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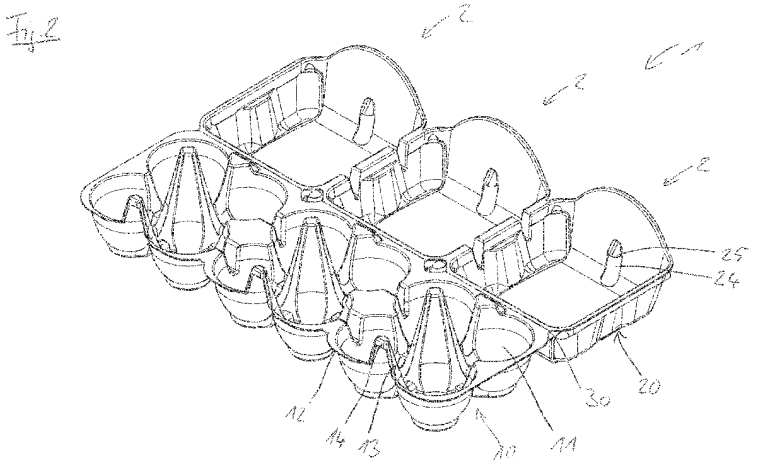
(54) EGG PACKAGING UNIT AND MANUFACTURING METHOD

(57) The invention relates to an egg packaging unit (1) and a method for manufacturing such an egg packaging unit.

The Egg packaging unit (1) made of molded pulp comprising a bottom part (10) with depressions (11) for receiving an egg each and a cover part (20) with a top surface (22) and a front surface (21), wherein the cover part (20) is connected to the bottom part (10) via a hinge (30) for the cover part (20), and wherein the bottom part (10) on its upper edge (12) opposite to the hinge (30) comprises a rigid hook element (13) extending upwardly with an outwardly extending hook-shaped protrusion (14) at its far end, wherein the edge (23) of the cover part (20), where the front surface (21) and the top surface (22) meet, is provided with a radius and wherein the cover part (20) comprises a locking aperture (24) on the front surface (21) with an inwardly extending protrusion (25) distanced from said rounded edge (23) to form the counterpart for the hook-shaped protrusion (14) on the bottom part (10), wherein the locking aperture (24) extends upwardly from said protrusion (25) into said rounded edge (23) for the aperture (24) to be partially outside the plane defined by the front surface (21) .

The method of manufacturing uses a mold (100), which, at the section forming the front surface (21) of the cover part (20) of the egg packaging unit (1), is provided with an suction and blow-out free inlay (103) to form an aperture, wherein the suction and blow-out free inlay (103) is designed to be free of undercuts for the formed egg packaging unit (1) to be easily removed from the mold (100).



EP 3 508 441 A1

Description

[0001] The invention relates to an egg packaging unit and a method for manufacturing an egg packaging unit.

[0002] Egg packaging units are known in various shapes and makes. Often they are made from molded pulp and comprise a bottom part with depressions for receiving eggs and a cover part connected thereto by a hinge to be moved between a closed and an open position.

[0003] In order to secure the cover part in the closed position, various locking mechanism are known.

[0004] The most common locking mechanism comprises a protrusion located on a flap pivotably connected to the front edge of the bottom part that can selectively interlock with an opening in the front surface of the cover part. Alternatively, non-pivotable hook elements on the bottom part can interact with corresponding openings in the front surface of the cover part.

[0005] This known state of the art can be disadvantageous in at least two respects. Firstly, the required opening in the front surface of the cover part reduces and interrupts the surface available for labelling on the front face of the egg packaging, especially since the locking mechanism generally extends through the front surface of the cover part in the closed state of the egg packaging unit. Secondly, in order to provide for the required openings the manufacturing process is complicated, since said openings either require an additional manufacturing step for e.g. punching them out or, in case of suction molding of the egg packaging, the molds need to be furnished with suitable blowing elements instead of suction elements at the locations of the intended openings in order to keep said areas free from pulp during production. However, this added complexity to the molds increases their costs.

[0006] There have been some attempts in reducing the impact of the locking mechanism on the surface available for labelling, especially for egg packaging units with non-pivotable hook elements as part of the locking mechanism. There, it was tried to dent at least part of the edge forming the opening in the front surface of the cover part inwardly in order for the hook-element no longer having to extend through the top surface so that a label could span across the opening. However, since the degree of said denting according to the state of the art is often limited by the inclination of the front surface during molding as to the direction of removal from the mold to avoid any undercuts, the locking effectiveness of those embodiments is often limited due to small overlapping lengths of the hook with the inwardly dented edge of the opening. In other embodiments not suffering this disadvantage, complex molds have to be used that results in cost-intensive manufacturing.

[0007] It is an object of the present invention to provide an egg packaging unit with a rigid hook element on its bottom part and the possibility to provide a continuous label on the front side of the cover part and a corresponding method for manufacturing, where the disadvantages of the known state of the art are at least reduced.

[0008] This problem is solved by an egg packaging unit according to the main claim as well a method according to the independent claim 8.

[0009] Thus, the invention relates to an egg packaging unit made of molded pulp comprising a bottom part with depressions for receiving an egg each and a cover part with a top surface and a front surface, wherein the cover part is connected to the bottom part via a hinge for the cover part to be movable between an open position and a closed position, wherein the bottom part on its upper edge opposite to the hinge comprises a rigid hook element extending upwardly with an outwardly extending hook-shaped protrusion at its far end to interact with a counterpart on the cover part in the closed position of the cover part to form a lock, wherein the edge of the cover part, where the front surface and the top surface meet, is provided with a radius and the cover part comprises a locking aperture on the front surface with an inwardly extending protrusion distanced from said rounded edge to form the counterpart for the hook-shaped protrusion on the bottom part, wherein the locking aperture extends upwardly from said protrusion into said rounded edge for the aperture to be partially outside the plane defined by the front surface.

[0010] Furthermore, the invention relates to a method for manufacturing an egg packaging unit, wherein a suction mold of the outer contour of the egg packaging unit in an open state is shortly immersed into a pulp slurry while suction is provided to form a pulp film on the mold, which is then dried to become sturdy, wherein at the section forming the front surface of the cover part of the egg packaging unit, the mold is provided with an suction and blow-out free inlay to form an aperture, wherein the suction and blow-out free inlay is designed to be free of undercuts for the formed egg packaging unit to be easily removed from the mold.

[0011] Before the invention is described in detail, some terminology used in conjunction with the invention is explained.

[0012] A hook element on the bottom part is considered "rigid" if there is no intentional degree of freedom provided in relation to the bottom part. Consequently, swivelable flaps attached to the bottom part by means of a hinge may not be considered rigid hook element.

[0013] The term "hook-shaped protrusion" refers to a shape at the far (or free) end of hook element that provides an interaction surface directed towards the bottom end of the hook element to allow for the hook element to hook onto or into something else.

[0014] An inlay is "suction and blow-out free" if it is not involved in any suction or blow-out action. In other word, the inlay does have any openings which are actively used for sucking close or blowing away of pulp material. Preferably, the inlay is impermeable, i.e. it does not even have any openings suitable for suction or blow-out flow.

[0015] All directional information provided for the egg

packaging unit according to the invention refer to the said unit in a closed state with its bottom part sitting on a horizontal tabletop, so that the top surface of the cover part is essentially parallel to said tabletop.

[0016] The present invention is based on the realization that to provide for a sufficiently inwardly protruding counterpart in the cover part for good locking interaction with the hook-shaped protrusion on the bottom part, instead of a manufacturing with complex molds or including additional processing steps, it is favorable to extend the cover part's aperture above said inwardly protruding counterpart into the rounded edge between the front and the top surface of the cover part. As a result, the horizontal expansion of the aperture is no longer solely a function of the inclination of the front surface within the mold as to the direction of removal from the molds, since potential undercuts can be avoided by extending the aperture into the radius at the upper edge of the front surface or even into the top surface.

[0017] It has been found that the decrease of rigidity of the cover part or the egg packaging unit as a hole, as might be suspected when interrupting the radius between the top and front surface of the cover part with an aperture, is hardly noticeable or at least sufficiently small not to pose any problem in regard to usability of the egg packaging unit and protection of eggs contained therein. This is especially true when a label is applied to the cover part, that extends to both the front and the top surface thereof and thus also fully extends across the aperture. In this case, the label might reinforce the cover part in the area of the aperture.

[0018] It is preferred that in a projection on the plane defined by the top surface, the inwardly extending protrusion on the front surface extends into the rounded edge between the front surface and the top surface. In other words, the protrusion on the front side of the cover part extends inwardly to an extend that is not feasible in a molding process according to the state of the where the inclination of the front surface comprising an opening closed on all sides as to the direction of removal from the mold is decisive for allowing a molding free of undercuts.

[0019] In order to securely avoid any undercuts, it is preferred when, in a projection on the plane defined by the top surface, the inwardly extending protrusion on the front surface is completely within the aperture. This way, in case of a direction of removal perpendicular to the top surface of the cover part absence of undercuts - at least in conjunction with the locking mechanism - is guaranteed.

[0020] The maximum horizontal deviance of the aperture from the plane defined by the top surface may be greater than the maximum horizontal deviance of the inwardly extending protrusion from said plane. This can further simplify the mold required for manufacturing the egg packaging unit according to the invention and allow for tolerances.

[0021] It is preferred that distance between the plane defined by the top surface of the cover part and the inwardly extending protrusion is between 80% to 120%, preferably between 90% and 110%, preferably around 100% of the vertical distance between the upper edge of the bottom part and the hook-shaped protrusion. It turned out that by having the actually interlocking parts of the locking mechanism about half-way between the upper edge of the bottom part and the top surface of the cover part in a closed state, a good compromise between the mechanical stability of the hook element and the cover part as well as a secure closure of the egg packaging unit is reached.

[0022] It is preferred the hook element on the bottom part is designed to be solely on one side of the plane defined by the front surface of the cover part in a closed state of the egg packaging. This ensures that a continuous label may be provided on the front surface of the cover part extending across the aperture.

[0023] The bottom part and the cover part, including the hook element on the bottom part and the inwardly extending protrusion on the cover part, may be shaped to allow for two egg packaging units to be stacked in an open position with a predetermined engagement depth. For this to be achieved, the whole egg packaging unit needs to be provided with inclined walls in those sections actually engaging with another egg packaging unit.

[0024] The egg packaging unit according to the invention provides the advantage of being very easy to manufacture, especially since, at least for the locking mechanism, undercuts and/or blow-out elements within the mold can be fully avoided. The inventive method for manufacturing reflect this by using a mold having a suction and blow-out free inlay for forming the aperture, which - due to the aperture extending into the rounded edge between the front and the top surface of the cover part may be designed without producing any undercut.

[0025] It is preferred that after the mold having been immersed into the pulp slurry, the wet pulp film attached to mold is transferred to a support member having the shape of the inner contour of the egg packaging unit in an open state by a brief interlocking of the support member with the mold, preferably using suction means on the support member. This way, the egg packaging unit may be dried away from the mold, which in turn can be utilized to form a further egg packaging unit.

[0026] To allow for continuous manufacturing, it is preferred to provide a plurality of molds and/or support members on a mold and/or a support member turret. By turning the turrets, a continuous operation in manufacturing can be achieved.

[0027] The claimed method is particularly suitable for producing egg packaging units according to the present invention. As a result, all preferred embodiments of the inventive egg packaging unit may be mirrored in the inventive method of manufacturing the same.

[0028] The invention is now described in more detail in conjunction with the enclosed drawings. These show:

Figure 1: an elevated view of a first embodiment

of an egg packaging unit according to the invention in a closed state;

Figure 2: an elevated view of the egg packaging unit of figure 1 in an open state;

Figure 3: a top view of the egg packaging unit of figure 1 in an open state;

Figure 4a,b: front and rear views of the egg packaging unit of figure 1 in an open state;

Figure 5: a top view of the mold for manufacturing the egg packaging of figure 1; and

Figure 6: a sectional view of the mold of figure 4 along the section line VI-VI.

[0029] The egg packaging unit 1 according to figures 1 to 4 comprises three detachably joint sections 2, each being able to accommodate four egg in a 2-by-2 array. Apart from the connection elements to an adjacent section 2, each section 2 of the egg packaging unit 1 is identically shaped.

[0030] The egg packaging unit 1 or each section 2 comprises a bottom part 10 with depressions 11, each of which is designed to accommodate an individual egg, as well a cover part 20 that is connected to the bottom part 10 by an integral hinge 30. By means of this hinge 30, the cover part 10 can be moved between a closed position (cf. figure 1) and an open position (cf. figures 2 to 4). The cover part 20 comprises a front surface 21 and a top surface 22 that are suitable for attaching a label thereto. The edge 23 of the cover part 20, where said two surfaces 21, 22 meet, is provided with a radius, thus forming a rounded edge.

[0031] The egg packaging unit 1 is also provided with a locking mechanism to secure the cover part 20 in its closed position on the bottom part 10.

[0032] As part of the locking mechanism, the bottom part 10 on its upper edge 12 opposite the hinge 30 comprises a rigid, upwardly extending hook element 13. On its far end, the hook element 13 is provided with an outwardly extending hook-shaped protrusion 14.

[0033] As a counterpart, the cover part 20 comprises a locking aperture 24 on the front surface 21 with an inwardly extending protrusion 25 distanced from the rounded edge 23. The upwardly facing surface of the protrusion 25 on the cover part can interlock with the downwardly facing surface of the hook-shaped protrusion 14 on the bottom part 10, as illustrated in figure 1.

[0034] Starting from the protrusion 25 on the front surface 21, the locking aperture 24 extends upwardly into the rounded edge 23 of the cover part 20. As a result, the aperture 24 is partially outside the plane defined by the front surface 21 of the cover part 20.

[0035] As can be best seen in figure 3 (which can be seen as a projection of the egg packaging unit 1 on the plane defined by the top surface 22 of the cover part 20), this allows the inwardly extending protrusion 25 to extend into the rounded edge 23. In figure 3 the divide between the front surface 21 and the rounded edge 23 in the area of the aperture 24 is indicated as a dashed line, illustrating the protrusion 25 extending into the rounded edge 23 is this projection.

[0036] At the same time, in the projection shown in figure 3 the inwardly extending protrusion 25 is fully within the boundaries of the aperture 24, whose maximum horizontal deviance l_{H24} from the plane defined by the front surface 21 is greater than the corresponding maximum horizontal deviance l_{H25} of the protrusion 25.

[0037] As depicted in figure 4a, b, the vertical distance l_{V25} between the plane defined by the top surface 22 of the cover part 20 and the inwardly extending protrusion 25 is about 110% of the vertical distance l_{V14} between the edge 12 and the hook-shaped protrusion 14 on the bottom part 10.

[0038] The hook-shaped protrusion 14 is shaped not to extend through the front surface 21 of the cover part 20 in a closed state of the egg packaging unit (cf. figure 1). It is readily apparent from figures 2 to 4 that the egg packaging unit 1 is stackable in an open state due to all engagement surfaces being inclined.

[0039] The egg packaging unit 1 as depicted in figures 1 to 4 is made from molded pulp, e.g. by using suction molding techniques. A mold 100 to be used for producing the egg packaging unit 1 of figures 1 to 4 by suction molding is shown in figures 5 and 6.

[0040] The shaping surface 101 of the mold 100 reflects the outside shape of the egg packaging unit 1 in its open state and is provided with a multitude of suction holes 102. In order to distribute the suctioning over the whole surface of the mold 100, where pulp shall be drawn to when the mold 100 is immersed into a pulp slurry, a metal mesh (not shown) is provided on the shaping surface 101 of the mold 100. The mold 100 is designed to provide a direction of removal of a suction molded egg packaging unit 1 perpendicular to the plane of the sheet of figure 5 and as illustrated in figure 6 by the arrow 90. Especially, there are no undercuts whatsoever that might hinder the removal of a molded egg packaging unit 1 from the mold 100 in said direction.

[0041] In order to provide for the aperture 24 in the cover part 20 of the egg packaging unit 1 (cf. figures 1 to 4), the mold is provided with impermeable and thus suction and blow-out free inlays 103 at the corresponding positions on the shaping surface 101 of the mold 100. Due to the inlays 103 being impermeable, pulp does not adhere to the inlays 103 when the mold 100 is immersed into pulp slurry thus forming an aperture 24. Due to the specific shape of the aperture 24 already described in context of figures 1 to 4, the inlays 103 do not cause any undercuts. As a result, the mold 100 can be used is generally known manufacturing processes, e.g. mounted on a turret and interacting with support members mounted on another turret for continuous operation.

Claims

1. Egg packaging unit (1) made of molded pulp comprising a bottom part (10) with depressions (11) for receiving an egg each and a cover part (20) with a top surface (22) and a front surface (21), wherein the cover part (20) is connected to the bottom part (10) via a hinge (30) for the cover part (20) to be movable between an open position and a closed position, and wherein the bottom part (10) on its upper edge (12) opposite to the hinge (30) comprises a rigid hook element (13) extending upwardly with an outwardly extending hook-shaped protrusion (14) at its far end to interact with a counterpart on the cover part (20) in the closed position of the cover part (20) to form a lock,
characterized in that
the edge (23) of the cover part (20), where the front surface (21) and the top surface (22) meet, is provided with a radius and the cover part (20) comprises a locking aperture (24) on the front surface (21) with an inwardly extending protrusion (25) distanced from said rounded edge (23) to form the counterpart for the hook-shaped protrusion (14) on the bottom part (10), wherein the locking aperture (24) extends upwardly from said protrusion (25) into said rounded edge (23) for the aperture (24) to be partially outside the plane defined by the front surface (21).

2. Egg packaging unit according to claim 1,
characterized in that
in a projection on the plane defined by the top surface (22), the inwardly extending protrusion (25) on the front surface (21) extends into the rounded edge (23) between the front surface (21) and the top surface (22).

3. Egg packaging unit according to claim 1,
characterized in that
in a projection on the plane defined by the top surface (22), the inwardly extending protrusion (25) on the front surface (21) is completely within the aperture (24).

4. Egg packaging unit according to claim 1 or 2,
characterized in that
the maximum horizontal deviance (l_{H24}) of the aperture (24) from the plane defined by the front surface (31) is equal or greater than the maximum horizontal deviance (l_{H25}) of the inwardly extending protrusion (25) from said plane.

5. Egg packaging unit according to one of the preceding claims,
characterized in that
vertical distance (l_{V25}) between the plane defined by the top surface (22) of the cover part (20) and the inwardly extending protrusion (25) is between 80% to 120%, preferably between 90% and 110%, preferably around 100% of the vertical distance (l_{V14}) between the upper edge (12) of the bottom part (10) and the hook-shaped protrusion (14).

6. Egg packaging unit according to one of the preceding claims,
characterized in that
the hook element (14) on the bottom part (10) is designed to be solely on one side of the plane defined by the front surface (21) of the cover part (20) in a closed state of the egg packaging unit (1).

7. Egg packaging unit according to one of the preceding claims,
characterized in that
the bottom part (10) and the cover part (20), including the hook element (13) on the bottom part (10) and the inwardly extending protrusion (25) on the cover part (20), are shaped to allow for two egg packaging units (1) to be stacked in an open state with a predetermined engagement depth.

8. Method for manufacturing an egg packaging unit (1), wherein a suction mold (100) of the outer contour of the egg packaging unit (1) in an open state is shortly immersed into a pulp slurry while suction is provided to form a pulp film on the mold (100), which is then dried to become sturdy,
characterized in that
at the section forming the front surface (21) of the cover part (20) of the egg packaging unit (1), the mold (100) is provided with an suction and blow-out free inlay (103) to form an aperture, wherein the suction and blow-out free inlay (103) is designed to be free of undercuts for the formed egg packaging unit (1) to be easily removed from the mold (100).

9. Method according to claim 8,
characterized in that
the suction and blow-out free inlay (103) is impermeable.

10. Method according to claim 8 or 9,
characterized in that
after the mold (100) having been immersed into the pulp slurry, the wet pulp film attached to mold (100) is transferred to a support member having the shape of the inner contour of the egg packaging unit (1) in an open state by a brief interlocking of the support member with the mold (100), preferably using suction means on the support member.

11. Method according to any one of claims 8 to 10,
characterized in that
a plurality of molds (100) and/or support members are arranged on a mold and/or a support member turret for continuous operation.

12. Method according to any one of claims 8 to 11, **characterized in that** the product resulting from the method is an egg packaging unit (1) according to one of the claims 1 to 6.

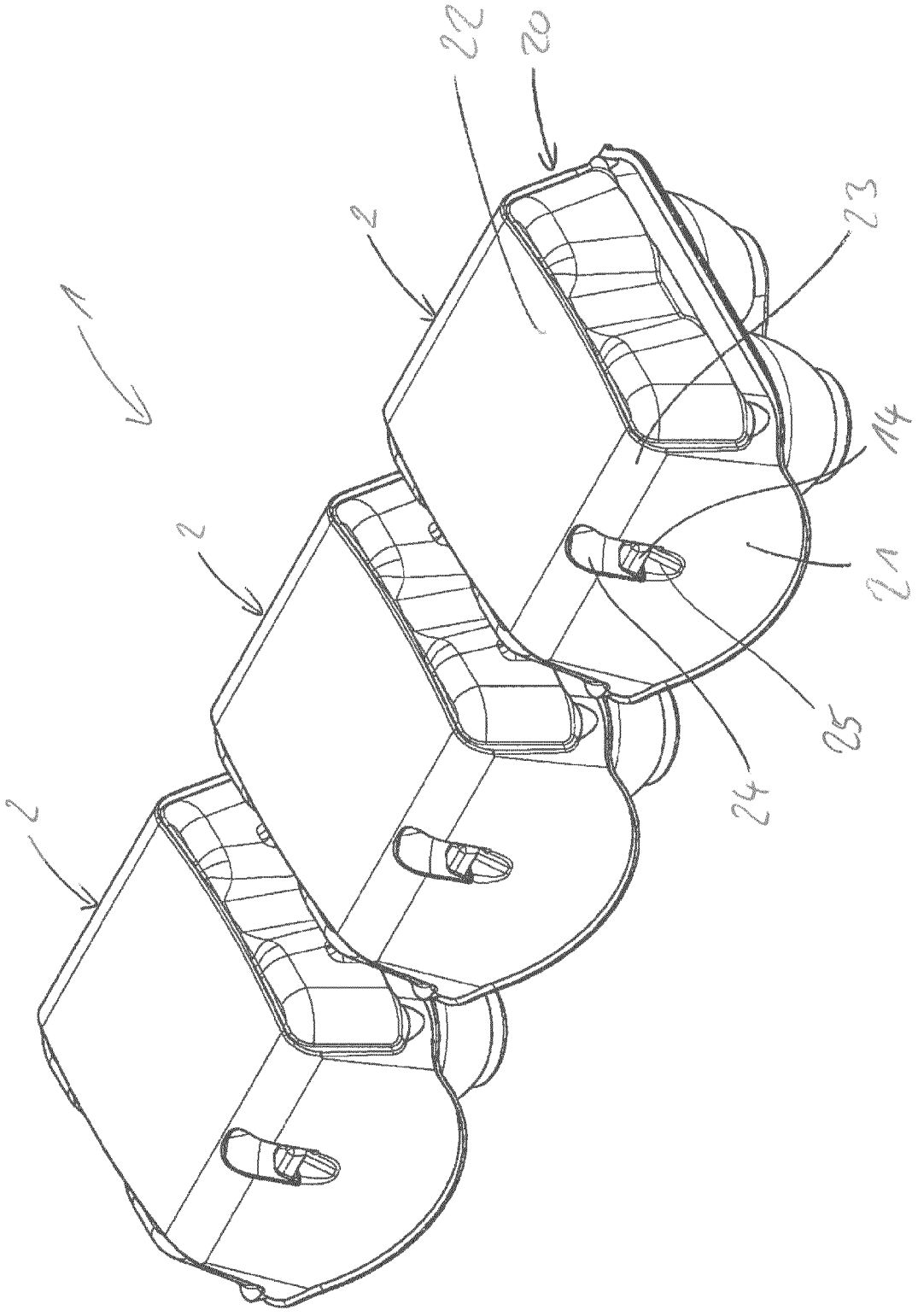


Fig. 1

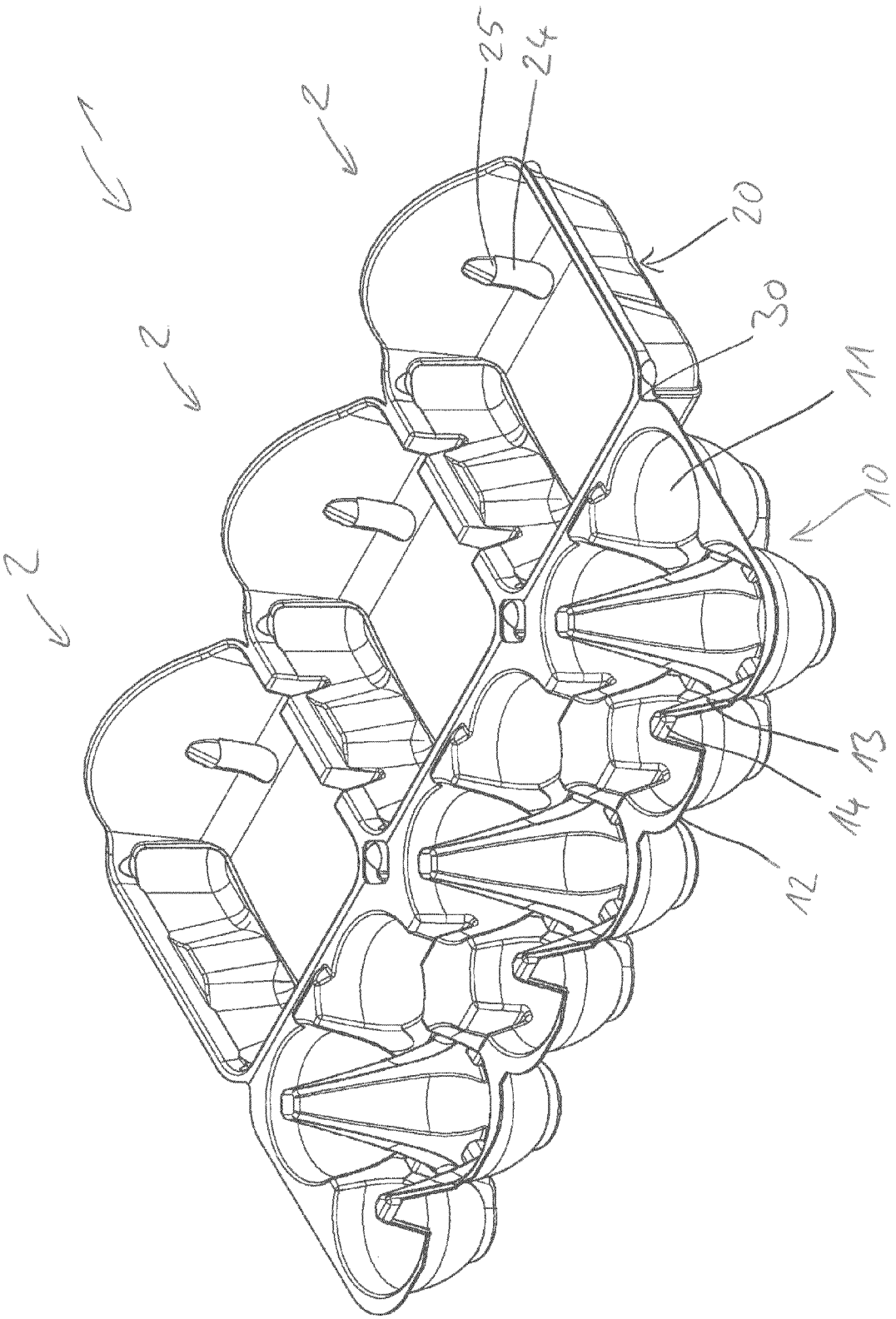


Fig.2

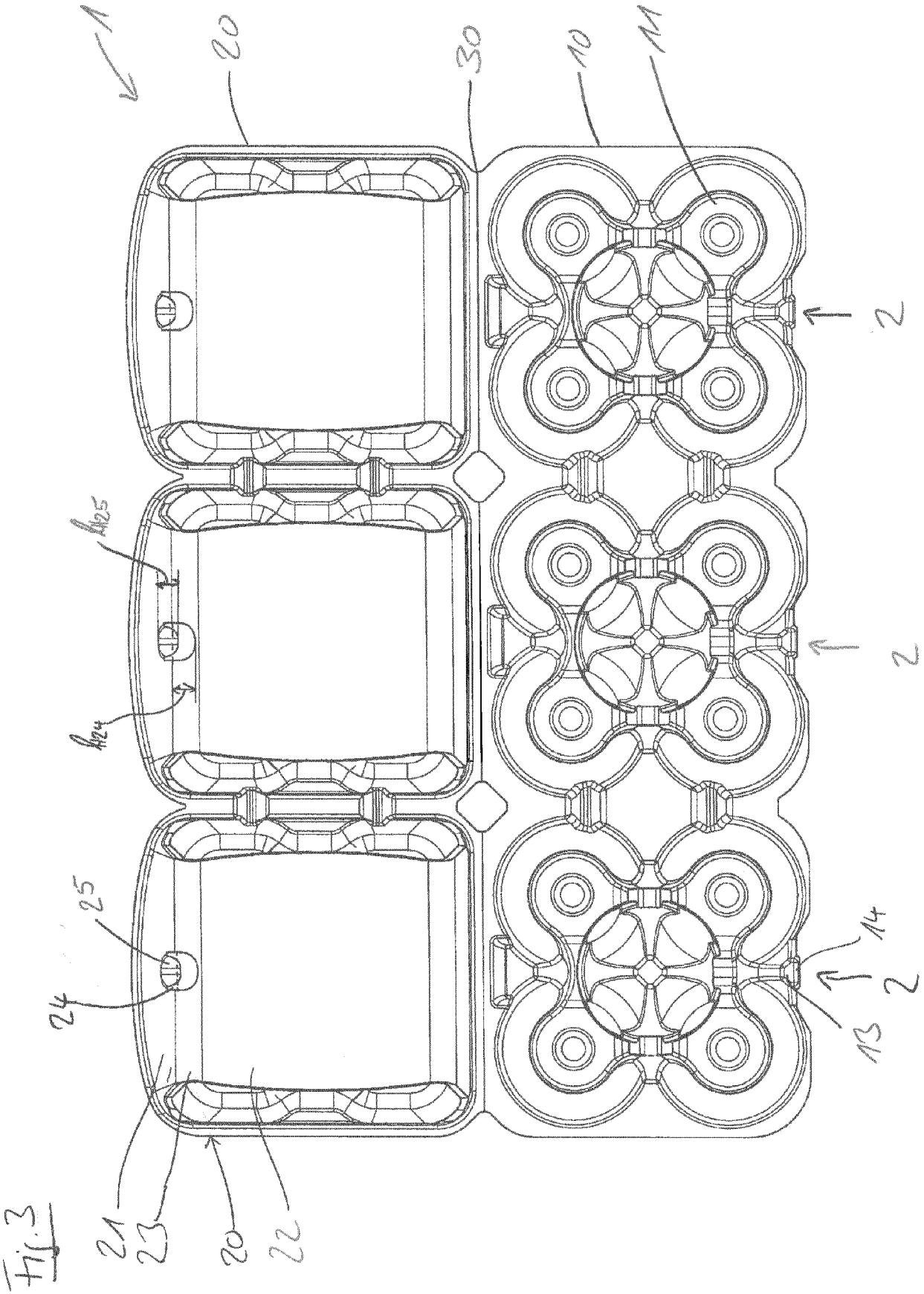


Fig. 3

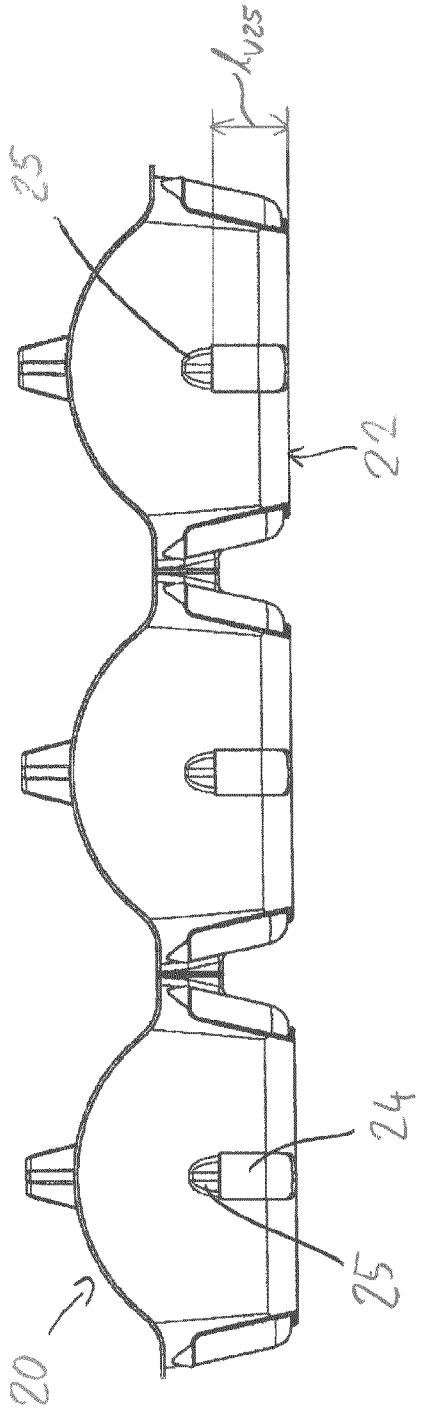


Fig. 4a

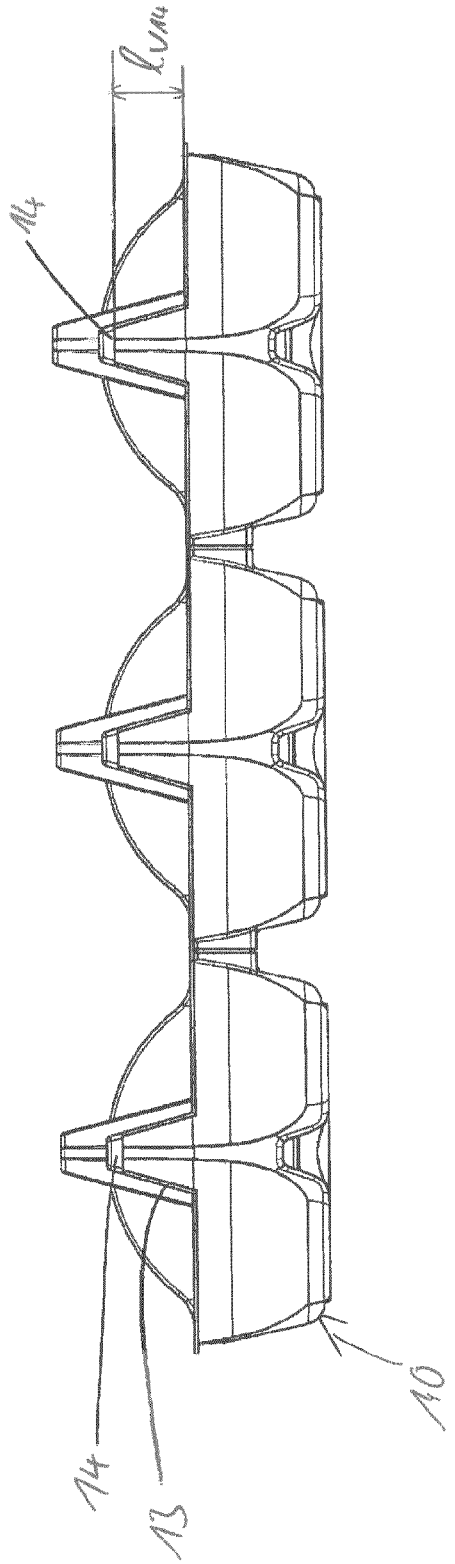


Fig. 4b

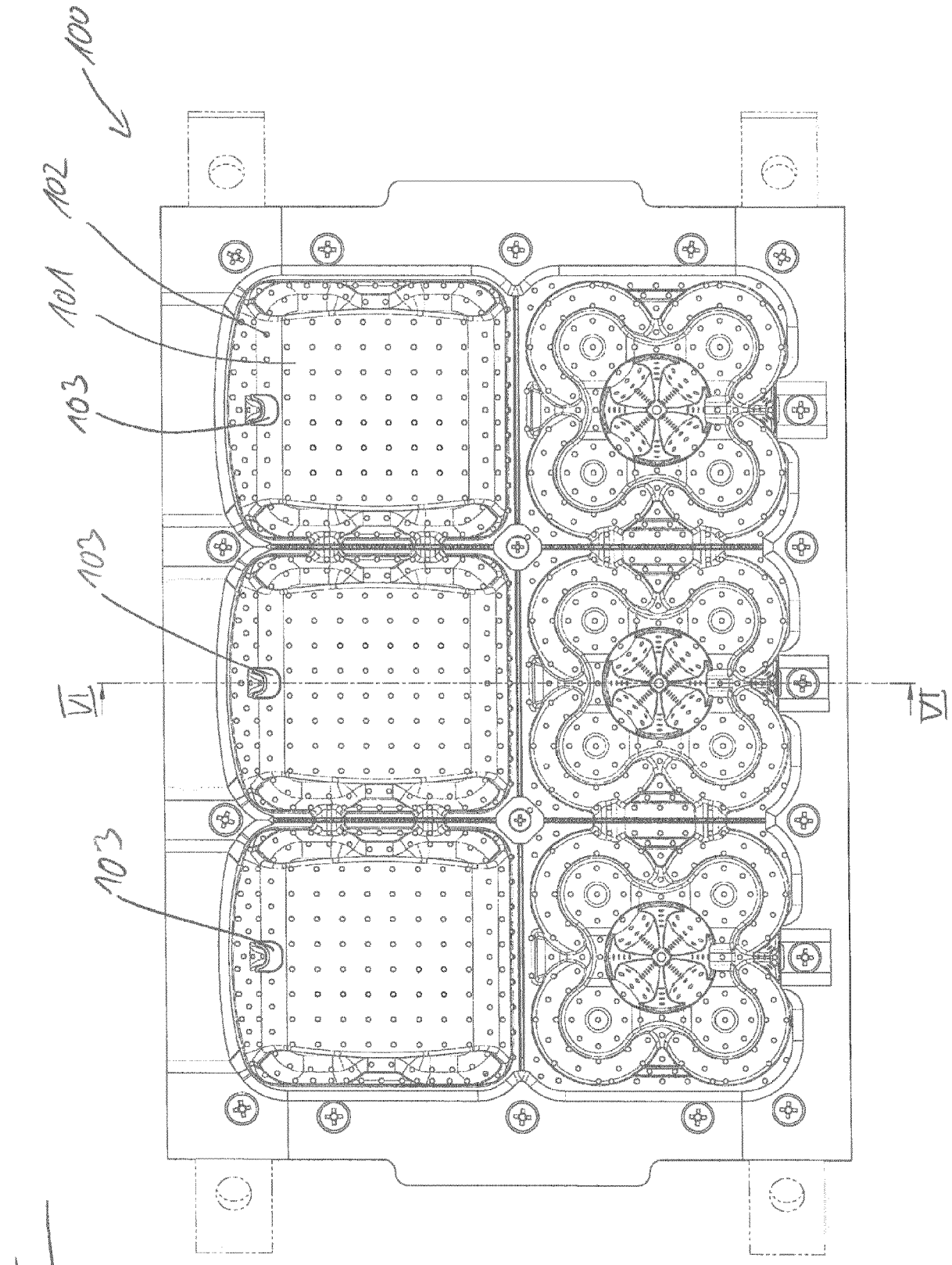


Fig. 5

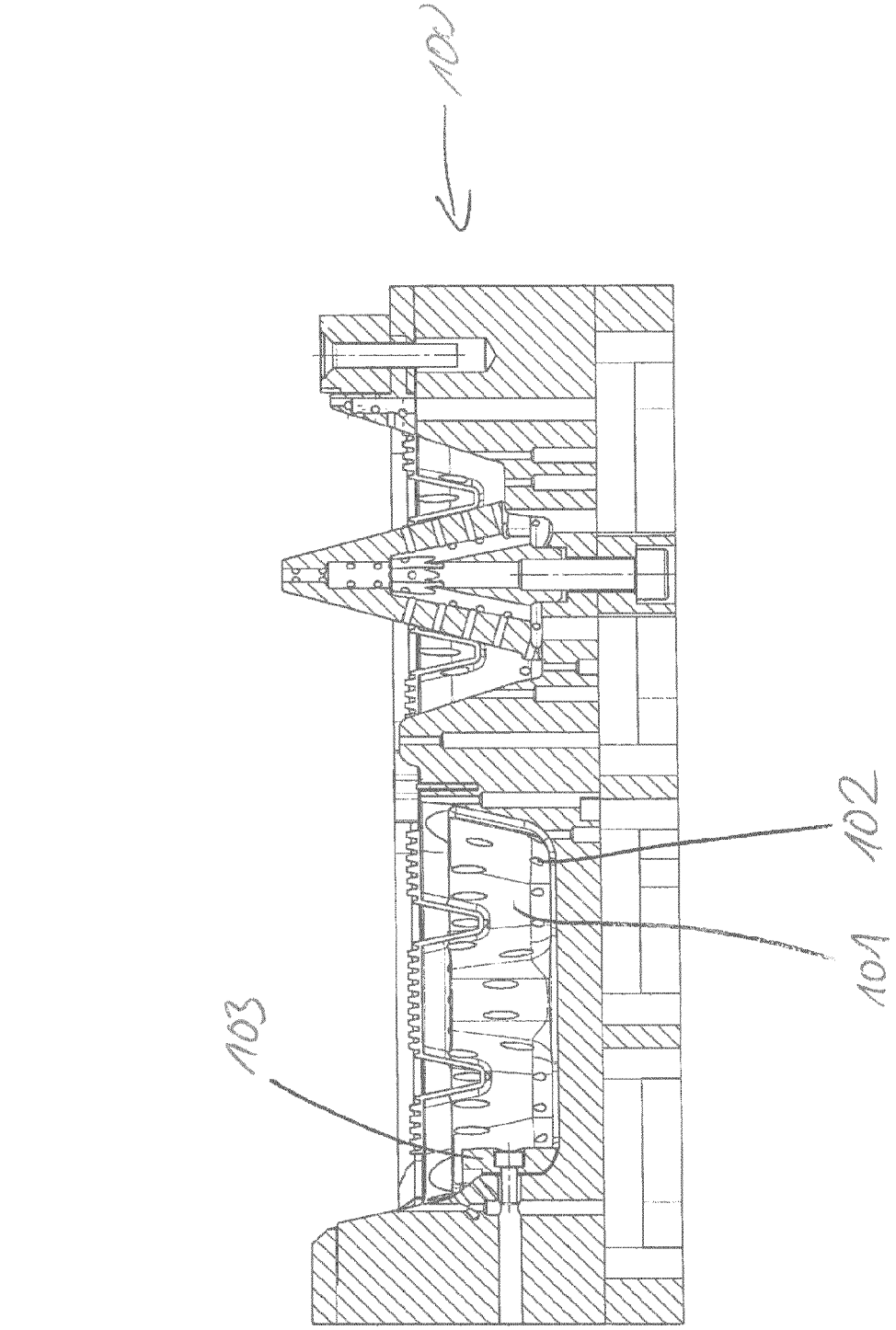


Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 18 15 0128

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	GB 1 269 475 A (DIAMOND INT CORP [US]) 6 April 1972 (1972-04-06) * the whole document *	1-7	INV. B65D85/32
X	DE 67 52 962 U (SILVERPLASTICS GMBH & CO K G [DE]) 20 March 1969 (1969-03-20) * the whole document *	1-7	
X	GB 1 309 896 A (PACKAGING CORP AMERICA) 14 March 1973 (1973-03-14) * the whole document *	1-7	
X	US 4 446 088 A (DAINES JOHN [US]) 1 May 1984 (1984-05-01) * the whole document *	1-7	
			TECHNICAL FIELDS SEARCHED (IPC) B65D

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	31 May 2018	Serbescu, Anca

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
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L : document cited for other reasons

& : member of the same patent family, corresponding document

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Application Number
EP 18 15 0128

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-7

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 18 15 0128

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-7

   Egg packaging unit with locking mechanism

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2. claims: 8-12

   Method for manufacturing an egg packaging unit

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 18 15 0128

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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31-05-2018

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