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- (71) **Applicant (for all designated States except US):** **CRY-
OVAC, INC.** [US/US]; 100 Rogers Bridge Rd., Duncan,
SC 29334 (US).
- (72) **Inventors; and**
- (75) **Inventors/Applicants (for US only):** **PALUMBO, Ric-
cardo** [IT/IT]; Via Garelli 20, I-28041 Arona (Novara)
(IT). **CAPITANI, Stefano** [IT/IT]; Via Andrea Alciato
19, I-22100 Como (IT).
- (74) **Agent:** **FRAIRE, Cristina**; c/o Sealed Air Srl, Via Tren-
to 7, I-20017 Passirana di Rho (IT).
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(54) **Title:** PACKAGING RIGID PLASTIC TRAY AND RELATED PACKAGING METHOD

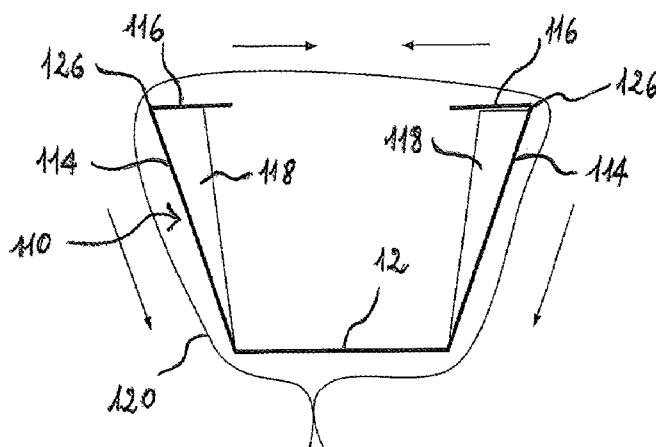


FIG. 9

(57) **Abstract:** The invention relates to a packaging rigid plastic tray (110) comprising a bottom surface (12) and side walls (114, 115) extending upwardly from said bottom surface (12), wherein a free end portion (14a, 15a) of at least one of said side walls (114, 115) defines an inwardly foldable flange (116, 117).

Description

Packaging rigid plastic tray and related packaging method

Technical Field

- [0001] The present invention relates to a packaging rigid plastic tray. In particular, the invention relates to a packaging rigid plastic tray enclosable by a shrink film.
- [0002] The present invention also relates to a method of packaging an item into the aforementioned rigid plastic tray.

Background Art

- [0003] Throughout the following description and in the annexed claims, the expression "rigid plastic tray" is used to indicate any plastic tray having a desired rigidity when properly shaped.
- [0004] Packaging rigid plastic trays are well-known in the art. They are for example used to package oxygen-sensitive, perishable products such as poultry, fresh and processed meats, fish, bakery items and a variety of prepared foods.
- [0005] Generally, the plastic trays are made from polypropylene and have a substantially quadrangular shape. The tray comprises a planar bottom surface and four side walls extending upwardly from the bottom surface. In use, it is enclosed by a shrink film which hermetically seals the product arranged inside the tray. Alternatively, the tray is closed by a shrinkable lid film sealed all around onto the flange. The film is transparent (in order to let see the contained product) and provides an oxygen and moisture barrier, as well it prevents transfer of aromas and flavours.
- [0006] The free end portions of the four side walls of the tray comprise respective flanges substantially parallel to the bottom surface and extending outwards. Generally, the four flanges are joined to define a single, outwardly extending planar flange over which the shrink film enclosing the tray rests or it is sealed onto.
- [0007] In order to increase the rigidity of the plastic tray, each side wall of the plastic tray may be provided with reinforcing ribs which protrude inwards and extend from the bottom surface up to the flange level.

- [0008] The Applicant has found that, notwithstanding the provision of the aforementioned reinforcing ribs, the shrink force exerted by the film enclosing the tray may cause the flange, and consequently the tray, to be deformed. Specifically, due to the fact that the shrink force causes the external free portion of the flange - which is the weakest portion - to be compressed and the internal portion of the flange - which is strengthened by the contact with the tray side wall - to be stressed by traction, the flange may be subject to a momentum stress which causes the flange to collapse due to buckling and, consequently, the tray to be deformed. The product contained in the deformed tray may thus be damaged, let alone the poor appearance of the package with the deformed tray.
- [0009] The Applicant has noted that, in order to reduce the aforementioned deformation, the thickness of the material should be increased. However, this would cause an undesired increase of weight, and consequently of the manufacturing and shipment costs of the tray.
- [0010] The technical problem at the basis of the present invention is to provide a packaging rigid plastic tray that better withstands the shrink force of the film by which it is enclosed, thus making it possible to reduce the material thickness and, consequently, the manufacturing and shipment costs of the tray.

Disclosure of Invention

- [0011] The present invention, in a first aspect thereof, relates to a packaging rigid plastic tray, in particular a packaging rigid plastic tray enclosable by a shrink film, said tray comprising a bottom surface and side walls extending upwardly from said bottom surface, characterised in that a free end portion of at least one of said side walls defines an inwardly foldable flange.
- [0012] Throughout the following description and the annexed claims, the relative terms “inside” and “outside”, as well as similar terms as “inner” and “outer” or “internal” and “external” or “inwards/inwardly” and “outwards/outwardly”, respectively, are used making reference to the internal part of the tray. The terms “bottom” and “top” or “lower” and “upper” or “down” and “up” or “downwards/downwardly” and “upwards/upwardly” are used making reference to the usual position of the tray in use.

- [0013] The Applicant has surprisingly found that the tray of the present invention is more robust than the conventional trays. Indeed, the provision of the inwardly foldable flange allows the flange to be folded towards the internal part of the tray before shrinking of the film, so that in this position the external portion of the flange - which is subject to a compression stress - is strengthened by the contact with the tray side wall and better withstands the shrink force of the film, while the internal portion of the flange - which is the weakest portion - is subject to a traction stress and cannot collapse. Therefore, advantageously, it is possible to reduce the material thickness of the tray, so that manufacturing and shipment costs are reduced.
- [0014] Moreover, the available volume for the item contained inside the tray of the present invention is advantageously increased with respect to a conventional rigid plastic tray having a flange extending outwards, the external dimension of the trays being equal.
- [0015] Furthermore, the appearance of the package is improved because of the increased rigidity of the tray and there is no risk to damage the product contained inside the tray.
- [0016] The Applicant has found that the aforementioned advantageous effects are achievable also when using trays which, being closed by a film welded on the upper edges of the side walls, are subsequently subject to shrinking.
- [0017] Preferably, the bottom surface of the tray of the present invention is substantially planar and the inwardly foldable flange extends inwards in a plane substantially parallel to the bottom surface when the flange is folded inwardly.
- [0018] The flange can be advantageously oriented outwardly before an item is positioned inside the tray, so that positioning of the item is not hampered by the flange. Orienting the flange outwardly, preferably in a plane substantially parallel to the bottom surface, allows the stacking of a plurality of trays during shipment. After the item is positioned inside the tray, the flange is folded inwardly.
- [0019] Preferably, the aforementioned free end portion of at least one side wall is associated with a remaining portion of the side wall at a folding line

substantially parallel to the bottom surface. In this way, the flange is easily foldable along a predetermined line parallel to the bottom surface, and the folded flange results parallel to the bottom surface as well. This makes the tray compact and allows other trays to be superimposed in use.

- [0020] Preferably, the side wall provided with the inwardly foldable flange comprises at least one reinforcing rib which protrudes inwards. More preferably, the above-mentioned at least one reinforcing rib extends from the bottom surface substantially up to said at least one inwardly foldable flange.
- [0021] Advantageously, the rigidity of this side wall – and consequently of the tray – is thus considerably increased.
- [0022] Preferably, the at least one inwardly foldable flange rests on the top of the at least one reinforcing rib when the flange is folded inwardly. Advantageously, the top of the reinforcing rib(s) thus creates a support for the flange, avoiding the flange to collapse when an external load is applied to the tray.
- [0023] Preferably, the at least one inwardly foldable flange completely covers the top of the at least one reinforcing rib when said flange is folded inwardly. Advantageously, the ribs are thus hidden under the flange, thus improving the appearance of the tray with respect to a conventional rigid plastic tray having a flange extending outwards and visible ribs extending inwards. Moreover, the ribs below the flange of the invention do not hamper positioning of the item into the tray when this positioning is carried out after inwardly folding the flange. In addition thereof, the available volume for the item is increased with respect to a conventional rigid plastic tray, the footprint of the trays being equal.
- [0024] Preferably, the bottom surface of the tray of the invention comprises at least one further reinforcing rib. Advantageously, the rigidity of this bottom surface – and consequently of the tray – is thus further increased.
- [0025] In a preferred embodiment of the invention, the tray comprises four planar side walls joined by four rounded side walls, each side wall comprising a respective inwardly foldable flange.

- [0026] The tray of the invention is preferably enclosed by a shrink film, once an item has been positioned inside the tray. In a different embodiment of the present invention, the tray is closed by a film welded at the top thereof, that is at the upper edges of the side walls, to be subsequently subject to shrinking.
- [0027] In a second aspect thereof, the present invention relates to a method of packaging an item into a rigid plastic tray, the tray comprising a bottom surface and side walls extending upwardly from said bottom surface, wherein a free end portion of at least one of said side walls defines an inwardly foldable flange, the method comprising:
- a) positioning said item inside said tray;
 - b) inwardly folding said flange;
 - c) closing said tray by a film.
- [0028] Advantageously, the above method makes use of a tray according to the present invention and, therefore, allows to achieve all the advantageous effect discussed above.
- [0029] In a first embodiment of the method of the invention, inwardly folding is actuated before the tray is closed by welding a film at the upper edges of the side walls.
- [0030] In a preferred embodiment of the method of the invention, inwardly folding is actuated before the tray is enclosed by a shrink film or during shrinking the film. In other words, in the latter case, the shrinking of the film causes also a simultaneous, automatic folding of the flange.
- [0031] In the method of the invention, positioning the item inside the tray is actuated before or after inwardly folding the flange. In the former case, the item can better fill the available volume inside the tray, even the space between adjacent ribs of the side walls.
- [0032] Preferably, in the method of the invention, inwardly folding the flange comprises resting the flange on at least one reinforcement rib which protrudes inwards from the at least one side wall. In this way, a support for the flange is created, avoiding the flange to collapse in case it is folded down when an external load is applied to the tray (the flange cannot fold up because it is constrained by the shrink film).

Brief Description of Figures in the Drawings

- [0033] Further characteristics and advantages of the present invention shall become clearer from the following detailed description of preferred embodiments thereof, made with reference to the attached drawings and given for indicating and not limiting purposes. In such drawings:
- [0034] - figure 1 schematically shows a plan view of a packaging rigid plastic tray according to the prior art;
- [0035] - figure 2 schematically shows a perspective, partially sectioned view of the packaging rigid plastic tray of figure 1;
- [0036] - figure 3 schematically shows a perspective sketch of a portion of a packaging rigid plastic tray according to the prior art when shrinking forces are applied;
- [0037] - figure 4 schematically shows a perspective view of a packaging rigid plastic tray according to the present invention, in a first configuration thereof;
- [0038] - figure 5 schematically shows a perspective view of a packaging rigid plastic tray according to the present invention, in a second configuration thereof;
- [0039] - figure 6 schematically shows a perspective, partially sectioned view of the packaging rigid plastic tray of figure 5;
- [0040] - figure 7 schematically shows a plan view of the packaging rigid plastic tray of figure 5;
- [0041] - figure 8 schematically shows a sketch of a section of a packaging rigid plastic tray according to the present invention, in a state wherein a shrink film is not shrunk around the tray;
- [0042] - figure 9 schematically shows a sketch of a section of a packaging rigid plastic tray according to the present invention, in a state wherein the shrink film is shrunk around the tray;
- [0043] - figure 10 schematically shows a perspective sketch of a portion of a packaging rigid plastic tray according to the present invention when shrinking forces are applied.

- [0044] With reference to figures 1 and 2, a packaging rigid plastic tray in accordance with the prior art is shown. Such a tray is globally indicated with 10 and it is preferably made from plastic, such as polypropylene.
- [0045] The tray 10 has a substantially quadrangular shape and comprises a substantially planar bottom surface 12 and four side walls 14 extending upwardly from the bottom surface 12. In order to make these figures readable, only some of the side walls 14 are labelled with reference numerals.
- [0046] The free end portions 14a of the four side walls 14 of the tray 10 comprise respective flanges substantially parallel to the bottom surface 12 and extending outwards. The four flanges are joined to define a single, outwardly extending planar flange 16. In use, the tray 10 is enclosed by a shrink film (not shown in figures 1 and 2) in order to hermetically seals a product arranged inside the tray. This shrink film rests over the flange 16.
- [0047] The side walls 14 comprise reinforcing ribs 18 and also the bottom surface 12 comprises further reinforcing ribs 19.
- [0048] As shown in figure 3, a shrink force exerted by the film enclosing the tray 10 (such a force being represented by arrows indicated with SF) causes the axially external free portion 16a of the flange 16 - which is the weakest portion - to be compressed (such a stress is indicated with arrows C) and the axially internal portion 16b of the flange 16 - which is strengthened by the contact with the tray side wall 14- to be stressed by traction (such a stress is indicated with arrows T). As a result, the flange 16 is subject to a momentum stress which may cause the flange to collapse. Consequently, the tray 10 is deformed.
- [0049] With reference to figures 4-10, a packaging rigid plastic tray in accordance with the present invention is shown. Such a tray is globally indicated with 110 and it is preferably made from a plastic material selected from the group comprising: polypropylene, polystyrene and polyesters, such as for example PET (Polyethylene terephthalate esters), PLA (polylactic acid esters) and mixtures thereof. Elements of figures 4-10 that are similar from the structural point of view, or that correspond from the functional point of view, to the described elements of figures 1-3 are indicated with the same

reference numerals and, for the sake of shortness, their description will be not repeated.

- [0050] The tray 110 comprises a substantially planar bottom surface 12 and side walls extending upwardly from the bottom surface 12. In particular, the tray 110 comprises four planar side walls 114 joined by four rounded side walls 115. In order to make the figures readable, only some of the side walls 114, 115 are labelled with reference numerals.
- [0051] According to the present invention, the free end portions 14a, 15a of the side walls 114, 115 of the tray 110 define respective inwardly foldable flanges 116, 117.
- [0052] In figure 4, the flanges 116, 117 of the side walls 114, 115 are unfolded and extend outwards in a plane substantially parallel to the bottom surface 12.
- [0053] In figure 5, the flanges 116, 117 are folded and extend inwards in a plane substantially parallel to the bottom surface 12. The four arrows in dotted lines of figure 4 indicate the rotation of the flanges 116, 117 from the unfolded state to the folded state. Moreover, figure 4 shows that, in order to avoid that the lateral edges 116c, 117c of two adjacent flanges 116, 117 overlap each other, these edges are not perpendicular to the folding lines 126, 127 but they are tilted so that the flanges 116, 117 slightly taper towards the free end of the flanges.
- [0054] The flanges 116, 117 are folded along respective folding lines 126, 127 substantially parallel to the bottom surface 12. In other words, the free end portions 14a, 15a of the side walls 114, 115 are associated with respective remaining portions 14b, 15b thereof at the folding lines 126, 127.
- [0055] According to the embodiment of the invention shown in the figures 4-7, the side walls 114, 115 comprises a plurality of reinforcing ribs 118 which protrude inwards and extend from the bottom surface 12 substantially up to the flanges 116, 117. In particular, the reinforcing ribs 118 extend substantially up to the level of the folding lines 126, 127, i.e. all the reinforcing ribs 118 substantially have the same height.

- [0056] As shown in figures 5-7 and more schematically in figure 9, the flanges 116, 117 rest on the top 118a of the reinforcing ribs 118 when the flanges are folded inwardly.
- [0057] Moreover, the flanges 116, 117 completely cover the top 118a of the reinforcing ribs 118 when the flanges are folded inwardly. The dimension of the flanges is thus such that the reinforcing ribs 118 are totally hidden by the flanges 116, 117 when these are folded inwardly.
- [0058] In a different embodiment (not shown), the dimension of the flanges 116, 117 is such that the reinforcing ribs 118 are not totally hidden by the flanges 116, 117, that is flanges 116, 117 do not completely cover the top 118a of the reinforcing ribs 118 when the flanges are folded inwardly.
- [0059] Figure 8 schematically shows the tray 110 enclosed by a shrink film 120, in a state wherein the film 120 is not shrunk around the tray 110.
- [0060] Figure 9 shows the film 120 shrunk around the tray 110. The arrows in dotted lines of figure 8 indicate the rotation of the flanges from the unfolded state to the folded state.
- [0061] As shown in figure 10, the shrink force (represented by arrows indicated with SF) exerted by the film 120 causes the axially external portion 116a of the inwardly folded flange 116 (or 117) to be compressed (such a stress is indicated with arrows C) and the axially internal free portion 116b of the flange 116 (or 117) to be stressed by traction (such a stress is indicated with arrows T). Contrary to the arrangement of the prior art shown in figure 3, since the axially external portion 116a of the flange 116 (or 117) is strengthened by the contact with the tray side wall 114 (or 115), it can withstand the shrink force SF of the film so that the flange does not collapse.
- [0062] Preferably, the flanges 116 and 117 are unfolded during manufacturing and shipment in order to allow stacking of the trays and a subsequent easier positioning of the product into the tray. More preferably, the flanges 116 and 117 are partially folded at an angle of 45°-60° during manufacturing and shipment.
- [0063] When an item is to be packaged, it is positioned inside the tray 110 according to the present invention with the flanges 116, 117 in the

unfolded state (figure 4). Then the flanges 116, 117 are inwardly folded and the tray 110 is enclosed by the shrink film 120. Alternatively, the item can be positioned inside the tray 110 after inwardly folding the flanges 116, 117.

- [0064] Moreover, the flanges 116, 117 can be inwardly folded before the tray 110 is enclosed by the shrink film 120 or during shrinking the film 120. In figure 8 it is shown that the shrinking of the film 120 causes the simultaneous, automatic folding of the flanges 116 (and 117), being said automatic folding particularly smooth when the flanges 116 (and 117) are partially folded at an angle of 45°-60°.
- [0065] As shown in figure 9, the flanges 116 (and 117) are folded inwardly till they rest on the reinforcement ribs 118.
- [0066] The tray 110 of the invention can be industrially pre-made or it is produced at customer level using a conventional billet forming machine.
- [0067] Of course, a man skilled in the art can bring numerous modifications and variants to the packaging rigid plastic tray and to the related packaging method described above, in order to satisfy specific and contingent requirements, all of which are however covered by the scope of protection of the present invention as defined by the following claims.

Claims

1. Packaging rigid plastic tray (110) comprising a bottom surface (12) and side walls (114, 115) extending upwardly from said bottom surface (12), characterised in that a free end portion (14a, 15a) of at least one of said side walls (114, 115) defines an inwardly foldable flange (116, 117).
2. Plastic tray (110) according to claim 1, wherein said bottom surface (12) is substantially planar and said inwardly foldable flange (116, 117) extends inwards in a plane substantially parallel to said bottom surface (12) when said flange (116, 117) is folded inwardly.
3. Plastic tray (110) according to claim 1 or 2, wherein said free end portion (14a, 15a) is associated with a remaining portion (14b, 15b) of said at least one of said side walls (114, 115) at a folding line (126, 127) substantially parallel to said bottom surface (12).
4. Plastic tray (110) according to any one of the previous claims, wherein at least the side wall (114, 115) provided with said at least one inwardly foldable flange (116, 117) comprises at least one reinforcing rib (118) which protrudes inwards.
5. Plastic tray (110) according to claim 4, wherein said at least one reinforcing rib (118) extends from said bottom surface (12) substantially up to said at least one inwardly foldable flange (116, 117).
6. Plastic tray (110) according to claim 4 or 5, wherein said at least one inwardly foldable flange (116, 117) rests on the top (118a) of said at least one reinforcing rib (118) when said flange (116, 117) is folded inwardly.
7. Plastic tray (110) according to anyone of claims 4 to 6, wherein said at least one inwardly foldable flange (116, 117) completely covers the top (118a) of said at least one reinforcing rib (118) when said flange (116, 117) is folded inwardly.
8. Plastic tray (110) according to any one of the previous claims, wherein said bottom surface (12) comprises at least one further reinforcing rib (19).
9. Plastic tray (110) according to any one of the previous claims, wherein said tray (110) comprises four planar side walls (114) joined by four rounded side walls (115), each side wall (114, 115) comprising a respective inwardly foldable flange (116, 117).

10. Plastic tray (110) according to any one of the previous claims, wherein said tray (110) is enclosed by a shrink film (120) or closed by a film welded at the top thereof.
11. Method of packaging an item into a rigid plastic tray (110), the tray (110) comprising a bottom surface (12) and side walls (114, 115) extending upwardly from said bottom surface (12), wherein a free end portion (14a) of at least one of said side walls (114, 115) defines an inwardly foldable flange (116, 117), the method comprising:
 - a) positioning said item inside said tray (110);
 - b) inwardly folding said flange (116, 117);
 - c) closing said tray (110) by a film (120).
12. Method according to claim 11, wherein said inwardly folding is actuated before the tray (110) is closed by welding a film at the upper edges of the side walls (114, 115).
13. Method according to claim 11, wherein said inwardly folding is actuated before the tray (110) is enclosed by a shrink film (120) or during enclosing the tray (110) by shrinking the film (120).
14. Method according to any of claims 11 to 13, wherein positioning said item inside said tray (110) is actuated before or after inwardly folding said flange (116, 117).
15. Method according to any one of claims 11 to 14, wherein inwardly folding said flange (116, 117) comprises resting said flange (116, 117) on at least one reinforcement rib (118) which protrudes inwards from said at least one side wall (114, 115).

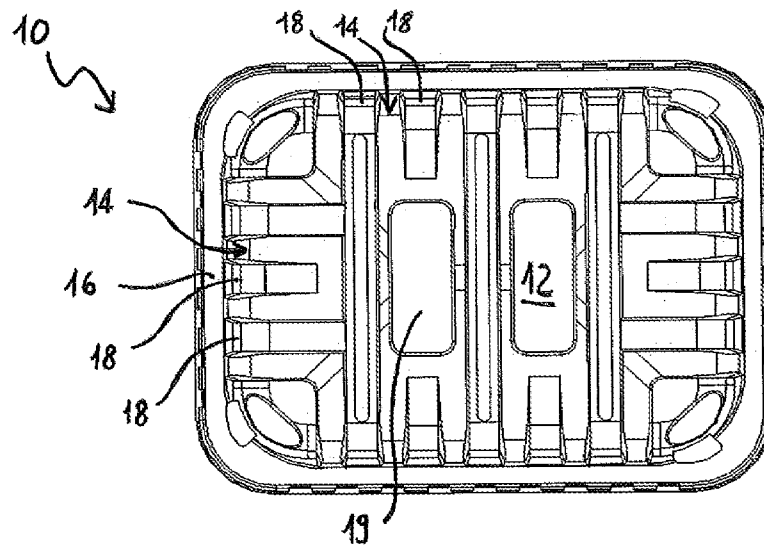


FIG. 1 PRIOR ART

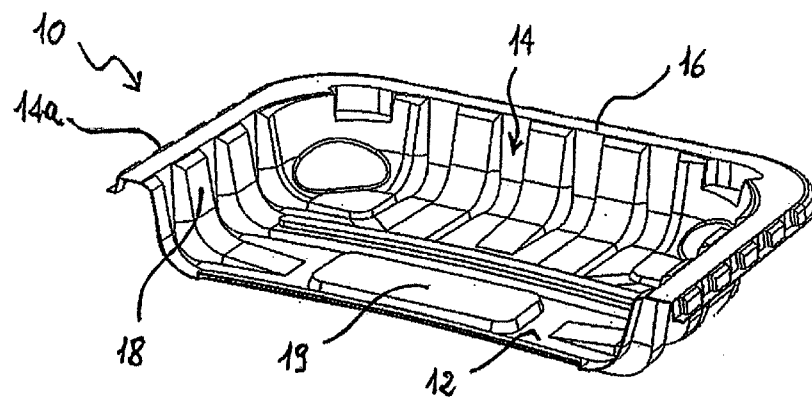


FIG. 2 PRIOR ART

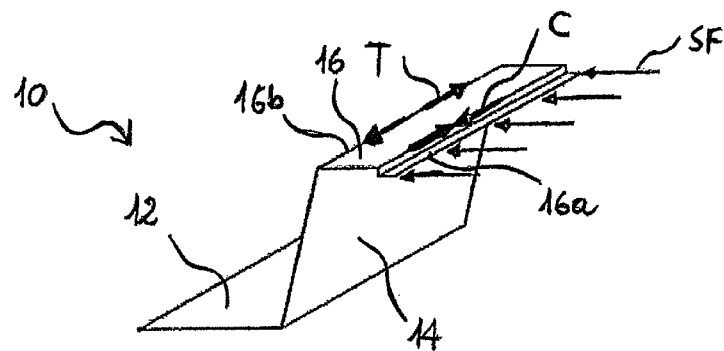


FIG. 3 PRIOR ART

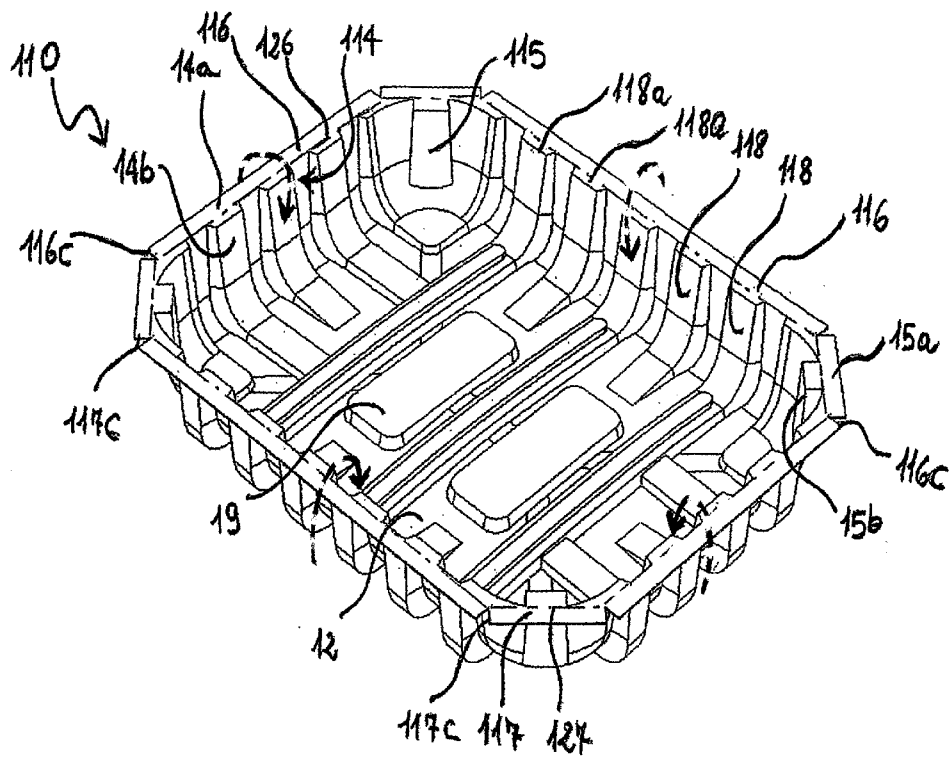


FIG. 4

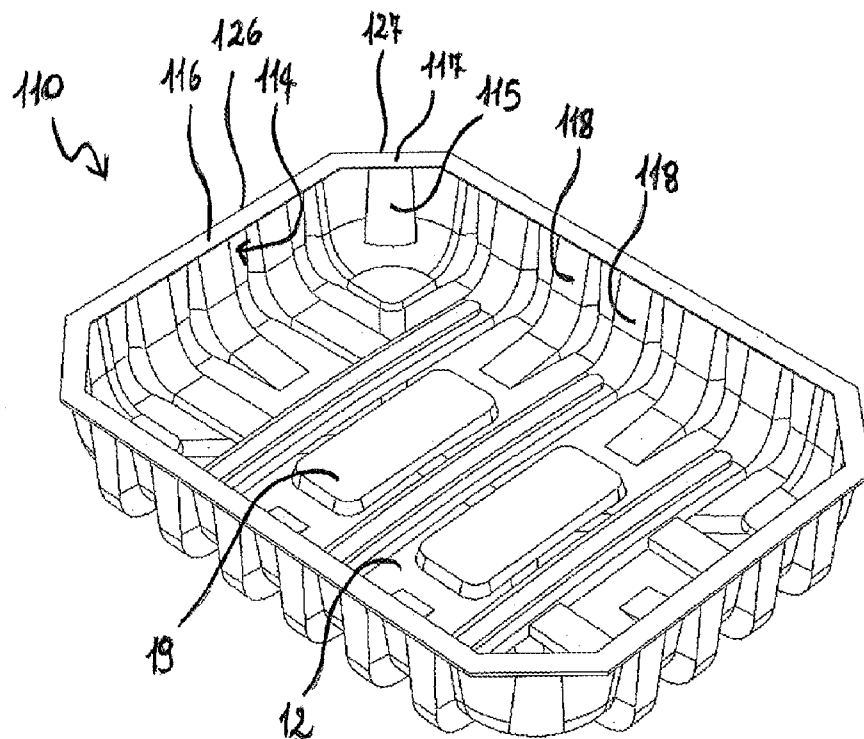


FIG. 5

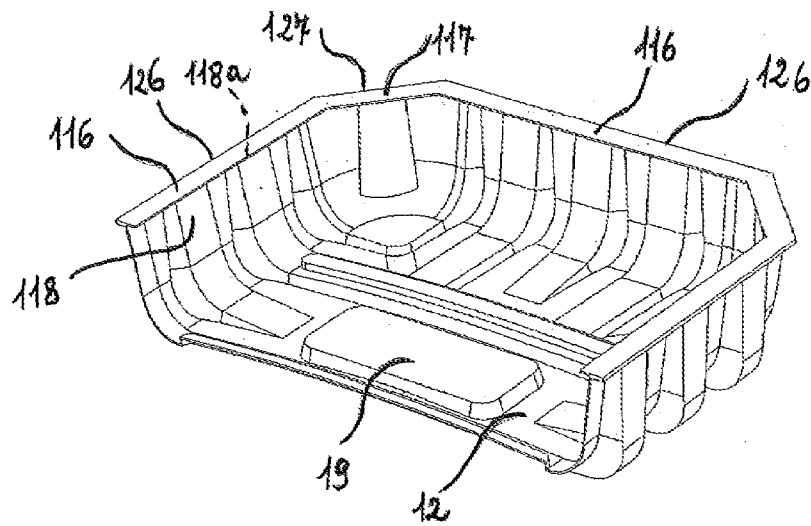


FIG. 6

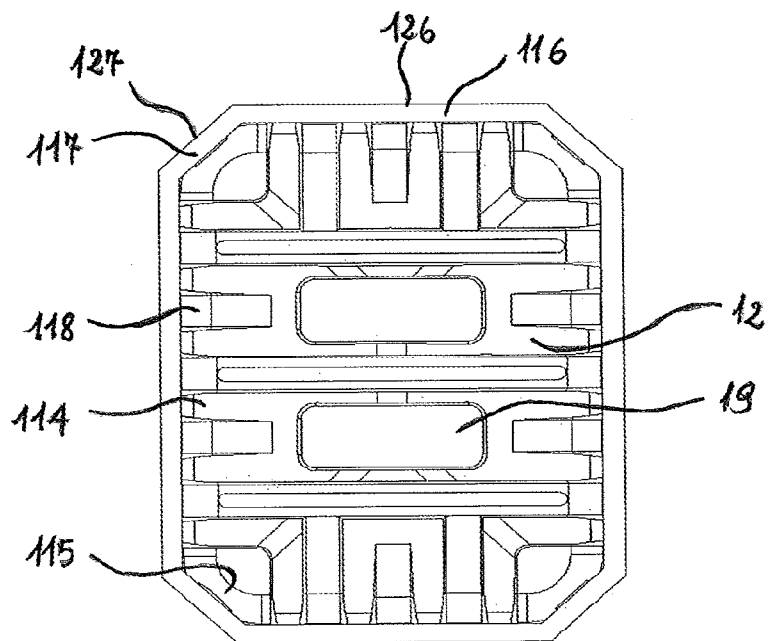
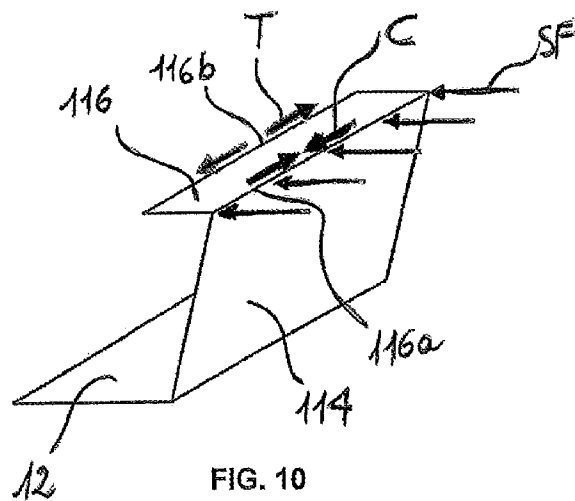
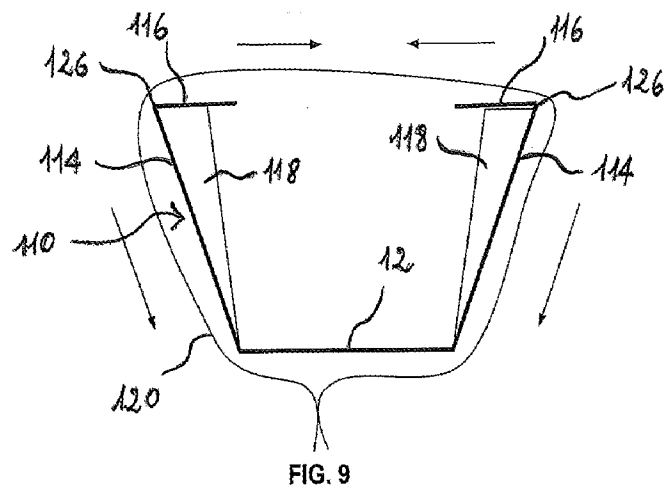
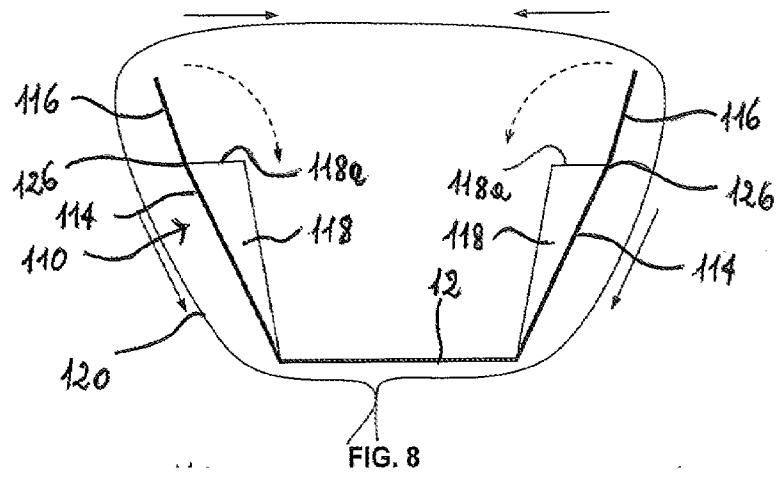


FIG. 7



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/063251

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D1/34 B65D77/00
ADD.

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

B. FIELDS SEARCHED

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

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

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

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 269 345 A (EMERY ROY W) 26 May 1981 (1981-05-26) column 2, line 43 - column 3, line 38; figures 1-3 -----	1-3,11, 14
X	US 3 707 227 A (BRITT THOMAS M) 26 December 1972 (1972-12-26) column 2, lines 13-53; figures 1-5 -----	1,3,8,11
A	US 4 889 231 A (FOOTE MARK A [US] ET AL) 26 December 1989 (1989-12-26) column 3, lines 33-43; figures 3-8 -----	1,11
A	US 2 004 486 A (SIMON COOPER) 11 June 1935 (1935-06-11) page 1, column 2, lines 9-50; figures 1-5 -----	1,11



Further documents are listed in the continuation of Box C.



See patent family annex.

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PCT/EP2011/063251

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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