

PACKAGING SYSTEM COMPRISING A PLURALITY OF SUB UNITS, AND A SUB UNIT

Field of the invention

5 The present invention relates to a packaging system and a sub unit for packaging using said packaging system.

Background of the invention

Disclosure of the state of art

10 Many types of products are packaged for many simultaneous reasons such as technical requirements relating to safety, hygiene and portions while also for aesthetics and convenience. At the same time it is important to make sure the packages are compact and sturdy, particularly for transport.

15 Many packages today satisfy only a few of these aspects. For instance many packages are cylindrical leaving much space between packages when stacked together. Tapered structures are also known such sections of as pyramids or cones, typically having a frustum. Also these contribute to the problem of unused space.

Objects of the present invention

Summary of the invention

20 The packaging system according to the present invention is characterised in that it comprises a plurality of sub units having a tapered structure towards a narrow end from a first opposing surface at an end opposite the narrow end, wherein the sub units are configured to be positioned so that the first opposing surfaces form an
25 outside of the packaging system.

The present invention also comprises a sub unit for assembling into a packaging system according to the above packaging system, wherein said sub unit is formed with a tapered body having sidewalls towards a narrow end from a first opposing or
30 outer surface at an end opposite the narrow end.

One typical packaging system of the present invention comprises 6 sub units arranged with each of their narrow ends towards the centre of the packaging system and their respective opposing surfaces towards the outer surface of the packaging system. This packaging system thus constitutes a rectangular parallelepiped, preferably a cube. Although such a cube of 6 sub units constitutes a feasible system, a larger number of sub units may constitute a system of the present invention.

A number of cubes may further be assembled to constitute a collection of cubes.

10 A problem to be Solved by the invention is to utilize dead volume in packaging systems of today.

Another problem to be solved by the invention is inherent support of fragile walls. The walls, including openings, of said sub unit may be fragile. The design of the sub units enables a substantial part of their walls to mutually support each other force wise when stacked together 6 in a cube and further on when stacking multiples of cubes next to each.

When stacking together systems of rectangular parallelepipeds, e.g. cubes, into a collection of parallelepipeds, e.g. collection of cubes, the outer boundaries of the collection may be positioned adjacent the inner walls of a housing.

Therefore, a main objective of the present invention is to provide a packaging system and a packaging collection that is compact and sturdy.

Means for Solving the Problems

The objective is achieved according to the invention by a packaging system as defined in the preamble of claim 1, having the features of the characterising portion of claim 1, and a sub unit for packaging using said packaging system as defined in the preamble of claim 2, having the features of the characterising portion of claim 2.

A number of non-exhaustive embodiments, variants or alternatives of the invention are defined by the dependent claims.

5 The present invention attains the above-described objective by sub units having a tapered structure towards a narrow end from a first opposing surface at an end opposite the narrow end, so that a plurality of said sub units can be assembled to a package unit.

Effects of the invention

10 The technical differences over prior art is that stacking is not by layers but by forming package units by positioning sub units so that the narrow end points towards the centre of the assembled package unit.

These effects provide in turn several further advantageous effects:

15 it makes it possible to form ready packages comprising sub packages for use cases where different contents is required

it makes it possible to form cubic packages that can be more easily stacked and unloaded than individual sub packages.

20 **Description of the diagrams**

Embodiments of the present invention will now be described, by way of example only, with reference to the following diagrams wherein:

Fig. 1 shows a packaging system according to prior art

Fig. 2A shows a first embodiment of sub unit

25 Fig. 2B shows a second embodiment of sub unit

Fig. 2C shows a third embodiment of sub unit having a frustum

Fig. 2D shows the first embodiment of sub unit with a lid

Fig. 2E shows the first embodiment of sub unit with the lid closed

Fig. 3A shows a preassembled collection of a first embodiment of sub unit

30 Fig. 3B shows a preassembled collection of a second embodiment of sub unit

Fig. 3C shows a preassembled collection of a third embodiment of sub unit having a frustum

Fig. 3D shows a preassembled collection of a first embodiment of sub unit

Fig. 4A shows a partially assembled package unit from a collection of a first embodiment of sub unit with one sub unit removed

Fig. 4B shows a partially assembled package unit from a collection of a third

5 embodiment of sub unit with one sub unit removed and wherein the frusta form an inner volume

Fig. 5 shows a partially assembled package unit having four sub units on each side

Fig. 6 shows a reversed assembly

Fig. 7A shows a preassembled collection of a third embodiment of sub units having a

10 frustum as in Fig. 3C, about to get assembled

Fig. 7B presents how a vertical force applied to a cube with 6 sub units having a frustum gets transferred to horizontal forces on the sub units

Fig. 7C shows 6 cubes arranged to be put inside a housing

Fig. 7D shows 6 cubes arranged inside a housing.

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Description of the Reference Signs

The following reference numbers and signs refer to the drawings:

10	Packaging system according to prior art
100	Packaging system
110	Inner volume
11, 112	Lost volume or dead space
200	Sub unit
12, 212	Lid
204	Outer surface
20, 300	Body
34, 304	Sidewalls
36, 306	Partition wall
37, 307	End point
38, 308	Frustum, bottom face
40, 310	Enclosed volume
42, 312	Primary volume

44, 314	Secondary volume
46, 316	Primary content
48, 318	Secondary content

Description of preferred embodiments of the invention

Principles forming the basis of the invention

- 5 Fig. 1 shows a typical packaging system 10 according to prior art, with a detachably attached lid 12 that when attached to a body having sidewalls 34 and a bottom face 38 forms a volume for holding contents 42. In some cases it is preferred to have separated contents in one unified packaging such as yoghurt and muesli. In such cases the body is also provided with a partition wall 36 that divides the enclosed
- 10 volume 40 into two parts 42, 44.

However, when placing these in a cubic array a lot of lost volume or dead space 11 between the units is present. Also these are not suited to turn on the side as the shape does not lend itself to this.

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- Central to the present invention is the adaption of sub units to fit together forming a package system having little wasted space 112. Sub units 200 are formed with a tapered structure or body 300 having sidewalls 304 towards a narrow end 307, 308 from a first opposing or outer surface 204 at an end opposite the narrow end. Said
- 20 sub units assembled with the narrow end inwards of the assembled packaging system. When assembled the first opposing surface forms the outer surface of the packaging system.

Best Modes of Carrying Out the Invention

- 25 In a preferred embodiment the sub units 200 are shaped like pyramids having a square lid 212 and a body 300 wherein the body has sidewalls 304 that taper towards an end. The end can be a point 307 like the peak of a pyramid or a frustum 308. The sidewalls 303 taper at an angle of about 45 degrees inwards. This means

that four sub units can be placed together forming a periphery and two more perpendicular to these thus forming a packaging system 100.

This packaging system is a cube where the lids 212 form the outer surface. This has the advantage of providing a convenient surface for product or contents identification, no matter which direction the cube is placed on. Moreover the cube itself has very little dead space 112. Also cubes are well known to be stackable having little dead space between each cube.

10 The sub units can be formed in many ways.

Fig. 2A shows a second embodiment of sub unit in the form of a pyramid having an endpoint 307. The body 300 forms an enclosed volume 310 sealed with a detachable lid 212 holding contents.

15 Fig. 2B shows a first embodiment of sub unit in the form of a pyramid having a partition wall 306. The body 300 forms an enclosed volume 310 divided into a primary volume 312 and a secondary volume 314, both sealed with a detachable lid 212 holding contents. Preferably the lid seals in both volumes so that when detaching the lid both volumes are uncovered. More preferably the lid is directionally
20 openable in order to uncover one volume at a time.

Fig. 2C shows a third embodiment of sub unit in the form of a pyramid having a frustum 308. The body 300 forms an enclosed volume 310 sealed with a detachable lid 212 holding contents. The frustum provides a convenient foot for placing the sub
25 unit on a flat surface such as a table. For liquid contents it is also easier to recover more of the contents for a sub unit having a frustum and more so if the transition between the sidewalls and the frustum is curved.

The sub units then will have to be assembled into a packaging system. There are at
30 least 3 preferred embodiments for providing sub units for assembling. Some of these are pre assemblies wherein sub units are provided attached edge to edge in the same direction. Thus typically when the pre assembly is laid out all the bodies are

facing up ready to be filled with contents and then closed with lids. The edge attachments can be cut to split one pre assembly into several smaller pre assemblies. In a more preferred embodiment the joints are bendably flexible, elastically and/or plastically, so that a pre assembly can be formed into an assembly system while minimizing cuts.

Fig. 3A shows a first embodiment each sub unit is detached and are freely selected to be assembled together into a packaging system. This provides full freedom in selecting different sub systems, lids and/or contents into one packaging system. The selection can be made at the very end of the process just before assembling. Such single units can be obtained by cutting off individual sub units from a roll of many sub units.

Fig. 3B shows a second embodiment wherein sub units are provided on strips or rolls of many sub systems joined together. Preferably the joints or attachments are detachable. On assembling four sub units are cut from the strip to form a ring, and two detached sub units are placed perpendicular to these thus forming a packaging system. As an alternative two strips of three sub units each are placed facing and perpendicularly together and slotted in together to form a packaging system.

Fig. 3C shows a third embodiment wherein all sub units are provided as a pre assembled collection wherein all sub units required to form a complete package system are attached together. In a preferred embodiment for a cubic packaging system the pre assembly comprises a strip of four sub units with further two sub systems wherein these are located on opposite sides of the longitudinal axis of the strip.

Fig. 4A shows a partially assembled package unit from a collection of a first embodiment of sub unit, illustrating how dead space is minimised.

Fig. 4B shows a partially assembled package unit from a collection of a third embodiment of sub unit wherein the frusta form an inner volume 110. This inner volume has many applications.

- 5 The inner volume can be used to contain a cooling element in order to maintain a low temperature for instance for perishable goods. In one example one can insert ice or dry ice. The cooling medium is typically a fluid such as water or CO₂ gas will flow along the inner surfaces of the sub units, keeping them cool.
- 10 Dry ice is particularly beneficial as the fluid is less affected by gravity and cools also the upper part of the package system well. On the other hand dry ice has a sublimation point of -78.5 °C which for some goods may require some thermal insulation between the dry ice and the sub units to avoid excessive freezing.
- 15 When using ice or other cooling media that forms a liquid it is beneficial to make the package system substantially water tight. If the packaging system is formed from a pre assembly the joints forming edges will easily be made water tight. Remaining edges can be made water tight using a sealant or by wrapping an outer layer around the packaging system. This wrapping can beneficially form the lids or labels on the
20 lids on the individual sub units.

Alternatively the inner volume can be used for a heating element.

- 25 It is also beneficial to make at least one sub unit easily movable to uncover the inner volume in order to allow refilling cooling or heating medium at point of purchase.

The inner volume offers a position that is protected by the surrounding sub units and is therefore suitable for fragile objects.

- 30 When heating sub units on opposing sides can be detached leaving a tunnel like structure through which a fluid such as water or steam can be directed.

Condensation is very efficient in transferring heat to all exposed surfaces. A plurality of such tunnels can be stacked for more efficient heating.

Alternative Embodiments

- 5 For the case of the pyramidal embodiment shown in Fig. 2A one may conveniently use a frame for placing the sub unit on a table in order to provide further stability.

While a cubic shape for the packaging system is preferred it is clear that deviations from this are easily achieved. For instance the packaging system can easily be made
10 squat or tall using rectangular sides wherein the sides are rectangles and the top and bottom faces are squares. Alternatively all faces can be rectangular non-squares.

In a further embodiment also higher order Platonic solid geometries can be used
15 such as dodecahedrons. Also other isogonal geometries can be used even with different lids can be used such as truncated icosahedron having pentagonal and hexagonal lids.

While a single sub unit per face is disclosed above there are also alternative
20 embodiments possible. Fig. 5 shows an embodiment wherein a plurality of sub units forms a single face.

Sub units can be filled with contents before sealing with lid and assembling into a packaging system. Alternatively it is possible to start with a pre formed packaging
25 system and inject the contents through an opening and into the body. Preferably the pre formed packaging system comprises soft sidewalls for each sub units that are flat against the lid prior to filling. The side walls can in one embodiment be flexible or elastic and thus increase the volume of the body to accommodate the content. The opening can be provided on the lid or a part of the side wall.

During the filling process one can chose whether or not to have an inner volume, simply by inserting a suitable object inside the packaging system. The sidewalls will expand to enclose the object and secure it.

- 5 In one embodiment the packaging system is used for packaging fragile objects in the inner volume and the enclosed volumes of the sub units are filled with a fluid, more preferably a shock absorbing fluid.

In these embodiments much of the air between the sub units can be pressed out.

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While the sidewalls could be vulnerable to mechanical damage said sidewalls will not be exposed to the outside. Instead the outer surface of the packaging system will provide the protection. Alternatively the sidewalls can be cured or a more robust material applied to the outside of the sidewalls to improve mechanical strength.

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In many applications it is preferred to provide sub units with foil lids or other means for easy removal and thus access to the contents. Such foils can be fragile and easily punctured. It is in these cases possible to locate the foil lid on an inner surface of an assembled packaging system and use a more robust outer surface. This outer surface could optionally be made of the same material as the side walls.

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Another preferred embodiment is a packaging system 100 where the substantial part of the outer surface e.g. the substantial part of sidewalls 304 and the lid 212 of each sub unit 200 mutually supports at least one, preferably at least two, most preferably at least four other sub units 200. Fig. 7B shows how a vertical force on one upper sub unit 200, indicated by a vertical open arrow, gets transferred to the remaining 5 sub units of a cube of 6 sub units 200, indicated by solid arrows. If a plurality of such cubes of sub units 200 is arranged inside a housing, such as indicated in Figs. 7C and 7D, forces, generated from e.g. weight of sub units 200 and applied from above, are ultimately distributed to the walls of this housing. This mutual support, resulting in the sub units 200 being capable of withstanding considerable forces, is a fact if a substantial part of the total outer surface of the sub unit 200 is mutually supported. A

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substantial part of the total outer surface of the sub unit 200 is preferably intended to be more than 50%, more preferably more than 90% of the total outer surface of the sub unit 200. As is generally understandable, practical details in the design of edges and corners of the sub unit 200 will in many cases result in the fringes of the walls not getting being 100 % support from mutual sub units 200. This is of little consequence as a substantial part of the forces are supported.

When stacking together systems of rectangular parallelepipeds, e.g. cubes, into a collection of parallelepipeds, e.g. collection of cubes, the outer boundaries of the collection may be positioned adjacent the inner walls of a housing.

The example housing of Figs. 7C, 7D may contain any number of rectangular parallelepipeds, e.g. cubes in all three orthogonal axis.

The housing can be made of any material having tensile strength resisting stretching. In one preferred embodiment, the material may be cardboard. In another preferred embodiment the material may be plastic film.

Fig. 6 shows a reversed assembly, which is the assembly of sub units with end points pointing outwards rather than inwards. This can be assembled directly from strips as disclosed earlier, or by reversing the folding of a packaging system disclosed earlier. By assembling from strips, preferably long and continuous strips the packaging of pre assembled systems can be made very compact, and then assembled on demand and on site. Likewise this can be disassembled for reuse and transported in a very compact manner without the problems associated with expanded polystyrene.

The technical effect of this is that volume now is maximized rather than minimized as is the case for non-reversed packaging systems.

In one application, the packaging system 100 contains e.g. a meal. When this meal is consumed, the remaining waste, often occupying more volume than the meal

itself, may be collected inside the packaging system 100, taking advantage of the fact that the reversed packaging system encloses a larger volume.

In another application of the reversed assembly, this can be used for lighting devices such as lamps. This can be transported as a packaging system, preferably with the more shock sensitive parts such as bulbs in the inner volume. On unpacking the sub units form the lamp shading.

In a second application this can be used for extra packaging protection known as an alternative to “packaging chips” or “foam peanuts” made of expanded polystyrene.

In the case of pre assembled sub units, as strips shown in Fig. 3B or as more complete assembled shown in Fig. 3C the sub units can be attached in many ways. In a first embodiment the sub units are attached by their bodies using the same material as in the bodies, preferably using living joints. This allows for production of continuous strips of sub units. Sub units can then easily be filled with contents and lids then sealing the contents in place before the sub units are cut to length and assembled into a packaging system.

In a second embodiment sub units are attached to each other using the lid, typically a foil. This allows for mix and match of various types of sub units, filling sub units with contents and then sealing the contents and simultaneously connecting said sub units using these lids. In a variation the sealing and connecting stages are separated, allowing freely ordering of sealing and connecting processes.

By these two embodiments, using a separate material for the sub units and the connecting parts between the sub units allows for transforming strips shown in Fig. 3B into more complete pre assemblies shown in Fig. 3C. Hybrid solutions with any combinations of separate subunits and pre-assembled sub units and attachments using lids or separate connecting stages in one packaging system is also possible.

Industrial Applicability

The invention according to the application finds use in compact and robust packaging, transport and unpacking of goods.

Claims

1. A packaging system (100) comprising a plurality of sub units (200), wherein each sub unit (200) is shaped as a pyramid having a square lid and a body wherein the body has sidewalls that taper towards a narrow end (307, 308) from the square lid forming an opposing surface at an end opposite the narrow end,
5 wherein the sub units (200) are configured to be positioned so that the opposing surfaces form an outer surface of the packaging system,
characterised in that the sub units assemble into a packaging system, so
10 that the lids form the outer surface of each side of the packaging system (100),
wherein the packaging system comprises six sub units and constitutes a rectangular parallelepiped.
2. A packaging system (100) according to claim 1, further comprising at least two
15 instances of the packaging system, the first opposing surface (204) positioned against an inner wall of a housing, resulting in complementing the inside of the housing.
3. A sub unit (200) for assembling into a packaging system according to claim 1
20 or 2, wherein said sub unit (200) is shaped as a pyramid having a square lid and a body wherein the body has sidewalls that taper towards a narrow end (307, 308) from a first opposing or outer surface (204) at an end opposite the narrow end,
characterised in that the sub unit is configured to assemble into a packaging system, so that the lid forms the outer surface of a side of the packaging system
25 (100).
4. A sub unit according to claim 3, wherein the narrow end is a frustum (308).
5. A sub unit according to claim 3 or 4, wherein the body (300) comprises at
30 least one partition wall (306), dividing a volume (310) within the body (300) into a plurality of volumes (312, 314).

6. A sub unit according to claim 3, wherein the sidewalls (304) taper inwards at 45 degrees.

5 7. A sub unit according to claim 3, wherein the outer surface (204) is provided with a lid (212).

8. A sub unit according to claim 3, wherein a sidewall (304) is provided with a lid (212).

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