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(54) **Package assembly and process for packaging products**

(57) It is described a food package assembly comprising a first container hosting at least one first food product, a second container hosting at least one second food product, and a connecting device configured for forming a communication channel between the first container and the second container. Use of the packaging assembly is also disclosed together with a process for making the packaging assembly.

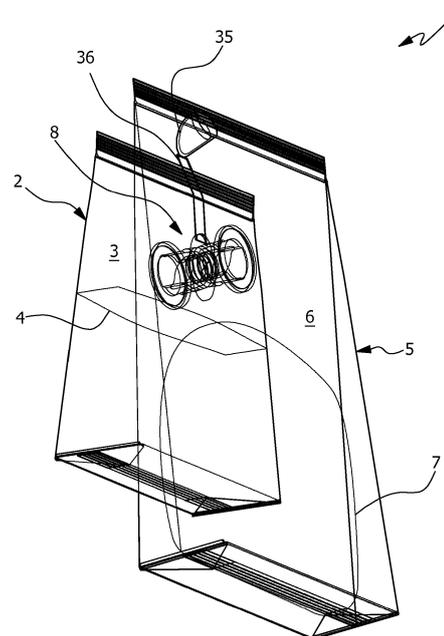


FIG.1

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Description

Technical field

[0001] The present invention relates to a package assembly and to a process for packaging products. In particular the package assembly and the process are configured to package food products. More particularly, the package assembly is configured for separately packaging a first food product mainly comprising a liquid component and a second food product mainly comprising a solid component.

Background art

[0002] Plastic containers are used for the packaging of items, such as food or other products. A plastic pouch of a tray with a film lid may be used to define a closed package containing the food product. The food product hosted in the package is protected and isolated from the external atmosphere. In this manner food products may be shipped in a relatively simple manner and food properties preserved.

[0003] In certain instances it may be desirable to keep two food products separate until the two products are used. For this reason multi-compartment packaging containers have been conceived in the past: according to these solutions each compartment of a single package receives a respective food product which is kept separate from the other food products until the package is opened and used by a customer.

[0004] For instance, document WO2006/051383 A1 discloses a food product package which comprises two compartments divided by a membrane, wherein the first compartment is used for containing a first relatively solid substance and the second department is used for containing a second more liquid substance. The package comprises a means for easily producing an opening in the membrane thereby enabling the second substance to flow to the first compartment before the combined food product is then consumed.

[0005] Although the described solutions allow packaging of different products, the design and construction of multi-compartment packages is often complex and not cheap.

[0006] Moreover, multi-compartment containers are often characterized by scarce flexibility for the final user. In practice, a user may only use the specific components (typically two) housed in the multi-compartment container, with no possibility of choosing different combinations. Also, a user cannot decide on the specific quantity of the second component that should be mixed with the first component. In addition, when using multi-compartment containers, the shelf life of the overall packaging is dictated by shelf life of the product having the shortest shelf life. This sometimes results in food waste.

[0007] Thus it is an object of the invention conceiving a packaging process and a package assembly which can

overcome the limitations of the known solutions described above.

[0008] In particular, it is a main object of the invention, to offer a package assembly for a number of food products characterized by an improved ease of use and flexibility of operation for the final user.

[0009] Furthermore, it is an auxiliary object conceiving a package assembly characterized by a higher sustainability compared to conventional food packages.

[0010] A further object is offering a package assembly ideal for packaging multiple food products.

[0011] An ancillary object, is that of offering a package assembly suitable for allowing isolated packaging of multiple food products before use (e.g. during shipping, storing and exposing of the products), and facilitated mixing of the products when it comes the moment to consume or cook or prepare the final food product.

[0012] A further object of the invention is a packaging process which can be implemented without significantly impairing on costs and thus suitable for offering a package assembly of competitive price.

Summary of the invention

[0013] One or more of the objects specified above are substantially achieved by a package assembly according to any one of the appended claims.

[0014] Aspects of the invention are here below disclosed.

[0015] A 1st aspect concerns a food package assembly comprising:

- a first container delimiting a first volume hosting at least one first product,
- a second container delimiting a second volume hosting at least one second product, the first and second products being food products,
- a connecting device including at least a first connecting member carried by the first container and a second connecting member carried by the second container,

wherein the food package assembly is configured to be placed in at least one disconnected condition, where said first and second volumes are isolated the one from the other and, optionally hermetically sealed, with the first container physically separated from the second container, and in at least one connected condition, where the connecting device connects the first connecting member with the second connecting member forming a communication channel between the first volume and the second volume.

[0016] In a 2nd aspect according to the 1st aspect said channel presents a channel lumen configured to allow passage of the first product from the first volume to the second volume while preventing passage of the second product from the second volume to the first volume.

[0017] In a 3rd aspect according to any one of the pre-

ceding aspects the first container is a pouch formed from one or more plastic films, the plastic film or films forming the pouch being sealingly joined at sealing lines to form an hermetically sealed first volume.

[0018] In a 4th aspect according to any one of the preceding 1st and 2nd aspects, the first container is a tray with a base wall, a side wall emerging from the base wall, a top rim and a plastic film sheet sealingly fixed at least to the tray top rim to form an hermetically sealed first volume.

[0019] In a 5th aspect according to any one of the preceding aspects the second container is a pouch formed from one or more plastic films, the plastic film or films forming the pouch being sealingly joined at sealing lines to form an hermetically sealed second volume.

[0020] In a 6th aspect according to any one of the preceding aspects from the 1st to the 4th the second container is a tray with a base wall, a side wall emerging from the base wall, a top rim and a plastic film sheet sealingly fixed at least to the tray top rim to form an hermetically sealed second volume.

[0021] A 7th aspect concerns a food package assembly comprising:

- a first container delimiting a first volume hosting at least one first product,
- a second container delimiting a second volume hosting at least one second product, the first and second products being food products,
- a connecting device including at least a first connecting member carried by the first container and a second connecting member carried by the second container,

wherein the food package assembly is configured to be placed in at least one disconnected condition, where said first and second volumes are isolated the one from the other, with the first container physically separated from the second container, and in at least one connected condition, where the connecting device connects the first connecting member with the second connecting member forming a communication channel between the first volume and the second volume, wherein the first container is:

- a pouch formed from one or more plastic films, the plastic film or films forming the pouch being sealingly joined at sealing lines to form an hermetically sealed first volume,

and wherein the second container is:

- a pouch formed from one or more plastic films, the plastic film or films forming each pouch being sealingly joined at sealing lines to form an hermetically sealed second volume or
- a tray with a base wall, a side wall emerging from the base wall, a top rim and a plastic film sheet seal-

ingly fixed at least to the tray top rim to form an hermetically sealed second volume.

[0022] In a 8th aspect according to any one of the preceding aspects, the first product in the first container is in the form of a liquid or a gel or a particulate or a paste, or a mixture of liquid or gel or paste with particulate, such as a sauce, a soup, a juice, a cream, a topping, a seasoning.

[0023] In a 9th aspect according to any one of the preceding aspects, the second product hosted in the second container is a solid food product comprising one or more solid food pieces sized not to pass through said channel lumen.

[0024] In a 10th aspect according to any one of the preceding aspects, the first connecting member comprises a tubular body having a terminal flange and a side wall, further wherein the terminal flange of the first connecting member is fixed to an inner surface or to an outer surface of the first container.

[0025] In a 11th aspect according to any one of the preceding aspects, the second connecting member comprises a tubular body having a terminal flange and a side wall, further wherein the terminal flange of the second connecting member is fixed to an inner surface or to an outer surface of the first container.

[0026] In a 12th aspect according to any one of the preceding aspects, the first connecting member is positioned inside the first volume and said terminal flange of the first connecting member is fixed to an inner surface of a wall of said first container, wherein - before first connection of the first connecting member with the second connecting member - a wall portion of the first container closes a lumen of the tubular body at said terminal flange.

[0027] In a 13th aspect according to any one of the preceding aspects, the second connecting member is positioned inside the second volume and said terminal flange of the second connecting member is fixed to an inner surface of a wall of said second container, wherein - before first connection of the first connecting member with the second connecting member - a wall portion of the second container closes a lumen of the tubular body at said terminal flange.

[0028] In a 14th aspect according to any one of the preceding aspects from the 1st to the 13th with the exclusion of the 12th aspect, the first connecting member is positioned outside the first volume and said terminal flange of the first connecting member is fixed to an outer surface of a wall of said first container, wherein - before first connection of the first connecting member with the second connecting member - a wall portion of the first container closes a lumen of the tubular body at said terminal flange.

[0029] In a 15th aspect according to any one of the preceding aspects from the 1st to the 14th with the exclusion of the 13th aspect, the second connecting member is positioned outside the second volume and said terminal flange of the second connecting member is fixed to

an outer surface of a wall of said second container, wherein - before first connection of the first connecting member with the second connecting member - a wall portion of the second container closes a lumen of the tubular body at said terminal flange.

[0030] In a 16th aspect according to any one of the preceding aspects, the side wall of the tubular body of the first connecting member forms a one or more radial passages.

[0031] In a 17th aspect according to any one of the preceding aspects, the side wall of the tubular body of the second connecting member forms a one or more radial passages.

[0032] In a 18th aspect according to any one of the preceding aspects, the first and second connecting members are identical.

[0033] In a 19th aspect according to any one of the preceding aspects, the connection device further includes an interconnection piece.

[0034] In a 20th aspect according to any one of the preceding aspects, the connection device further includes an interconnection piece, further wherein the interconnection piece - when the food package assembly is placed in said connected condition - is configured to be interposed between the first and second connecting members and connect the first connecting member with the second connecting member, forming said channel.

[0035] In a 21st aspect according to any one of the preceding two aspects, the interconnection piece comprises:

- a main body of tubular shape,
- a flange radially emerging from an outer surface of the main body, the main body presenting opposite tubular segments extending on opposite sides of the flange, each of the tubular segments being insertable through a tubular body of a respective of said first and second connecting members,
- axially opposite piercing portions defined at ends of said opposite tubular segments.

[0036] In a 22nd aspect according to any one of the preceding three aspects the interconnection piece is in the form of a separate component distinct from the first and the second connecting members.

[0037] In a 23rd aspect according to any one of the aspects from the 19th to the 21st the interconnection piece carried by, for instance integrally formed with, one of said connection members.

[0038] In a 24th aspect according to any one of aspects from the 19th to the 23rd wherein each one of opposite tubular segments of the interconnection piece is configured to engage one respective of said first connecting member and second connecting member.

[0039] In a 25th aspect according to any one of aspects from the 19th to the 24th wherein each one of opposite tubular segments of the interconnection piece is configured to engage one respective of said first connecting

member and second connecting member, further wherein said opposite tubular segments of the interconnection piece have an axial length which is shorter than an axial length of said first and second connecting members.

[0040] In a 26th aspect according to any one of aspects from the 19th to the 25th opposite tubular segments of the interconnection piece are identical, and wherein said first and second connecting members are identical such that each of said opposite tubular segments of the interconnection piece is configured to interchangeably engage one or the other of said first connecting member and second connecting member.

[0041] In a 27th aspect according to any one of aspects from the 19th to the 26th wherein the opposite tubular segments of the interconnection piece are configured to be slidably inserted into the corresponding tubular bodies of the first and second connecting members such that the axially opposite piercing portions defined at ends of said opposite tubular segments pierce and open the wall portion of the first and second container at each terminal flange of the first and second connecting members.

[0042] In a 28th aspect according to any one of aspects from the 19th to the 27th the interconnection piece bears an integrally associated closure cap member which can be removably coupled to one of the opposite tubular segments to open or close fluid passage through the interconnection piece.

[0043] In a 29th aspect according to any one of aspects from the 19th to the 28th the interconnection piece comprises a unidirectional valve positioned inside the main body of the interconnection piece.

[0044] In a 30th aspect according to the preceding aspect the unidirectional valve comprises one or more bendable flaps radially emerging from the inner surface of the main body of the interconnection piece and angularly displaceable from an extended condition where the flap or flaps interdict fluid passage to a bent condition where the flap or flaps allow fluid passage.

[0045] In a 31st aspect according to the 29th aspect the unidirectional valve comprises one or more frangible membranes extending across the lumen of the main body and each having one or more weakening lines, said weakening lines of each frangible membrane being configured to allow a direction of preferential opening of the membrane when a pressure above atmosphere is generated inside one of said first and second containers.

[0046] In a 32nd aspect according to any one of aspects from the 19th to the 31st the tubular segments of the interconnection piece comprises a proximal portion having a first external diameter and end portion having second external diameter bigger than first external diameter to define on the outer surface of each tubular segment a radial step configured to snap fit into corresponding recess provided in the first and second connecting member.

[0047] In a 33rd aspect according to any one of the preceding aspects either the first or the second connecting member fixedly carries a spout emerging outside the

respective first or second container.

[0048] In a 34th aspect according to the preceding aspect the spout bears an integrally associated closure cap member which can be removably coupled to the spout to open or close fluid passage through the connecting member carrying the spout.

[0049] In a 35th aspect according to any one of the preceding two aspects the spout carried by one of said first and second connecting members presents one or more piercing members and is configured to be inserted into and engage with the tubular body of the other of said first and second connecting members, and pierce the wall portion at said terminal flange thereby opening fluid passage between the first and the second volumes.

[0050] In a 36th aspect according to any one of the preceding three aspects the spout is in the shape of an ogive with radial passages and a pointed piercing tip.

[0051] In a 37th aspect according to any one of the preceding four aspects the spout carried by one of said first and second connecting members presents a spout outer surface with an annular protruding lip configured to snap fit into a corresponding recess provided in the other of said first and second connecting member.

[0052] In a 38th aspect according to any one of the preceding aspects one of the first and second connecting members terminally integrates a female coupling, optionally a female bayonet or a female thread, while the other of the first and second connecting members terminally integrates a male coupling, optionally as a male bayonet or a male thread, such that the first connecting member may be directly coupled to the second connecting member forming said communication channel and opening a passage of fluid between the first and the second volumes.

[0053] In a 39th aspect according to the preceding aspect the coupling of the first and second connecting members causes piercing of the wall portions or of membranes associated in closure of each connecting member. Preferably a membrane closes one of the ends of the first and second connecting members before the two connecting members are coupled by screwing or bayonet coupling the one into the other: upon coupling the penetration of the male member into the female member causes rupture of the membrane. The connecting member without membrane (the male) is provided with a closure cap which can be removed when the coupling between the connecting members needs to take place.

[0054] A 40th aspect concerns a package assembly according to any one of the preceding aspects, wherein the first container is a tray with a base wall, a side wall emerging from the base wall, a top rim and a plastic film sheet sealingly fixed at least to the tray top rim, and wherein the first connecting member is attached to the first container in correspondence of a film portion which is part of said plastic film sheet; and the second container is a tray with a base wall, a side wall emerging from the base wall, a top rim and a plastic film sheet sealingly fixed at least to the tray top rim, and wherein the second con-

necting member is attached to the first container in correspondence of a film portion which is part of said plastic film sheet;

[0055] A 41st aspect concerns a package assembly according to any one of the preceding aspects from the 1st to the 39th, wherein the first container is a pouch formed from one or more plastic films, the plastic film or films forming the pouch being sealingly joined at sealing line(s) to form an hermetically sealed first volume, and wherein the first connecting member is attached to the first container in correspondence of a film portion part of said plastic film or films and located apart from said sealing line(s); and the second container is a pouch formed from one or more plastic films, the plastic film or films forming the pouch being sealingly joined at sealing line(s) to form an hermetically sealed first volume, and wherein the second connecting member is attached to the second container in correspondence of a film portion part of said plastic film or films and located apart from said sealing line(s).

[0056] A 42nd aspect concerns a package assembly according to any one of the preceding aspects from the 1st to the 39th, wherein the first container is a tray with a base wall, a side wall emerging from the base wall, a top rim and a plastic film sheet sealingly fixed at least to the tray top rim, and wherein the first connecting member is attached to the first container in correspondence of a film portion which is part of said plastic film sheet; and the second container is a pouch formed from one or more plastic films, the plastic film or films forming the pouch being sealingly joined at sealing line(s) to form an hermetically sealed first volume, and wherein the second connecting member is attached to the second container in correspondence of a film portion part of said plastic film or films and located apart from said sealing line(s).

[0057] A 43rd aspect concerns a package assembly according to any one of the preceding aspects from the 1st to the 39th, wherein the first container is a pouch formed from one or more plastic films, the plastic film or films forming the pouch being sealingly joined at sealing line(s) to form an hermetically sealed first volume, and wherein the first connecting member is attached to the first container in correspondence of a film portion part of said plastic film or films and located apart from said sealing line(s); and the second container is a tray with a base wall, a side wall emerging from the base wall, a top rim and a plastic film sheet sealingly fixed at least to the tray top rim, and wherein the second connecting member is attached to the first container in correspondence of a film portion which is part of said plastic film sheet.

[0058] In a 44th aspect according to any one of the preceding aspects when the first container or the second container is in the form of a pouch, said pouch is provided with at least a through hole positioned in correspondence of a top zone of the pouch external to a sealing perimeter delimiting the first and/or second volume of said first and/or second containers, the through hole being designed to allow vertical hanging of the pouch on a support

arm.

[0059] In a 45th aspect according to any one of the preceding aspects, the first container - when in the form of a pouch - is provided with a central narrower region positioned between two larger regions, the narrower region facilitating squeezing of the pouch defining the first container.

[0060] In a 46th aspect according to any one of the preceding aspects, the first container packages the respective first product under vacuum forming a respective vacuum skin container.

[0061] In a 47th aspect according to the preceding aspect the first connecting members is provided with a frangible membrane located at a respective terminal flange of the respective tubular body of the first connecting member.

[0062] In a 48th aspect according to any one of the preceding aspects, the second container packages the respective first product under vacuum forming a respective vacuum skin container.

[0063] In a 49th aspect according to the preceding aspect the second connecting members is provided with a frangible membrane located at a respective terminal flange of the respective tubular body of the second connecting member.

[0064] A 50th aspect concerns a package assembly according to any one of the preceding aspects comprising:

- a plurality of said first containers each containing a respective and different first product which is a liquid food product or a gel food product or a paste food product or a particulate food product which is able to pass through said communication channel, and
- at least one second container hosting a second product comprising a solid food product unable to pass through said communication channel, wherein each one of the first containers of said plurality comprises an identical first connecting member forming said connecting device when coupled to the second connecting member of the second container.

[0065] A 51st aspect concerns the use of the package assembly according to any one of the preceding aspects for packaging in the first container a first product comprising one or more in the group of: a liquid food product or a gel food product or a paste food product or a particulate food product, wherein the food product in the first container is able to pass through said communication channel; and for packaging a second product comprising a solid food product in the second container, wherein the solid food product in the second container is sized not to pass through the communication channel.

[0066] A 52nd aspect concerns the use the package assembly according to the 50th aspect for packaging in each first container a respective of a plurality of different first products comprising one or more in the group of: a liquid food product or a gel food product or a paste food

product or a particulate food product, wherein the food products in the first containers are able to pass through said communication channel; and for packaging a second product comprising a solid food product in the second container, wherein the solid food product in the second container is sized not to pass through the communication channel.

[0067] A 53rd aspect concerns a process for the preparation of food, using the package assembly of any one of aspects from the 1st to the 50th.

[0068] In a 54th aspect according to the preceding aspect the process comprises the steps:

- coupling one first container to one second container using said connecting device and forming said channel between the first and second volumes,
- transferring the first product or part of it from the first to the second container.

[0069] In a 55th aspect according to the preceding aspect the process comprises, after the transferring, the step of cooking the first and second products.

[0070] In a 56th aspect according to any one of the preceding two aspects said step of coupling comprises:

- inserting the opposite tubular segments of the interconnection piece into the corresponding tubular bodies of the first and second connecting members until the axially opposite piercing portions defined at ends of said opposite tubular segments pierce and open the wall portion of the first and second container at each terminal flange of the first and second connecting members; or
- inserting the spout carried by one of said first and second connecting members into the tubular body of the other of said first and second connecting members, until the one or more piercing members pierce the wall portion at said terminal flange thereby opening fluid passage between the first and the second volumes; or

directly coupling the first connecting member to the second connecting member forming said communication channel and opening a passage of fluid between the first and the second volumes, wherein coupling of the first and second connecting members causes piercing of the wall portions or of membranes associated in closure of each connecting member, wherein one of the first and second connecting members terminally integrates a female coupling, optionally a female bayonet or a female thread, while the other of the first and second connecting members terminally integrates a male coupling, optionally as a male bayonet or a male thread.

[0071] In a 57th aspect according to the preceding aspect, after the transferring step, the second container is separated from the first container and - optionally - a closure cap member coupled to one of the opposite tubular segments of the interconnection piece or to the spout or

directly to one of the first and second connecting members.

[0072] A 58th aspect concerns a process of making a food assembly according to any one of the preceding aspects from the 1st to the 50th.

[0073] In a 59th aspect according to the preceding aspect the process of making comprises:

- making the first container,
- providing the first container with the first connecting member,
- inserting the first food product into the first container,
- optionally forming a vacuum and/or a controlled atmosphere into the first container,
- hermetically sealing the first container,

and

- making the second container,
- providing the second container with the second connecting member,
- inserting the second food product into the second container,
- optionally forming a vacuum and/or a controlled atmosphere into the first container,
- hermetically sealing the second container.

[0074] In a 60th aspect according to any one of the preceding aspects the materials used for making the first container, the second container, the first connecting member, the second connecting member, the spout and the interconnection piece are as indicated in the section dedicated to 'materials' in the detailed description.

[0075] In a 61th aspect according to anyone of the preceding aspects from 1st to 50th, the package assembly comprises a first connecting member having the terminal flange fixed to a wall of the first container, wherein the first container is in the form of a tray and wherein said wall is the base wall or the side wall of the tray.

[0076] In a 62th aspect according to anyone of the preceding aspects from 1st to 50th, the package assembly comprises a second connecting member having the terminal flange fixed to a wall of the second container, wherein the second container is in the form of a tray and wherein said wall is the base wall or the side wall of the tray.

Brief description of the drawings

[0077] Aspects of the present invention are disclosed in the following detailed description, given by way of example and not of limitation, to be read with reference to the accompanying drawings, wherein:

Figure 1 is a perspective view of a package assembly according to aspects of the invention,
Figure 2 is a front elevation view of the assembly of figure 1,

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Figure 3 is a cross section according to section plane III-III of figure 2,

Figure 4 is a front elevation view of the assembly of a variant of the assembly of figure 1,

Figure 5 is a cross section according to section plane V-V of figure 4,

Figure 6 is a front elevation view of a first container of the assembly of figure 1,

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Figure 6A is an enlarged view of a particular of figure 6,

Figure 7 is a cross section according to section plane VII-VII of figure 6,

Figure 8 is a front elevation view of a second container of the assembly of figure 1,

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Figure 9 is a perspective view of a package assembly according to further aspects of the invention,

Figure 10 is a front elevation view of the assembly of figure 9,

Figure 11 is a cross section according to section plane XI-XI of figure 10,

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Figure 12 is a front elevation view of an interconnection piece usable for connecting the containers of disclosed in the preceding figures from 1 to 11,

Figure 13 is a cross section according to section plane XIII-XIII of figure 12,

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Figure 14 is a side view of the interconnection piece of figure 12,

Figure 15 is a front elevation view of the interconnection piece usable for connecting the containers of disclosed in the preceding figures from 1 to 11, in a second operating condition,

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Figure 16 is a cross section according to section plane XVI-XVI of figure 15,

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Figure 17 is a side view of the interconnection piece of figure 15,

Figure 18 is a perspective view representing a first or a second container usable in an alternative assembly according to the invention,

Figures 19 to 21 show respective perspective views of a spout attached to the container of figure 18,

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Figures 22 and 23 are front elevation views of a first and of a second container usable in a further alternative assembly of the invention, and

Figures 24 and 25 are front elevation views of a first and of a second container usable in a yet further alternative assembly of the invention.

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Definitions and conventions

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[0078] It should be noted that in the present detailed description corresponding parts shown in the various figures are indicated with the same reference numeral through the figures. Note that the figures may not be in scale and, thus, the parts and components shown therein may be schematic representations.

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[0079] Pouch (or bag) comprises a deformable container obtained by joining together one or more films.

[0080] Tray comprises a container having a base wall,

a side wall emerging from the base wall and a top rim directed transversely to the side wall.

Detailed description

[0081] With reference to the attached figures, a food package assembly is globally indicated with reference numeral 1.

[0082] The assembly 1 includes a first container 2 which is configured for delimiting a first volume 3 wherein at least one first product 4 is inserted. The first container 2 may be a pouch (see figure 1) formed from one or more plastic films: the plastic film or films forming the pouch are sealingly joined at sealing lines and form an hermetically sealed first volume 3 inside which the first food product 4 is inserted before completely sealing the pouch. Alternatively, the first container 2 may be in the form of a tray: the tray is a single piece plastic body having a base wall, a side wall emerging from the base wall, and a top rim; a plastic film sheet is sealingly fixed at least to the tray top rim and forms an hermetically sealed first volume inside which the first product is inserted before hermetic closure of the film sheet to the tray.

[0083] The package assembly also includes a second container 5 delimiting a second volume 6 where at least one second product 7 is positioned. The second container 5 may be a pouch (figure 1) formed from one or more plastic films: the plastic film or films forming the pouch are sealingly joined at sealing lines and form an hermetically sealed second volume inside which the second food product is inserted before completely sealing the pouch. Alternatively, the second container may be in the form of a tray (figure 9): in this case too, the tray is a single piece plastic body having a base wall, a side wall emerging from the base wall, and a top rim; a plastic film sheet is sealingly fixed at least to the tray top rim and forms an hermetically sealed second volume inside which the second product is inserted before hermetic closure of the film sheet to the tray.

[0084] As shown in the enclosed drawings, various combinations are possible: for instance the first container may be a pouch while the second container may be a tray (see figure 9), or both containers can be in the form of pouches (figure 1), or both containers may be in the form of trays (not shown).

[0085] The products inside the first and second containers are food products such as by way of non-limiting example:

- meat, with or without bones, in one or more pieces of different size,
- whole fish or fish in pieces,
- crustaceans and sea food,
- vegetables, fruits, legumes,
- sauces (tomato, pesto, mayonnaise, ketchup, toppings, seasonings, etc.),
- soups,
- drinks, fruit juices, purees, beverages,

- jams, marmalades,
- milk, dairy products, yoghurt, creams, milk derivatives (e.g. cheeses, butter),
- sweet creams, chocolate, syrups,
- 5 - oils,
- vinegar,
- honey and bee products,
- ready meals,
- pasta, risotto,
- 10 - food powders, dehydrated food, coffee,
- desserts, sweets,
- bakery products.

[0086] All the above goods may be hosted in the respective first or second container either alone or in combination with other goods in the above list or premixed with particulate (salt, flavors, other).

[0087] In particular, the first container 2 which is typically a pouch and may host a food product 4 in the form of a liquid or a gel or a paste or a particulate, or a mixture of liquid or gel with particulate, such as a sauce, a soup, a juice, a cream, a topping, a seasoning or the like, while the second container 5 is typically a pouch (figure 1) or a tray (figure 9) hosting a solid product 7, such as a piece of meat, a piece of fish, pasta, risotto or any other solid food product which - before being consumed - may require to receive the food product present in the first container.

[0088] According to one aspect, the package assembly 1 includes a connecting device 8 designed to connect the first and second containers 2 and 5. The connecting device 8 presents a first connecting member 9 carried by the first container 2 and a second connecting member 10 carried by the second container 5. The first and second connecting members 9 and 10 are designed to cooperate such as to define, when directly or indirectly connected, a channel 11 placing the first and second containers in fluid communication.

[0089] In particular, the package assembly 1 is configured to be placed in at least one disconnected condition, where said first and second volumes 3 and 6 are isolated the one from the other: in practice in this condition the two containers are completely independent and isolated. Each container 2, 5 is preferably hermetically sealed, with the first container 2 physically separated from the second container 5, such that the two containers may be manufactured, shipped, presented for sale one independently from the other.

[0090] The package assembly 1 may also be placed in a connected condition (see e.g., figures 3, 5, 11), where the connecting device 8 connects the first connecting member 9 with the second connecting member 10 forming said communication channel 11 between the first volume 3 and the second volume 6, so that the first and second food products may be brought one in contact with the other.

[0091] In accordance with one aspect, the communication channel 11 presents a channel lumen configured

to allow passage of the first product 4 from the first volume 3 to the second volume 6, while preventing passage of the second product 7 from the second volume 6 to the first volume 3. In practice as the first volume typically hosts a liquid or a gel or a particulate or a paste or a mixture of liquid or gel or paste with particulate, such as a sauce, a soup, a juice, a cream, a topping, a seasoning or the like, the channel 11 should be sufficiently sized to have a lumen of few mm (e.g. from 0, 50 mm to 30 mm) allowing the first product to pass from the first container to the second container. On the other hand, the second container 5 typically hosts a solid food product comprising one or more solid food pieces sized not to pass through said channel lumen. Thus, in use, the food contained in the first container can be poured or transferred into the second container and then the final food product prepared.

[0092] Here below, further aspects of the specific embodiments shown in figures are disclosed.

[0093] As shown in the embodiment of figures 1-8, the first connecting member 9 comprises a tubular body 12 having a terminal flange 13 and a side wall 14. The terminal flange 13 of the first connecting member is fixed to an inner surface 2a of the first container 2, such that the first connecting member may entirely extend and be housed in the first volume 3 inside the first container 2. Alternatively, the terminal flange 13 of the first connecting member may be fixed to an outer surface 2b of the first container with the first connecting member extending outside the first container. The first connecting member may also comprise a further terminal flange 15, which delimits an open end of the tubular body and which is axially opposite with respect to the terminal flange 13. Similar to the first connecting member, also the second connecting member 10 comprises a tubular body 16 having a terminal flange 17 and a side wall 18; the terminal flange 17 of the second connecting member is fixed to an inner surface 5a the second container 5, such that the second connecting member may entirely extend and be housed in the second volume 6 defined inside the second container 5. Alternatively, the terminal flange of the second connecting member may be fixed to an outer surface 5b of the second container with the second connecting member extending outside the first container. The second connecting member 10 may also comprise a further terminal flange 19, which delimits an open end of the tubular body and which is axially opposite to the terminal flange 17.

[0094] Note that the side wall 14 of the tubular body of the first connecting member 9 forms one or more radial passages 20 (see figure 5). Analogously, the side wall 18 of the tubular body of the second connecting member 10 forms a one or more radial passages 21. The radial passages 20 and 21 facilitate fluid exchange. In practice, the first and second connecting members 9 and 10 may be identical, such that in term of manufacturing only one product type needs to be made when it comes to the connecting members.

[0095] In figures 6-8 a condition where the first and second containers 2 and 5 are disconnected is shown: in particular the two containers have never been connected before and thus the first and second volumes 3 and 6 are isolated and hermetically closed. The following description relates to the case where both the first and second connecting members 9 and 10 are housed inside the respective containers although - as mentioned above - the first and second connecting members may alternatively be fixed to an outer surface of the respective container and extend outside the first and second volumes. The first connecting member 9 is positioned inside the first volume 3 and the terminal flange 13 of the first connecting member is fixed to an inner surface 2a of a wall of said first container 2; before first connection of the first connecting member 9 with the second connecting member 10, a wall portion 22 of the first container 2 closes a lumen of the tubular body of the first connecting member 9 at said terminal flange 13 (figure 7): in other words a part of the film forming the pouch or the top film sheet of the first container acts in closure of the passage delimited by the terminal flange 13. The second connecting member 10 is positioned inside the second volume 6 and said terminal flange 17 of the second connecting member 10 is fixed to an inner surface 5a of a wall of said second container 5: again, before first connection of the first connecting member with the second connecting member, a wall portion 23 of the second container 5 closes a lumen of the tubular body at said terminal flange 17 (figure 8).

[0096] Upon connection of the first connecting member with the second connecting member (figures 1, 3 and 11), the wall portions 22, 23 which close the lumen of the first and second connecting members 9 and 10 are opened and thus a fluid passage is created through communication channel 11.

[0097] In order to create the communication channel 11 between the first and second containers, the connection device 8 further includes an interconnection piece 24 (figures 3, 5 and 11). Details of the interconnection piece 24 - when the food package assembly is placed in said connected condition - is configured to be interposed between the first and second connecting members 9 and 10 and connect the first connecting member with the second connecting member, forming said communication channel 11. In practice, once properly engaged, the first connecting member 9 couples with the second connecting member 10 via interposition of the interconnection piece 24 which also causes opening (e.g. rupture) of the film wall portions 22, 23 closing each tubular body of the first and second connecting members.

[0098] As shown in figures 12-17, the interconnection piece 24 comprises a main body 25 of tubular shape and a flange 26 radially emerging from an outer surface 25a of the main body 25: in practice, the flange 26 may be axially positioned in the middle of the main body 25 and divide the interconnection piece in two axially symmetrical portions. As shown in the mentioned figures, the main

body presents opposite tubular segments 27, 28 extending on opposite sides of the flange 26: each of the tubular segment is insertable through the tubular body of the respective of said first and second connecting members 9 and 10, thereby engaging together the three components 9, 10 and 24 and causing formation of the communication channel 11.

[0099] Furthermore, the interconnection piece 24 has axially opposite piercing portions 29, 30 defined at ends of said opposite tubular segments 27, 28: upon insertion of the opposite tubular segments 27, 28 into the respective connecting member 9,10 the piercing portions 29, 30 are configured to rupture the film portions 22,23 closing the lumens of the connecting members, thereby creating a fluid passage through the communication channel 11 (figures 3, 5 and 11).

[0100] In the embodiments shown, the interconnection piece 24 is in the form of a separate component distinct from the first and the second connecting members 9 and 10; according to a possible alternative the interconnection piece 24 may be carried by one or the other of the first and second connecting members.

[0101] As mentioned, each of said opposite tubular segments 27, 28 of the interconnection piece 24 is configured to engage one respective of said first connecting member and second connecting member 9 and 10: the opposite tubular segments 27, 28 of the interconnection piece 24 may therefore be identical if the first and second connecting members 9 and 10 are identical. In this case, the opposite tubular segments 27, 28 of the interconnection piece 24 may interchangeably engage one or the other of said first connecting member and second connecting member 9 and 10.

[0102] According to a further aspect, the opposite tubular segments 27, 28 of the interconnection piece 24 may have an axial length which is shorter than an axial length of said first and second connecting members 9, 10: this allows the tubular segments of the interconnection piece to remain inside the first and second connecting members even when the first and second containers are connected thus avoiding that the piercing portions also undesirably pierce the first and second container walls at locations different from those where the connecting members are fixed.

[0103] Going in further details of the coupling between the interconnection piece 24 and the connecting members 9, 10, it is noted that the opposite tubular segments 27, 28 of the interconnection piece 24 may be configured to be slidably inserted into the corresponding tubular bodies of the first and second connecting members 9, 10: in other words, the outer surface of the opposite tubular segments substantially matches in shape and size the inner surface of the respective connecting members. Note that according to certain embodiments a light interference may exist between the tubular segments outer surfaces and the inner surfaces of the corresponding connecting members. When the tubular segments 27, 28 are inserted into the connecting members, the flange 26

acts as an abutment on both sides of the flange 26 (see figure 5) and the axially opposite piercing portions 29, 30 defined at ends of said opposite tubular segments pierce and open the wall portion 22 and the wall portion 23 respectively of the first and second container 2 and 5, located at each terminal flange 13, 17 of the first and second connecting members.

[0104] The tubular segments 27, 28 of the interconnection piece 24 may also comprise a proximal portion having a first external diameter and end portion having second external diameter bigger than first external diameter to define, on the outer surface of each tubular segment, a radial step 31 configured to snap fit into a corresponding recess provided in the first and second connecting member 9 and 10: the recess may be defined in correspondence of one of said radial openings 20, 21 present on each connecting member.

[0105] In accordance with a further aspect and referring particularly to figures 13, 16, the interconnection piece 24 comprises a unidirectional valve 32 positioned inside the main body 25. The unidirectional valve 32 comprises one or more bendable flaps 33 radially emerging from the inner surface of the main body 25 of the interconnection piece 24 and angularly displaceable from an extended condition (figures 12 and 13) where the flap or flaps 33 interdict fluid passage to a bent condition (figures 15 and 16) where the flap or flaps 33 allow fluid passage. The flaps are integrally formed with the interconnection piece body. In this embodiment, the flaps are initially connected the one with the other at weakening lines or pre-cut lines 34 and thus form a membrane which closes fluid passage. As pressure raises in the first container, a force is generated on the flaps 33 which brake along the weakening lines 34 and pass to the extended configuration of figures 15 and 16. The lines 34 may define closure borders when - due to a pressure decrease - the flaps return to their initial extended position.

[0106] In an alternative, the unidirectional valve may include one frangible membrane (it may also be possible using two or more consecutively positioned membranes) extending across the lumen of the main body and having one or more weakening lines or precuts; the weakening lines or the precuts on the frangible membrane are configured to allow a direction of preferential opening of the membrane when a pressure above atmosphere is created inside one of said first and second containers placed in the connected condition (for instance when - after connection - a user squeezes one of the two containers).

[0107] It is noted that the interconnection piece 24 may also include a closure cap member 35 - which may be fixed to or integrally formed with the interconnection piece. The closure cap member 35 may alternatively be linked to one of the two connecting members. In the embodiment shown in figures 1, 3, 5 the cap member 25 may be linked to the flange 26 of the interconnection piece 24 by means of flexible and elongated band 36 which allows the closure cap to be engaged in closure on one of said tubular segments when the other of said

tubular segments is inserted into the respective one of the connecting members.

[0108] In accordance with an alternative embodiment which is shown in figures 18-21, the first container 2 and the first connecting member 9 may be exactly as described above. On the other hand the second connecting member 10 fixedly carries a spout 37 emerging outside the respective second container 5. The spout 37 may bear an integrally associated cap member which can be removably coupled to the spout to open or close fluid passage through the connecting member carrying the spout.

[0109] The spout 37 presents one or more piercing members 38 and is configured to be inserted into and engage with the tubular body of the first connecting member 9 to pierce the wall portion 22 at said terminal flange 13 thereby opening fluid passage between the first and the second volumes 3 and 6, when the two containers 2 and 5 are in the connected condition.

[0110] Going in further detail and particularly referring to figures 19-21, it is noted that the spout 37 may take the shape of an ogive with radial passages 39 and a pointed piercing tip 38. Furthermore, the spout outer surface 37a may be provided with an annular protruding lip 40 configured to snap fit into a corresponding recess provided in the first connecting member 9.

[0111] In accordance with further alternative embodiment which is shown in figures 22-25, the first container 2 and second container 5 may be in the form of stand-up containers, for instance stand-up pouches. The first and second connecting members may be as described above in their general structure (i.e. each comprising a tubular body and a flange fixed to the container wall) and additionally integrate one of a female coupling (such as a female bayonet or a female thread or the like) and a male coupling (such as a male bayonet or a male thread) such that the first connecting member may be directly coupled to the second connecting member opening open and open the passage of fluid between the first and the second volumes.

[0112] More in detail the first connecting member 9 may have a tubular body in the form of a threaded male configured to be inserted into and engage with female thread carried by the tubular body of the second connecting member 10. The coupling of the two connecting members causes piercing of the wall portions or membranes associated in closure of each connecting member 9, 10, thereby opening fluid passage between the first and the second volumes 3 and 6, when the two containers 2 and 5 are in the connected condition.

[0113] As it can be seen in the variants shown in figures 22-25, the first and second members may be either fixed to a side wall of the respective container or to a terminal top end of the respective container.

[0114] Preferably a membrane closes one of the ends of the first and second connecting members (the female) before the two connecting members are coupled by screwing or bayonet coupling the one into the other: upon

coupling the penetration of the male member into the female member causes rupture of the membrane associated to the female connecting member. The connecting member without membrane (the male) is provided with a closure cap which can be removed when the coupling between the connecting members needs to take place.

Further aspects

[0115] When the first container is in the form of a pouch, the pouch may be provided with at least a through hole, positioned in correspondence of a top zone of the pouch and designed to allow vertical hanging of the pouch on a support arm. Furthermore, the second container may be in the form of a stand up pouch.

[0116] The first container - when in the form of a pouch - may be provided with an ergonomic shape: for instance the pouch may present a central narrow region positioned between two larger regions, the narrower region facilitating squeezing of the pouch defining the first container when it comes to emptying the first container content into the second container. Furthermore in case the first and or second containers are configured to package the respective products under vacuum, then the first and/or second connecting members may be provided with a frangible membrane located at the terminal flange thereof. The frangible membrane has the function to bear the film forming part or all the first and/or second container during the creation of a vacuum insides the first and/or second container.

Materials

a) film or film material usable for pouch(es) and film lid(s)

[0117] In this section a) the film materials used for making the first and second containers when in the form of a pouch are described. The same film materials may also be used for the lid covering the tray (non-vacuum skin applications).

[0118] The film material may be obtained by co-extrusion or lamination (hot or glue) processes, may have a symmetrical or asymmetrical structure and can be monolayer or multilayer.

[0119] The multilayer films have at least 2, more frequently at least 5, even more frequently at least 7 layers.

[0120] The total thickness of the film may vary frequently from 3 to 200 micron, in particular from 5 to 150 micron, even more frequently from 10 to 120 micron.

[0121] The films may be optionally cross-linked. Cross-linking may be carried out by irradiation with high energy electrons at a suitable dosage level as known in the art.

[0122] The films may be heat shrinkable or heat-set. The heat shrinkable films typically show free shrink value at 120°C measured according to ASTM D2732 in the range of from 1 to 80%, more frequently from 5 to 60%, even more frequently from 10 to 40% in both the longi-

tudinal and transverse direction. The heat-set films usually have free shrink values lower than 10% at 120°C, preferably lower than 5% in both the longitudinal and transversal direction (ASTM D 2732).

[0123] In case the film is a monolayer, typical compositions comprise polyesters or polyamides as herein defined and their blends or polyolefins as herein defined and their blends.

[0124] In most of the cases, the films typically comprise at least a heat sealable layer and an outer skin layer, which is generally made up of heat resistant polymers or polyolefin. The sealing layer usually comprises a heat-sealable polyolefin which in turn comprises a single polyolefin or a blend of two or more polyolefins such as polyethylene or polypropylene or a blend thereof. The sealing layer can be further provided with antifog properties by incorporating one or more antifog additives into its composition or by coating or spraying one or more antifog additives onto the surface of the sealing layer by technical means well known in the art. The sealing layer may further comprise one or more plasticisers.

[0125] The skin layer typically comprises polyesters, polyamides or polyolefins. In some structures, a blend of polyamide and polyester can advantageously be used for the skin layer, as described in EP2691233A1.

[0126] In most of the cases, the films comprise a barrier layer. Barrier films typically have an OTR (evaluated at 23°C and 0 % R.H. according to ASTM D-3985) below 100 cm³/(m²·day·atm) and more frequently below 80 cm³/(m²·day·atm). The barrier layer is usually made of a thermoplastic resin selected among a saponified or hydrolyzed product of ethylene-vinyl acetate copolymer (EVOH), a polyamide, a polyester and a vinyl-vinylidene chloride (PVdC) and their admixtures. Some materials comprise an EVOH barrier layer, sandwiched between two polyamide layers.

[0127] Film compositions particularly suitable for pouches and lidding films are described in EP2582518A1, the disclosure of which is herein incorporated by reference.

[0128] Particularly in the case of fresh red meat packages, twin lidding film comprising an inner, oxygen-permeable, and an outer, oxygen-impermeable, lidding film are advantageously used. These films are described for example in EP1848635 and EP0690012, the disclosures of which are herein incorporated by reference.

[0129] Peculiar compositions polyester-based are those used for tray lidding of ready-meals packages. For these films, the polyester resins can make up at least 50%, 60%, 70%, 80%, 90% by weight of the film. These films are typically used in combination with polyester-based supports or trays. For instance the tray can be made of a cardboard coated with a polyester or it can be integrally made of a polyester resin. Examples of suitable trays for the package are CPET, APET or APET/CPET containers, either foamed or not-foamed. Usually, biaxially oriented PET films are used as lidding films in ready meals packages due to the high thermal stability of PET

at standard food heating/cooking temperatures. Often biaxially oriented polyester films are heat-set, i.e. non-heat-shrinkable. To improve the heat-sealability of the PET lidding film to the tray a heat-sealable layer of a lower melting material is usually provided on the film. The heat-sealable layer may be coextruded with the PET base layer (as disclosed in EP1529797 and WO2007/093495) or it may be solvent- or extrusion-coated over the base film (as disclosed in US2762720 and EP1252008).

[0130] A disclosure of ovenable polyester- or polyamide-based materials and the method of packaging and cooking can be found in EP1945512, the disclosures of which is herein incorporated by reference.

[0131] Ovenable polyamide-based materials are for instance those reported in EP1393897, the disclosure of which is herein incorporated by reference. These materials can advantageously be used to obtain ovenable bags or pouches or thermoformed ovenable support and the lid sealed thereto.

[0132] Furthermore, the films herein described for lidding applications can be formulated to provide strong or peelable sealing onto the support. A method of measuring the force of a peelable seal, herein referred to as "peel force" is described in ASTM F-88-00. Acceptable peel force values are in the range from 100 g/25 mm to 850 g/25 mm, from 150 g/25 mm to 800 g/25 mm, from 200 g/25 mm to 700 g/25 mm. The desired seal strength is achieved specifically designing the tray and the lid formulations.

[0133] In all the film layers herein described, the polymer components may contain appropriate amounts of additives normally included in such compositions. Some of these additives are preferably included in the outer layers or in one of the outer layers, while some others are preferably added to inner layers. These additives include slip and anti-block agents such as talc, waxes, silica, and the like, antioxidants, stabilizers, plasticizers, fillers, pigments and dyes, cross-linking inhibitors, cross-linking enhancers, UV absorbers, odor absorbers, oxygen scavengers, bactericides, antistatic agents, anti-fog agents or compositions, and the like additives known to those skilled in the art of packaging films.

[0134] In general, one or more layers of the films above described can be printed, in order to provide useful information to the consumer, a pleasing image and/or trademark or other advertising information to enhance the retail sale of the packaged product. The films may be printed by any suitable method, such as rotary screen, gravure or flexographic techniques as known in the art.

b) material usable for the film adopted in vacuum skin packages.

[0135] In this section b) the film materials used for making the the film used in the first and/or second container when said container(s) is in the form either of a pouch or of a tray closed by a film under vacuum with the film forming a skin on the tray and the product (vacuum skin

applications). The film or film material is skin associated to the tray and or product and matching the contour of the product.

[0136] The film for skin applications may be made of a flexible multi-layer material comprising at least a first outer heat-sealable layer, an optional gas barrier layer and a second outer heat-resistant layer. The outer heat-sealable layer may comprise a polymer capable of welding to the inner surface of the supports carrying the products to be packaged, such as for instance ethylene homo- or co-polymers, like LDPE, ethylene/alpha-olefin copolymers, ethylene/acrylic acid copolymers, ethylene/methacrylic acid copolymers, and ethylene/vinyl acetate copolymers, ionomers, co-polyesters, e.g. PETG. The optional gas barrier layer preferably comprises oxygen impermeable resins like PVDC, EVOH, polyamides and blends of EVOH and polyamides. The outer heat-resistant layer may be made of ethylene homo- or copolymers, ethylene/cyclic-olefin copolymers, such as ethylene/norbornene copolymers, propylene homo- or co-polymers, ionomers, (co)polyesters, (co)polyamides. The film may also comprise other layers such as adhesive layers or bulk layers to increase thickness of the film and improve its abuse and deep drawn properties. Particularly used bulk layers are ionomers, ethylene/vinyl acetate copolymers, polyamides and polyesters.

[0137] One or more layers of the film can be cross-linked to improve the strength of the film and/or its heat resistance. Cross-linking may be achieved by using chemical additives or by subjecting the film layers to an energetic radiation treatment. The films for skin packaging are typically manufactured in order to show low shrink when heated during the packaging cycle. Those films usually shrink less than 15% at 160°C, more frequently lower than 10%, even more frequently lower than 8% in both the longitudinal and transversal direction (ASTM D2732). The films usually have a thickness comprised between 15 microns and 200 microns, more frequently between 25 and 180 microns and even more frequently between 40 microns and 150 microns.

[0138] The skin packages are usually "easy-to-open", i.e. they are easily openable by manually pulling apart the two webs, normally starting from a point like a corner of the package where the upper web has purposely not been sealed to the support. To achieve this feature, either the film or the tray can be provided with a suitable composition, allowing easy opening of the package, as known in the art. Typically, the sealant composition and/or the composition of the adjacent layer of the tray and/or the film are adjusted in order to achieve the easy opening feature. Various mechanisms can occur while opening an easy-to-open package. In the first one ("peelable easy opening") the package is opened by separating the film and the tray at the seal interface. In the second mechanism ("adhesive failure") the opening of the package is achieved through an initial breakage through the thickness of one of the sealing layers followed by delamination of this layer from the underlying support or film. The third

system is based on the "cohesive failure" mechanism: the easy opening feature is achieved by internal rupture of a seal layer that, during opening of the package, breaks along a plane parallel to the layer itself. Specific blends are known in the art to obtain such opening mechanisms, ensure the peeling of the film from the tray surface, such as those described in EP1084186.

[0139] In all the film layers herein described, the polymer components may contain appropriate amounts of additives normally included in such compositions. Some of these additives are preferably included in the outer layers or in one of the outer layers, while some others are preferably added to inner layers. These additives include slip and anti-block agents such as talc, waxes, silica, and the like, antioxidants, stabilizers, plasticizers, fillers, pigments and dyes, cross-linking inhibitors, cross-linking enhancers, UV absorbers, odor absorbers, oxygen scavengers, bactericides, antistatic agents, anti-fog agents or compositions, and the like additives known to those skilled in the art of packaging films.

[0140] Films suitable for skin applications are for instance exemplified in EP1398149, EP1465765 and EP1871597, the disclosure of which is herein incorporated by reference.

c) materials usable for the first and second connecting members, the spout and the interconnection pieces

[0141] The spout, the connecting members and the interconnection pieces of the invention can be made by any conventional injection molding technique.

[0142] The thermoplastic materials suitable for their manufacturing are, for example, polyethylene terephthalate, high density polyethylene, polypropylene, nylon, polyvinyl chloride.

[0143] In case of ovenable packages, the thermoplastic material to be used for the manufacturing of the spout and the connecting members will be selected in order to resist to the heat treatment in the microwave and in the conventional oven.

d) materials for the trays

[0144] The trays may be made of a single layer or, preferably, of a multi-layer polymeric material.

[0145] In case of a single layer material suitable polymers are for instance polystyrene, polypropylene, polyesters, high density polyethylene, poly(lactic acid), PVC and the like, either foamed or solid.

[0146] Preferably the tray is provided with gas barrier properties. As used herein such term refers to a film or sheet of material which has an oxygen transmission rate of less than 200 cm³/m²-day-bar, less than 150 cm³/m²-day-bar, less than 100 cm³/m²-day-bar as measured according to ASTM D-3985 at 23°C and 0% relative humidity.

[0147] Suitable materials for gas barrier monolayer

thermoplastic trays are for instance polyesters, polyamides and the like.

[0148] In case the tray is made of a multi-layer material, suitable polymers are for instance ethylene homo- and co-polymers, propylene homo- and co-polymers, polyamides, polystyrene, polyesters, poly(lactic acid), PVC and the like. Part of the multi-layer material can be solid and part can be foamed.

[0149] For example, the tray may comprise at least one layer of a foamed polymeric material chosen from the group consisting of polystyrene, polypropylene, polyesters and the like.

[0150] The multi-layer material may be produced either by co-extrusion of all the layers using co-extrusion techniques or by glue- or heat-lamination of, for instance, a rigid foamed or solid substrate with a thin film, usually called "liner".

[0151] The thin film may be laminated either on the side of the tray in contact with the product or on the side facing away from the product or on both sides. In the latter case the films laminated on the two sides of the tray may be the same or different. A layer of an oxygen barrier material, for instance (ethylene-co-vinyl alcohol) copolymer, is optionally present to increase the shelf-life of the packaged product.

[0152] Gas barrier polymers that may be employed for the gas barrier layer are PVDC, EVOH, polyamides, polyesters and blends thereof. The thickness of the gas barrier layer will be set in order to provide the tray with an oxygen transmission rate suitable for the specific packaged product.

[0153] The tray may also comprise a heat sealable layer. Generally, the heat-sealable layer will be selected among the polyolefins, such as ethylene homo- or co-polymers, propylene homo- or co-polymers, ethylene/vinyl acetate copolymers, ionomers, and the homo- and co-polyesters, e.g. PETG, a glycol-modified polyethylene terephthalate. Additional layers, such as adhesive layers, to better adhere the gas-barrier layer to the adjacent layers, may be present in the gas barrier material for the tray and are preferably present depending in particular on the specific resins used for the gas barrier layer.

[0154] In case of a multilayer material used to form the tray, part of this structure may be foamed and part may be un-foamed. For instance, the tray may comprise (from the outermost layer to the innermost food-contact layer) one or more structural layers, typically of a material such as foam polystyrene, foam polyester or foam polypropylene, or a cast sheet of e.g. polypropylene, polystyrene, poly(vinyl chloride), polyester or cardboard; a gas barrier layer and a heat-sealable layer. The tray may be obtained from a sheet of foamed polymeric material having a film comprising at least one oxygen barrier layer and at least one surface sealing layer laminated onto the side facing the packaged product, so that the surface sealing layer of the film is the food contact layer the tray. A second film, either barrier or non-barrier, may be laminated on the outer surface of the tray.

[0155] Specific tray formulations are used for food products which require heating in conventional or microwave oven before consumption. The surface of the tray in contact with the product, i.e. the surface involved in the formation of the seal with the lidding film, comprises a polyester resin. For instance the tray can be made of a cardboard coated with a polyester or it can be integrally made of a polyester resin. Examples of suitable trays for the package of the invention are CPET, APET or APET/CPET trays. Such trays can be either foamed or not-foamed.

[0156] Trays used for lidding or skin applications containing foamed parts, have a total thickness lower than 8 mm, and for instance may be comprised between 0.5 mm and 7.0 mm and more frequently between 1.0 mm and 6.0 mm.

[0157] In case of rigid tray not containing foamed parts, the total thickness of the single-layer or multi-layer thermoplastic material is preferably lower than 2 mm, and for instance may be comprised between 0.1 mm and 1.2 mm and more frequently between 0.2 mm and 1.0 mm.

e) definitions and conventions concerning materials

[0158] PVDC is any vinylidene chloride copolymers wherein a major amount of the copolymer comprises vinylidene chloride and a minor amount of the copolymer comprises one or more unsaturated monomers copolymerisable therewith, typically vinyl chloride, and alkyl acrylates or methacrylates (e.g. methyl acrylate or methacrylate) and the blends thereof in different proportions. Generally a PVDC barrier layer will contain plasticisers and/or stabilizers as known in the art.

[0159] As used herein, the term EVOH includes saponified or hydrolyzed ethylene-vinyl acetate copolymers, and refers to ethylene/vinyl alcohol copolymers having an ethylene comonomer content preferably comprised from about 28 to about 48 mole %, more preferably, from about 32 to about 44 mole % ethylene, and even more preferably, and a saponification degree of at least 85%, preferably at least 90%.

[0160] The term "polyamides" as used herein is intended to refer to both homo- and co- or ter-polyamides. This term specifically includes aliphatic polyamides or copolyamides, e.g., polyamide 6, polyamide 11, polyamide 12, polyamide 6/6, polyamide 6/9, polyamide 6/10, polyamide 6/12, copolyamide 6/9, copolyamide 6/10, copolyamide 6/12, copolyamide 6/66, copolyamide 6/69, aromatic and partially aromatic polyamides or copolyamides, such as polyamide 61, polyamide 6I/6T, polyamide MXD6, polyamide MXD6/MXD1, and blends thereof.

[0161] As used herein, the term "copolymer" refers to a polymer derived from two or more types of monomers, and includes terpolymers. Ethylene homopolymers include high density polyethylene (HDPE) and low density polyethylene (LDPE). Ethylene copolymers include ethylene/alpha-olefin copolymers and ethylene/unsaturated

ester copolymers. Ethylene/alpha-olefin copolymers generally include copolymers of ethylene and one or more comonomers selected from alpha-olefins having from 3 to 20 carbon atoms, such as 1-butene, 1-pentene, 1-hexene, 1-octene, 4-methyl-1-pentene and the like.

[0162] Ethylene/alpha-olefin copolymers generally have a density in the range of from about 0.86 to about 0.94 g/cm³. The term linear low density polyethylene (LLDPE) is generally understood to include that group of ethylene/alpha-olefin copolymers which fall into the density range of about 0.915 to about 0.94 g/cm³ and particularly about 0.915 to about 0.925 g/cm³. Sometimes linear polyethylene in the density range from about 0.926 to about 0.94 g/cm³ is referred to as linear medium density polyethylene (LMDPE). Lower density ethylene/alpha-olefin copolymers may be referred to as very low density polyethylene (VLDPE) and ultra-low density polyethylene (ULDPE). Ethylene/alpha-olefin copolymers may be obtained by either heterogeneous or homogeneous polymerization processes.

[0163] Another useful ethylene copolymer is an ethylene/unsaturated ester copolymer, which is the copolymer of ethylene and one or more unsaturated ester monomers. Useful unsaturated esters include vinyl esters of aliphatic carboxylic acids, where the esters have from 4 to 12 carbon atoms, such as vinyl acetate, and alkyl esters of acrylic or methacrylic acid, where the esters have from 4 to 12 carbon atoms.

[0164] Ionomers are copolymers of an ethylene and an unsaturated monocarboxylic acid having the carboxylic acid neutralized by a metal ion, such as zinc or, preferably, sodium.

[0165] Useful propylene copolymers include propylene/ethylene copolymers, which are copolymers of propylene and ethylene having a majority weight percent content of propylene, and propylene/ethylene/butene terpolymers, which are copolymers of propylene, ethylene and 1-butene.

[0166] As used herein, the term "polyolefin" refers to any polymerized olefin, which can be linear, branched, cyclic, aliphatic, aromatic, substituted, or unsubstituted. More specifically, included in the term polyolefin are homo-polymers of olefin, co-polymers of olefin, co-polymers of an olefin and an non-olefinic co-monomer copolymerizable with the olefin, such as vinyl monomers, modified polymers thereof, and the like. Specific examples include polyethylene homo-polymer, polypropylene homo-polymer, polybutene homo-polymer, ethylene-alpha-olefin co-polymer, propylene-alpha-olefin co-polymer, butene-alpha-olefin co-polymer, ethylene-unsaturated ester co-polymer, ethylene-unsaturated acid co-polymer, (e.g. ethylene-ethyl acrylate co-polymer, ethylene-butyl acrylate co-polymer, ethylene-methyl acrylate co-polymer, ethylene-acrylic acid co-polymer, and ethylene-methacrylic acid co-polymer), ethylene-vinyl acetate copolymer, ionomer resin, polymethylpentene, etc.

[0167] The term "polyester" is used herein to refer to both homo- and co-polyesters, wherein homo-polyesters

are defined as polymers obtained from the condensation of one dicarboxylic acid with one diol and co-polyesters are defined as polymers obtained from the condensation of one or more dicarboxylic acids with one or more diols.

Suitable polyester resins are, for instance, polyesters of ethylene glycol and terephthalic acid, i.e. poly(ethylene terephthalate) (PET). Preference is given to polyesters which contain ethylene units and include, based on the dicarboxylate units, at least 90 mol %, more preferably at least 95 mol %, of terephthalate units. The remaining monomer units are selected from other dicarboxylic acids or diols. Suitable other aromatic dicarboxylic acids are preferably isophthalic acid, phthalic acid, 2,5-, 2,6- or 2,7-naphthalenedicarboxylic acid. Of the cycloaliphatic dicarboxylic acids, mention should be made of cyclohexanedicarboxylic acids (in particular cyclohexane-1,4-dicarboxylic acid). Of the aliphatic dicarboxylic acids, the (C₃-C₉)alkanedioic acids are particularly suitable, in particular succinic acid, sebacic acid, adipic acid, azelaic acid, suberic acid or pimelic acid. Suitable diols are, for example aliphatic diols such as ethylene glycol, diethylene glycol, triethylene glycol, propylene glycol, 1,3-butane diol, 1,4-butane diol, 1,5-pentane diol, 2,2-dimethyl-1,3-propane diol, neopentyl glycol and 1,6-hexane diol, and cycloaliphatic diols such as 1,4-cyclohexanedimethanol and 1,4-cyclohexane diol, optionally heteroatom-containing diols having one or more rings.

[0168] Co-polyester resins derived from one or more dicarboxylic acid(s) or their lower alkyl (up to 14 carbon atoms) diesters with one or more glycol(s), particularly an aliphatic or cycloaliphatic glycol may also be used as the polyester resins for the base film. Suitable dicarboxylic acids include aromatic dicarboxylic acids such as terephthalic acid, isophthalic acid, phthalic acid, or 2,5-, 2,6- or 2,7-naphthalenedicarboxylic acid, and aliphatic dicarboxylic acids such as succinic acid, sebacic acid, adipic acid, azelaic acid, suberic acid or pimelic acid. Suitable glycol(s) include aliphatic diols such as ethylene glycol, diethylene glycol, triethylene glycol, propylene glycol, 1,3-butane diol, 1,4-butane diol, 1,5-pentane diol, 2,2-dimethyl-1,3-propane diol, neopentyl glycol and 1,6-hexane diol, and cycloaliphatic diols such as 1,4-cyclohexanedimethanol and 1,4-cyclohexane diol. Examples of such copolyesters are (i) copolyesters of azelaic acid and terephthalic acid with an aliphatic glycol, preferably ethylene glycol; (ii) copolyesters of adipic acid and terephthalic acid with an aliphatic glycol, preferably ethylene glycol; and (iii) copolyesters of sebacic acid and terephthalic acid with an aliphatic glycol, preferably butylene glycol; (iv) co-polyesters of ethylene glycol, terephthalic acid and isophthalic acid. Suitable amorphous copolyesters are those derived from an aliphatic diol and a cycloaliphatic diol with one or more, dicarboxylic acid(s), preferably an aromatic dicarboxylic acid. Typical amorphous copolyesters include co-polyesters of terephthalic acid with an aliphatic diol and a cycloaliphatic diol, especially ethylene glycol and 1,4-cyclohexanedimethanol.

Modified Atmosphere for tray lidding packages

[0169] In general modified atmosphere mixtures include a volumetric quantity of one or more of N₂, O₂ and CO₂ which is different from the quantity of these same gases as present in the atmosphere at 20°C and sea level (1 atmosphere pressure). The following gas mixtures may for instance be used (quantities are expressed in volume percentages at 20°C, 1atm of pressure) depending on the food product to be packaged:

- Red meats, Poultry skinless: O₂=70%, CO₂=30%
- Poultry with skin on, Cheese, Pasta, Bakery products: CO₂=50%, N₂=50%
- Fish CO₂=70%, N₂=30% or CO₂=40%, N₂=30%, O₂=30%
- Processed meat CO₂=30%, N₂=70%

Uses

[0170] In an advantageous application a plurality of first containers 2 may be used: each first container may host a respective and different first product 4. For instance each first container may host a different liquid or gel-like or paste-like or particulate food product, and the second container 5 may host a solid food product 7 requiring to receive one or more of the food products present in the first containers in order to make a final food product aligned with the user need/taste. Each of the first containers 2 of said plurality comprises, in this case, an identical first connecting member 9 forming said connecting device 8 when coupled to the second connecting member 10 of the second container 5, such that the user may select the first container 2 with the first product 4 he likes and then easily connect the first container to the second container flowing or pouring the content of the first container into the second container.

[0171] In general, the first containers 2 may be used for hosting a plurality of different liquid or gel-like or paste-like or particulate first food products, each in a respective first container 2, while the second container 5 may be used for packaging a solid food product which may receive the selected one of the first food products.

[0172] The process for the preparation of food, using the package assembly described above or as claimed in any one of the appended package assembly claims may comprise the following steps.

[0173] First one first container 2 is coupled to one second container 5 using said connecting device 8 and forming said channel 11 between the first and second volumes.

[0174] Then once the two containers are coupled the user may start transferring the first product or part of it from the first to the second container, e.g., by squeezing the first container.

[0175] Once the content or sufficient content of the first container 2 has been transferred, the first container 2

may be disengaged from the second container 5 and the second container 5 may be closed using the closure cap member 35.

[0176] Alternatively, once the content or sufficient content of the first container 2 has been transferred to the second container 5, the two container 2 and 5 are kept in connection one to the other and disposed by the end consumer as an assembly. The food in the second container may either be stored or left in an appropriate atmosphere (e.g., if the second food product needs time to be properly seasoned, or impregnated, or marinated by the first food product). Then, - if necessary - cooking may take place: the first and second food products hosted in the second container may be inserted in an appropriate oven for traditional or microwave cooking or it may be heated on a stove top or in boiler.

Manufacturing process

[0177] The package assembly described above and claimed in any one of the attached package assembly claims may be manufactured as follows.

[0178] The manufacturing process includes the following main steps:

- making the first container 2,
- providing the first container 2 with the first connecting member 9 (this step may take place during formation of the first container particularly if the first connecting member is housed inside the first container),
- inserting the first food product 4 into the first container 2,
- hermetically sealing the first container,

and

- making the second container 5,
- providing the second container 5 with the second connecting member 10 (this step may take place during formation of the second container particularly if the second connecting member is housed inside the second container),
- inserting the second food product 6 into the second container 5,
- hermetically sealing the second container.

[0179] When the first and second container are in the form of pouches they may be made with either a vertical process (e.g., a vertical form/fill/seal (VFFS) packaging systems allowing in particular to pour liquid in the container under formation) or using an horizontal process.

[0180] Vertical form/fill/seal (VFFS) packaging systems have proven to be very useful in packaging a wide variety of food and non-food pumpable and/or flowable products. The VFFS process is known to those of skill in the art, and described for example in U.S. Patent Nos. 4,506,494 (Shimoyama et al.), 4,589,247 (Tsuruta et al), 4,656,818 (Shimoyama et al.), 4,768,411 (Su),

4,808,010 (Vogan), and 5,467,581 (Everette), all incorporated herein by reference in their entirety. Typically in such a process, lay-flat thermoplastic film is advanced over a forming device to form a tube, a longitudinal (vertical) fin or lap seal is made, and a bottom end seal is made by transversely sealing across the tube with heated seal bars. A liquid, flowable, and/or pumpable product, such as a liquid, semiliquid, or paste, with or without particulates therein, is introduced through a central, vertical fill tube to the formed tubular film. Squeeze rollers spaced apart and above the bottom end seal squeeze the filled tube and pinch the walls of the flattened tube together. When a length of tubing of the desired height of the pouch has been fed through the squeeze rollers a heat seal is made transversely across the flattened tubing by heat seal bars which clamp and seal the film of the tube therebetween. After the seal bars have been withdrawn the film moves downwardly to be contacted by cooled clamping and severing bars which clamp the film therebetween and are provided with a cutting knife to sever the sealed film at about the midpoint of the seal so that approximately half of the seal will be on the upper part of a tube and the other half on the lower. When the sealing and severing operation is complete, the squeeze rollers are separated to allow a new charge of product to enter the flattened tube after which the aforementioned described process is repeated thus continuously producing vertical form/fill/seal pouches which have a bottom end and top end heat seal closure.

[0181] The process can be a two-stage process where the creation of a transverse heat seal occurs at one stage in the process, and then, downstream of the first stage, a separate pair of cooling/clamping means contact the just-formed transverse heat seal to cool and thus strengthen the seal. In some VFFS processes, an upper transverse seal of a first pouch, and the lower transverse seal of a following pouch, are made, and the pouches cut and thereby separated between two portions of the transverse seals, without the need for a separate step to clamp, cool, and cut the seals.

[0182] Alternatively the pouch forming the first and/or the second container may be obtained using an horizontal form/fill/seal (HFFS) packaging system. HFFS use a flat film which is horizontally sealed to form a tubular body. The product (which should be solid or at least have the ability not to flow away during packaging) is positioned inside the tubular body which is sealed at intervals and severed to form separate pouches.

[0183] The first connecting member and the second connecting member are inserted into the respective pouch during formation of the pouch. For instance U.S. Pat. No. 4,603,793 (Stern), incorporated herein by reference in its entirety, discloses a how a connecting member 6a is mounted on the inside wall of a pouch.

[0184] In case the first or second containers adopt a tray, then the tray (which may be pre-formed or in-line thermoformed) is moved to a station where the product is inserted into the tray. Then a film is applied to the top

of the tray: the film may be either a continuous film which is then severed or a pre-cut film sheet. In either case the film may form a lid (with regular or controlled atmosphere inside the tray) or the film may be used to form a vacuum skin above the tray and above the product. The connecting member is fixed to the film covering the tray top mouth either inside the tray or outside the tray. For instance the connecting member could be fixed to the film before coupling the film to the tray.

Claims

1. A food package assembly (1) comprising:

- a first container (2) delimiting a first volume (3) hosting at least one first product (4),
- a second container (5) delimiting a second volume (6) hosting at least one second product (7), the first and second products (4, 7) being food products,
- a connecting device (8) including at least a first connecting member (9) carried by the first container (2) and a second connecting member (10) carried by the second container (5),

wherein the food package assembly is configured to be placed in at least one disconnected condition, where said first and second volumes (3, 6) are isolated the one from the other and, optionally hermetically sealed, with the first container (2) physically separated from the second container (5), and in at least one connected condition, where the connecting device (8) connects the first connecting member (9) with the second connecting member (10) forming a communication channel (11) between the first volume (3) and the second volume (6), wherein said channel (11) presents a channel lumen configured to allow passage of the first product (4) from the first volume (3) to the second volume (6) while preventing passage of the second product (7) from the second volume (6) to the first volume (3).

2. A package assembly according to claim 1, wherein the first container (2) is:

- a pouch formed from one or more plastic films, the plastic film or films forming the pouch being sealingly joined at sealing lines to form an hermetically sealed first volume, or
- a tray with a base wall, a side wall emerging from the base wall, a top rim and a plastic film sheet sealingly fixed at least to the tray top rim to form an hermetically sealed first volume,

and wherein the second container (5) is:

- a pouch formed from one or more plastic films,

the plastic film or films forming each pouch being sealingly joined at sealing lines to form an hermetically sealed second volume or

- a tray with a base wall, a side wall emerging from the base wall, a top rim and a plastic film sheet sealingly fixed at least to the tray top rim to form an hermetically sealed second volume.

3. A food package assembly comprising:

- a first container (2) delimiting a first volume (3) hosting at least one first product (4),
- a second container (5) delimiting a second volume (6) hosting at least one second product (7), the first and second products (4, 7) being food products,
- a connecting device (8) including at least a first connecting member (9) carried by the first container (2) and a second connecting member (10) carried by the second container (5),

wherein the food package assembly is configured to be placed in at least one disconnected condition, where said first and second volumes (3, 6) are isolated the one from the other, with the first container (2) physically separated from the second container (5), and in at least one connected condition, where the connecting device (8) connects the first connecting member (9) with the second connecting member (10) forming a communication channel (11) between the first volume (3) and the second volume (6), wherein the first container (2) is:

- a pouch formed from one or more plastic films, the plastic film or films forming the pouch being sealingly joined at sealing lines to form an hermetically sealed first volume,

and wherein the second container (5) is:

- a pouch formed from one or more plastic films, the plastic film or films forming each pouch being sealingly joined at sealing lines to form an hermetically sealed second volume or
- a tray with a base wall, a side wall emerging from the base wall, a top rim and a plastic film sheet sealingly fixed at least to the tray top rim to form an hermetically sealed second volume.

4. A package assembly according to claim 1 or 2 or 3 wherein the first product (4) in the first container (2) is in the form of a liquid or a gel or a particulate or a paste, or a mixture of liquid or gel or paste with particulate, such as a sauce, a soup, a juice, a cream, a topping, a seasoning; and wherein the second product (7) hosted in the second container (5) is a solid food product comprising one or more solid food pieces sized not to pass through

said channel lumen.

5. A package assembly according to any one of the preceding claims wherein:

- the first connecting member (9) comprises a tubular body (12) having a terminal flange (13) and a side wall (14), further wherein the terminal flange (13) of the first connecting member (9) is fixed to an inner surface (2a) or to an outer surface (2b) of the first container (2);
- the second connecting member (10) comprises a tubular body (16) having a terminal flange (17) and a side wall (18), further wherein the terminal flange (17) of the second connecting member (10) is fixed to an inner surface (5a) or to an outer surface (5b) of the second container (5).

6. A package assembly according to claim 5, wherein:

- the first connecting member (9) is positioned inside the first volume (3) and said terminal flange (13) of the first connecting member is fixed to an inner surface (2a) of a wall of said first container (2), wherein - before first connection of the first connecting member with the second connecting member - a wall portion (22) of the first container (2) closes a lumen of the tubular body (12) at said terminal flange (13); and
- the second connecting member (10) is positioned inside the second volume (6) and said terminal flange (17) of the second connecting member is fixed to an inner surface (5a) of a wall of said second container, wherein - before first connection of the first connecting member with the second connecting member - a wall portion (23) of the second container (5) closes a lumen of the tubular body (16) at said terminal flange (17).

7. A package assembly according to claim 5, wherein:

- the first connecting member (9) is positioned outside the first volume (3) and said terminal flange (13) of the first connecting member is fixed to an outer surface (2b) of a wall of said first container, wherein - before first connection of the first connecting member with the second connecting member - a wall portion (22) of the first container (2) closes a lumen of the tubular body (12) at said terminal flange (13); and
- the second connecting member (10) is positioned outside the second volume (6) and said terminal flange (17) of the second connecting member is fixed to an outer surface (5b) of a wall of said second container, wherein - before first connection of the first connecting member with the second connecting member - a wall por-

tion (23) of the second container (5) closes a lumen of the tubular body (16) at said terminal flange (17).

8. A package assembly according to claim 6, wherein the side wall (14) of the tubular body (12) of the first connecting member (9) forms a one or more radial passages (20) and wherein the side wall (18) of the tubular body (16) of the second connecting member (10) forms a one or more radial passages (21).
9. A package assembly according to any one of the preceding claims wherein the first and second connecting members (9, 10) are identical.
10. A package assembly according to any one of the preceding claims wherein the connection device (8) further includes an interconnection piece (24), further wherein the interconnection piece - when the food package assembly is placed in said connected condition - is configured to be interposed between the first and second connecting members (9, 10) and connect the first connecting member with the second connecting member, forming said channel (11), the interconnection piece (24) comprising:

- a main body (25) of tubular shape,
- a flange (26) radially emerging from an outer surface (25a) of the main body (25), the main body presenting opposite tubular segments (27, 28) extending on opposite sides of the flange (26), each of the tubular segments being insertable through a tubular body (12, 16) of a respective of said first and second connecting members (9, 10),
- axially opposite piercing portions (29, 30) defined at ends of said opposite tubular segments (27, 28);

further wherein the interconnection piece (24) is in the form of a separate component distinct from the first and the second connecting members or is carried by one of said connection members.

11. A package assembly according to claim 10, wherein each of said opposite tubular segments (27, 28) of the interconnection piece (24) is configured to engage one respective of said first connecting member and second connecting member; optionally wherein said opposite tubular segments (27, 28) of the interconnection piece (24) have an axial length which is shorter than an axial length of said first and second connecting members (9, 10); further wherein said opposite tubular segments (27, 28) of the interconnection piece (24) are identical, and wherein said first and second connecting members are identical such that each of said opposite tubular segments (27, 28) of the interconnection piece (24) is config-

ured to interchangeably engage one or the other of said first connecting member and second connecting member.

12. A package assembly according to any one of the preceding claims from 10 to 11 wherein the opposite tubular segments (27, 28) of the interconnection piece (24) are configured to be slidably inserted into the corresponding tubular bodies (12, 16) of the first and second connecting members (9, 10) such that the axially opposite piercing portions (29, 30) defined at ends of said opposite tubular segments pierce and open the wall portion (22, 23) of the first and second container (2, 5) at each terminal flange (13, 17) of the first and second connecting members, optionally wherein the interconnection piece (24) bears an integrally associated closure cap member (35) which can be removably coupled to one of the opposite tubular segments to open or close fluid passage through the interconnection piece.
13. A package assembly according to any one of claims from 10 to 12, wherein the interconnection piece (24) comprises a unidirectional valve (32) positioned inside the main body (25); further wherein the unidirectional valve (32) comprises:

- one or more bendable flaps (33) radially emerging from the inner surface of the main body (25) of the interconnection piece and angularly displaceable from an extended condition where the flap or flaps (33) interdict fluid passage to a bent condition where the flap or flaps (33) allow fluid passage.
- one or more frangible membranes extending across the lumen of the main body and each having one or more weakening lines (34), said weakening lines of each frangible membrane being configured to allow a direction of preferential opening of the membrane when a pressure above atmosphere is generated inside one of said first and second containers (2, 5).

14. A package assembly according to any one of the preceding claims from 1 to 9, wherein either the first or the second connecting member fixedly carries a spout (37) emerging outside the respective first or second container (2, 5), optionally wherein the spout bears a integrally associated closure cap member (35) which can be removably coupled to the spout to open or close fluid passage through the connecting member carrying the spout.
15. A package assembly according to claim 14, wherein the spout (37) carried by one of said first and second connecting members presents one or more piercing members (38) and is configured to be inserted into and engage with the tubular body (12, 16) of the other

of said first and second connecting members (9, 10), and pierce the wall portion (22, 23) at said terminal flange thereby opening fluid passage between the first and the second volumes, optionally wherein the spout (37) is in the shape of an ogive with radial passages and a pointed piercing tip.

16. A package assembly according to any one of claims 1 to 9 wherein one of the first and second connecting members (9, 10) terminally integrates a female coupling, optionally a female bayonet or a female thread, while the other of the first and second connecting members terminally integrates a male coupling, optionally as a male bayonet or a male thread, such that the first connecting member may be directly coupled to the second connecting member forming said communication channel (11) and opening a passage of fluid between the first and the second volumes (3, 6), optionally wherein coupling of the first and second connecting members causes piercing of the wall portions or of membranes associated in closure of at least one of the connecting members.

17. A package assembly according to any one of claims from 2 to 16, wherein:

the first container (2) is a tray with a base wall, a side wall emerging from the base wall, a top rim and a plastic film sheet sealingly fixed at least to the tray top rim, and wherein the first connecting member is attached to the first container in correspondence of a film portion which is part of said plastic film sheet; and the second container (5) is a tray with a base wall, a side wall emerging from the base wall, a top rim and a plastic film sheet sealingly fixed at least to the tray top rim, and wherein the second connecting member is attached to the first container in correspondence of a film portion which is part of said plastic film sheet;

or

wherein the first container (2) is a pouch formed from one or more plastic films, the plastic film or films forming the pouch being sealingly joined at sealing line(s) to form an hermetically sealed first volume, and wherein the first connecting member is attached to the first container in correspondence of a film portion part of said plastic film or films and located apart from said sealing line(s); and the second container (5) is a pouch formed from one or more plastic films, the plastic film or films forming the pouch being sealingly joined at sealing line(s) to form an hermetically sealed first volume, and wherein the second connecting member is attached to the second container in correspondence of a film portion part of said plastic film or films and located apart from said sealing line(s);

or

the first container (2) is a tray with a base wall, a side wall emerging from the base wall, a top rim and a plastic film sheet sealingly fixed at least to the tray top rim, and wherein the first connecting member is attached to the first container in correspondence of a film portion which is part of said plastic film sheet; and the second container (5) is a pouch formed from one or more plastic films, the plastic film or films forming the pouch being sealingly joined at sealing line(s) to form an hermetically sealed first volume, and wherein the second connecting member is attached to the second container in correspondence of a film portion part of said plastic film or films and located apart from said sealing line(s); or

the first container (2) is a pouch formed from one or more plastic films, the plastic film or films forming the pouch being sealingly joined at sealing line(s) to form an hermetically sealed first volume, and wherein the first connecting member is attached to the first container in correspondence of a film portion part of said plastic film or films and located apart from said sealing line(s); and the second container (5) is a tray with a base wall, a side wall emerging from the base wall, a top rim and a plastic film sheet sealingly fixed at least to the tray top rim, and wherein the second connecting member is attached to the first container in correspondence of a film portion which is part of said plastic film sheet; optionally wherein, when the first container (2) or the second container (5) is in the form of a pouch, said pouch is provided with at least a through hole positioned in correspondence of a top zone of the pouch external to a sealing perimeter delimiting the first and/or second volume of said first and/or second containers, the through hole being designed to allow vertical hanging of the pouch on a support arm.

18. A package according to any one of the preceding claims wherein the first container (2) - when in the form of a pouch - is provided with a central narrower region positioned between two larger regions, the narrower region facilitating squeezing of the pouch defining the first container.

19. A package assembly according to any one of the preceding claims wherein the first and/or the containers (2, 5) are package the respective products under vacuum forming respective vacuum skin container(s), further wherein the first and/or second connecting members (9, 10) are provided with a frangible membrane located at a respective terminal flange.

20. A package assembly according to any one of the preceding claims comprising:

- a plurality of said first containers (2) each containing a respective and different first product which is a liquid food product or a gel food product or a paste food product or a particulate food product which is able to pass through said communication channel, and
- at least one second container (5) hosting a second product comprising a solid food product unable to pass through said communication channel, wherein each one of the first containers of said plurality comprises an identical first connecting member forming said connecting device when coupled to the second connecting member of the second container.

21. Use of the package assembly (1) according to any one of the preceding claims for packaging in the first container (2) a first product (4) comprising one or more in the group of: a liquid food product or a gel food product or a paste food product or a particulate food product, wherein the food product in the first container (2) is able to pass through said communication channel (11); and for packaging a second product (7) comprising a solid food product in the second container (5), wherein the solid food product in the second container (5) is sized not to pass through the communication channel (11).

22. Use of the package assembly according to claim 20 for packaging in each first container (2) a respective of a plurality of different first products (4) comprising one or more in the group of: a liquid food product or a gel food product or a paste food product or a particulate food product, wherein the food products (4) in the first containers (2) are able to pass through said communication channel (11); and for packaging a second product (7) comprising a solid food product in the second container (5), wherein the solid food product in the second container (5) is sized not to pass through the communication channel (11).

23. A process for the preparation of food, using the package assembly (1) of any one of claims from 1 to 20, comprising the steps:

- coupling one first container (2) to one second container (5) using said connecting device (8) and forming said channel (11) between the first and second volumes (3, 6),
- transferring the first product (4) or part of it from the first to the second container,
- optionally cooking the first and second products (4, 7);

further wherein said step of coupling comprises:

- inserting the opposite tubular segments (27, 28) of the interconnection piece (24) into the corresponding tubular bodies (12, 16) of the first and second connecting members (9, 10) until the axially opposite piercing portions (29, 30) defined at ends of said opposite tubular segments pierce and open the wall portion (22, 23) of the first and second container (2, 5) at each terminal flange (13, 17) of the first and second connecting members; or
- inserting the spout (27) carried by one of said first and second connecting members (9, 10) into the tubular body (12, 16) of the other of said first and second connecting members (9, 10), until the one or more piercing members pierce the wall portion at said terminal flange thereby opening fluid passage between the first and the second volumes (3, 6); or
- directly coupling the first connecting member (9) to the second connecting member (10) forming said communication channel (11) and opening a passage of fluid between the first and the second volumes (3, 6), wherein coupling of the first and second connecting members causes piercing of the wall portions (22, 23) or of membranes associated in closure of each connecting member, wherein one of the first and second connecting members terminally integrates a female coupling, optionally a female bayonet or a female thread, while the other of the first and second connecting members terminally integrates a male coupling, optionally as a male bayonet or a male thread

yet further after the transferring step the second container (5) is separated from the first container (2) and - optionally - a closure cap member (35) coupled to one of the opposite tubular segments of the interconnection piece (24) or to the spout (37) or directly to one of the first and second connecting members (9, 10).

24. A process for making a food assembly according to any one of the preceding claims from 1 to 20 comprising:

- making the first container (2),
- providing the first container (2) with the first connecting member (9),
- inserting the first food product (4) into the first container (2),
- optionally forming a vacuum and/or a controlled atmosphere into the first container (2),
- hermetically sealing the first container (2),

and

- making the second container (5),

- providing the second container (5) with the second connecting member (10),
- inserting the second food product (7) into the second container (5),
- optionally forming a vacuum and/or a controlled atmosphere into the second container (5),
- hermetically sealing the second container (5).

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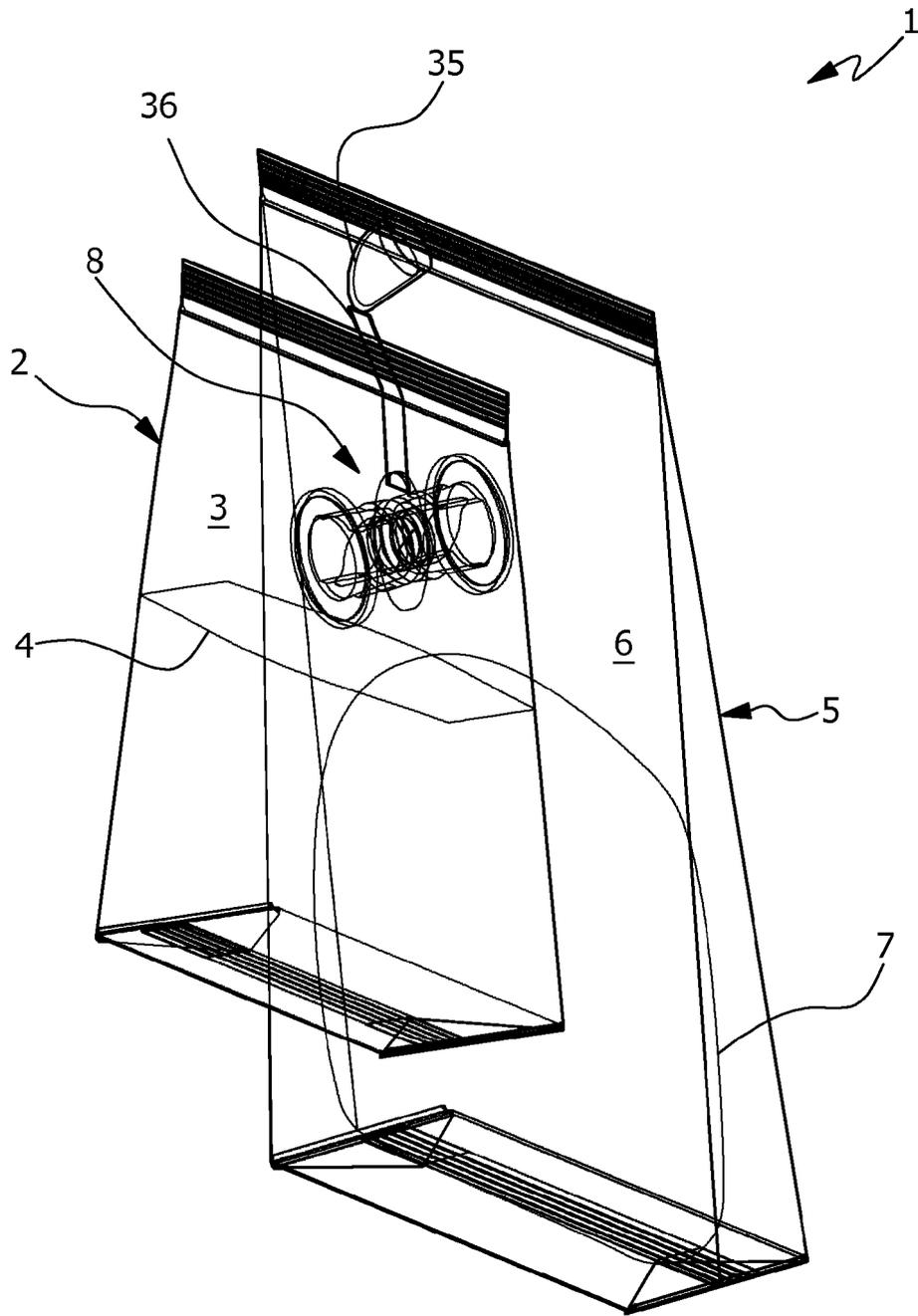


FIG.1

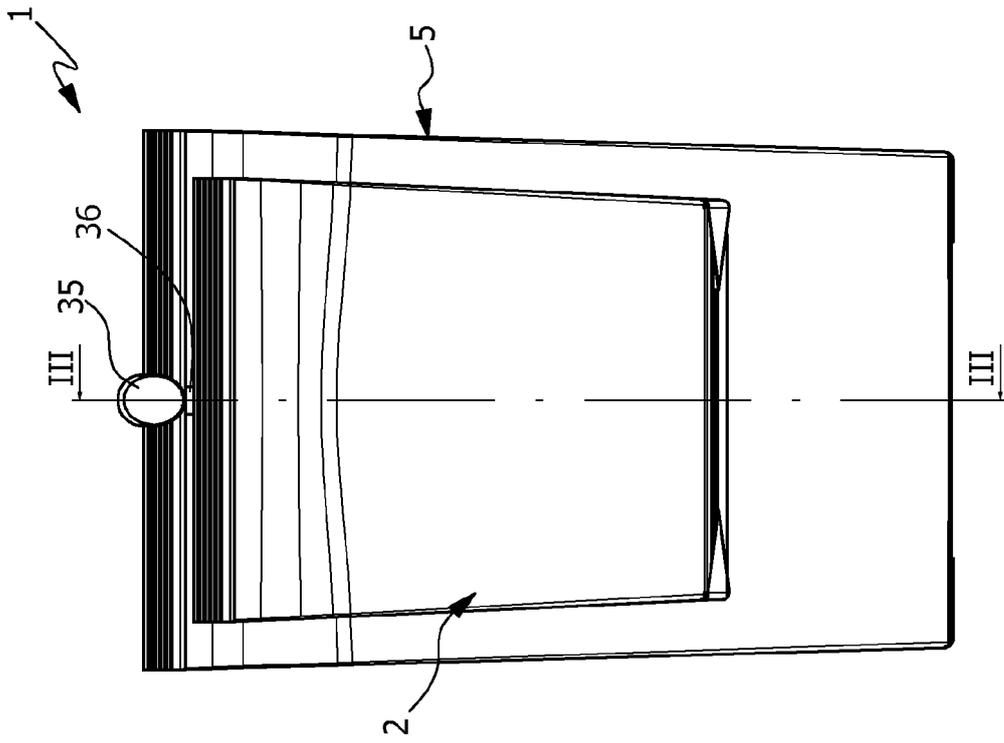


FIG. 2

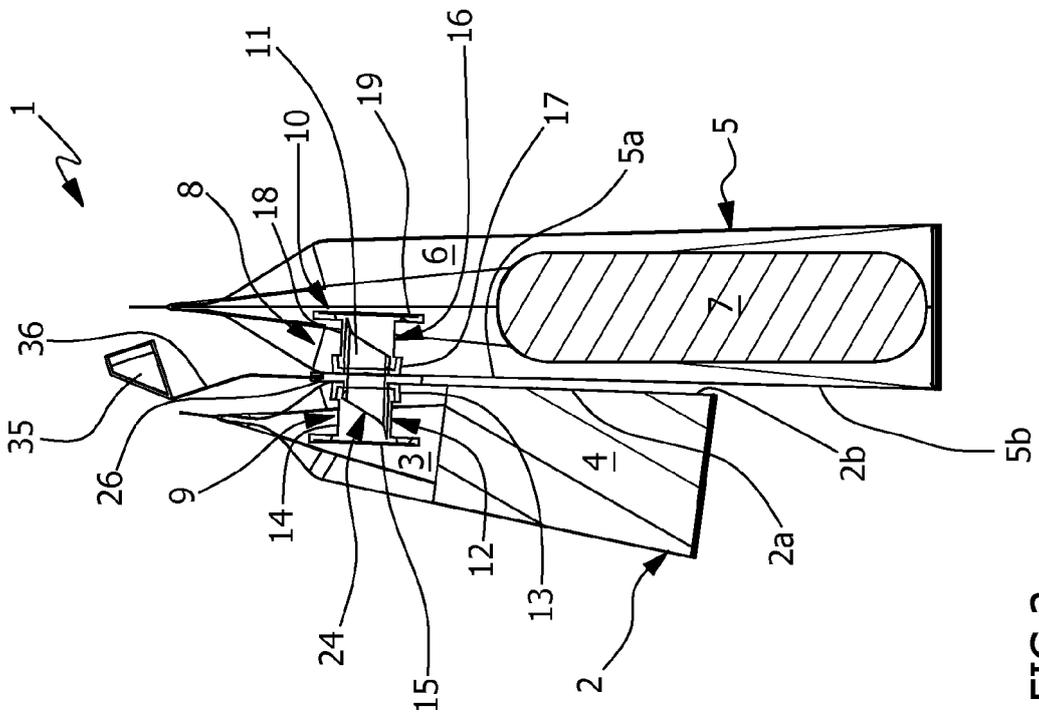


FIG. 3

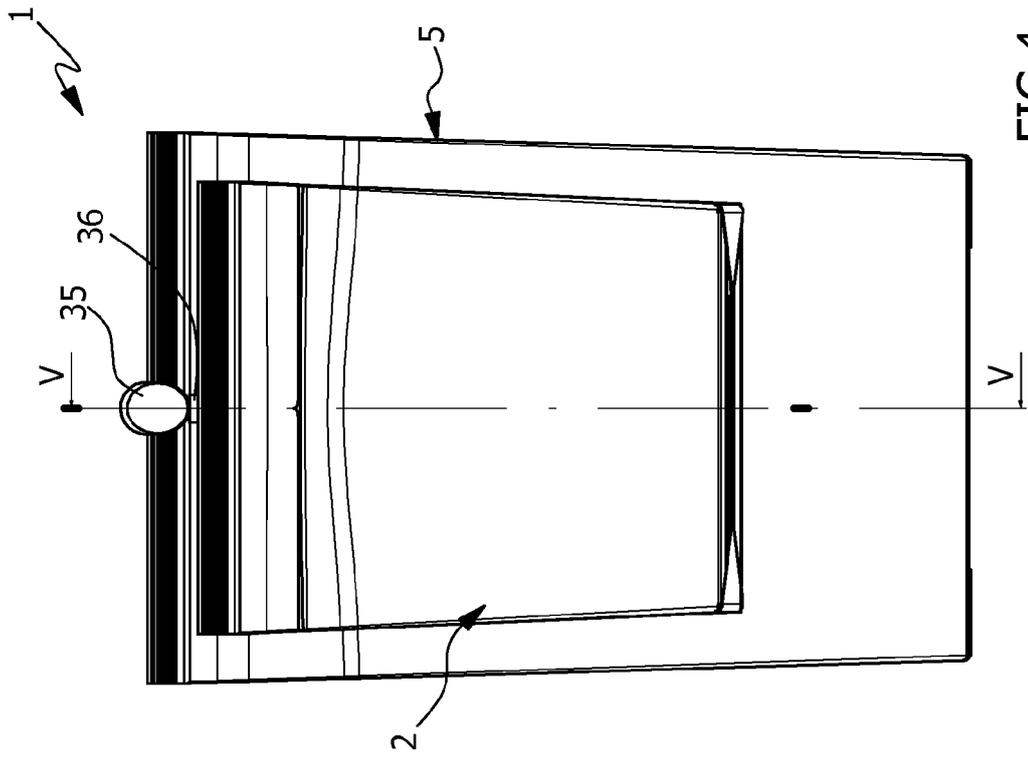


FIG. 4

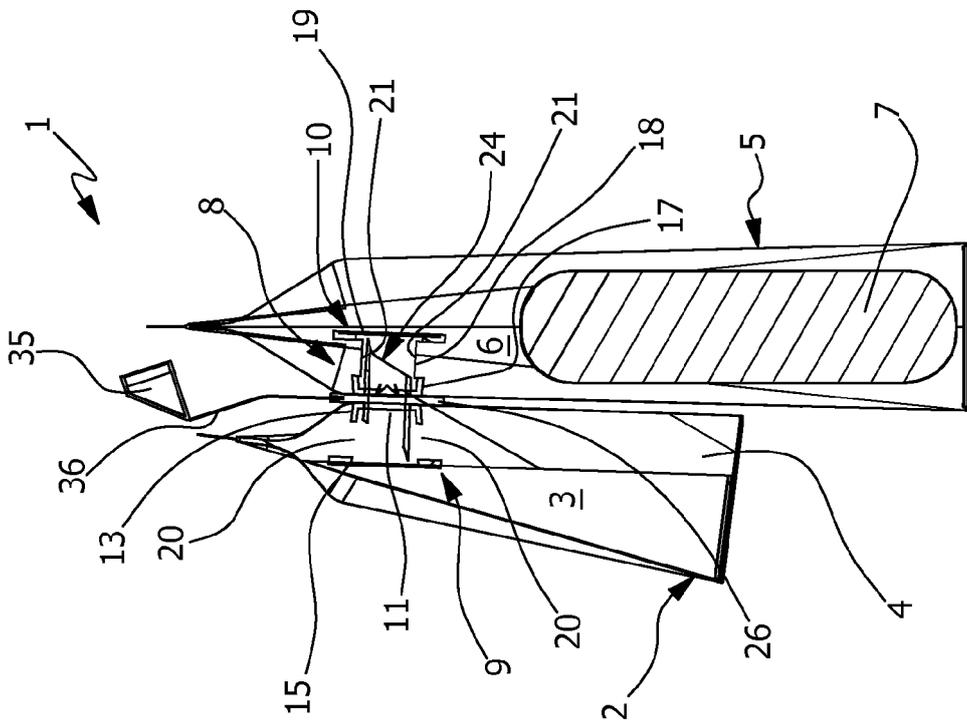


FIG. 5

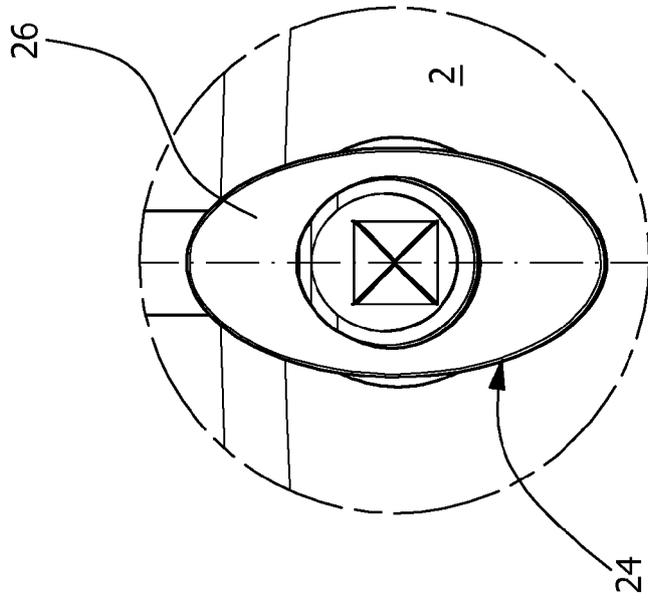
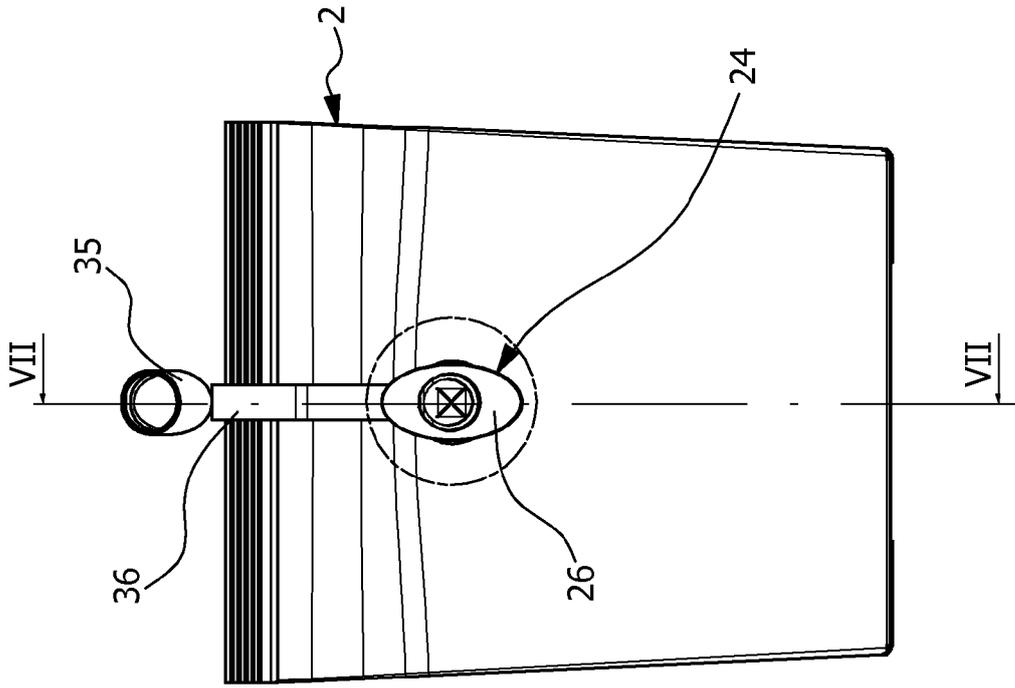


FIG. 6A

FIG. 6

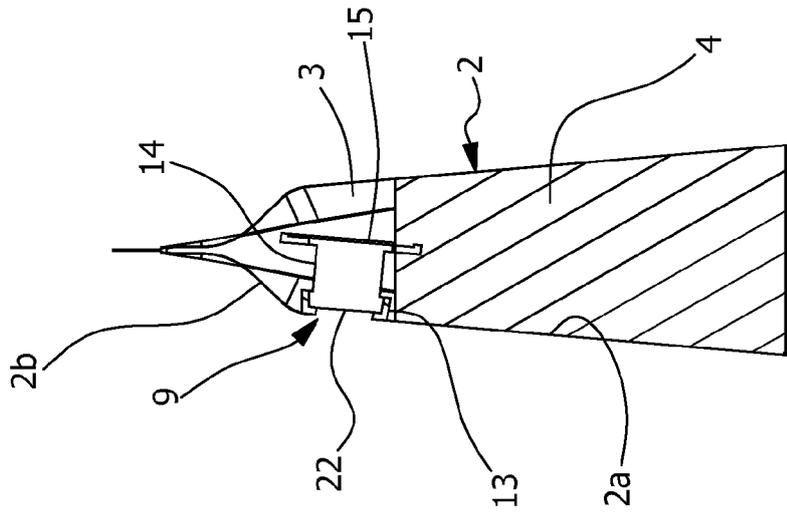
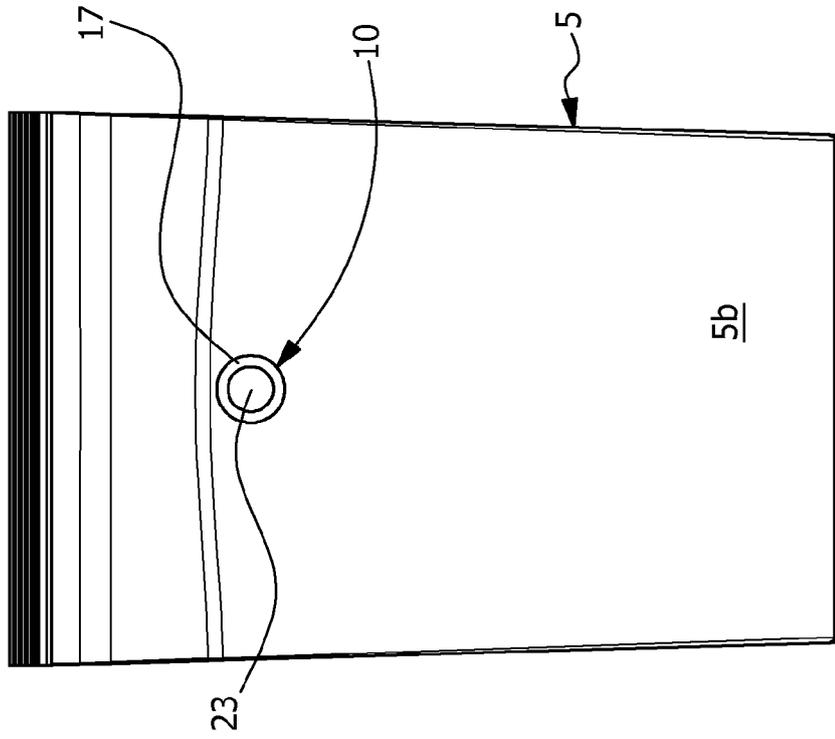


FIG.8

FIG.7

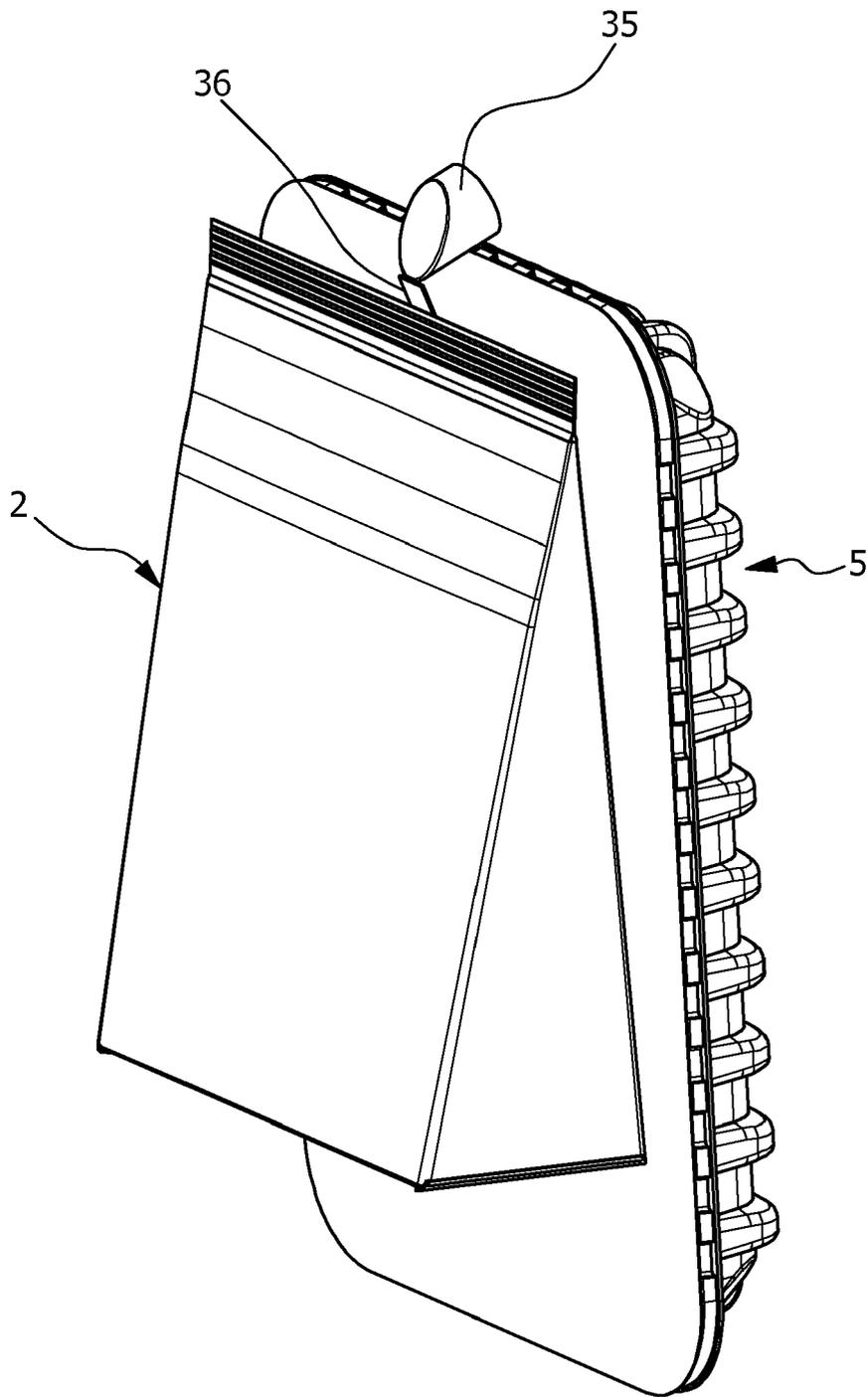


FIG.9

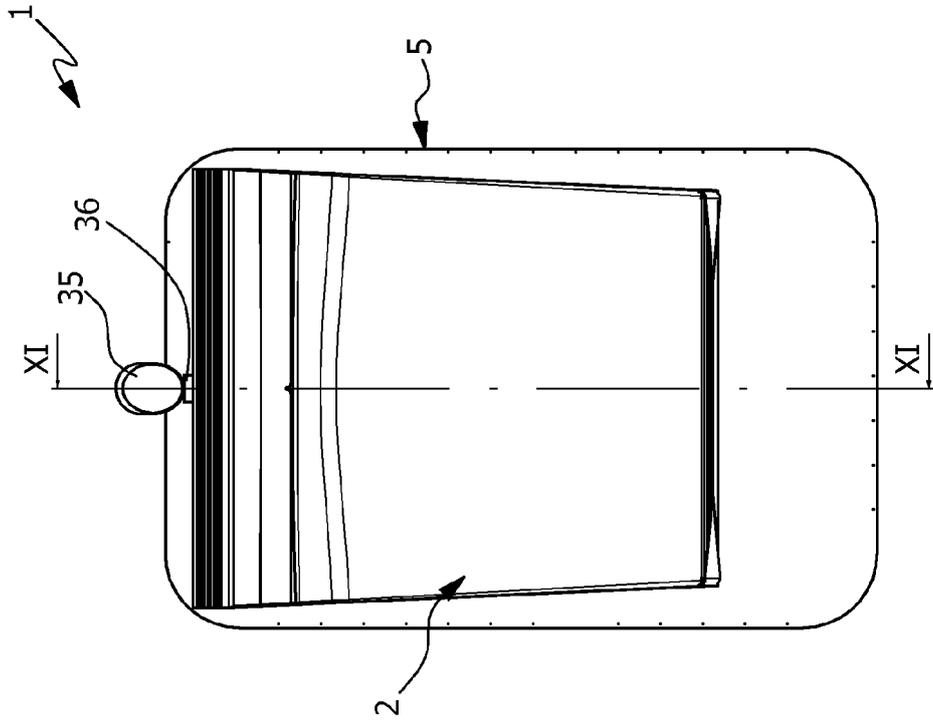


FIG.10

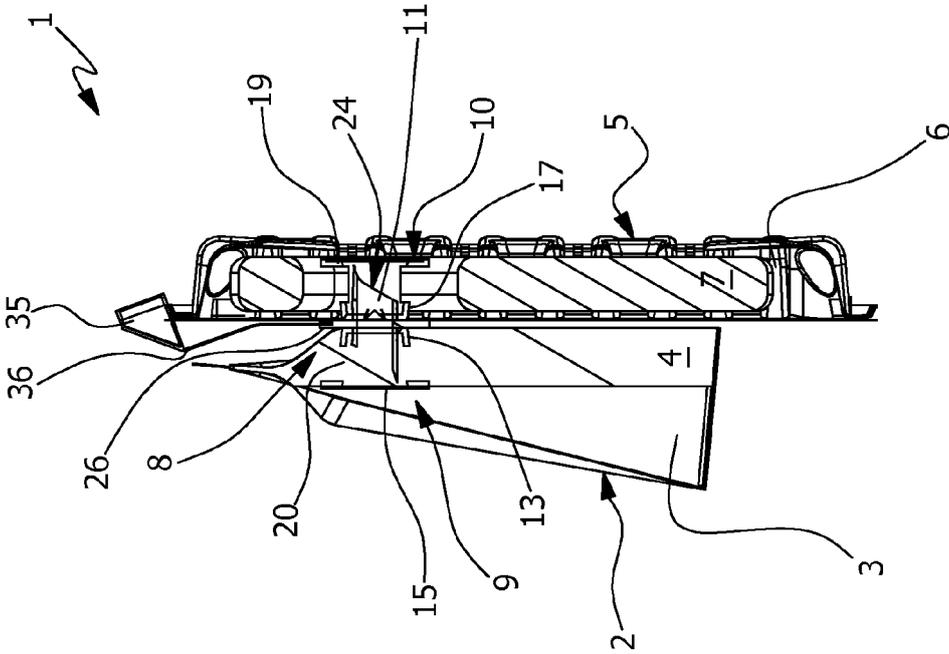
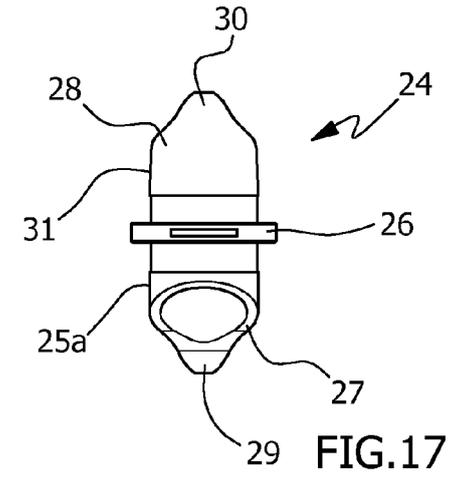
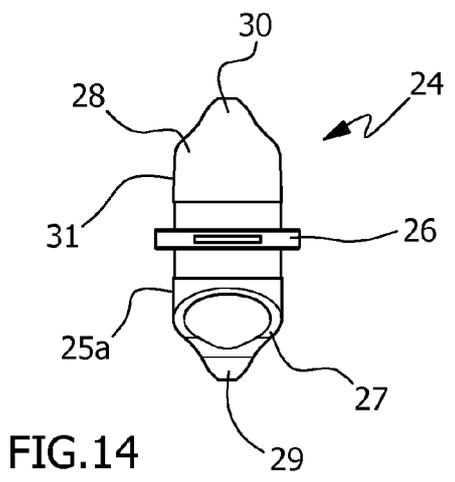
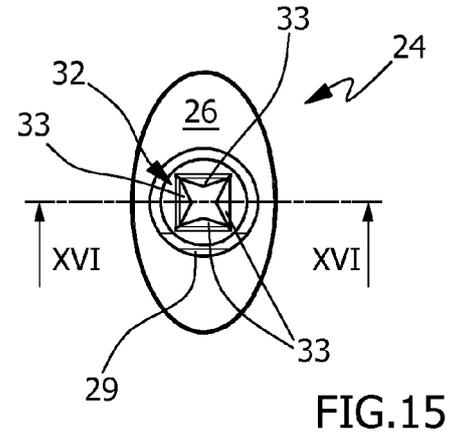
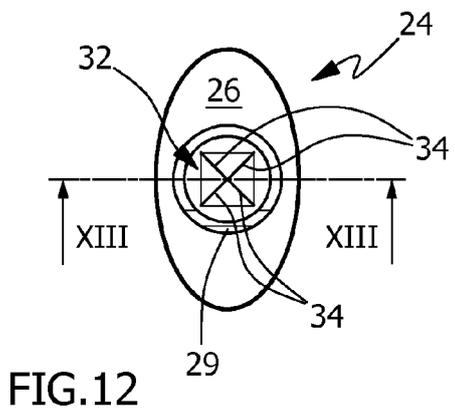
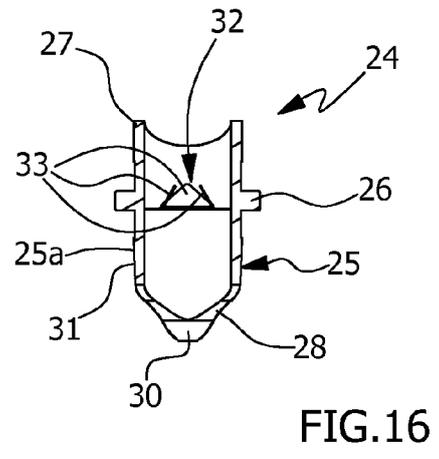
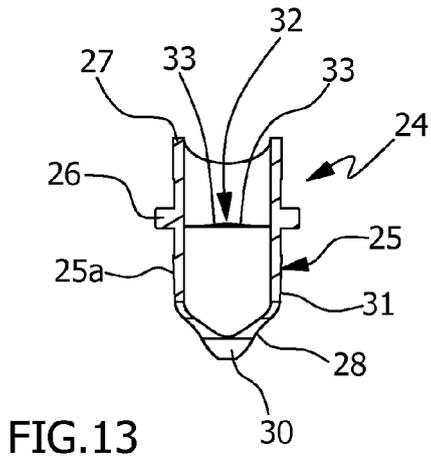


FIG.11



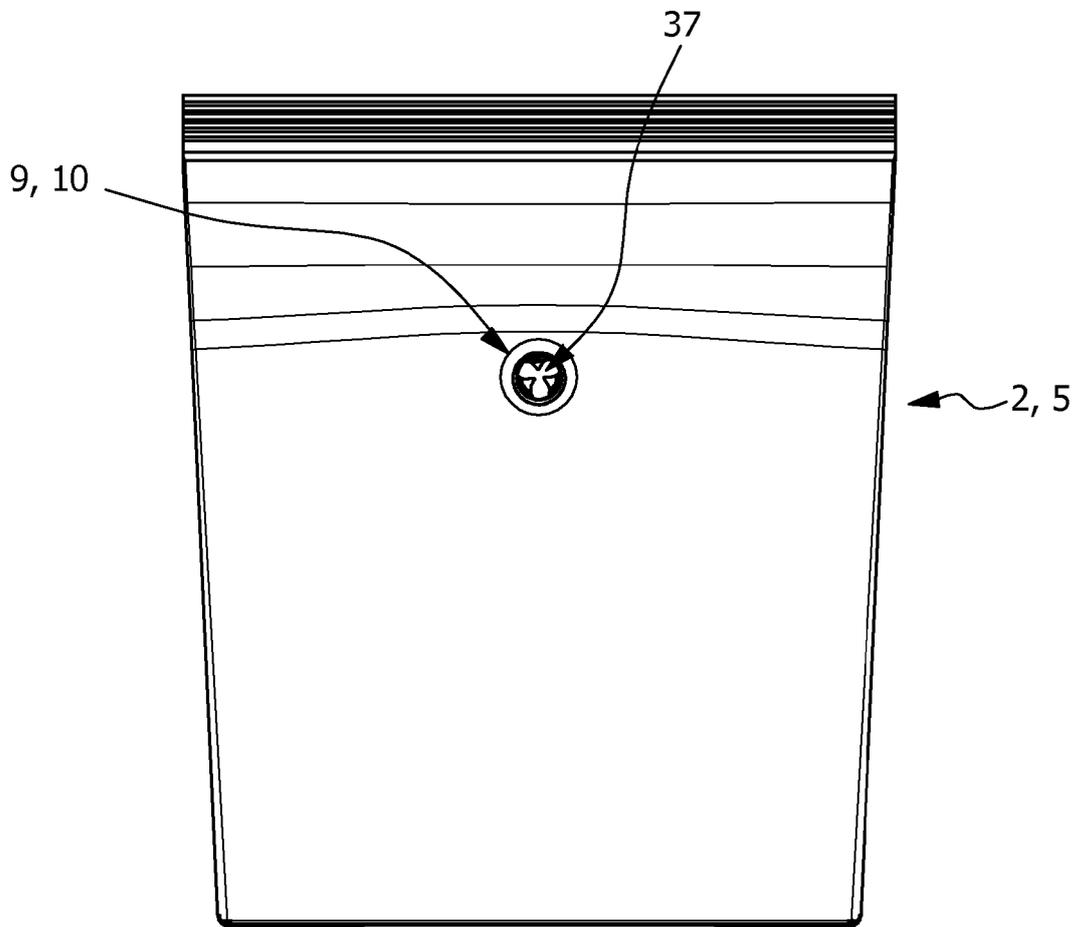


FIG.18

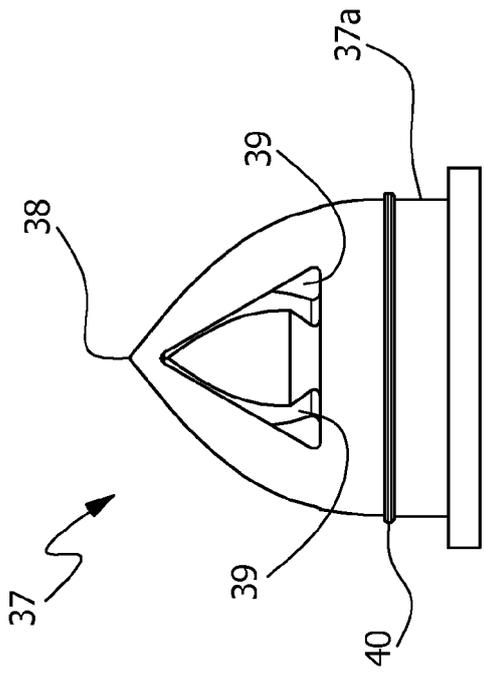


FIG. 20

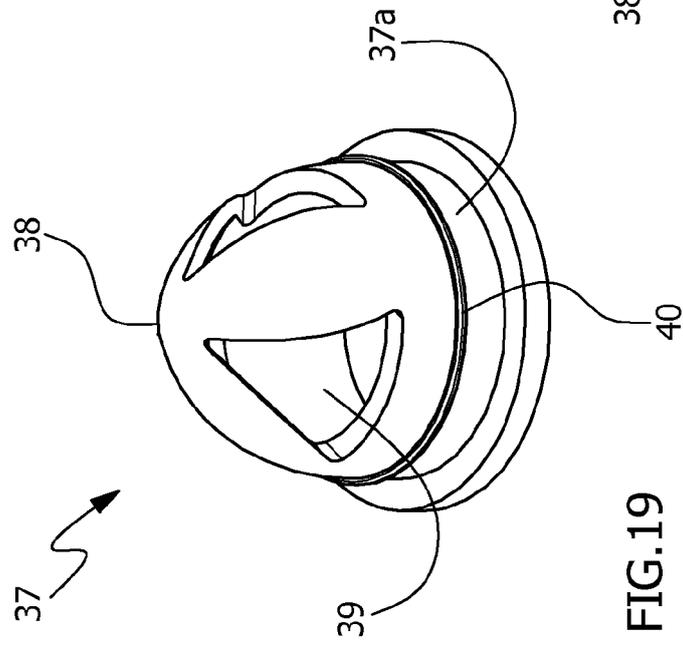


FIG. 19

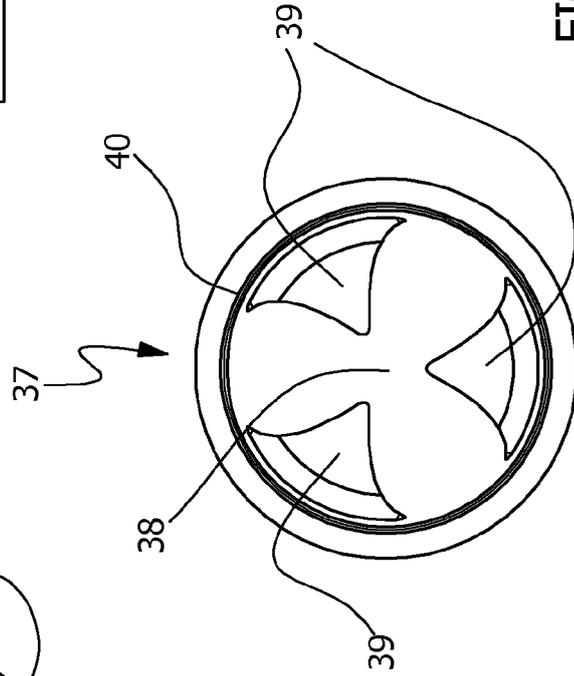


FIG. 21

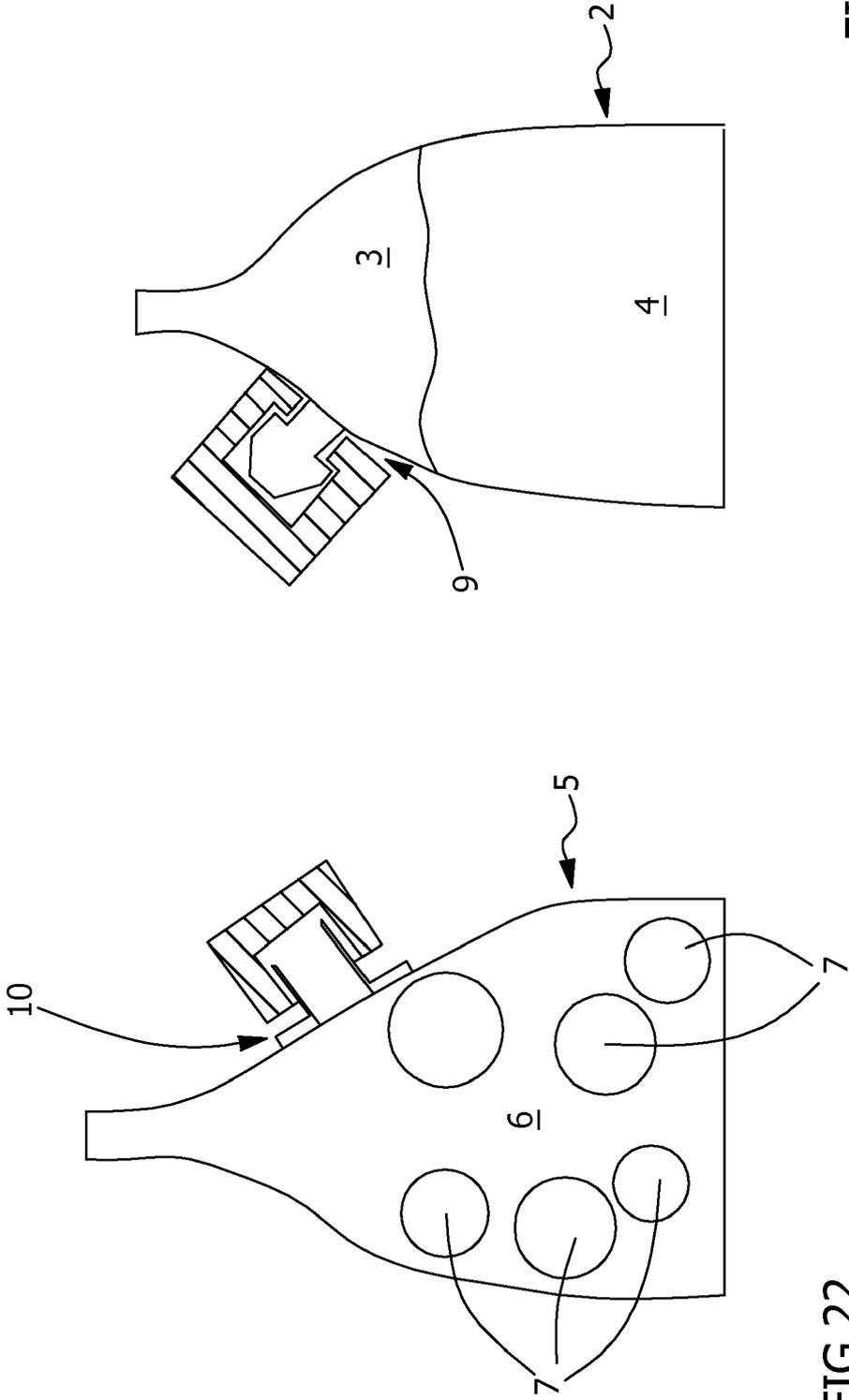


FIG.23

FIG.22

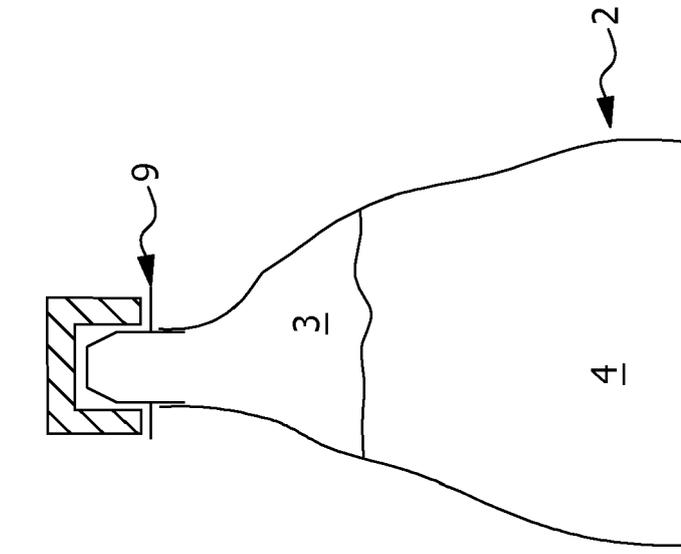


FIG.25

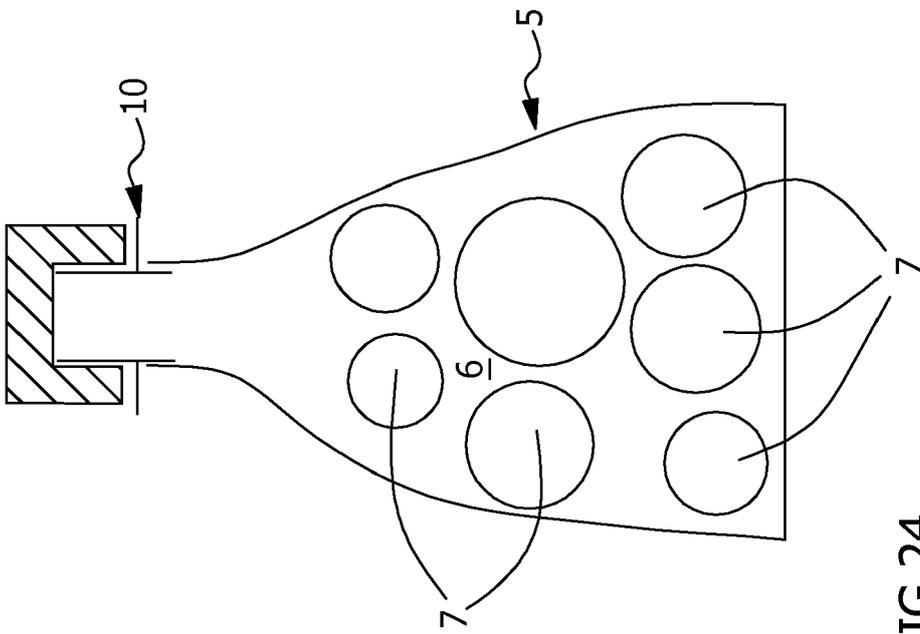


FIG.24



EUROPEAN SEARCH REPORT

Application Number
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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	US 2009/311389 A1 (ZOSS ROBERT A [US] ET AL) 17 December 2009 (2009-12-17)	1-5,16, 17, 20-22,24	INV. B65D30/24 B65D75/58 B65D81/32
Y	* paragraphs [0113] - [0124]; figures 7-9 *	6-9	
Y,D	----- US 4 603 793 A (STERN LEIF EINAR [SE]) 5 August 1986 (1986-08-05)	6-9	
A	* figures 3,4 *	1-5,16, 17, 20-22,24	
A	----- US 3 064 802 A (JESS THURMAN S ET AL) 20 November 1962 (1962-11-20) * figures 1-11 * -----	1-9,16, 17, 20-22,24	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 12 September 2014	Examiner Jervelund, Niels
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	

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Application Number

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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:

1-9, 16, 17, 20-22, 24

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).



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

EP 14 16 1774

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: 1-9, 16, 17, 20-22, 24

A food package comprising a a first container and a second container which are connectable in order to allow a product in the first container to flow into the second container, while preventing the product in the second container from flowing into the first container, wherein connecting members are located inside the respective first and second containers such that a wall portion of the respective container closes an opening of the connecting member.

2. claims: 10-13, 23

A food package comprising a a first container and a second container which are connectable in order to allow a product in the first container to flow into the second container, while preventing the product in the second container from flowing into the first container, further comprising an interconnecting piece for connecting the two containers

3. claims: 14, 15

A food package comprising a a first container and a second container which are connectable in order to allow a product in the first container to flow into the second container, while preventing the product in the second container from flowing into the first container, further comprising a spout to pierce open a wall of the repective first and second containers in order to allow product to flow from the first container to the second container.

4. claim: 18

A food package comprising a a first container and a second container which are connectable in order to allow a product in the first container to flow into the second container, while preventing the product in the second container from flowing into the first container, wherein the first container is provided with a central narrow portion between two larger regions.

5. claim: 19

A food package comprising a a first container and a second container which are connectable in order to allow a product in the first container to flow into the second container, while preventing the product in the second container from



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
EP 14 16 1774

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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:

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flowing into the first container, wherein the containers are vacuum skin containers.

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ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 14 16 1774

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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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12-09-2014

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009311389 A1	17-12-2009	CA 2727449 A1	17-12-2009
		EP 2300329 A1	30-03-2011
		US 2009311389 A1	17-12-2009
		WO 2009152231 A1	17-12-2009

US 4603793 A	05-08-1986	AT 387197 B	12-12-1988
		DE 3129777 C2	06-05-1993
		DK 398681 A	09-09-1981
		EP 0042857 A1	06-01-1982
		FI 812768 A	07-09-1981
		GB 2079723 A	27-01-1982
		JP H0236465 B2	17-08-1990
		JP S56501877 A	24-12-1981
		NO 154388 B	02-06-1986
		SE 445824 B	21-07-1986
		US 4603793 A	05-08-1986
		WO 8101992 A1	23-07-1981

US 3064802 A	20-11-1962	GB 943842 A	11-12-1963
		US 3064802 A	20-11-1962

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EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2006051383 A1 [0004]
- EP 2691233 A1 [0125]
- EP 2582518 A1 [0127]
- EP 1848635 A [0128]
- EP 0690012 A [0128]
- EP 1529797 A [0129]
- WO 2007093495 A [0129]
- US 2762720 A [0129]
- EP 1252008 A [0129]
- EP 1945512 A [0130]
- EP 1393897 A [0131]
- EP 1084186 A [0138]
- EP 1398149 A [0140]
- EP 1465765 A [0140]
- EP 1871597 A [0140]
- US 4506494 A, Shimoyama [0180]
- US 4589247 A, Tsuruta [0180]
- US 4656818 A, Shimoyama [0180]
- US 4768411 A, Su [0180]
- US 4808010 A, Vogan [0180]
- US 5467581 A, Everette [0180]
- US 4603793 A, Stern [0183]