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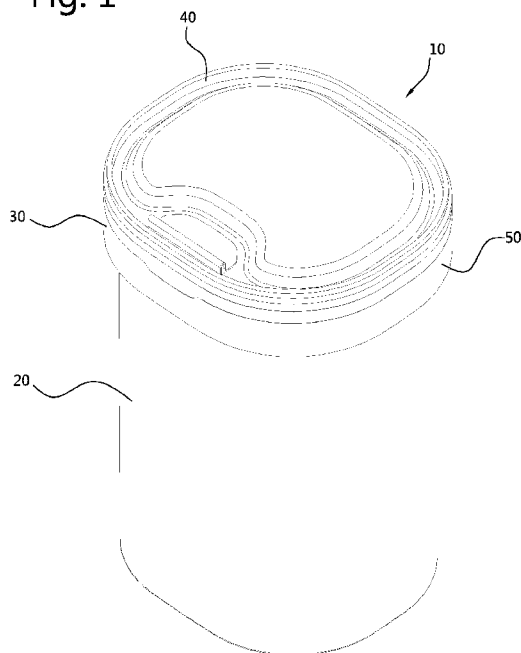
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(54) Title: CARD BASED PACKAGE FOR POWDERED INFANT NUTRITION PRODUCTS

Fig. 1



(57) Abstract: A card-based package for powdered infant nutrition, comprises a container portion, the container portion defining an interior space for receiving the powdered infant nutrition and having a base and a side-wall extending to an upper peripheral edge for receiving a removable seal for hermetically sealing the container portion prior to use. The package further comprises a collar portion and a lid portion. The collar portion is connected to and extends upwardly from the upper peripheral edge of the container portion and comprises a connection segment and an upper peripheral closure rim surrounding an access opening giving access to the interior space. The lid portion comprises a lid and a frame and forms a re-closable joint with the upper peripheral closure rim of the collar portion, allowing repeated and selective opening and closing of the access opening. The container portion, the collar portion and the lid portion all comprise card-based material.



CARD BASED PACKAGE FOR POWDERED INFANT NUTRITION PRODUCTS**BACKGROUND OF THE INVENTION***Field of the invention*

5 [001] The present invention relates to card-based packages and in particular to ones that are suitable for packaging of sensitive materials such as powdered infant nutrition or milk formula. The invention relates in particular to the structure of such packages.

Description of the related art

10 [002] Packages of all types are well known and have evolved throughout history to maximise the benefits of the latest material technologies. During the last half century, plastic materials have been developed that are exceptionally well suited for packaging, ensuring high barrier protection for sensitive materials. Such materials are also very versatile and allow designs with functional and ergonomic shapes.

15 [003] Nevertheless, plastics and other petroleum-based materials for packaging have a significantly higher environmental impact in comparison to those made of renewable materials, for example, cellulose pulp. For that reason, current trends in packaging consumer goods point towards the use of cellulose-based materials that substitute for petroleum-based materials. Unfortunately, consumers and producers are reluctant to compromise the gains in functionality and recyclable or
20 environmentally friendly packages must still meet with consumer expectations and regulatory requirements if they are to be accepted as alternatives.

[004] Card or paperboard is one preferred material that is highly versatile in the context of packaging. High quality laminates have been produced with good barrier properties that can be used in the construction of rigid or semi-rigid boxes, tubs, tubes, and sleeves. These materials are
25 even suitable for long term packaging of foodstuffs and liquids such as in the now ubiquitous brick packages and beverage cartons. Such card-based materials are known from WO 2011/003566, WO 2017/093125, the contents of which are incorporated herein in their entirety. These containers can be sealed hermetically after filling and can maintain sterility for lengthy periods prior to first opening. For subsequent closure, they have however generally relied on plastic-based materials
30 for making re-closable elements such as spouts and lids.

[005] Boxes made exclusively of card-based material are also known, e.g., of the type used for soaps and washing powder. These may have re-closable lids in the form of a wing or flap of card material. This allows the box to be reclosed after first opening and repeatedly opened and closed for dosing of product at each use. Although these packages may be very economical and
35 environmentally friendly, such closures have not generally been considered adequate for sensitive materials such as foodstuffs, in particular infant nutrition. This is particularly important in countries with high humidity or where small insects may attempt to enter the package.

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[006] It would thus be desirable to provide an improved package that at least partially overcomes some of the inconveniences of the prior art and is compliant with the highly challenging requirements for Infant nutrition that are so easily obtained when using non-paper based materials like plastic and metal.

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BRIEF SUMMARY OF THE INVENTION

[007] Therefore, according to a first aspect of the invention, there is provided a card-based package for powdered infant nutrition, comprising: a container portion, the container portion defining an interior space for receiving the powdered infant nutrition and having a base and a sidewall
10 extending to an upper peripheral edge for receiving a removable seal for hermetically sealing the container portion prior to use. The package further comprises a collar portion and a lid portion. The collar portion is connected to and extends upwardly from the upper peripheral edge of the container portion and comprises a connection segment and an upper peripheral closure rim surrounding an access opening giving access to the interior space. The lid portion comprises a lid and a frame and
15 forms a re-closable joint with the upper peripheral closure rim of the collar portion, allowing repeated and selective opening and closing of the access opening. The container portion, the collar portion and the lid portion are all formed of card-based material. In this context, formed of card-based material is intended to denote that the respective component is predominantly of card and can be disposed of in the existing recycling streams, in particular the paper and card waste streams. It will
20 be understood that the precise requirement in terms of cellulose or paper content may vary from country to country and will be detailed further below. Furthermore, card-based may be understood to distinguish over components that are predominantly of plastic or metal.

[008] By providing a collar portion between the upper peripheral edge of the sidewall and the lid portion, the respective functionalities can be spatially separated and better optimized. For initial
25 sealing of the interior space of the container portion, the removable seal must be capable of forming a hermetic closure with the upper peripheral edge that meets the required level of performance. Once opened, the required degree of closure achieved by the lid portion may be lower but nevertheless sufficiently high that careful tolerances apply. A collar portion of card-based material also allows additional functionalities to be implemented.

[009] In an embodiment, the collar portion has a height of between 10 mm and 70 mm, preferably between 20 mm and 40 mm. The collar portion has a height that defines an additional inner space at the upper end of the package. This further has the advantage of allowing for the presence of additional elements inside the package. For example, a scoop for extracting and measuring the product. The package itself may typically have an overall size in the range of (l x b x
35 h) up to 130 x 120 x 200 mm and may have a volume of the container portion in the range of 100 ml to 5 litres in size.

[0010] The collar portion may also comprise a functional insert allowing additional functionalities to be introduced between the container portion and the lid portion. It will be understood that the

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functional insert and its associated functionalities will be present in a region of the package that is separated from the interior space prior to opening of the package by removal of the seal. Various functionalities may be contemplated including but not limited to a scoop leveller, a scoop holder, a latch for securing the lid portion, a stiffening flange, an insect barrier, and a sealing surface. The insert is preferably also of card-based material and may comprise a plate having an aperture corresponding to the access opening. The insert may be connected to the collar portion at its periphery. In one embodiment, the insert is connected to the collar portion in a folded seam to form the upper peripheral closure rim.

[0011] The lid portion may be of any suitable construction, including moulded or one-piece construction. In a preferred embodiment, the lid and the frame are separate elements that are joined together during manufacture. This may be achieved using a folded seam as frequently used for closing the base of tubular card containers. In the following, reference to a folded seam is intended to denote a connection between two layers of card material that are adhered together and where one or both layers are subsequently folded over the other to produce a fold of at least three layers. In the case of the lid portion, the folded seam may form an upwardly extending peripheral rim that extends upwards above the level of the adjacent portions of the lid. This may be termed a stacking rim, whether or not it actually participates in stacking, as will be discussed further below.

[0012] The lid may be planar e.g., in the form of a flat disk, folded together with the frame at its periphery to form an upwardly extending peripheral rim. In another embodiment, the lid itself may be non-planar and may have a profiled shape. In particular, the lid may be bowed upwards in a central region and/or have a cavity at its underside. The lid may be bowed upwards to a height approximating the height of the stacking rim. The space created beneath the lid provides additional possibilities for storing objects such as a scoop or the like.

[0013] The frame may have a constant cross-sectional shape over its height. In one embodiment, the frame may extend downwards to form a skirt that, in the closed position of the lid, covers at least part of the upper peripheral closure rim of the collar part. The skirt may alternatively have a larger cross-section than the remainder of the frame. This can allow it to better fit over and close around the outside of the upper peripheral closure rim of the collar part. In general, it will be understood that the joint between the upper peripheral closure rim of the collar portion and the lid portion can be arranged at the skirt, elsewhere on the frame, at a lower surface of the lid or at a junction between the frame and the lid. Preferably the upper peripheral closure rim is at least partly covered by the skirt extending downwards from the frame. As noted above, a highly effective joint between these two components is required to ensure that the package can be properly reclosed after initial opening e.g. to prevent powder exit on tipping the container and avoid the entry of unwanted insects and other animals that may otherwise be attracted to the contents. The closure may ensure that no gap greater than 150 microns is present, preferably no greater than 100 microns. It has been found that openings of 70 microns or more can allow ingress of insects and the disclosed closure most preferably ensures an insect-tight closure during the use of the package

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having no opening greater than 70 microns. The joint should be maintained to the required tolerance e.g. of 70 microns or less, even after repeated opening and closing of the lid during use. Preferably, the joint should be maintained for more than 50 openings or more than 70 openings or even more than 100 openings.

5 [0014] In another embodiment, further improved closure may be achieved at the joint between the lid portion and the collar portion by providing an additional resilient element. The lid portion may comprise a gasket that can resiliently bear against part of the collar portion, in particular against the upper peripheral closure rim. The gasket is preferably also made of card-based material. The gasket may be located at an underside of the lid and can have an outwardly extending edge that is resilient.

10 In this context, resilient is intended to include both that the material is resilient or that it is resiliently mounted. The edge of the gasket may be a freely floating edge that can bear against the upper peripheral closure rim. Alternatively, the edge of the gasket may be captured, and a floating annulus may perform the function of a joint. The edge of the gasket may be captured between the lid and the frame, which together may form a folded seam.

15 [0015] The gasket may extend across the full extent of the lid or may only be present at the periphery. By providing it to be co-extensive, the double layer construction provides additional reinforcement of the lid portion. It can also be used to provide further functionality, e.g., for supporting a latch or a scoop holder.

[0016] The upper peripheral edge of the container may have any suitable termination that allows
20 it to perform its required functions. In principle, these functions include forming a hermetic seal with the removable seal and connection to the collar portion. Reference to the upper peripheral edge is intended to denote a region rather than a distinct point i.e., the region at which the sidewall terminates, including both the inner surface and the outer surface. For the avoidance of doubt, the uppermost extremity of the sidewall will be referred to as the uppermost edge.

25 [0017] The removable seal may be connected at any point of the upper peripheral edge, either to the inner surface or the outer surface or across the uppermost edge. In an embodiment, the upper peripheral edge comprises a circumferential flange. This may be formed by rolling or folding over the sidewall. Preferably, the circumferential flange extends outwards from the container i.e., the sidewall is rolled or folded over outwards. This ensures that the inner surface of the sidewall
30 defining the interior space is available for connection of the seal. The circumferential flange advantageously offers a stable surface to receive the removable seal, providing additional area for the connection. preferably the flange extends outwardly to provide a connecting structure that secures the collar portion to the peripheral edge of the container.

[0018] Connection to the collar portion takes place at the connection segment. This connection
35 is less critical than that of the removable seal, in that the connection is outside the region of the interior space and the connection need not have the same barrier properties. Nevertheless, this connection should be secure enough to prevent separation during use and also to avoid ingress of insects and the like as discussed above. In an embodiment, an inner circumference of the

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connection segment engages around an outer circumference of the upper peripheral edge of the container portion. Alternatively, the connection segment can be connected at the uppermost edge of the container portion and can even be attached onto the removable seal, thus sandwiching the seal between the container portion and the collar portion. In this sense, it will be understood that the seal may not be removable in its entirety and may have a removable section.

[0019] In an embodiment, the connection segment may comprise a circumferentially extending groove which can receive part of the upper peripheral edge of the container in an interference fit. This is particularly advantageous when the upper peripheral edge is in the form of an outwardly extending circumferential flange, which can enter the groove. This can allow the portions to be snap-fitted together, which allows for simplified assembly. The groove may be formed by deformation of the material of the connection segment to form a corrugation. Alternatively, or additionally, the connection can be welded, glued, heat-sealed, or as otherwise known in the art including additional connecting elements on the inner or outer surfaces of the container and the collar portion.

[0020] According to a particular embodiment, the package may comprise a locking arrangement between the lid portion and the collar portion. The locking arrangement can prevent accidentally opening of the lid portion. More importantly, it can assist in maintaining the lid portion biased against the upper peripheral closure rim to ensure an adequate joint. If a gasket is present, the locking arrangement may bias the gasket into engagement with part of the collar portion to maintain a high degree of closure. This can greatly assist in keeping the contents viable once the package has been initially opened. At the very least, biasing the gasket in this way may help ensure that the closure is insect tight. Insect tight in this sense is intended to mean that no gap of greater than 70 microns is present.

[0021] The locking arrangement may comprise a first locking element arranged on the collar portion and a second locking element arranged on the lid portion. Advantageously, the locking elements can allow repeated opening and closing of the locking arrangement. Preferably, the locking arrangement is configured to be manipulated with one hand, which provides to the user an easy access to the product. The first locking element may be a detent formed e.g., on a functional insert. The second locking element may be a latch, pivotally mounted in, on, under or through the lid. A further advantage of the mentioned gasket is that it can serve to maintain a force on the locking arrangement between the first and second locking elements. Closing the lid portion can require a user to apply a force to compress the resilient gasket sufficiently for the first and second locking elements to engage. Once engaged, the gasket maintains the force, which assists in keeping the first and second locking elements in firm engagement. In an embodiment, the locking arrangement retains the gasket under a compressive force of at least 0.5 N

[0022] The lid portion may be slid downwardly over the collar portion in a sliding fit and may be completely removed to access the contents. Preferably, a hinge is provided between the lid portion and the collar portion, whereby the lid portion can be pivoted open and closed. A hinge provides a

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user with an easier selective opening and closing of the access opening by ensuring that the lid stays attached to the package during use.

[0023] In a further embodiment, the package can be provided with a wrapper, removable prior to use, around at least part of the collar portion and the lid portion. This may be present prior to first
5 use and may be completely or partially removed to gain access to the interior of the package. Most preferably, the wrapper is made of paper or card-based material. It will nevertheless be understood that if the wrapper is removed completely, it can be disposed of in a separate waste stream and need not then be made of paper or card.

[0024] The term banderol is often used for wrappers that encircle an item and is used in the
10 following for a narrow wrapper in the form of a strip that spans part of the collar portion and the lid portion. This can guarantee sealing between the collar portion and the lid portion during storage and transportation of the package and can serve to provide tamper evidence. In an embodiment removal of the banderol or part of the banderol may reveal a contrasting colour beneath. The removable portion may be a strip defined by one or more lines of weakness.

[0025] In a particular embodiment, a hinge may be formed between the lid portion and the collar
15 portion by removing a circumferentially extending section of the banderol, leaving a portion of the banderol intact.

[0026] For use in the context of powdered infant nutrition, all of the inner surfaces of the package preferably have a food compatible surface. This should apply to all of the surfaces that normally
20 enter into contact with the contents. It will be understood that the sidewall and base of the container portion are particularly important in maintaining the sterility and condition of the product during storage. Nevertheless, once opened and during use of the package, other portions of the package will come into contact with the contents. In particular, when scooping out powdered infant nutrition, some powder will inevitably fall onto portions of the collar portion and can fall back into the interior
25 space. Furthermore, if the package is accidentally inverted or tipped, powder may make contact with the lid portion. All such surfaces should be free from crevices and fibres that can catch and retain powder. For this reason, uncoated card material is less preferred, and the relevant internal surfaces may be coated with a food compatible layer such as a polymer coating or the like. The thickness of the polymer coating should be the minimum required to achieve food compatibility
30 without jeopardising the ability to dispose of the package in the paper recycling stream.

[0027] In a preferred embodiment, the card-based material of at least the collar portion and the frame of the lid portion is made of spiral wound cardboard. Spiral wound cardboard has the advantage of offering a stable and durable structure and can be easily provided with a smooth
35 internal surface by conventional lamination and coating techniques. It further requires no overlap seal in the longitudinal direction of the package, facilitating a smooth fit between the collar portion and frame of the lid portion for better closure e.g. insect tightness

[0028] The package as described may comprise elements that are not completely made of card and the term card-based material merely denotes a predominance of card. In particular, there may

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be barrier layers and connections or joints that use other materials, not excluding metals or polymers. In the present context, card-based material denotes a material formed from a cellulose based pulp, which may further include one or more layers of non cellulose materials, such as barrier layers, sealing layers, adhesive layers and decorative layers. It may comprise any suitable card or paper construction in a single or multiple cellulose-based layers, including reinforced, corrugated, honeycomb, moulded and foamed constructions. The card-based materials may also have inclusions such as fillers, pigments, inks, and the like. It is well recognised that different definitions and requirements may be applied for the manufacturing and disposal of paper and card and, where reference is made below to percentages of paper, these include all of the paper constituents, including cellulose fibers, mineral filler, bound water, paper additives, size, bulk pigment and latex binders. The percentages of non-paper will apply to all other layers not usually considered to be paper, including print, varnish and non-water-soluble adhesive layers and the barrier layers as mentioned elsewhere.

[0029] In an embodiment, the card-based material consists of at least 85 wt% paper or at least 90 wt% paper, preferably at least 95 wt% paper and more preferably at least 98 wt% paper or even at least 99 wt% of paper. The precise amount may also be adapted according to local regulations concerning recycling.

[0030] It will be understood that the above values for paper content may apply to each of the individual components separately and that the card-based material of the collar portion may have a different paper content to that of the container portion and/or the lid portion. In an embodiment, the package taken as a whole in its used state may have an overall paper content of at least 85 wt% paper or at least 90 wt% paper, preferably at least 95 wt% paper and more preferably at least 98 wt% paper or even at least 99 wt% of paper.

[0031] The package may further comprise a removable seal hermetically sealing the container prior to use. Although it is desirable that the seal may also be of recyclable material and may also fall within the above percentage values of paper material. Nevertheless, since the seal is completely or at least partially removed on initially opening the package, it can be disposed in a separate stream and for this reason it need not be included within the definition of the package in its used state, for the paper content.

[0032] The package may also further comprise a scoop located within the collar portion beneath the lid. The scoop may also be manufactured of a material other than card and may thus be separately recycled. It may also be excluded from the determination of paper percentage. Alternatively, a card-based scoop may be provided.

[0033] The package may also comprise a scoop holder. As noted above, the functional insert may include a location or placement for a scoop. Alternatively, a scoop holder may be located on an underside of the lid, such as on part of the gasket.

[0034] The container portion may be of a generally conventional construction. In particular, the sidewall may be a tube of card-based laminate material such as the well-known Cekacan material,

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having a longitudinal seam, either overlapped or butt-joined. The well-known Cekacan material comprises an aluminium layer which is disadvantageous in terms of recyclability of the material. The base and sidewall can also be joined together by conventional techniques, preferably in a folded seam. Such constructions are described in co-pending application No PCT/EP2022/057364, the contents of which are incorporated herein by reference in their entirety. Preferably, the container portion has light, oxygen and water vapour barrier properties sufficient for storage of the product for a period exceeding 24 months. The package is particularly intended for powdered infant nutrition but will be equally applicable to similar products with the same requirements such as other high-fat powdered nutritional products. It will be understood that the light, oxygen and water vapour barrier properties are primarily requirements of the sidewall, base and removable seal, which together form the barrier to the interior space. The lid structure may have lower requirements, since it is present as a secondary barrier and only forms a primary barrier after the removable seal has been opened. From this point on, the storage time is thus limited. Nevertheless, it will be understood that the integrity of the lid structure can contribute to the overall barrier properties of the package both during storage and after initial opening.

[0035] In an embodiment the container portion is a tube of a constant first outer cross-section. This may be referred to as being a cylinder although it will be understood that it need not be circular in cross-section. A preferred cross-section is a rectangle with rounded corners. This provides good visibility for printed surfaces of the package, while ensuring that it can be manufactured using techniques for forming tubes. The base may comprise a downwardly extending rim in the following referred to as the base rim. The base rim may have the same first outer cross-section as the remainder of the container portion. This is particularly the case when the base is connected to the sidewall in a folded seam that is rolled over inwardly. The lid portion may have a second outer cross-section that is greater than the first outer cross-section, such that the base of a first container can stack on the lid of a second container. In particular, for the construction discussed above with the frame and the lid connected using a folded seam to form an upwardly extending stacking rim, the base rim can stack inside of the stacking rim of another package. In cases where a latch for releasing the lid portion from the collar portion is provided, this may be located on the lid at a position that lies within the base rim.

[0036] The invention also contemplates a package constructed of card-based material, the package comprising a longitudinal extending tubular body with at least four transverse elements, sealingly connected to the tubular body at four junctions, comprising in sequence: a first element forming a base; a second element forming a removable seal for enclosing an interior space; a third element being a functional insert; and a fourth element forming a lid. The longitudinal extending tubular body may be constructed in separate segments, between the respective transverse elements, thus a container sidewall may be located between the base and the removable seal, a connection segment may be located between the removable seal and the functional insert, and a

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frame may be located between the functional insert and the lid. The segments may differ from each other in outer cross-section.

[0037] The transverse elements assist in making a package with adequate strength and functionality. In particular, at each junction, the tubular body may be folded or rolled into a rim or
5 flange. As described above, the base and the sidewall may be joined together in a folded seam to form a downwardly extending rim. The sidewall may be rolled or folded outwardly to form a circumferentially extending flange on which the removable seal can be attached by welding or the like. The functional insert may be joined together with the collar portion in a folded seam to form the upper peripheral closure rim. The lid may be joined together with the frame in a folded seam to form
10 the stacking rim.

The package may be provided with an amount of powdered infant nutrition sealed within the interior space. The interior space may further contain an inert gas and less than 2% oxygen, preferably less than 1.5% oxygen and more preferably, less than 1% oxygen. This may be achieved by application of vacuum and gas flushing with the inert gas during the filling procedure and can ensure an
15 adequate shelf life for the infant nutrition.

BRIEF DESCRIPTION OF THE DRAWINGS

[0038] Embodiments will now be described, by way of example only, with reference to the accompanying schematic drawings in which corresponding reference symbols indicate
20 corresponding parts.

[0039] Figure 1 shows a perspective view of a package according to an embodiment of the present invention.

[0040] Figure 2 is a partially exploded view of the package of Figure 1.

[0041] Figure 3A shows a cross-sectional view through the collar portion of Figure 2 on the
25 sagittal plane X-Z.

[0042] Figure 3B shows a top view of the collar portion of Figure 2.

[0043] Figure 3C show a top view of the collar portion of Figure 2 with a functional insert according to an alternative configuration and a scoop.

[0044] Figure 4A shows an exploded view of the lid portion of Figure 2.

30 [0045] Figure 4B shows a cross-section through the lid portion on the sagittal plane X-Z.

[0046] Figure 5A shows a partial cross-section through the package of Figure 1 on the sagittal plane X-Z.

[0047] Figure 5B shows a closeup of part of the closure between the lid portion and collar portion from Figure 5A.

35 [0048] Figure 6 shows a perspective rear view of the package of Figure 1 with the lid portion partially open.

[0049] Figure 7 shows a cross-sectional view of the upper part of the package of Figure 1 stacked with another package.

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[0050] The figures are meant for illustrative purposes only, and do not serve as restriction of the scope or the protection as laid down by the claims.

DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

5 [0051] The following is a description of certain embodiments of the invention, given by way of example only and with reference to the figures.

[0052] Figure 1 shows a card-based package 10 for powdered infant nutrition according to the present invention, comprising a container portion 20, a collar portion 30 and a lid portion 40. The package 10 further comprises a banderol 50 surrounding the collar portion 30 and part of the lid
10 portion 40, which is present prior to first use to guarantee sealing during storage and transportation.

[0053] Figure 2 is a partially exploded view of the card-based package 10 of Figure 1 illustrating the arrangement of the individual portions. The package 10 has a longitudinal axis X-X, by which may be defined a transverse plane X-Y and a sagittal plane X-Z. In the following, reference to upper, lower, top, bottom etc. is given with respect to the package 10 in its upright condition, with the axis
15 X-X arranged vertically.

[0054] The container portion 20 comprises a container 21 with a tubular body, having a base 22 and a sidewall 23 extending upwards to an upper peripheral edge 24 to define an interior space S for receiving the powdered infant nutrition. The upper peripheral edge 24 comprises a circumferential flange 25 extending outwards from the container 21, to receive a removable seal
20 26. The removable seal 26 hermetically seals the container prior to use and may be removed partially or completely by the user to have access to the interior space S.

[0055] The collar portion 30 comprises, at the bottom, a connection segment 31; and at the top, an upper peripheral closure rim 32 defining an access opening O to the interior space S of the package 10 after opening of the seal 26. The collar portion 30 has a height of around 35 mm in the
25 illustrated embodiment but it will be understood that this may be adapted according to requirements. The height of the collar portion 30 defines an additional inner space above the container 21 that allows for the presence of additional optional elements inside the package 10, for example, an informational leaflet and/or scoop.

[0056] In the package presented in Figure 2, the collar portion 30 includes a functional insert 33. Insert 33 comprises scoop levellers 34 and detent 72. Figures 3A and 3B, described below, show
30 two examples of the insert 33 configured with different functionalities.

[0057] The banderol 50 is a narrow band of paper material of under 10 g/m² having a height of around 35 mm corresponding to that of the collar portion 30. In this view it can be seen to further comprise two circumferential lines of weakness 52 that define a removable strip 51. When the
35 package is to be used for a first time, the strip 51 can be removed to allow the lid portion 40 to be open. The strip 51 preferably has a contrasting colour, to that of the underlying collar portion 30, that functions as tamper evidence and includes grasping tabs 54, that facilitate its removal.

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[0058] The lid portion 40 provides a closure to the package 10 and includes a locking element 71. Further details on the construction of the lid portion 40 are described below with reference to Figure 4.

[0059] Figure 3A shows a cross-sectional view through the collar portion 30 of Figure 2 on the sagittal plane X-Z. The collar portion 30 is formed of spiral-wound card material of around 540 gsm. The insert 33 comprises a die-cut plate of card-based material, with an aperture O corresponding to the package access opening. It is connected to the collar portion 30 by a folded seam that forms the upper peripheral closure rim 32. As can be seen in this view, the upper peripheral closure rim 32 has a slightly smaller outer cross-section than the rest of the collar portion 30. At a lower part of the collar portion 30, groove 35 is formed between two corrugations of the card material. The groove 35 and corrugations extend circumferentially completely around the connection segment 31 of the collar portion 30. The detent 72 is formed by a portion of the insert 33 folded upwards out of the plane of the insert 33 into a triangular or prismatic form. The insert 33 is also folded over at the position of the scoop levellers 34 to give additional strength to the edge that is intended for levelling.

[0060] Figure 3B and Figure 3C show top views of the collar portion 30 of Figure 2 with two possible configurations of insert 33. In the configuration of Figure 3B, the insert 33 comprises two scoop levellers 34 extending inwards at two corners of the insert 33 at either side of the detent 72. In the case of the configuration shown in Figure 3C, the insert 33 is provided with scoop levellers 34 and a scoop holder 61 to receive a scoop 60.

[0061] Figure 4A shows an exploded view of the lid portion 40 according to the package of Figure 2. The lid portion 40 comprises a frame 42 and a lid 41. The frame 42 is made of spiral wound card of a similar quality to that of the collar portion 30.

[0062] The lid 41 is formed as a die-cut plate of card-based material, shaped to be bowed upwards in the central region 47. A supplementary plate 45 is provided at an underside of the lid portion 40 and has the same general shape as the lid 41, also being bowed upwards. The supplementary plate 45 has different functions. In this example, the supplementary plate 45 reinforces the lid 41 providing the lid portion 40 with a more durable and solid construction. Furthermore, the supplementary plate 45 is configured to include scoop holder 61 to have easy access to a scoop after opening the lid portion 40. Finally, in the closed position of the lid 41, a resilient edge 48 of the supplementary plate 45 has the function of a gasket to improve the closure of the lid portion 40. Further details of the gasket function are described below with reference to Figures 4B and 5.

[0063] Figure 4B shows a cross-section through the lid portion on the sagittal plane X-Z. The frame 42 is connected to the lid 41 by a folded seam, which forms an upwardly extending stacking rim 44 at the top of the lid portion. The frame 42 also extends downwards to a closure skirt 43 having a larger cross-section than the stacking rim 44. In this view, it can be seen that the upwardly bowed central region 47 forms a cavity C with a height h corresponding to a height of the frame 42.

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The cavity C created beneath the lid 41 provides additional space for storing elements such as a scoop or the like.

[0064] The central region 47 of the lid 41 is in direct contact with and adhesively connected to the supplementary plate 45. The resilient edge 48 of the supplementary plate 45 is bowed downwards and floating with respect to the edge of the lid 41. This configuration allows the resilient edge 48 to flex. On a region of the lid portion 40, between the stacking rim 44 and the cavity C, a locking element, in this case a latch 71, is pivotally mounted through the lid 41 and supplementary plate 45. An upper part 73 of the latch 71 extends upwardly from the lid 41, while the lower part 74 has a slit 75 and extends downwards under the supplementary plate 45. A cover 76 is adhesively connected to the upper part 73 to retain it to the lid 41.

[0065] Figures 5A and 5B show a partial cross-section through the package of Figure 1 on the sagittal plane X-Z.

[0066] In Figure 5A is shown the container 21 of the container portion 20. The container 21 is made from a card blank, joined to itself in a longitudinal seam (not shown) to form a tube with constant outer cross-section. At its bottom, the base 22 and the sidewall 23 of the container 21 are joined together by a folded seam which closes the lowest part of the container 21 and forms a base rim 27 extending downwardly and having the same outer cross-section as the container 21. At the top of the container portion 20, the sidewall 23 is rolled over outwardly from the upper peripheral edge 24 of the container 21 to form the circumferential flange 25. The seal 26 is placed on almost the entire surface defined by the circumferential flange 25, which ensures appropriate hermetic sealing of the container 21 prior to use.

[0067] The collar portion 30 is connected to the container portion 20 by a snap-fit joint formed between the circumferential flange 25 and the circumferentially extending groove 35. Additionally, the joint between the collar portion 30 and the container portion 20 may be glued together to ensure proper permanent sealing.

[0068] Figure 5A also shows a scoop 60 stored in the space formed above the seal 26 by the collar portion 30 and the lid portion 40 and held by the scoop holder 61 in supplementary plate 45. The banderol 50 extends circumferentially around the outer surface of the collar portion 30 and the closure skirt 43 of the lid portion 40.

[0069] In the closed position of the lid portion 40, as shown in Figure 5B, the closure skirt 43 covers the outer circumferential surface of the upper peripheral closure rim 32, forming a joint between the lid portion 40 and the collar portion 30. The folded seams of the closure skirt 43 and the upper peripheral closure rim 32 ensure that these elements are relatively rigid and can form a tight interference fit. Importantly, high manufacturing tolerances can be achieved ensuring that any gaps are smaller than 70 microns, ensuring adequate insect-tightness. The closure is further improved by the supplementary plate 45. The resilient edge 48 acts as a gasket, flexing into engagement with the upper peripheral closure rim 32. The resilient edge 48 also extends to meet

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the closure skirt 43, providing additional support for the resilient edge 48 and further enhancing the gasket function.

[0070] In the locked position of the lid portion 40, as shown in Figure 5B, the detent 72 resides in the slit 75 of the latch 71, effectively retaining the lid portion 40. To unlock the lid portion 40, the upper part 73 of the latch 71 is pushed radially outwards, acting as a lever arm such that the slit 75 releases the detent 72. A pulling movement upwards on the lid portion 40 allows a user to open the package 10.

[0071] Figure 6 shows a perspective rear view of the package of Figure 1 with the lid portion 40 partially open after the removal of strip 51. Removing the strip 51 from the banderol 50 releases the joint between the lid portion 30 and the lid portion 40 and forms a hinge 53. The hinge 53 secures the lid portion 40 to the collar portion 30 after the seal 26 has been removed from the container portion 20.

[0072] Figure 7 shows a cross-sectional view of the package of Figure 1 stacked with another package. The stacking rim 44 of the first package 10 fits radially outside the base rim 27' of the second package 10', while the base 22' of the second package 10' rests on the top the lid portion 40 of the first package. It can also be seen that there is adequate space for the latch 71 to fit radially inwards of the base rim 27', while the upwardly bowed central region 47 of the lid 41 fits beneath the base 22'. This requires that the base rim 27' also extends downwards a distance greater than h below the base 22'.

[0073] The invention has been described by reference to certain embodiments discussed above. It will be recognized that these embodiments are susceptible to various modifications and alternative forms well known to those of skill in the art. In particular, both the locking arrangement and the scoop holder may be distinct from the schematically illustrated design. Accordingly, although specific embodiments have been described, these are examples only and are not limiting upon the scope of the invention.

Claims

1. A card-based package for powdered infant nutrition, comprising:
 - 5 a container portion, the container portion defining an interior space for receiving the powdered infant nutrition and having a base and a sidewall extending to an upper peripheral edge for receiving a removable seal for hermetically sealing the container portion prior to use;
 - a collar portion, connected to and extending upwardly from the upper peripheral edge of the container portion and comprising a connection segment and an upper peripheral closure rim surrounding an access opening giving access to the interior space; and
 - 10 a lid portion, comprising a lid and a frame and forming a re-closable joint with the upper peripheral closure rim of the collar portion, allowing repeated opening and closing of the access opening,
 - wherein the container portion, the collar portion and the lid portion are all formed of
 - 15 card-based material.
2. The package according to claim 1 or claim 2, wherein the collar portion has a height of between 10 mm and 70 mm, preferably between 20 mm and 40 mm.
- 20 3. The package according to any one of the preceding claims, wherein the collar portion comprises a functional insert, including one or more functionalities selected from the group consisting of: scoop leveller, scoop holder, latch, stiffening flange, insect barrier and sealing surface.
- 25 4. The package according to any one of the preceding claims, wherein the lid and frame are joined together, preferably in a folded seam.
5. The package according to any one of the preceding claims, wherein the frame extends downwards to form a skirt that, in the closed position of the lid portion, covers at least part
- 30 of the upper peripheral closure rim.
6. The package according to any one of the preceding claims, wherein the lid portion further comprises a gasket located at an underside of the lid and having a resilient edge
- 35 7. The package according to any one of the preceding claims, wherein the upper peripheral edge of the container comprises a circumferential flange extending outwards from the container.

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8. The package of any one of the preceding claims, wherein an inner circumference of the connection segment engages around an outer circumference of the container portion.
- 5 9. The package of claim 8, wherein the connection segment comprises a circumferentially extending groove which receives part of the upper peripheral edge of the container in an interference fit.
- 10 10. The package of any one of the preceding claims, further comprising a locking arrangement between the lid portion and the collar portion
- 11 11. The package of any one of the preceding claims, further comprising a hinge between the lid portion and the collar portion.
- 15 12. The package of any one of the preceding claims, further comprising a paper banderol provided prior to use around at least part of the collar portion and the lid portion.
- 13 13. The package of claim 12, wherein a circumferentially extending section of the banderol is removable to form a hinge between the lid portion and the collar portion.
- 20 14. The package of claim 13, wherein the circumferentially extending section of the banderol is a strip defined by one or more lines of weakness and removal of the strip preferably reveals a contrasting colour beneath the banderol.
- 25 15. The package of any one of the preceding claims, wherein inner surfaces of the package have a food compatible surface.
- 16 16. The package of any one of the preceding claims, wherein the card-based material of at least the collar portion and the frame is made of spiral wound cardboard.
- 30 17. The package of any one of the preceding claims, wherein the card-based material of the lid portion and/or the collar portion comprises at least 90 wt% paper, preferably at least 95 wt% paper or at least 98 wt% paper.
- 35 18. The package of any one of the preceding claims, further comprising a removable seal hermetically sealing the container prior to use.
19. The package of any one of the preceding claims, further comprising a scoop located within the collar portion beneath the lid.

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20. The package of any one of the preceding claims, further comprising a scoop holder, preferably located on an underside of the lid.
- 5 21. The package of any one of the preceding claims, wherein the base and sidewall are joined together, preferably in a folded seam.
22. The package of any one of the preceding claims, wherein the container portion is a tube of a constant first outer cross-section.
- 10 23. The package of claim 22, wherein the base comprises a downwardly extending rim having the first outer cross-section and the lid portion has a second outer cross-section that is greater than the first outer cross-section, such that the base of a first container can stack on the lid of a second container.
- 15 24. The package of claim 23, wherein a latch for releasing the lid portion from the collar portion is located on the lid at a position that lies within the downwardly extending rim.
- 20 25. The package of any one of the preceding claims, wherein the re-closable joint has no gaps of greater than 150 microns, preferably less than 100 microns and more preferably less than 70 microns.
- 25 26. A package constructed of card-based material, the package comprising a longitudinal extending tubular body with at least four transverse elements, sealingly connected to the tubular body at four junctions, comprising in sequence: a first element forming a base; a second element forming a removable seal for enclosing an interior space; a third element being a functional insert; and a fourth element forming a lid.
- 30 27. The package according to claim 26, wherein at each junction, the tubular body is folded or rolled into a rim or flange.
28. The package according to any one of the preceding claims, further comprising an amount of powdered infant nutrition sealed within the interior space.
- 35 29. The package according to claim 28, where the interior space contains an inert gas and less than 2 % oxygen.

Fig. 1

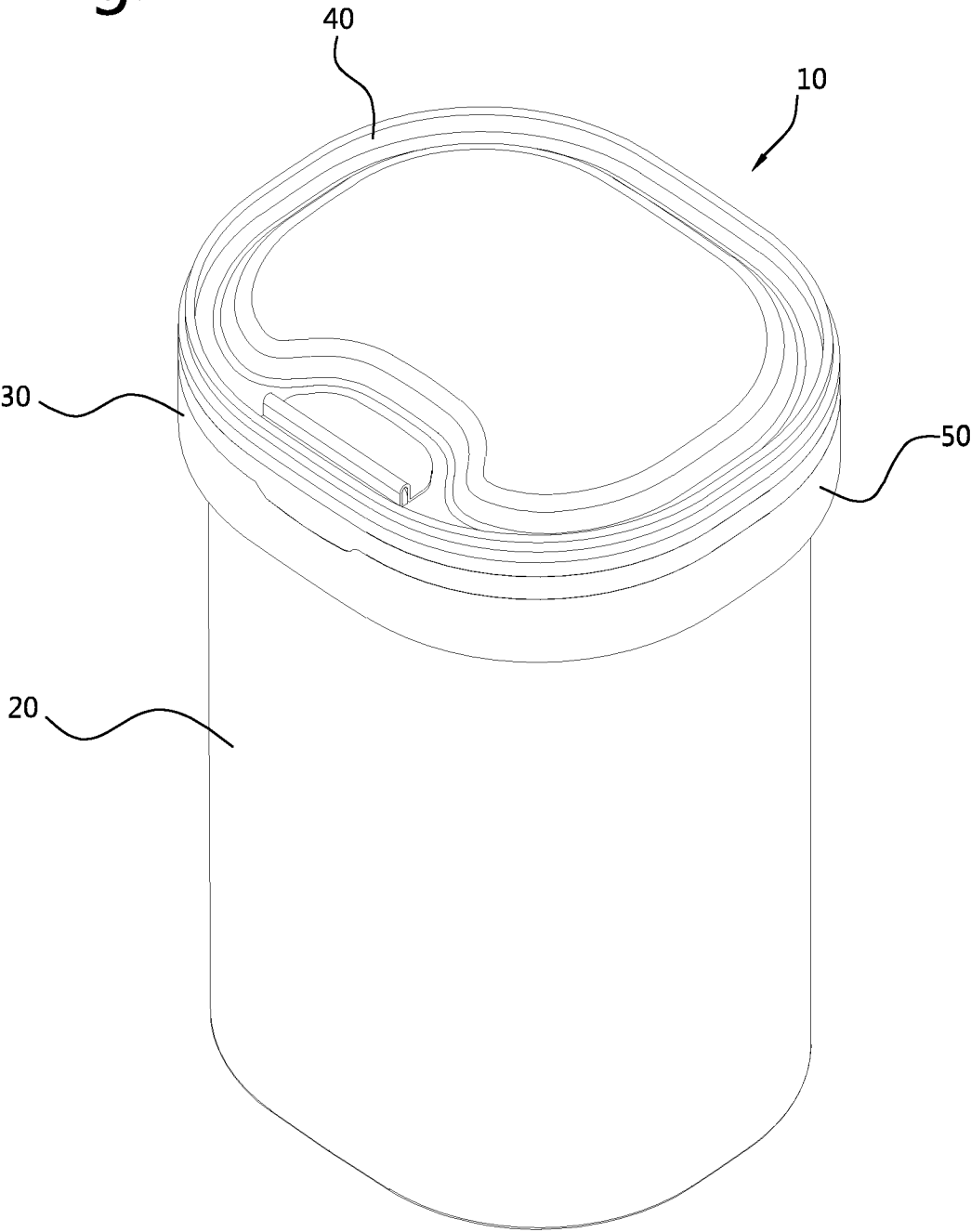
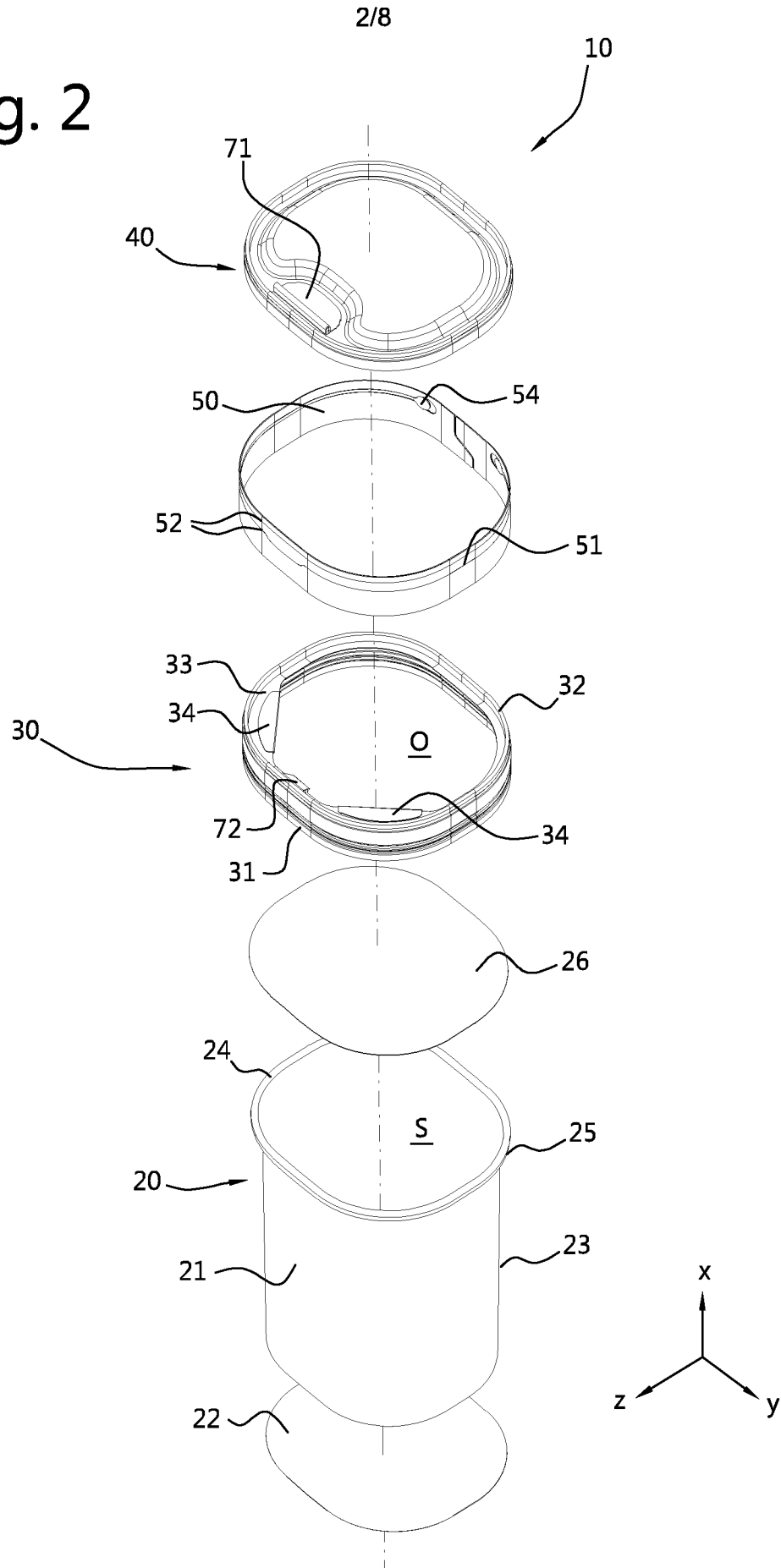


Fig. 2



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Fig. 3A

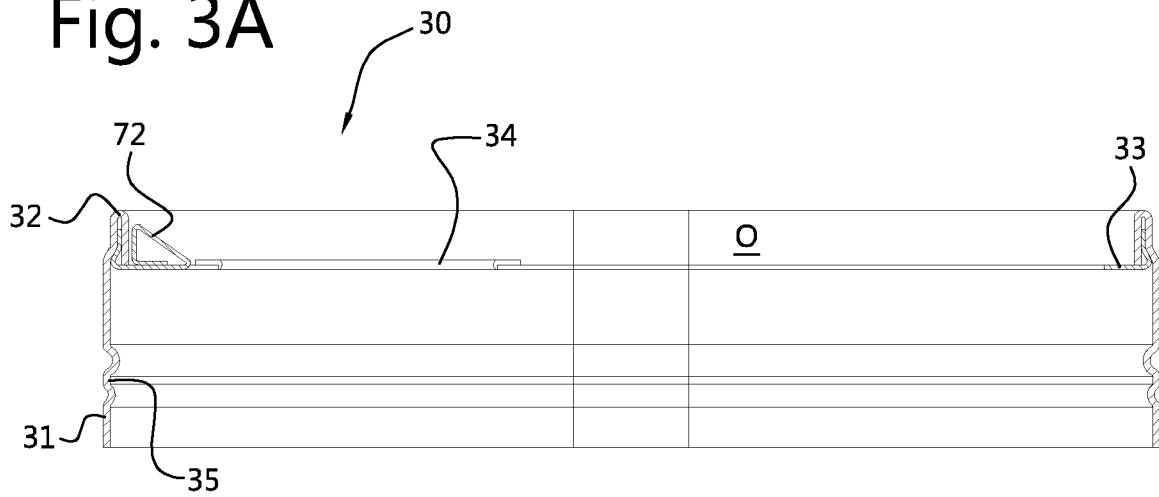


Fig. 3B

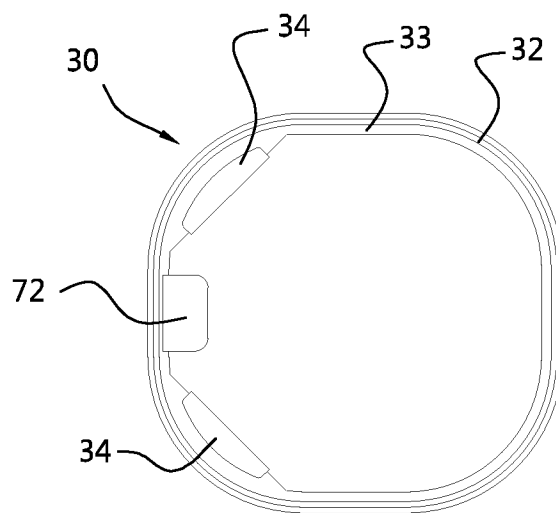
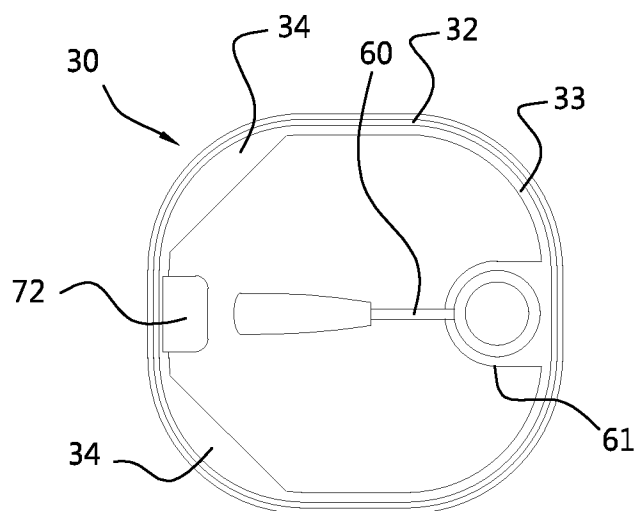


Fig. 3C



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Fig. 4A

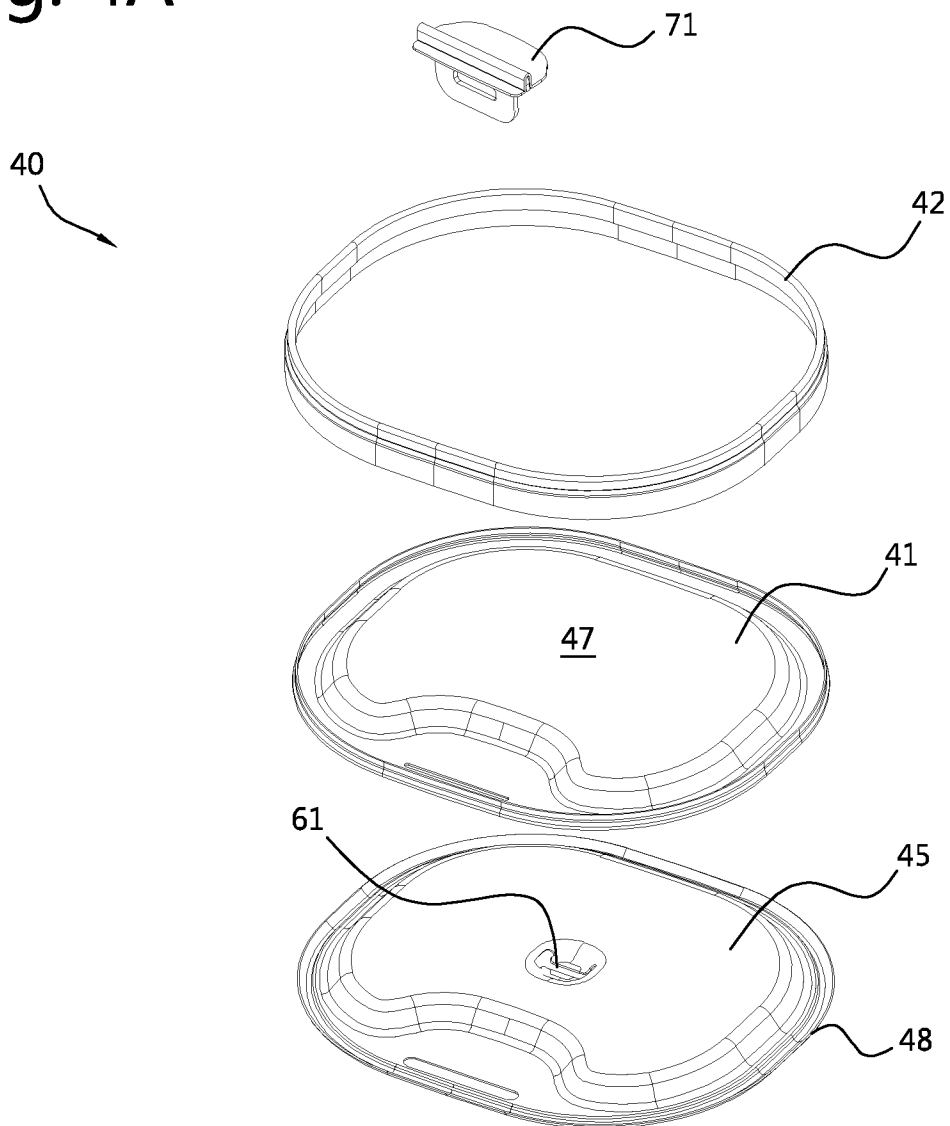


Fig. 4B

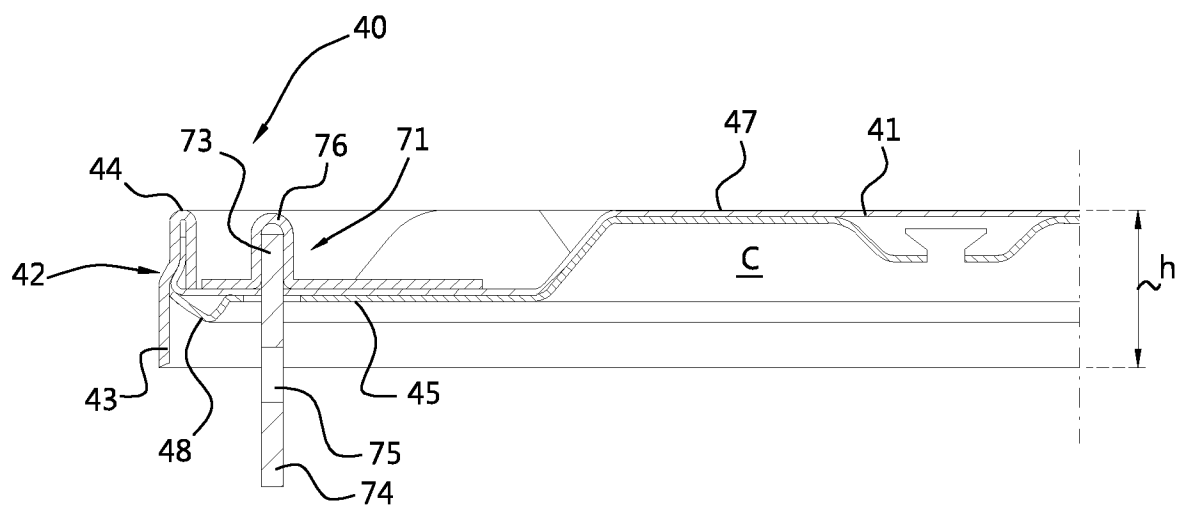


Fig. 5A

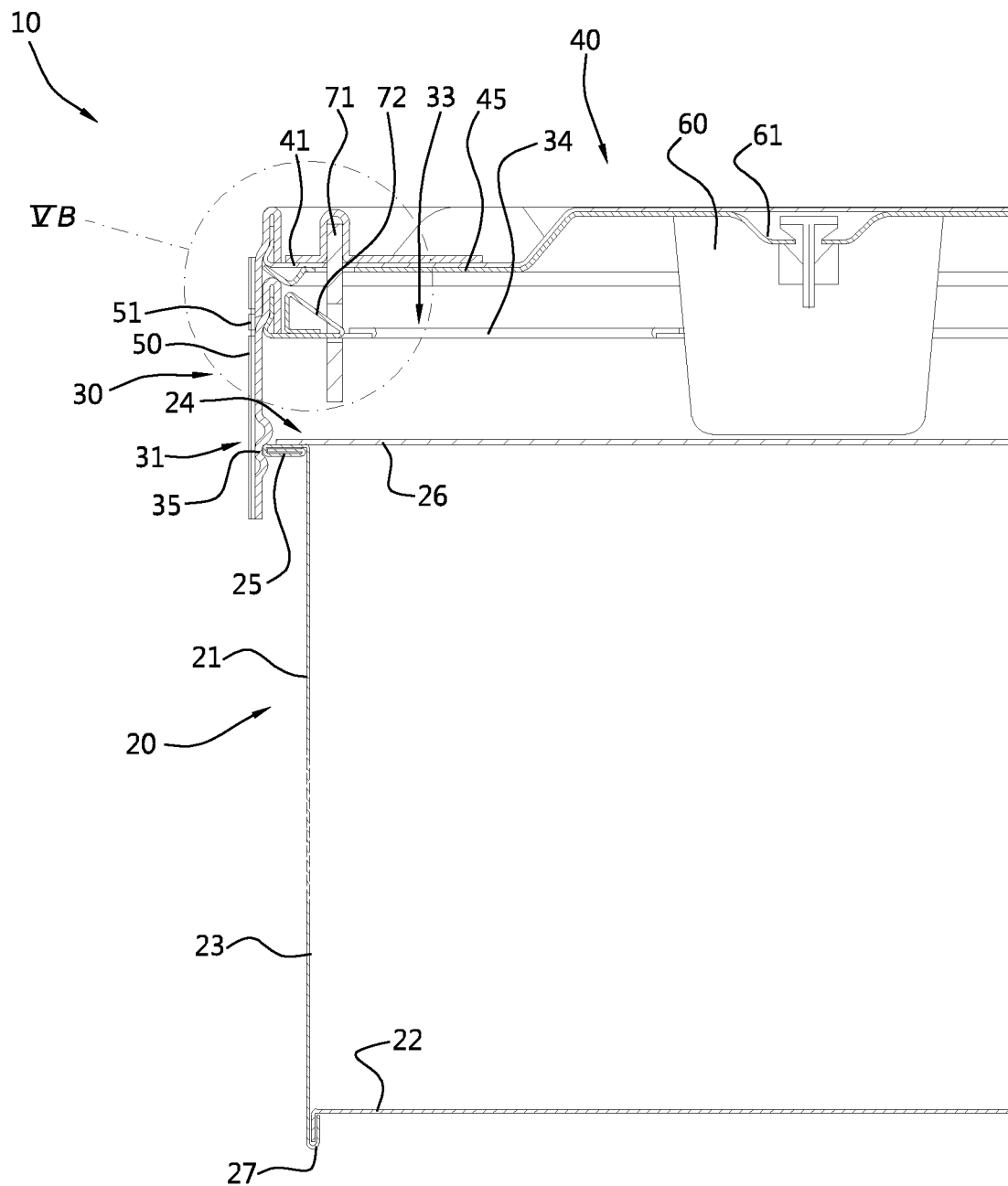
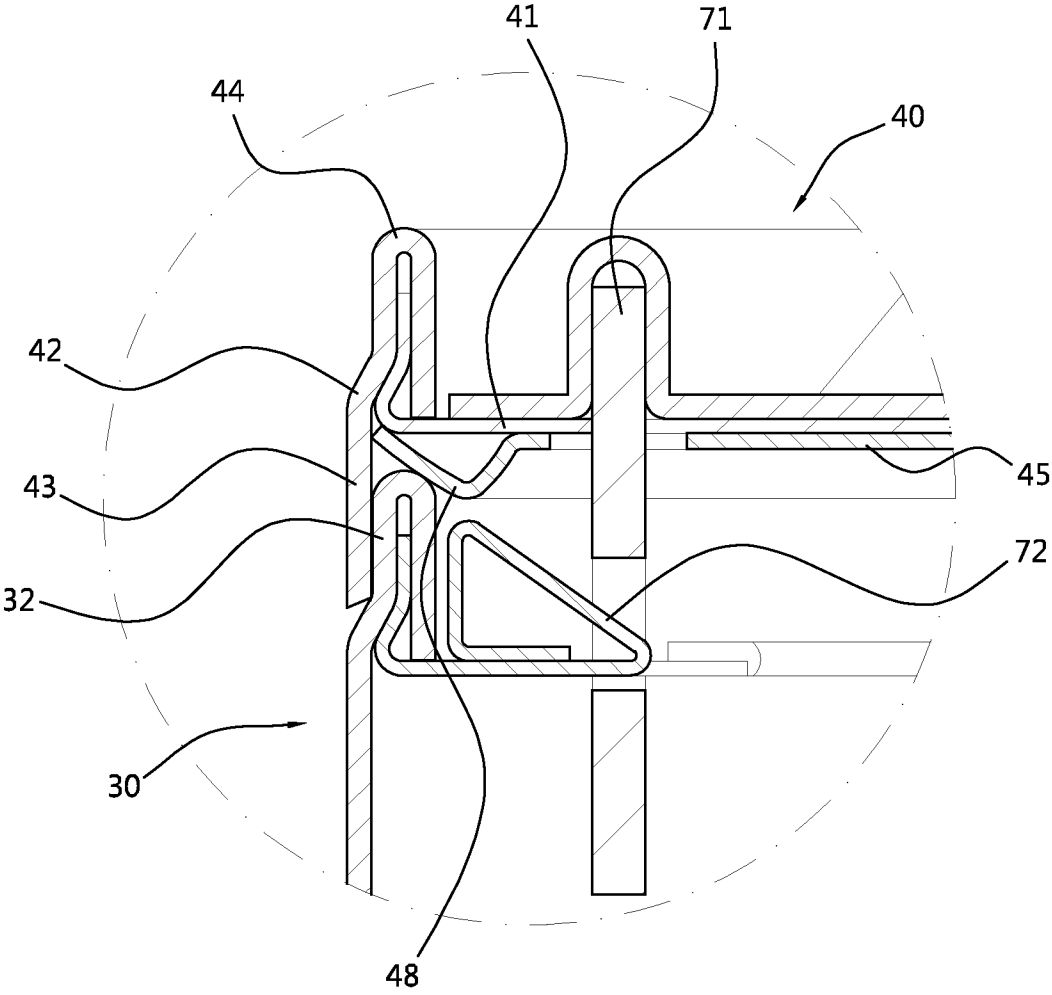


Fig. 5B



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Fig. 6

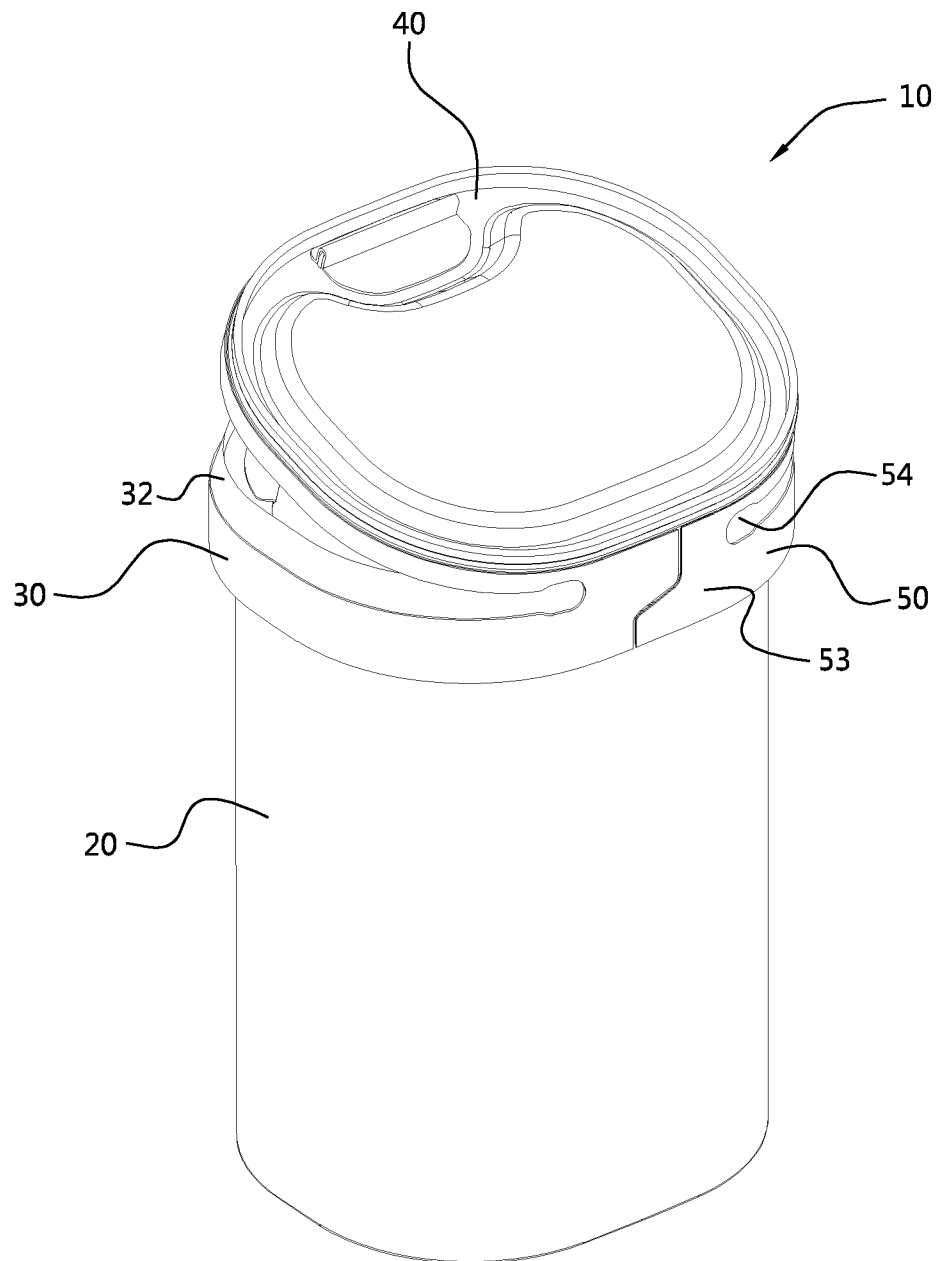
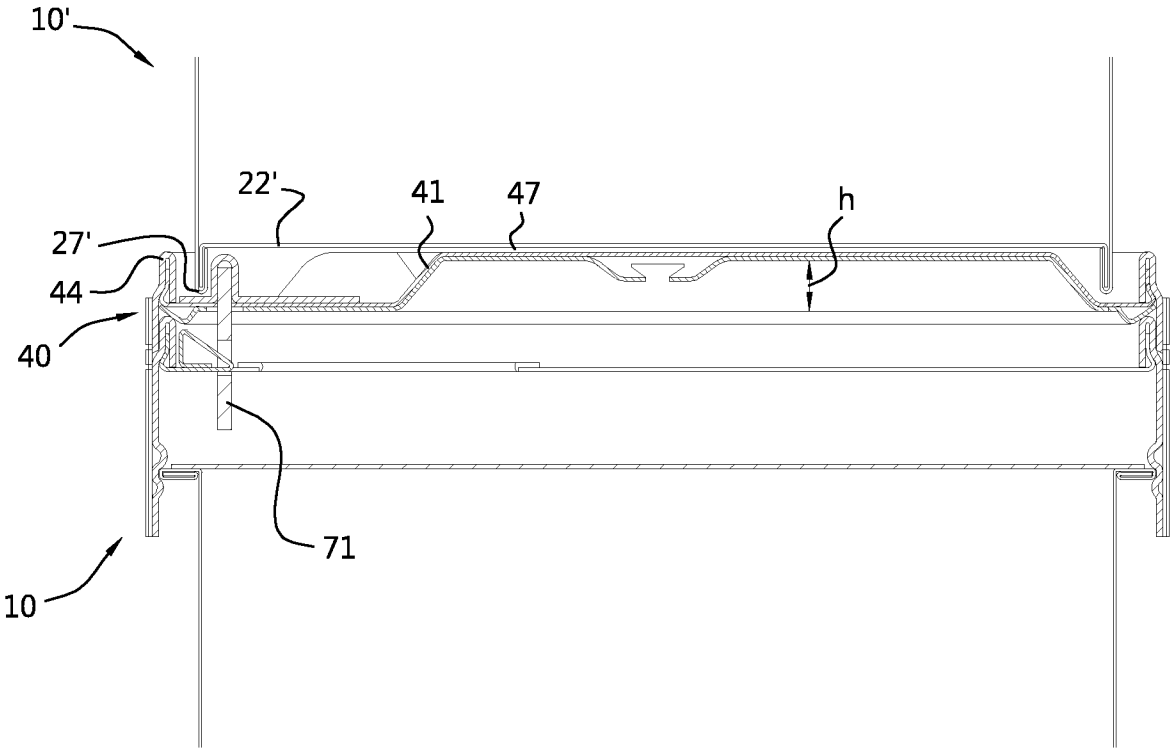


Fig. 7



INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2022/078851

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims;; it is covered by claims Nos.:
1-25

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2022/078851

A. CLASSIFICATION OF SUBJECT MATTER INV. B65D3/26 B65D6/00 B65D21/02 B65D43/16 B65D51/20 B65D77/24 ADD. According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) B65D Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2002/074387 A1 (STEWART NOEL G [US] ET AL) 20 June 2002 (2002-06-20) paragraphs [0005], [0075], [0078]; figures -----	1-25
A	US 1 456 424 A (FREDERICK COATES) 22 May 1923 (1923-05-22) figures -----	1
A	WO 2017/180056 A1 (Å&R CARTON LUND AB [SE]) 19 October 2017 (2017-10-19) claim 1; figures -----	1
A	EP 3 904 226 A1 (SHANGHAI ZIDAN FOOD PACKAGING & PRINTING CO LTD [CN]) 3 November 2021 (2021-11-03) paragraphs [0019] - [0020]; figures ----- -/-	1
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 20 June 2023		Date of mailing of the international search report 21/08/2023
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Fournier, Jacques

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2022/078851

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2016/126191 A1 (Å&R CARTON LUND AKTIEBOLAG [SE]) 11 August 2016 (2016-08-11) figures -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2022/078851

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 1456424 A	22-05-1923	NONE	
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FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-25

Claims 1-25 deal with a card-based package for powdered infant nutrition comprising a container portion, a collar portion and a lid portion.

2. claims: 26-29

Claims 26-29 deal with a package constructed of card-based material comprising a longitudinal extending tubular body with at least four transverse elements sealingly connected to the tubular body at four junctions.
