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## (54) A loading unit and a method for forming loading units to be handled and/or stocked on pallets

(57) The invention relates to a method for forming a loading unit (30) to be handled and/or stocked on a pallet (31), characterised by comprising the steps of:
a) forming bundles (20, 20') containing n rows of m containers (1) each, with n different from m, a bottom (3) of each container (1) being shaped so as to be adapted to at least partly receive a top portion (4, 5, 6) of an identical container (1) arranged inferiorly thereto;
b) forming a plurality of layers (33, 33'), each of said layers (33) comprising a respective plurality of said bundles (20, 20'); and
c) stacking said layers (33, 33') on said pallet (31); every said bundle (20) in each said layer (33) being arranged so as to directly cooperate with at least two bundles (20') in at least one immediately adjacent layer (33').

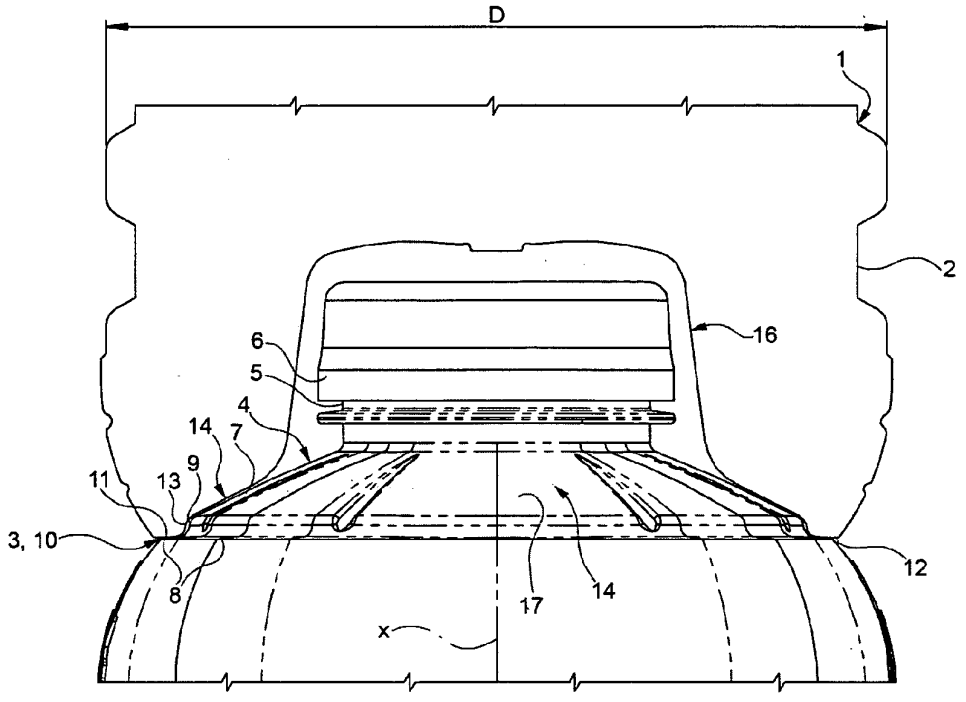


FIG. 4

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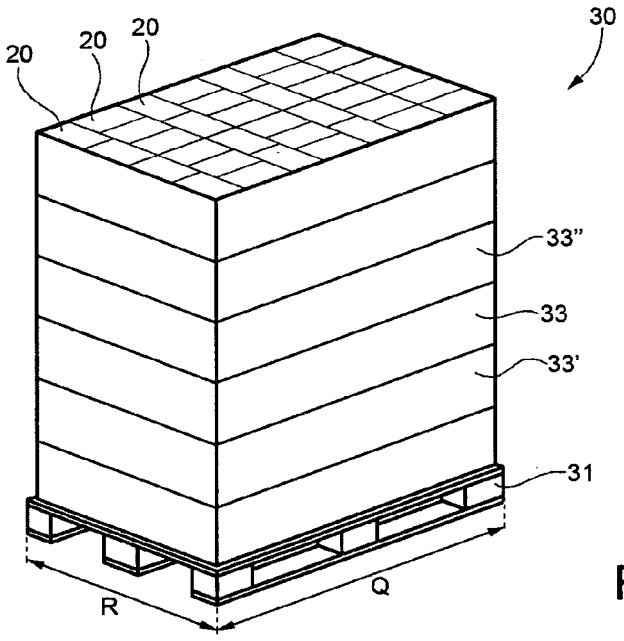


FIG. 5

## Description

### TECHNICAL FIELD

**[0001]** The present invention relates to a method for forming loading units to be handled and/or stocked on pallets, in particular loading units comprising a plurality of bottles filled with a pourable product.

### BACKGROUND ART

**[0002]** A pallet is a transport structure defining a flat surface adapted to stably support groups of items. Because they have to subsequently be shipped, items are typically sorted on a pallet and fixed to one another and/or to the pallet, for instance by being wrapped in a layer of a thermoplastic film.

**[0003]** In particular, in the case of bottles filled with a pourable product, such as e.g. in the beverage industry, multi-bottle packs are commonly formed by bundling together a predetermined number of mutually juxtaposed bottles, each multi-bottle pack being independently and conveniently suitable for both automatic and manual handling. Multi-bottle packs are arranged on a pallet to form a loading unit, whereby a potentially very high number of items may be lifted and/or handled at the same time, for instance by means of a lift truck, a fork lift or the like.

**[0004]** In general, therefore, a pallet forms the structural base of a loading unit comprising a plurality of items, preferably arranged in a plurality of superimposed layers, and confers the loading unit stocking and transport convenience and efficiency.

**[0005]** Different size standards are applied internationally for pallets (ISO, GMA Grocery Manufacturers' Association, EURO, Australian Standard pallet). These standards set a size which in general is not an exact multiple of the size of the containers or of the bundles/packs to be grouped on the surface of the pallet. For handling convenience and optimum exploitation of the available room, however, the arrangement of the containers or packagings on the support surface defined by the pallet is preferably such as to maximise the density (intended as the number of packagings or containers per surface unit) and compactness (that in general results in stability in the handling operations) of the loading unit.

**[0006]** In general, the need is felt in the field to form loading units comprising a pallet as structural base and a plurality of layers of items (as single containers or bundles/packs thereof) sorted on the pallet according to grouping algorithms such as to achieve the above mentioned density and compactness in a rapid and efficient manner.

**[0007]** For this purpose, as well as comprising a station for filling the containers with a corresponding product, a station for capping/closing the containers and a grouping station in which bundles of containers are formed, the bottling/packaging systems of liquid or powder products also comprise an end-of-line sorting station, which is fed with bundles of containers and comprises means for sorting the bundles according to a predetermined algorithm and for making these bundles available to a storage station. Subsequently, at a storage station immediately downstream of the end-of-line station, single layers of a loading unit of containers sorted according to the above said algorithm are formed and then transferred on a pallet.

**[0008]** Especially in sectors wherein market requirements impose very high productivity, a very high number of containers (for instance multiple packagings of bottles) is fed daily to an end-of-line sorting station to form loading units.

**[0009]** In view of transportation and distribution costs, as well as of the need to minimise the space devoted to product storage, it is highly desirable that the greatest possible number of packs be placed on every loading unit, whilst ensuring, in the meantime, that each loading unit can be conveniently handled and transported.

**[0010]** In practice, the need is felt in the art for a method for forming a loading unit whereby a very compact arrangement of the packs on the pallet is achieved, the number of containers on a pallet being maximised whilst ensuring a satisfactory stability of the loading unit during transportation and handling operations in the storage space.

**[0011]** It is an object of the present invention to therefore provide a method for forming a loading unit to be handled and/or stocked on a pallet, which makes it possible to meet said need in a simple and cost-effective manner.

### DISCLOSURE OF THE INVENTION

**[0012]** The above said object is achieved by the present invention, as it relates to a method for forming a loading unit according to claim 1. Furthermore, a loading unit formed according to the method of the invention is also provided, according to claim 5.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0013]** A preferred embodiment is hereinafter disclosed for a better understanding of the present invention, by mere way of non-limitative example and with reference to the accompanying drawings, in which:

- Figure 1 shows a schematic side view of a container;
- Figure 2 shows a schematic perspective view from below of the container of Figure 1;
- Figure 3 shows in larger-scale a detail of the container of Figure 2;
- Figure 4 shows a larger-scale, partial lateral section of two containers of the type illustrated in Figure 1 stacked upon one another
- Figure 5 shows a schematic perspective view of a multi-layer loading unit formed according to the

method of the invention; and

- Figures 6A, 6B and 6C shows a larger scale schematic top view of three consecutive layers of multi-container packs in the loading unit of Figure 5.

## BEST MODE FOR CARRYING OUT THE INVENTION

**[0014]** In Figures 1, 2 and 4 numeral 1 indicates as a whole a container for a pourable product, namely a bottle, e.g. of the type for use in the beverage industry. In greater detail, container 1 is advantageously a stackable bottle made of plastic material, comprising a prismatic body 2 extending along a main axis X and having a transversal width D substantially constant along axis X.

**[0015]** In the following, reference shall be made to a specific embodiment of a stackable bottle 1 having certain characteristics which shall be described in greater detail. However, this is not intended to limit the scope of protection of the claims attached, and the method for forming a loading unit to be handled and/or stocked on a pallet disclosed herein may be conveniently applied to any stackable container, as long as the bottom of each container is shaped so as to be adapted to at least partly receive the top portion of an identical container arranged inferiorly, whereby the formation of a stack of containers is made possible.

**[0016]** Body 2 may have e.g. a substantially cylindrical cross-section, whereby a hollow substantially cylindrical body is defined, in which case D may be taken to represent the diameter of the circular cross-section. In the embodiment of Figures 1 to 4, body 2 has a substantially quadrangular, e.g. square, cross-section, whereby a hollow substantially parallelepiped body is defined, in which case D may be taken to represent the length of the side of the square cross-section.

**[0017]** Body 2 extends from a bottom 3 to a shoulder 4 opposite bottom 3 and prolonged, in turn, by a neck defining an opening. Neck 5 is couplable, e.g. by means of a threaded finish, with a corresponding cap 6 for closing the opening. Shoulder 4 defines (see Figure 4) a transition from body 3 to neck 5, in that it comprises a substantially frustoconical portion 7. However, frustoconical portion 7 does not connect directly body 2 to neck 5, because shoulder 4 further comprises a peripheral abutment face 8 extending annularly around main axis X and defining an abutment surface substantially perpendicular to main axis X and having transversal width L.

**[0018]** Peripheral abutment face 8 is separated from frustoconical portion 7 by an indentation 9 extending axially, i.e. substantially parallel to main axis X or, preferably, to form an acute angle with main axis X, and having a height H.

**[0019]** Bottom 3 of container 1 is advantageously shaped so as to be adapted to receive the top portion (shoulder 4 and neck 5) of an identical container arranged inferiorly, so as to enable the stacking of containers, as illustrated in Figure 4.

**[0020]** More particularly, bottom 3 is at least partly conformed complementary to shoulder 4, so as to enable proper stacking of two superimposed containers 1 by the mere insertion of shoulder 4 of the underlying container 1 into the bottom 3 of the upper container.

**[0021]** Accordingly, bottom 3 comprises an annular seat 10 which defines an abutment plane 12, complementary to peripheral abutment face 8 of shoulder 4 and lying in a plane substantially perpendicular to main axis X. In greater detail, annular seat 10 internally defines an annular rib 13 substantially complementary to indentation 9, extending axially from abutment plane 11 towards the inside of container 1, substantially parallel to main axis X or, preferably even, forming with main axis X an acute angle substantially identical to that formed by indentation 9, whereby an easy mutual arrangement of the two superimposed containers 1 is made possible.

**[0022]** Furthermore, bottom 3 comprises a conic vault 14 extending from annular seat 10 - and more precisely from an inner edge of indentation 9 - towards a central zone of bottom 3.

**[0023]** In greater detail, vault 14 comprises a central cavity 16 defined by a lateral wall extending substantially axially of, preferably even, slightly conically, vault 14 being conformed and sized to substantially completely accommodate neck 5 of an underlying container 1. Furthermore, vault 14 comprises a peripheral frustoconical section 17 extending from a top edge of rib 13 and a bottom edge of cavity 16. In practice, peripheral section 17 has substantially the same opening angle as frustoconical portion 7 of shoulder 4.

**[0024]** Groups of containers 1 are packed together to form bundles (or multi-container packs) 20 (see Figures 5 and 6A, 6B, 6C). In particular, containers 1 are advantageously packed together into bundles of n rows of m containers, with n different from m. In practice, substantially rectangular multi-container packs are formed, e.g. with two rows each including three containers each, as can often be the case with mid-sized bottles from 250 ml to 1 l. In each bundle 20, containers 1 are held together by wrapping, about the bundle periphery, a length of a suitable material, such as a web of heat-shrinking polymeric material.

**[0025]** In particular, the heat-shrink material is wrapped about bundle 20 so as to leave the top portion (shoulder 4 and neck 5), as well as bottom 3 of each container 1 in the bundle unhindered and available for cooperation with other bottles inferiorly and superiorly. Preferably, for each container, the heat-shrinking material is wrapped so as to cooperate only with a portion of the outer surface of body 2.

**[0026]** By way of example, the heat-shrinking material may be wrapped about the lateral periphery of a bundle 20 and only partly cooperates with the top and bottom of the bundle, whereby the top portions and bottom portions of the containers 1 in the bundle are left accessible for mutual cooperation and stacking of containers 1 one on top of the other.

**[0027]** Figure 5 schematically shows a loading unit 30

having, as a structural base element, a rectangular pallet 31, having sides measuring Q and R, respectively, and comprising a plurality of superimposed layers 33 the lowermost of which rests on pallet 31, each of layers 33 comprising a respective plurality of bundles 20 formed with several containers 1 grouped together and orderly arranged.

**[0028]** Sizes Q and R are set in accordance with one of the size standards applied internationally mentioned above. In general, sizes Q and R are not exact multiples of sizes n and m of a single bundle 20. However, it is generally possible to find at least one linear combination of sizes n and m whereby Q approximately equals ($\alpha \cdot n + \beta \cdot m$) and R approximately equals ($\alpha' \cdot n + \beta' \cdot m$).

**[0029]** Advantageously, every bundle 20 in each layer 33 is arranged so as to directly cooperate with at least two bundles 20' in at least one immediately adjacent layer 33'.

**[0030]** In this context, by "directly cooperate", reference is made to the fact that containers 1 are stacked one upon the other without the interposition of carton inter-layers, i.e. the sheets of cardboard that are conventionally placed between adjacent layers in a loading unit on a pallet to provide enough friction for bundles not to slide away. Accordingly, containers 1 cooperate at the interface between their relative top and bottom portions.

**[0031]** In practice, every bundle 20 in each layer 33 of loading unit 30 comprises at least two adjacent containers 1 which are stacked upon (underneath) two respective containers 1' in an immediately lower (higher) layer 33' (33"), each of said two respective containers 1' belonging to a different bundle 20'.

**[0032]** Preferably, loading unit 30 comprises at least three consecutive layers 33 and, in at least one of them, every bundle 20 comprises at least two adjacent containers 1 which directly cooperate with at least two different bundles 20' in the immediately upper layer and with at least two different bundles 20" in the immediately lower layer.

**[0033]** In one variant, even and odd layers in loading unit 30 always have a respective arrangement pattern of bundles 20. In other words, the same arrangement pattern of bundles 20 is found every two consecutive layers 33.

**[0034]** In another variant, illustrated with reference to Figures 5 and 6A, 6B, 6C, the arrangement of bundles 20" in layer 33" of Figure 6A differs from the arrangement of bundles 20 in layer 33 of Figure 6B which, in turn, differs from the arrangement of bundles 20' in layer 33' of Figure 6C. In practice, three different arrangement patterns of bundles 20 are found in three consecutive layers 33.

**[0035]** In the different layers 33, different linear combinations of the length and width of bundles 20 (n, m) to match the length and width of the pallet (Q, R) may conveniently be used.

**[0036]** In fact, if:

Q = longer side of the pallet;
R = shorter side of the pallet;
n = longer side of the bundle;
m = shorter side of the bundle;

in the example of Figures 6A, 6B, 6C, the following relationships may be found:

$$Q = 4 \cdot n + 3 \cdot m = 2 \cdot n + 5 \cdot m$$
$$R = 4 \cdot n = 6 \cdot m = 2 \cdot n + 3 \cdot m$$

**[0037]** From the analysis of the features of the method and system disclosed above, the advantages which can be obtained are clear.

**[0038]** In particular, according to the method of the invention, a loading unit can be formed which makes it possible to dispense with carton inter-layers and optimise storage space, while substantially avoiding, at once, crushed bottle necks.

**[0039]** Furthermore, a higher number of layers and, consequently, of containers, can conveniently be packed on a pallet, with respect to other solutions previously available in the art, whilst improving, at the same time, the overall stability of the resulting loading unit (see also the Example given below).

**[0040]** Because fewer pallets are required to transport the same product volume by road, fuel costs may also be reduced.

**[0041]** Interesting advantages are also made available for retailers. Because the loading units on pallets are delivered without inter-layers, no waste needs to be removed before displaying the bottles, and the increased number of bottles stacked on each pallet results in a less frequent restocking of the shelves.

**[0042]** Additionally, the look and feel of a loading unit obtained according to the method of the invention on the shop floor is a lot more attractive, which may offer additional new shelf-end promotional opportunities and generate more purchasing incentives. High product availability and rotational product presentation result in higher visibility and, in the end, in higher sales volumes.

**[0043]** Finally, it is clear that modifications and variants not departing from the scope of protection of the independent claims can be made to the disclosed and shown method and loading unit.

## COMPARATIVE EXAMPLE

**[0044]** Bundles of 2 x 3 conventional 500 ml bottles were packed for placement on a standard European pallet (800 by 1200 mm) to form a conventional loading unit.

**[0045]** In order to ensure proper stability during transportation, delivery and handling, and in order to comply with volume limitations (delivery truck size, etc.), a maximum number of 6 layers, separated from each other by carton inter-layers, could be formed.

**EXAMPLE 1**

**[0046]** Bundles of 2 x 3 500 ml bottles of the type described with reference to Figures 1 to 4 were packed for placement on a standard European pallet (800 by 1200 mm) to form a loading unit according to the method of the invention.

**[0047]** In particular, the bundle arrangement patterns of Figures 6A, 6B, 6C were used.

**[0048]** A loading unit comprising 9 layers and no carton inter-layers was formed, which displayed the same stability during transportation, delivery and handling as the loading unit of the comparative example.

**[0049]** It shall appear, therefore, that the method of the invention makes it possible to form loading unit having an intrinsically improved stability, in that more layers can be stacked on one another without negatively affecting the ease and safety of handling and transporting the loading unit. Furthermore, in the same overall volume, a significantly greater number of units (containers) can be made to fit on the same pallet, which makes a more convenient use of storage and transportation space available for producers and retailers of pourable products.

**Claims**

1. A method for forming a loading unit (30) to be handled and/or stocked on a pallet (31), **characterised by** comprising the steps of:

   a) forming bundles (20, 20') containing n rows of m containers (1) each, with n different from m, a bottom (3) of each container (1) being shaped so as to be adapted to at least partly receive a top portion (4, 5, 6) of an identical container (1) arranged inferiorly thereto;
   b) forming a plurality of layers (33, 33'), each of said layers (33) comprising a respective plurality of said bundles (20, 20'); and
   c) stacking said layers (33, 33') on said pallet (31); every said bundle (20) in each said layer (33) being arranged so as to directly cooperate with at least two bundles (20') in at least one immediately adjacent layer (33').

2. The method according to Claim 1, **characterized by** forming and stacking at least three consecutive layers (33, 33', 33"); in at least one of said layers (33), every bundle (20) comprises at least two adjacent containers (1) which directly cooperate with at least two different bundles (20') in the immediately upper layer (33') and with at least two different bundles (20") in the immediately lower layer (33").

3. The method according to Claim 2, **characterized in that**, in said step b), every other layer (33) is formed according to one same predetermined arrangement pattern of bundles (20).

4. The method according to Claim 2, **characterized in that,** in said step b), each of three said immediately adjacent layers (33', 33, 33") is formed according to a different arrangement pattern of bundles (20).

5. A loading unit (30) to be handled and/or stocked on a pallet (31), **characterised by** comprising a plurality of bundles (20, 20') containing n rows of m containers (1) each, with n different from m, a bottom (3) of each container (1) being shaped so as to be adapted to at least partly receive a top portion (4, 5, 6) of an identical container (1) arranged inferiorly thereto; said bundles (20, 20') being grouped to form layers (33, 33') to be stacked upon one another on said pallet (31); every said bundle (20) in each said layer (33) being arranged so as to directly cooperate with at least two bundles (20') in at least one immediately adjacent layer (33').

6. The loading unit (30) according to Claim 5, **characterized by** comprising at least three consecutive layers (33, 33', 33"); in at least one of said layers (33), every bundle (20) comprising at least two adjacent containers (1) which directly cooperate with at least two different bundles (20') in the immediately upper layer (33') and with at least two different bundles (20") in the immediately lower layer (33").

7. The loading unit (30) according to Claim 5 or 6, **characterized in that** every other layer (33) is formed according to one same predetermined arrangement pattern of bundles (20).

8. The loading unit (30) according to Claim 6, **characterized in that** each of three said immediately adjacent layers (33', 33, 33") is formed according to a different arrangement pattern of bundles (20).

9. The loading unit (30) according to any one of Claims 5 to 8, **characterized in that,** in each bundle (20), containers (1) are held together by wrapping, about the bundle periphery, a length of a wrapping material, whereby said top portion (4, 5, 6) and said bottom (3) of each said container (1) in said bundle (20) is left unhindered and available for cooperation with other containers (1) inferiorly and superiorly.

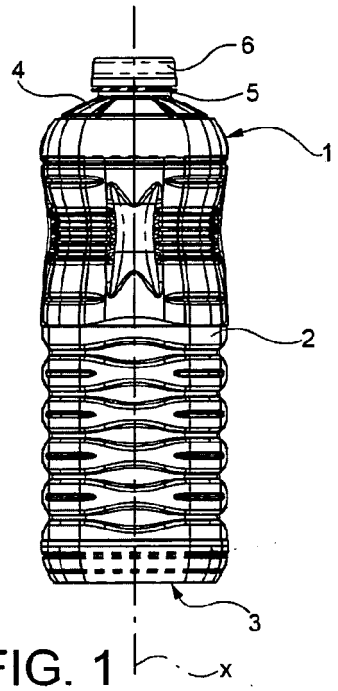


FIG. 1

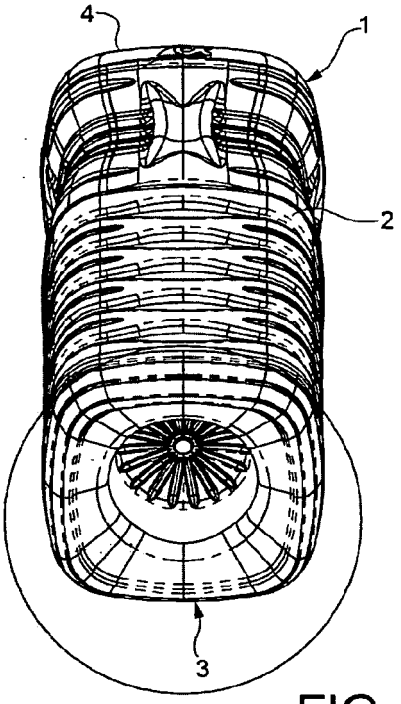


FIG. 2

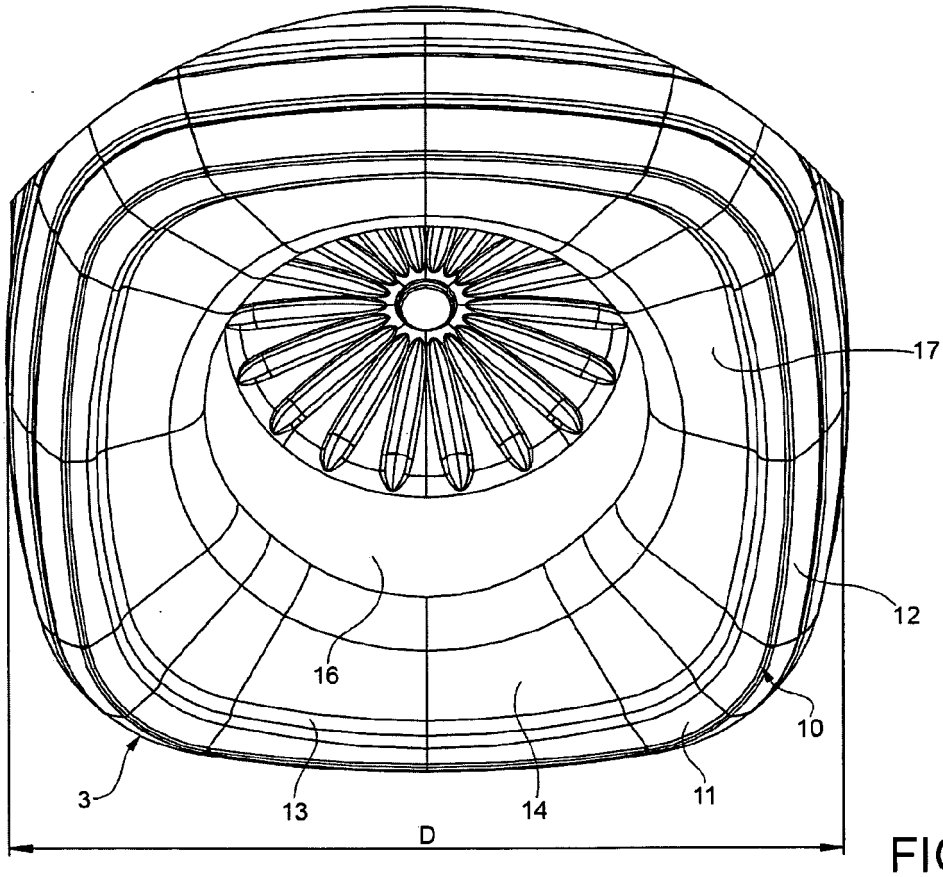


FIG. 3

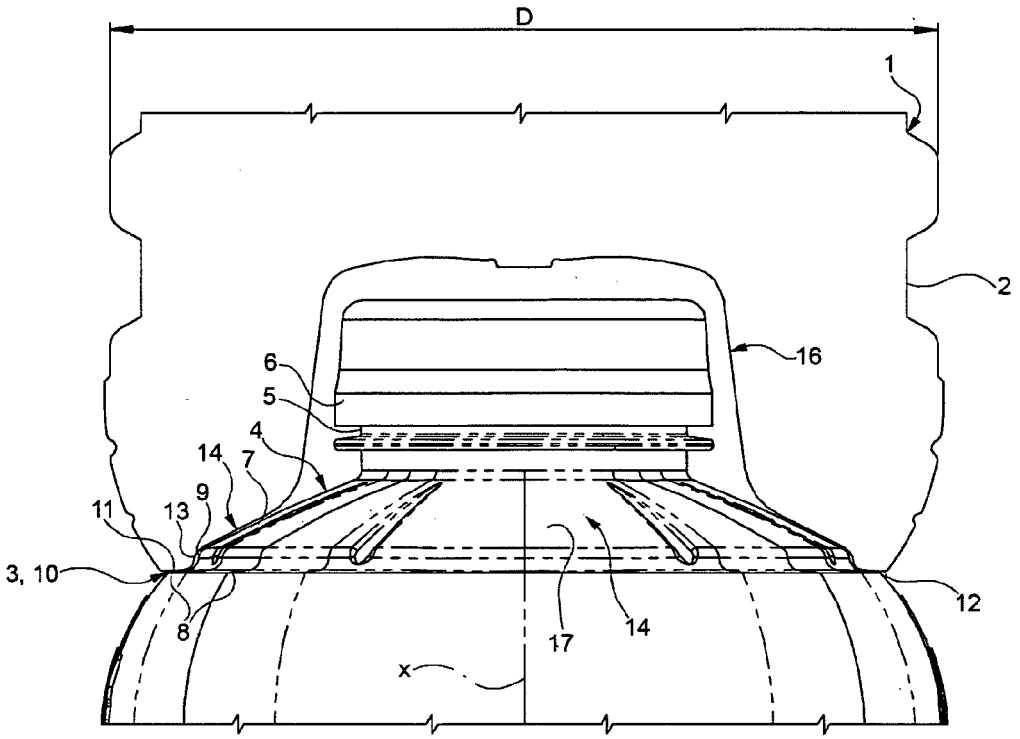


FIG. 4

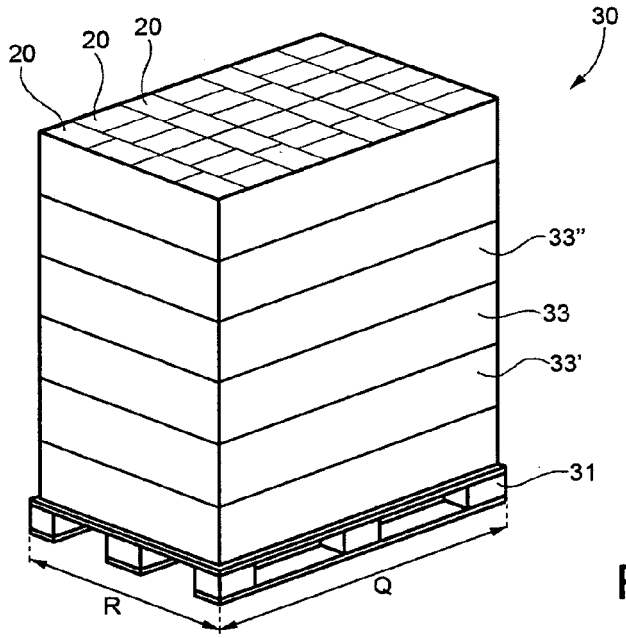


FIG. 5

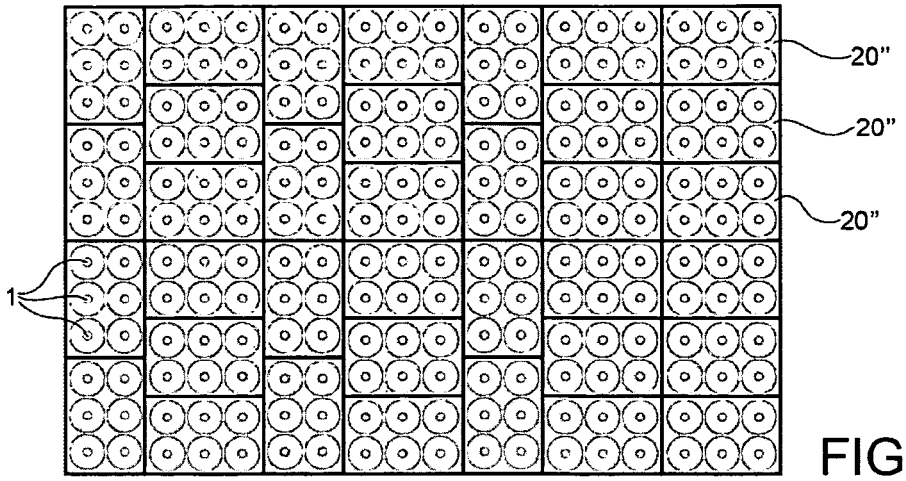


FIG. 6a

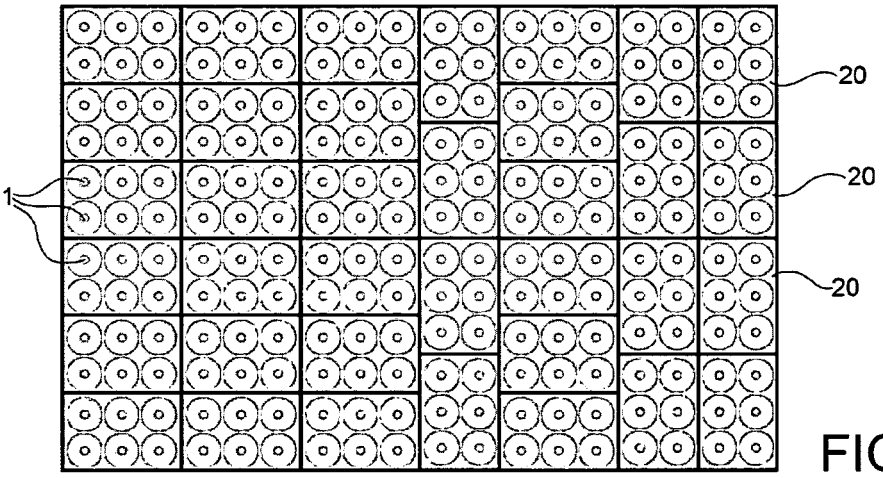


FIG. 6b

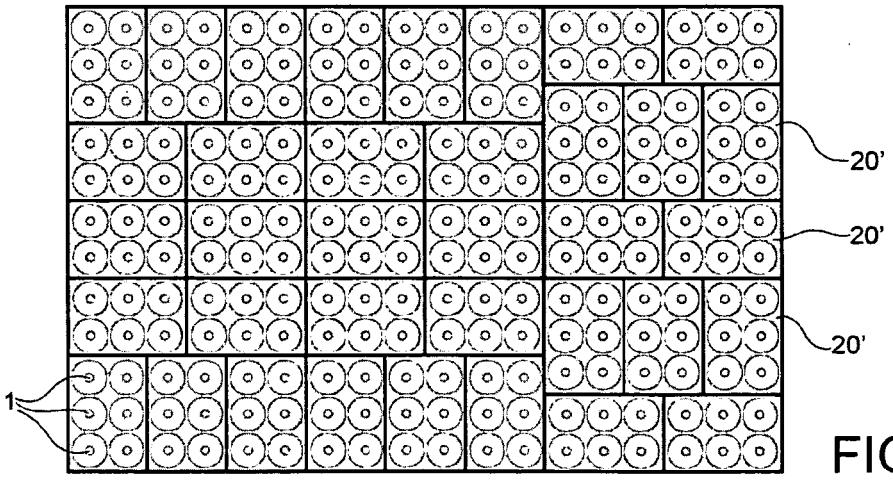


FIG. 6c

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# EUROPEAN SEARCH REPORT

Application Number
EP 12 42 5151

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| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
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TECHNICAL FIELDS SEARCHED (IPC)

B65D
B65B

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 28 February 2013 | Garlati, Timea |

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1

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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 42 5151

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28-02-2013

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