lid and/or the flange of the box to separate the lid and box from each other.

[0030] The invention also relates to a mould for forming a box as described above, preferably thermoforming a box as described above by deep-drawing. The mould may alternatively be used for forming a box as described above by injection moulding.

[0031] The invention further relates to a mould for forming a lid as described above, preferably thermoforming a lid as described above by deep-drawing. The mould may alternatively be used for forming a lid as described above by injection moulding.

[0032] The moulds for the box and lid may be a negative or positive mould, wherein in case of a negative mould a sheet of material may be drawn into a mould cavity, and wherein in case of a positive mould a sheet of material is drawn over the mould.

[0033] The invention further relates to a method for forming a plastic container according to the invention, wherein preferably use is made of a mould for thermoforming the box by deep-drawing and/or a mould for thermoforming the lid by deep-drawing.

[0034] The invention also relates to a lid for a plastic container according to the invention.

[0035] The invention will now be described in a non-limiting way by reference to the accompanying drawings in which like parts are indicated by like reference numerals, and in which:

- Fig. 1 depicts a side view of a box of a plastic container according to an embodiment of the invention;
- Fig. 2 depicts a perspective view from below of the box of Fig. 1;
- Fig. 3 depicts a side view of a stack of two boxes of Fig. 1;
- Fig. 4 depicts a perspective view from above of the box of Fig. 1;
- Fig. 5 depicts a perspective view of a lid suitable to close the box of Fig. 1;
- Fig. 6 depicts the box and lid of respectively Fig. 1 and 5 in a first closed configuration;
- Fig. 7 depicts a perspective view of the box and lid of respectively Fig. 1 and 5 in a second closed configuration;
- Fig. 8 depicts a top view of the second closed configuration of Fig. 7;
- Fig. 9 depicts a cross-sectional view along line A-A of the second closed configuration of Fig. 7; and
- Fig. 10 depicts a detail B of the second closed configuration of Fig. 7.

[0036] Fig. 1 depicts a side view of a box 1 as part of a plastic container according to an embodiment of the invention. Fig. 2 depicts a perspective view from below of the box 1 of Fig. 1. The plastic container is suitable for packaging food items, e.g. mushrooms, tomatoes, etc.

[0037] The box 1 comprises a bottom 3 and sidewalls 5 extending upwards from the bottom 3 to form a cavity for receiving the food items. The four side walls 5 in this embodiment define a rectangular shape in plan view as can be seen in the perspective view from above of Fig. 4, but the invention can be applied to any polygon shape or polygon resembling shape. Also shown in Fig. 4 is that the cavity is indicated by reference numeral 7.

[0038] Fig. 1 further discloses that the sidewalls 5 extend upwards from the bottom 3 and slightly away from each other, so that the opening of the cavity at the top of the box 1 is larger in size than the size of the bottom

thereby allowing the bottom 3 of a box 1 to be introduced into the cavity 7 of another box via the opening for stacking purposes.

[0039] The bottom 3 in this embodiment is not completely flat, but has a more complex shape thereby creating ribs 4 on the bottom 3 within the cavity 7. These ribs 4 can advantageously be used to strengthen the bottom 3 without having to increase the wall thickness of the bottom 3 and/or to act as space members to keep food items clear from the bottom and to receive fluids, e.g. water, in between the ribs which may be beneficial to separate the fluids and/or dirt from the food items if required/desired.

[0040] An example of a stack of two boxes 1, 1' is shown in Fig. 3. In order to prevent the two boxes from sticking to each other and allow easy separating of the two boxes, the two boxes are kept at a predetermined distance D from each other by protrusions 9 provided at an upper side of the sidewalls 5 in each corner of the rectangular shape. The protrusions 9 act as space members thereby setting the maximum extent to which one box 1' can be introduced into another box 1 during stacking. The underside of the protrusions 9 of box 1' therefor engages with an upper side of the sidewalls 5 of box 1.

[0041] Although the example of Fig. 2 only shows a stack of two boxes, the same applies to a stack of more than two boxes as each box is preferably provided with respective protrusions 9.

[0042] Further, it is explicitly mentioned here that this embodiment shows a protrusion 9 in each corner of the rectangular shape, but using one protrusion 9 may already be sufficient to keep two boxes in a stack at a proper distance from each other. In case of two protrusions 9, the two protrusions are preferably positioned at opposite sides of the polygon shape.

[0043] If two or more protrusions 9 are used as space members, these protrusions are preferably distributed, more preferably substantially evenly distributed around the perimeter of the opening of the cavity seen in plan view.

[0044] In this embodiment, preferably caused by fabricating the box using a sheet material having a constant thickness, the formation of the protrusions 9 is accompanied by the (automatic) formation of corresponding recesses 11 (see Fig. 4) on the cavity side of the sidewalls 5.

[0045] Fig. 5 depicts a perspective view of a lid 13 suitable to close the cavity 7 of the box 1 of Figs. 1-4. The lid 13 comprises a top surface 15 delimited by an edge 17 and sidewalls 19 extending downwards from the edge 17 to end in a flange 21 extending sideways.

[0046] Preferably, the top surface 15 has a size similar to the size of the bottom 3 of a box 1, so that the bottom 3 of a box 1 can be received on the top surface 15 within the edge 17 to be surrounded by the edge 17, preferably such that sideways motion is prevented thereby facilitating the easy stacking of filled and packaged containers in which the lid is connected to the box in a first closed configuration of the container as shown in Fig. 6 where

the lid 13 is in a first orientation with respect to the box 1.

[0047] The lid 13 in plan view has a similar polygon shape, i.e. a rectangular shape in this embodiment, as defined by the sidewalls 5 of the box 1. The lid comprises locking members 23 in the corners allowing to mate with respective recesses 11 of the box 1 to releasably connect the lid 13 to the box 1 in order to close the cavity 7 of the box 1 in a second closed configuration of the container as shown in Fig. 7 in which the lid 13 is in a second orientation with respect to the box 1, wherein the lid in the second orientation is upside-down compared to the lid being in the first orientation.

[0048] In the first closed configuration of Fig. 6, the flange 21 of the lid 13 engages with a corresponding flange 25 of the box 1. Flange 25 of the box is more clearly shown in Fig. 4. The two flanges 21, 25 in Fig. 6 are connected to each other using four welds at sites indicated by reference numeral 27 in Figs. 4 and 5. These four welds provide enough strength to keep the container closed during transport, but also allow a user to remove the lid from the box. After this removal, the welds can no longer be used and it is thus not possible to connect the lid and box together in the first orientation of the lid with respect to the box in a convenient manner.

[0049] The advantage of the container according to this embodiment of the invention is that the lid can be turned upside-down and be releasably connected to the box using the locking members 23 of the lid in combination with the recesses 11 in the box. The connection between the lid and box in the second closed configuration may for instance be made by frictional contact or a snap connection.

[0050] Fig. 8 shows a top view of the second closed configuration of the container as shown in Fig. 7. Fig. 8 clearly shows a line A-A indicating the orientation of the cross-sectional view of Fig. 9 in which it can be seen how the locking members 23 of the lid engage with the recess 11 of the box.

[0051] Fig. 10 shows in more detail the part B of Fig. 9. From this drawing it is clear that the locking member 23 of the lid 13 engages with the recess 11 of the box 1 in sidewall 5, where the angle of the sidewall portion of the recess 11 to the vertical indicated by reference symbol α is such that the locking member 23 hooks behind said sidewall portion of the recess, so that deformation of the lid and/or the locking member 23 and/or the sidewall 5 is required to remove the lid 13 from the box 1.

[0052] In this embodiment, the edge 17 of the lid is dimensioned such that it engages with the sidewall 15 when the lid is positioned in the second orientation with respect to the box and closes off the cavity, thereby aiding in making an appropriate connection between the lid and box.

[0053] The plastic container according to the invention may be made using a thermoforming process. The method to fabricate the container may comprise a deep-drawing step using a positive or negative mould.

[0054] Preferably, the box and/or lid are made out of

a sheet material.

[0055] Although the invention is described with reference to a specific embodiment shown in the drawings, the invention is not limited to this specific embodiment and features described in combination here may also be applied separately unless explicitly stated otherwise.

[0056] The invention may alternatively be described by the following clauses:

1. A container for packaging food items comprising:

- a. A box with a bottom and sidewalls extending upwards from the bottom to form a cavity for receiving the food items, wherein the sidewalls define an opening for access to the cavity;
- b. a lid to engage with the sidewalls to close off the cavity of the box;

wherein the box is configured such that the bottom of the box can be introduced into a cavity of another box via the opening thereof for stacking purposes, wherein the sidewalls comprise at least one protrusion extending away from the cavity in order to act as a space member thereby setting the extent to which one box can be introduced into another box during stacking of said boxes, wherein the sidewalls further comprise at least one recess arranged on the side of the sidewalls opposite to and corresponding to the at least one protrusion, wherein the lid comprises at least one locking member associated with the at least one recess of the box,

and wherein the locking member of the lid and the respective recess of the box are configured to engage with each other to releasably connect the lid to the box in order to close off the cavity of the box.

2. A container according to clause 1, wherein the box and lid are made of plastic, wherein the sidewalls of the box define an opening with a polygon shape in plan view, and wherein the at least one protrusion and corresponding one or more recesses are arranged at one or more corners of the polygon shape.

3. A container according to clause 2, wherein the lid has a similar polygon shape as the opening of the box in plan view, and wherein the at least one locking member is arranged at a respective corner of the polygon shape corresponding to the position of the at least one protrusion and corresponding one or more recesses of the box.

4. The container according to clause 1, wherein the box and lid comprise corresponding flanges at the respective perimeters thereof to engage with each other in order to allow the lid and box to be connected to each other using a weld to close the cavity of the

box.

5. The container according to clause 4, wherein the lid is in a first orientation with respect to the box when the flanges of the box and lid engage with each other, wherein the lid is in a second orientation with respect to the box when the locking members of the lid engage with the respective recesses of the box, wherein the lid in the first orientation is upside-down compared to the lid in the second orientation.

6. The container according to clause 2 and 3, wherein protrusions are provided in each corner of the polygon shape of the sidewalls of the box, and wherein the lid comprises a locking member at each corner to engage with a corresponding recess in each corner of the box.

7. The container according to clause 1, wherein the box and/or lid are thermoformed components.

8. A mould for forming, preferably thermoforming a box as defined in clause 1 by deep-drawing.

9. A mould for forming, preferably thermoforming a lid as defined in clause 1 by deep-drawing.

10. The mould according to clause 8 or 9, wherein the mould is a negative mould.

11. The mould according to clause 8 or 9, wherein the mould is a positive mould.

12. A method for forming a plastic container according to clause 1, wherein use is made of a mould according to one or more of the clauses 8-11.

13. A lid for a plastic container according to clause 1.

Claims

1. A plastic container for packaging food items comprising:

- a. a box with a bottom and sidewalls extending upwards from the bottom to form a cavity for receiving the food items, wherein the sidewalls define an opening with a substantially polygon shape for accessing the cavity;
- b. a lid to engage with the sidewalls to close off the cavity of the box, wherein the lid has a similar polygon shape as the opening of the box;

wherein the box is configured such that the bottom of the box can be introduced into a cavity of another box via the opening thereof for stacking purposes, wherein each corner of the polygon shape of the sidewalls of the box is provided with a protrusion and a recess, wherein the protrusion extends away from the cavity in order to act as a space member thereby setting the extent to which one box can be introduced into another box during stacking of the boxes, and wherein the recess is arranged opposite to and corresponding to the respective protrusion, wherein the lid comprises a locking member at each corner of the polygon shape of the lid, such that the

locking members are associated with respective recesses in the box, wherein each locking member of the lid and the respective recess of the box are configured to engage with each other to releasably connect the lid to the box in order to close off the cavity of the box,

wherein the box and lid comprise corresponding flanges at the respective perimeters thereof to engage with each other in order to allow the lid and box to be connected to each other using a weld to close the cavity of the box,

and wherein the lid is in a first orientation with respect to the box when the flanges of the box and lid engage with each other, wherein the lid is in a second orientation with respect to the box when the locking members of the lid engage with the respective recesses of the box, wherein the lid in the first orientation is upside-down compared to the lid in the second orientation.

2. The container according to claim 1, wherein in the second orientation the flanges of the box and lid are spaced apart.

3. The container according to claim 1, wherein the box and/or lid are thermoformed components.

4. A mould for forming, preferably thermoforming a box as defined in claim 1 by deep-drawing.

5. A mould for forming, preferably thermoforming a lid as defined in claim 1 by deep-drawing.

6. The mould according to claim 4 or 5, wherein the mould is a negative mould.

7. The mould according to claim 4 or 5, wherein the mould is a positive mould.

8. A method for forming a plastic container according to claim 1, wherein use is made of a mould according to one or more of the claims 4-7.

9. A lid for a plastic container according to claim 1.

FIG 1

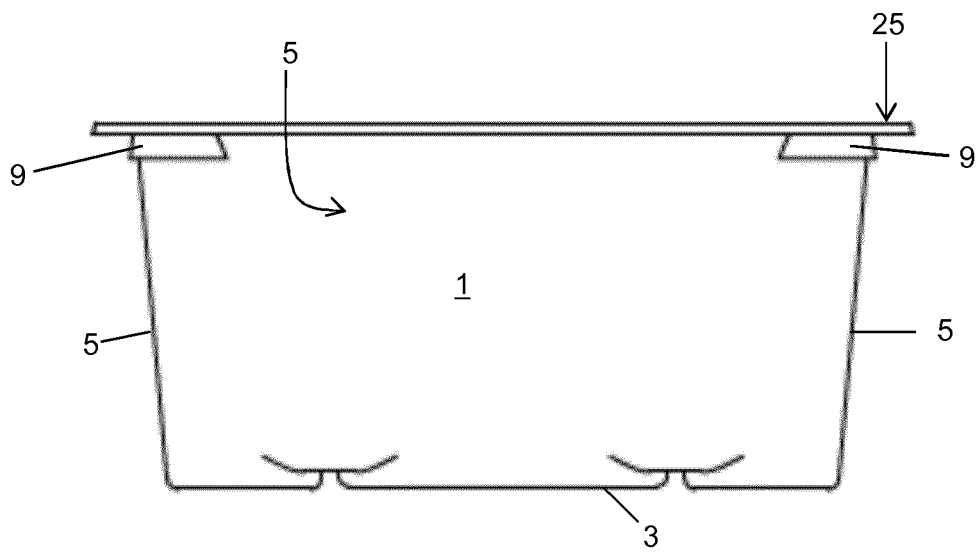


FIG 2

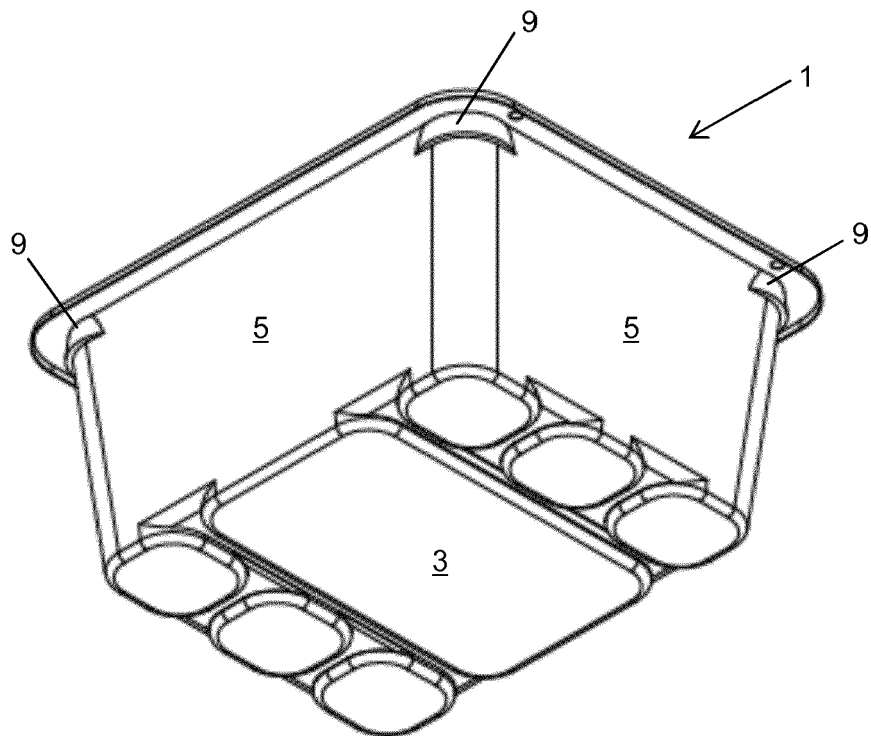


FIG 3

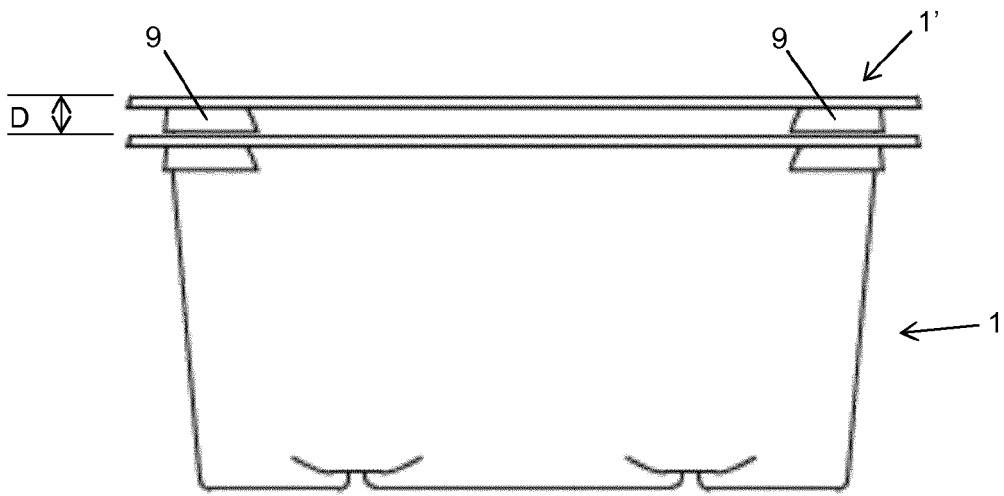


FIG 4

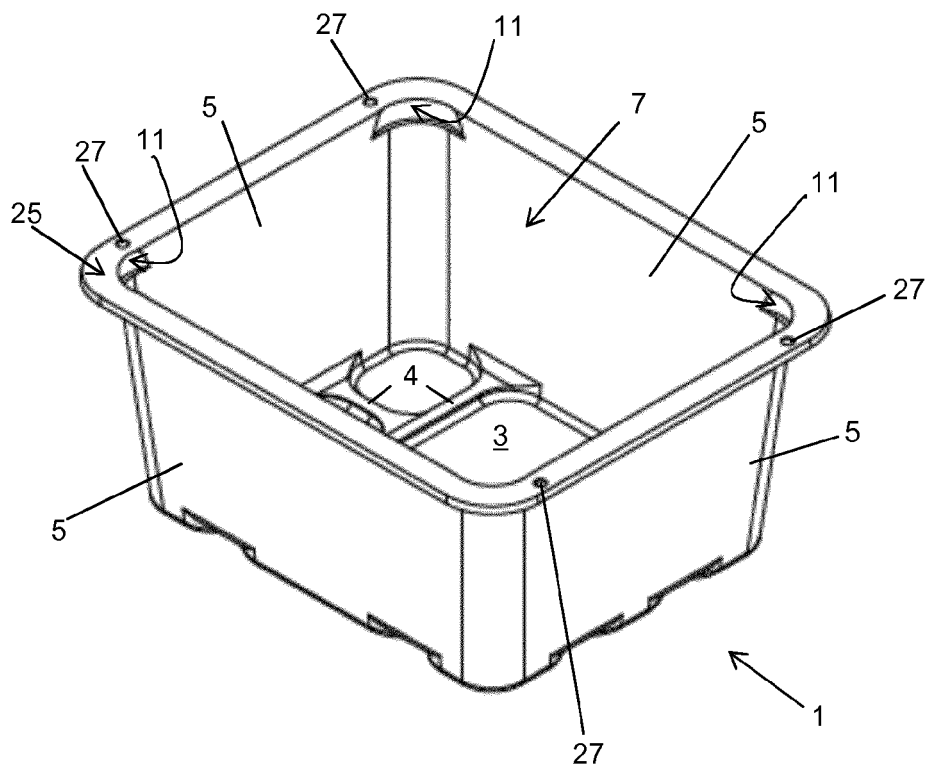


FIG 5

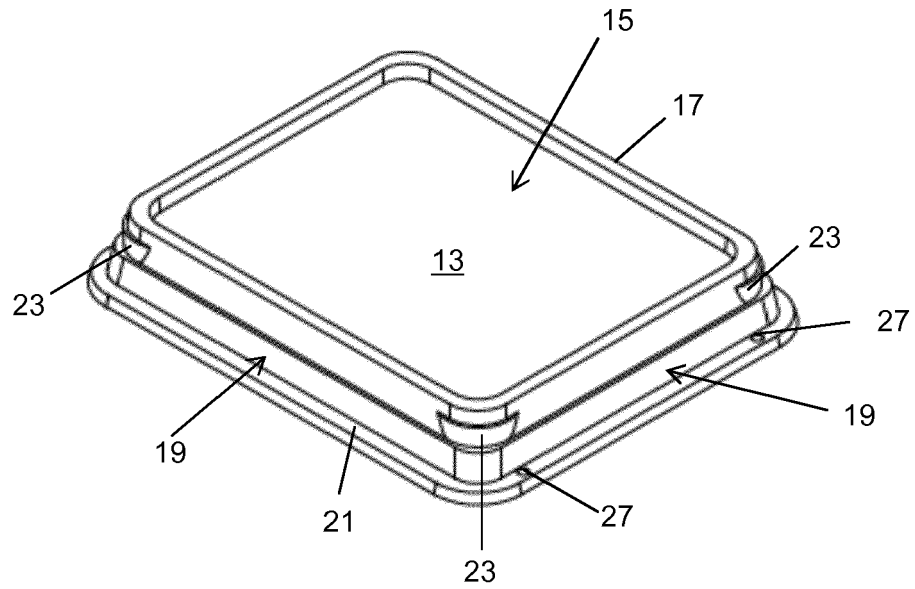


FIG 6

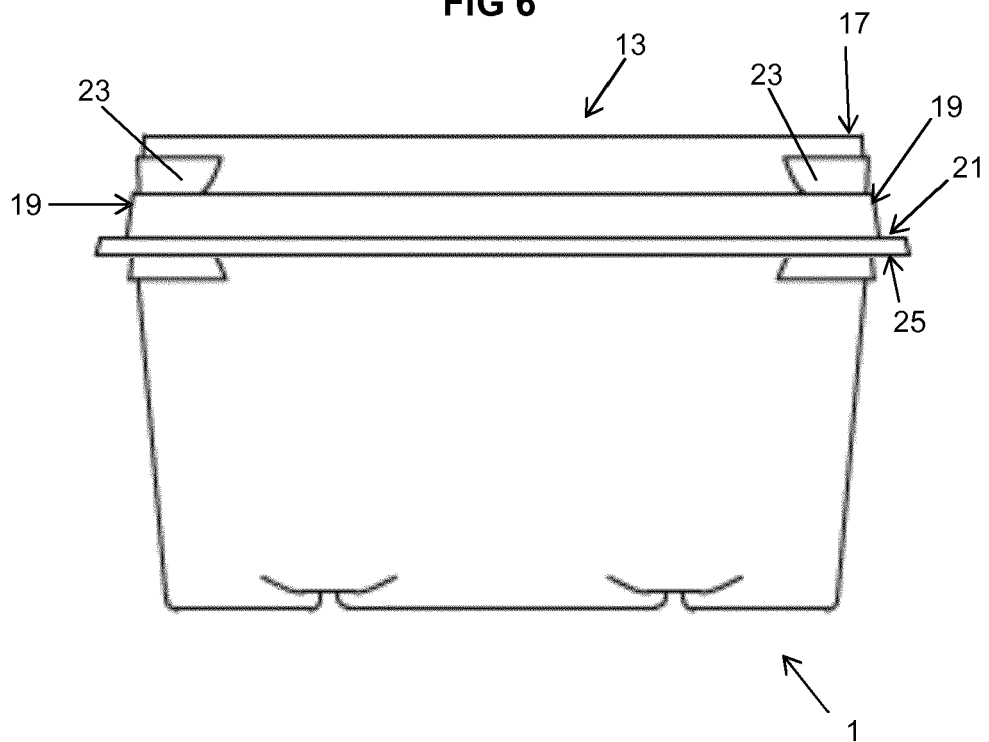


FIG 7

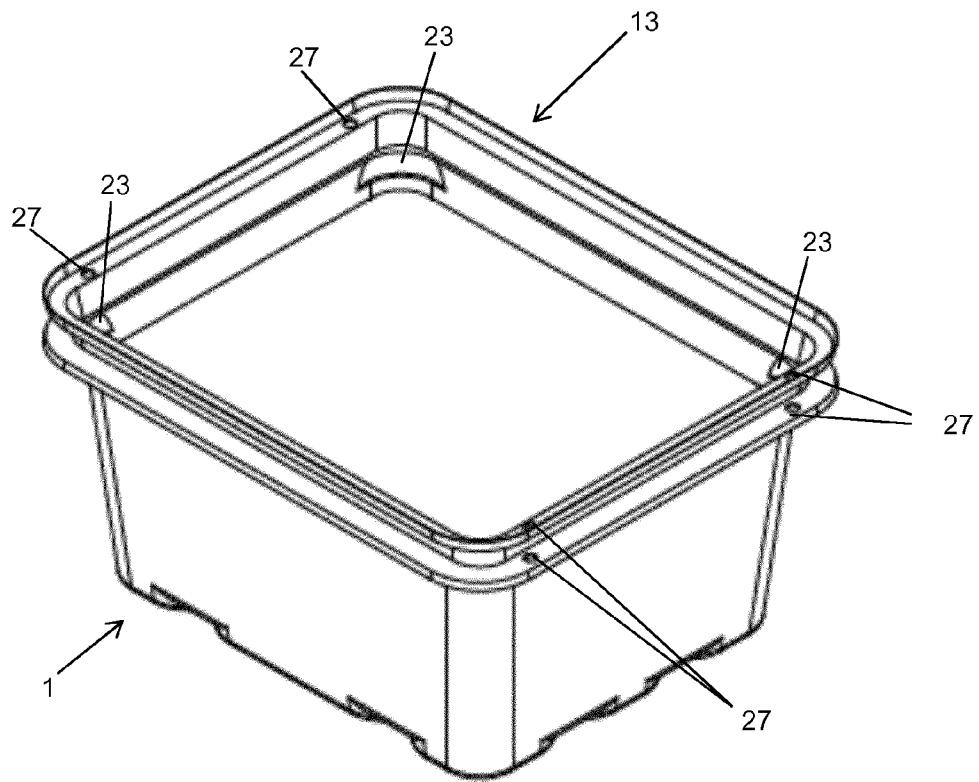


FIG 8

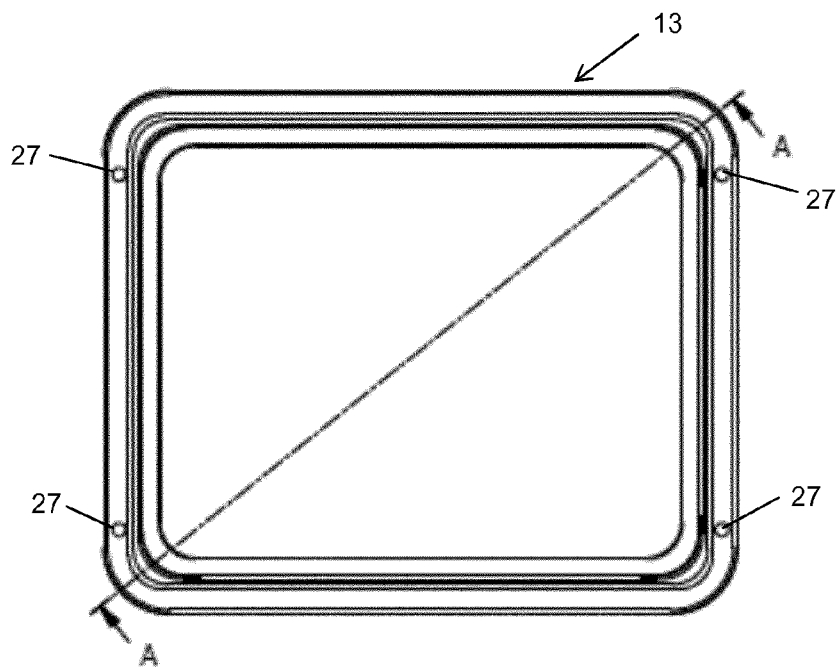


FIG 9

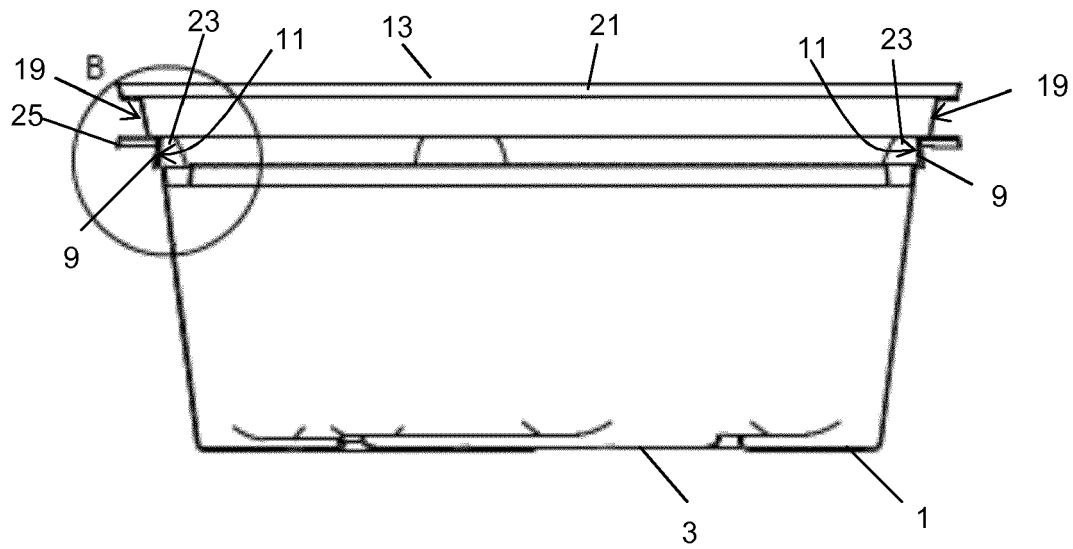
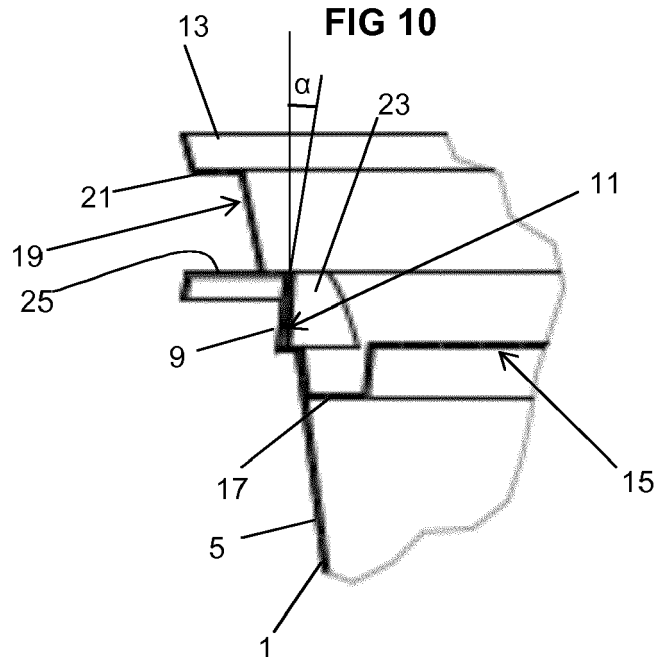


FIG 10





EUROPEAN SEARCH REPORT

Application Number
EP 14 15 0576

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	FR 2 256 874 A1 (MONOPLAST [FR]) 1 August 1975 (1975-08-01)	1,3-9	INV. B65D21/02
A	* page 1, line 2 - line 5 * * page 1, line 34 * * page 2, line 13 - line 18 * * page 3, line 29 - line 30 * * page 3, line 40; figures 3,5 *	2	B65D1/26 B65D43/02
X	JP S60 154226 U (N.A.) 15 October 1985 (1985-10-15)	5-7,9	
A	* figures 1-3 *	1-4,8	
A	WO 2006/091655 A1 (GLAD PRODUCTS CO [US]; RACANA LAWRENCE JOHN [US]) 31 August 2006 (2006-08-31) * Paragraph [0002], line 2; figures 24,26 *	1,4,5,8, 9	
A	DE 20 2011 102578 U1 (PETRI FEINKOST GMBH & CO KG [DE]) 10 November 2011 (2011-11-10) * paragraph [0027]; figure 5 *	1,4,5,8, 9	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 12 June 2014	Examiner Sundell, Olli
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 14 15 0576

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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12-06-2014

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