(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 947 443 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
06.10.1999 Bulletin 1999/40

(51) Int. Cl.[6]: **B65D 81/02**

(21) Application number: **98870061.3**

(22) Date of filing: **30.03.1998**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

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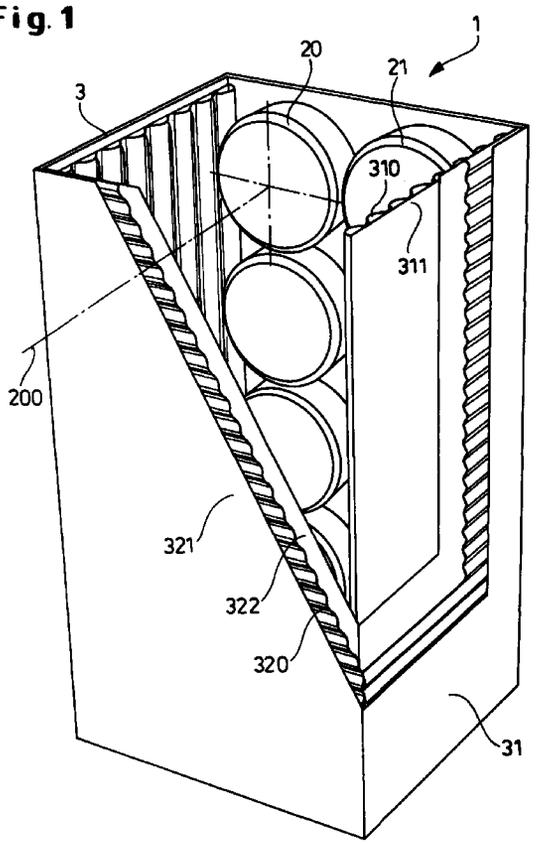
(54) A packaged product comprising tablets

(57) A packaged product (1) comprises the combination of a detergent tablet (20) with a packaging system (3) containing the detergent tablet (20).

The tablet (1) has a diametrical fracture stress comprised between 15 and 65 kilo Pascal and the packaging system (3) is at least partly formed from a material (31) having a flat crush-ability comprised between 50 and 800 kilo Pascal.

Fig. 1



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Description

Technical field

[0001] The invention relates to a packaged product comprising tablets, including pharmaceutical tablet and especially detergent tablets for use with laundry, i.e. washing clothes etc., and automatic dish-washing.

Background of the invention

[0002] Some tablets are designed to dissolve or disintegrate in a liquid, for example water, before use in order to provide a solution or suspension of active ingredients. When such tablets need to be dissolved or disintegrated, problems often arise due to the rate of dissolution and disintegration of the tablets. These problems are particularly severe in the field of detergent tablets where it is desirable to rapidly deliver active ingredients, especially surface active agents (surfactants). Furthermore these problems are particularly severe when detergent tablets are use for hand-washing, as opposed to machine washing, because very little agitation is provided by hand.

[0003] "Detergents Manufacture" by Marshall Sittig, published by Noyes Data Corp. 1976, says on page 340 that "the production of [detergent] tablets requires very special measures as regards selecting the components of the tablet and working up these components into the final detergent tablet. Consequently the production of detergent tablets is a complex matter. It involves even more than the mere selection of the components or the compression of a particular detergent composition into a tablet: the tablet must be capable of withstanding shocks of packing, handling and distribution without crumbling. In other words the tablet must be strong. Besides the tablet must have a satisfactory rate of disintegration when put in water. The tablets known so far have generally shown too long a disintegration time, in favour of their strength, or they have had a very low strength, in favour of their disintegration time." Such tablets are for example described in the pending European applications of the Applicant n° 96203471.6, 96203462.5, 96203473.2, 96203464.1 and 97870074.8.

[0004] There are also packaging systems known in the art which are more particularly adapted to such types of tablets. Such packaging systems are more particularly described in the pending European applications of the Applicant n° 97202674.4 for example, whereby the tablet contain a bleaching agent while the packaging system has a Moisture Vapour Transfer Rate of less than 20g/m^2/day measured at 40°C and 75% equilibrium relative humidity as well as a micro hole.

[0005] The present invention concerns a packaged product comprising the combination of a tablet with a packaging system containing the tablet.

[0006] Among the advantages of such known packaged products is that the tablets are prevented from uncontrolled chemical evolution during storage as they are shielded from the environment by a packaging system having particular transfer properties. Further, to allow normal chemical evolution, a micro-hole is provided.

[0007] While having these and other advantages, such packaged products have disadvantages. In particular, detergent or pharmaceutical tablets should be easy to handle, which means that they should be mechanically strong, meaning that they should be sufficiently hard. Indeed, if the tablets are not sufficiently hard, they may break easily, thus rendering handling and use non practical. Even though hardness of tablets may be obtained by compression, such compression may cause dissolution problems during use.

[0008] The invention seeks to provide a packaged product of the above mentioned kind which allows use of a tablet having satisfactory mechanical properties allowing easy handling, while avoiding dissolution problems during use.

Summary of the invention

[0009] In accordance with the invention, this object is accomplished in a packaged product of the above kind in that the tablet has a diametrical fracture stress comprised between 15 and 65 kilo Pascal, the packaging system being at least partly formed from a material having a flat crush-ability comprised between 50 and 800 kilo Pascal.

[0010] A packaged product formed in accordance with the invention has a number of advantages. Indeed, the combination of the hardness of the tablets with the flat crush-ability of the material forming the packaging system will allow to obtain good mechanical properties for the packaged product and good dissolution of the tablets. Indeed, the mechanical properties are being considered for the package as a whole, thus allowing to set a hardness for the tablets allowing satisfactory dissolution.

Brief description of the drawings

[0011] The invention will now be described by way of example and with reference to the accompanying drawings in which:

Figure 1 is a partial perspective view of a preferred embodiment of a packaged product according to the invention with part of it removed so as to view the structure.

Figure 2 is a partial perspective view of a preferred embodiment of a packaged product according to the invention with different elements being apart to further evidence the structure.

Description of the preferred embodiments

[0012] The packaged product according to the invention relates to a tablet. A tablet is a block of material having a longitudinal axis, a substantially constant section in a plane normal to the longitudinal axis and a height along the longitudinal axis. The section can take various shapes including a circle, an ellipse, a square, a rectangle or other polygons for example. It should be noted that such a tablet could have rounded or chamfered edges to avoid mechanical weakness at the edges. Typically, the surface of the section of a tablet is comprised between 50 and 5000 mm^2, preferably between 100 and 4900 mm^2, more preferably between 1000 and 3000 mm^2, even more preferably between 1200 and 2700 mm^2 and most preferably between 1900 and 2100 mm^2. Indeed, in a preferred embodiment, the tablet has a circular section having a 50 mm diameter. The area of the section can vary according to the particular use of the tablet. For example, if it is desired to have small dosing units, a smaller tablet can be chosen. Furthermore, the size can influence the dissolution of the tablet in a solvent such as water as dissolution is influenced by the ratio of the surface of contact between the tablet and the solvent and the volume of the tablet. For example, for a circular tablet having a section having a radius R and a height h, this ratio can be estimated by:

$$(2.\pi.R^2 + 2.\pi.R.h)/(\pi.R^2.h)$$

Whereby the maximisation of this ratio at constant volume will favour dissolution. Of course, other constraint exist such as the solidity of the tablet, which means that R should not be too large compared to h. Another manner to improve the surface to volume ratio would for example be to have a centred cylindrical hole in the tablet having an axis which is the axis of the tablet. Yet another manner would be to proportionally reduce the size of the tablets in order to use more tablets per dose while retaining the advantage in production of doing cylindrical tablets. Indeed, it is an object of the invention to favour dissolution of tablets in a solvent, and more particularly to favour dissolution of detergent or pharmaceutical tablets in water.

Typically, the height of a tablet along the longitudinal axis is comprised between 5 and 30 mm, preferably between 15 and 25 mm, and most preferably between 20 and 23 mm.

[0013] It was found for example that a tablet having a circular section having a 25 mm radius and a height of 21 mm would be particularly suited for use as a laundry detergent tablet, whereby such a tablet can be dispensed directly from the dispensing drawer of the machine, directly inserted in the tumble of the machine, or inserted in a dispensing device which in turn can be placed into the washing machine. Such dispensing devices may for example consist of a water permeable net in which the tablets could be inserted, the friction resulting from the contact between the net, the tablets and clothes further favouring dissolution.

[0014] Indeed, the invention relates more particularly to a detergent tablet. Detergent tablets are characterised in that they contain surfactant. Such tablets can be for example used for automatic dish-washing or for laundry. Preferably, the tablet according to the invention comprises more than 5% of surfactant by weight, more preferably between 7 and 30 % of surfactant by weight, even more preferably between 8 and 20 % of surfactant by weight and most preferably between 10 and 20 % of surfactant by weight. It was found that a tablet having 15% by weight of surfactant was particularly adapted for laundry. Higher levels of surfactant are favouring the surface activity, thus rendering washing more efficient, however, higher levels of surfactant also introduce difficulties in dissolving the tablet, as higher levels of surfactant tend to turn the tablet into a gel, thus hindering satisfactory dissolution, particularly in presence of water. Indeed, it is an object of the invention to avoid difficulties of dissolution due to having surfactant exposed to a humid environment.

[0015] In order to maintain good dissolution while keeping relatively high level of surfactant such as, preferably, 15% by weight, it was found that the tablet should not be too dense. However, a low density involves fragility as the bounds within the tablet are stronger when the tablet is more compressed. It was found that this could be solved by providing the tablet with a particular packaging system allowing to lower the constraints on the solidity of the tablet itself. An adequate packaging system was found to be at least partly formed from a material having a flat crush-ability comprised between 50 and 800 kilo Pascal, preferably between 50 and 400 kilo Pascal, more preferably between 250 and 350 kilo Pascal, and most preferably between 270 and 310 kilo Pascal. Indeed it is a further object of the invention to allow use of tablets having a density suitable for favouring dissolution while maintaining the mechanical properties of the packaged product at a good level.

[0016] The flat crush-ability corresponds to the largest force per unit area that the material can resist without being completely crushed, the force being applied along a direction normal to the surface of the material. It is measured using a Flat Crush Test, or FCT.

[0017] It was found that the combination of such a packaging system with a tablet having a diametrical fracture stress or tensile strength comprised between 15 and 65 kilo Pascal was allowing to obtain both appropriate mechanical resistance for the package product and satisfactory dissolution. Indeed, the tensile strength of the tablet should not be too low as it would be very fragile and difficult to handle, and it should not be too high as the tablet would be too solid and would therefore have difficulties to dissolve. Furthermore, it was found that a packaging system having a low flat crush-ability could not absorb the energy of a chock sufficiently to

prevent breaking the tablets, while a high flat crush-ability would render the packaging material too rigid, so that the energy of a chock would not be absorbed either but transmitted to the tablets.

[0018] The tensile strength or diametrical fracture stress of the tablet is measured by applying a force onto the side of the tablet in a direction normal to the longitudinal axis of the tablet up to cracking of the tablet. Such a test can be applied to various cross section of tablets, including circular for example. The tensile strength or diametrical fracture stress of the tablet is linked to the compression strength used for forming of the tablet. Indeed, if the tablet is highly compressed, it will be more solid, so that its diametrical fracture stress will be higher. It is preferred to use a tablet having a diametrical fracture stress comprised between 18 and 45 kilo Pascal, and more preferably between 20 and 25 kilo Pascal. It was found that a tablet having a diametrical fracture stress of 22 kilo Pascal was particularly suited for having a good dissolution.

[0019] When comprised in a packaged product according to the invention, the tablet is appropriately protected against mechanical chocks. It should be noted that the tablet was found to be more fragile when hit on the side, so that it is preferred that the part of the packaging system made of a material having a flat crush-ability comprised between 50 and 800 kilo Pascal is in a plane comprising the longitudinal axis of the tablet, so that the side of the tablet is protected in priority from chocks as being more fragile. Such a selection of the location of the material having a flat crush-ability comprised between 50 and 800 kilo Pascal allows to save materials as the rest of the packaging system could be made from other kinds of materials. Indeed, it is a further object of the invention to produce a packaged product reducing the amount of waste released in the environment.

[0020] A further advantage of a tablet according to the invention is that because dissolution is facilitated by the diametrical fracture stress being comprised between 15 and 75 kilo Pascal, the amount of phosphates or poly-phosphates used in the tablet can be set more freely. Indeed, phosphates or poly-phosphate compounds facilitate dissolution, so that lower amounts of such compounds can be used when dissolution is favoured by other means such as by use of tablets having the diametrical fracture stress according to the invention, as is allowed when using a packaging system according to the invention. Indeed, it is preferred to use a tablet having less than 45% by weight of phosphate or poly-phosphate compounds, more preferably less than 30%, even more preferably less than 15 and most preferably 0% of phosphate or poly-phosphate compounds. Indeed, it was found that a tablet having a circular section of 50 mm diameter, a height of 21 mm, containing 15% of surfactant by weight, having a diametrical fracture stress of 22 kilo Pascal and 0% by weight of phosphate or poly-phosphate compounds would readily dissolve in a laundry washing machine, even when placed directly in the dispensing drawer. It should be noted that the packaging system according to the invention could be completely or partially made of a material having a flat crush-ability comprised between 50 and 800 kilo Pascal, depending on the amount of protection desired. It may also be preferred that the packaging system is made of on material only, for simplifying production for example. Simplification of the production could also for example be allowed by the use of lower compression strength for forming the tablets. Indeed, it is a further object of the invention to reduce production costs and consumption of energy during production.

[0021] In a preferred embodiment according to the invention, the tablet is a tablet having a circular section of 50 mm diameter, a height of 21 mm, containing 15% of surfactant by weight, having a diametrical fracture stress of 22 kilo Pascal and 0% by weight of phosphate or poly-phosphate compounds, and also having a structure composed of a core and of a coating.

[0022] Indeed, use of a tablet having a core and a coating allows to further disconnect the dissolution constraint from the mechanical fragility constraint, this time at the level of the tablet itself and not only at the level of the packaged product. Indeed, the core may be a soft core, whereas the coating may be a hard coating, thus allowing to maintain the overall diametrical fracture resistance of the overall tablet while having a soft core which can be even more readily dissolved. Typically, such a soft core may be forming 80 to 99%, more preferably 90 to 99%, and even more preferably 95 to 98.5% of the tablet weight, the core having a diametrical fracture stress preferably comprised between 5 and 30 kilo Pascal, and in particular lower than the overall diametrical fracture stress of the overall tablet having a core and a coating. An example of coating used comprises dicarboxylic acids and a disintegrant, so that the coating cracks once in contact with the water, thus allowing easier release of the soft core. The coating is participating to the rigidity and solidity of the tablet in such a manner that the overall diametrical fracture stress of the tablet is maintain as a sufficiently high level. In the example, the soft core had a diametrical fracture stress of 10 kilo Pascal. Indeed, it is preferred to use a tablet having a soft core having a diametrical fracture stress comprised between 8 and 14 kilo Pascal.

[0023] In the example, the packaging system 3 was comprising the combination of a card board box and of a plastic bag, whereby at least part of the card board forming the box has a flat crush-ability comprised between 50 and 800 kilo Pascal. In this example the card board forming the box comprises a flute 310 and a liner 311, as well as a second flute 320 having two liners 321, 322, one on each side of the second flute 320. This particular packaged product 1 could contain a single tablet 20, but contains at least two 20, 21 in a preferred embodiment. More precisely, the packaged product 1 of the example comprises 32 tablets. These tablets are

firstly arranged by pairs 20, 21 in plastic bags, in such a manner that their longitudinal axis 200 are parallel, the two tablets 20, 21 forming the pair being side by side. This is described partially in Figures 1 and 2, whereby eight of the 32 tablets are shown, these eight tablets forming one layer in the packaging system 3, the full carton comprising 4 layers of 8 tablets each, thus forming eight columns of 4 tablets piled along their longitudinal axis to form a stack. It should be noted that the stack configuration participates to the rigidity of the whole packaged product, as explained in the pending European applications of the Applicant n° 97202673.6., whereby for example, if the packaging system contains a solid stack with a rectangular cross section so that each of sides of the packaging system is in contact with an extremity of the solid stack or of the plurality of solid stacks, the rigidity of the solid stack will co-operate to the rigidity of the packaging system 3 and the whole structure will be consequently more rigid: the packaging system will hold the solid stack and the solid stack will improve the rigidity of the packaging system, so that the packaging system structure and the solid stack structure synergistically co-operate to form a whole structure with improved rigidity and solidity. This synergistic effect is particularly useful if the structure is weakened further by a window and if the content of the packaging system is particularly brittle or fragile, as is the case for detergent tablets. Indeed, the packaging system of the invention is particularly suited for storing, protecting and dispensing solid stacks of such detergent tablets. In the example, the tablets are packet by pairs in 16 plastic bags, these 16 plastic bags being preferably similar to the kind described in the pending European applications of the Applicant n° 97202674.4 for example, whereby the bag has a Moisture Vapour Transfer Rate of less than 20g/m^2/day measured at 40°C and 75% equilibrium relative humidity as well as a micro hole, the bag being preferably re-closable. Such a bag will allow to regulate the chemical evolution of the tablet, while the rest of the packaging system constituted from the card board box will allow mechanical solidity. In the example, the packaging system comprises partial layer 330 made of a flute 310 having a liner 311 on one side, this particular flute being made from B fluting and, and of a full layer of a second flute 320 having a liner 321, 322 glued on each side, this flute 320 being made from F or E type fluting for example. The first single sided layer 330 is simply inserted into the second double sided flute, the first single sided flute 330 having in the example a U shape so that each of the three planes forming the U are comprising the longitudinal axis 200 of the tablets. Indeed, this first single sided flute 330 is such that it gives to the packaging system 3 in the U part a flat crush-ability value of 297 kilo Pascal, which best corresponds to the diametrical fracture stress of the tablets. In this manner, the protection of the tablets is ensured. Indeed, drop tests made with a full box from a 50 cm height and with the side of the tablets facing the ground, i.e. with the longitudinal axis of the tablets being horizontal as on the Figures, only 10 % of the tablets got cracked, which is an evidence of a good mechanical protection considering the softness of the tablets allowing good dissolution. It should be noted that the same drop test made with the same box with the longitudinal axis of the tablets aligned with gravity ended with no cracking of the tablets, further evidencing the fact that the U shape single sided flute is mostly useful on the side of the tablets. A further advantage of this is to use less material, thus reducing the amount of material released in the environment. It should also be noted that in the absence of the first single sided liner, drop tests made with a full box from a 50 cm height and with the side of the tablets facing the ground, i.e. with the longitudinal axis of the tablets being horizontal as on the Figures, resulted in 50 % of the tablets cracked.

[0024] It should be mentioned that the plastic bag in not shown on the drawings for clarifying the other elements.

[0025] In the Figures, the re-closable lid of the package is not shown, but is may be comprising various features as well know from the man skilled in the art to facilitate sift-proofness, reclosability and/or opening, such as snap lock features, tear strip, spring means to favour opening, freshness seal etc...

Claims

1. A packaged product (1) comprising the combination of a tablet (20) with a packaging system (3) containing the tablet (20), characterised in that the tablet (20) has a diametrical fracture stress comprised between 15 and 65 kilo Pascal, the packaging system (3) being at least partly formed from a material having a flat crush-ability comprised between 50 and 800 kilo Pascal.

2. A packaged product (1) according to claim 1, whereby the packaging system (3) comprises the combination of a card board box (30) and of a plastic bag.

3. A packaged product (1) according to claim 2, whereby at least part (31) of the card board forming the box (30) has a flat crush-ability comprised between 50 and 800 kilo Pascal.

4. A packaged product (1) according to claim 3, whereby the part (31) of the card board forming the box (30) and having a flat crush-ability comprised between 50 and 800 kilo Pascal comprises a flute (310) and a liner (311).

5. A packaged product (1) according to claim 2, whereby the box (30) comprises at least two tablets (20, 21), the two tablets (20, 21) being packed in the bag in such a manner that their longitudinal axis

(200) are parallel, the two tablets (20, 21) being side by side.

6. A packaged product (1) according to claim 1, whereby the material (31) of the packaging system having a flat crush-ability comprised between 50 and 800 kilo Pascal is in a plane comprising the longitudinal axis (200) of the tablet (20).

7. A packaged product (1) according to claim 1, whereby the tablet (20) is a detergent tablet containing surfactants.

8. A packaged product (1) according to claim 1, whereby the tablet (20) has a core and a coating, the core forming 80 to 99% of the tablet weight, the core having a diametrical fracture stress comprised between 5 and 30 kilo Pascal.

9. A packaged product (1) according to claim 1, whereby the tablet (20) comprises less than 45% by weight of phosphates or poly-phosphates compounds.

10. A packaged product (1) according to claim 1, whereby the tablet (20) has a section having a surface (201) comprised between 50 and 5000 mm^2, and a length (202) along the longitudinal axis (200) comprised between 5 and 30 mm.

Fig. 1

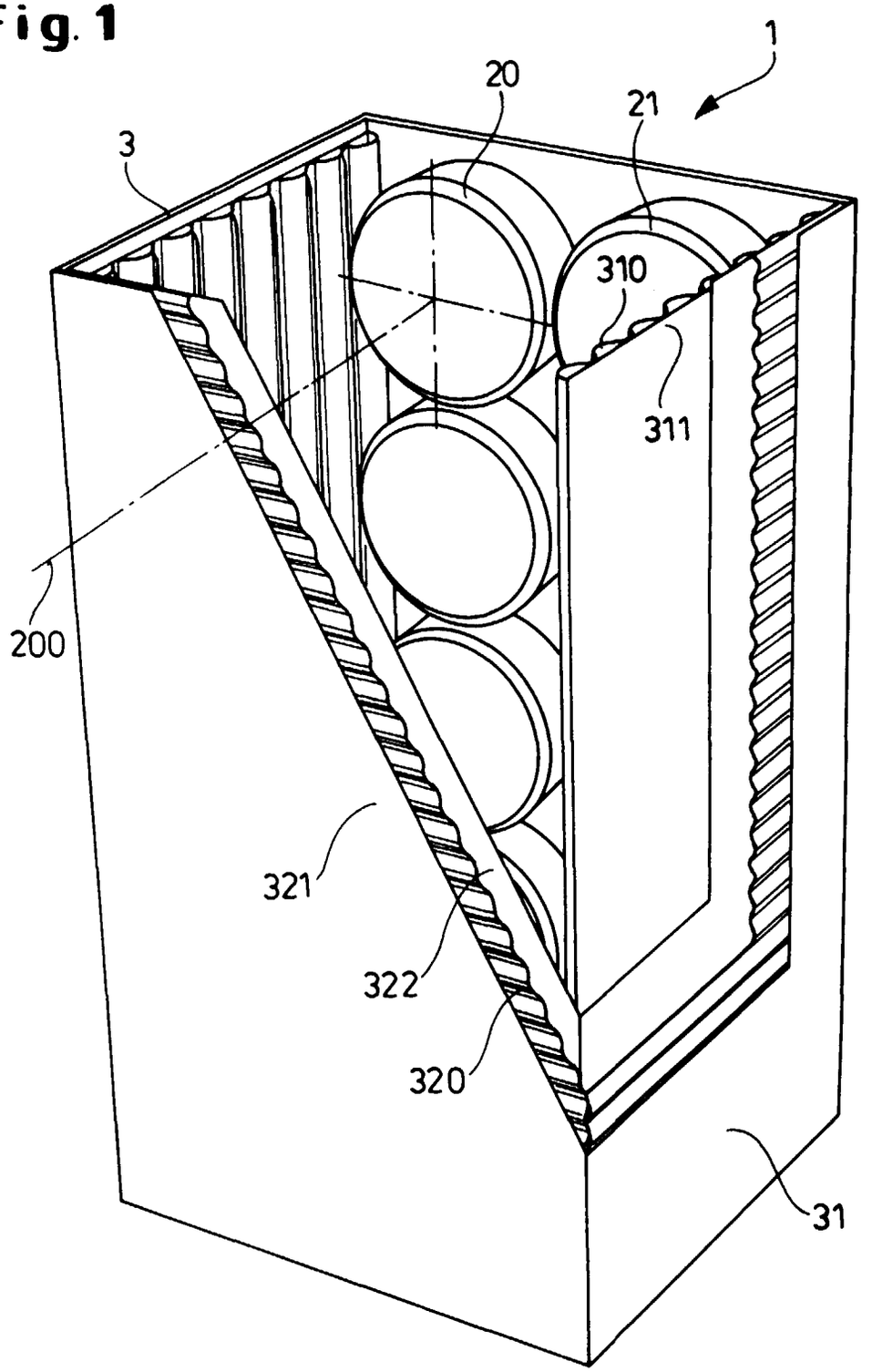
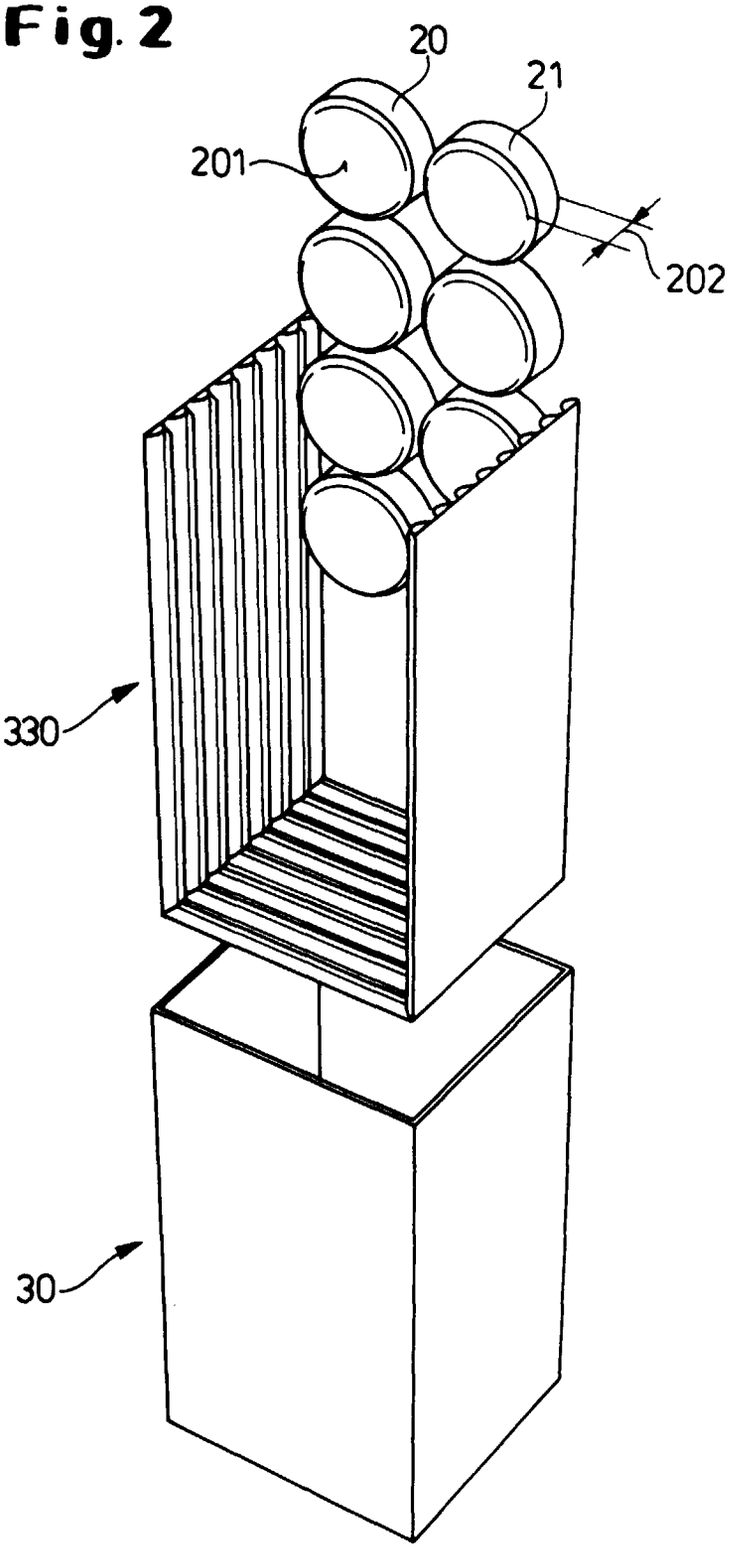


Fig. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 98 87 0061

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	EP 0 763 484 A (THE PROCTER & GAMBLE COMPANY) 19 March 1997 * column 1, line 21-24 * * column 3, line 36 - column 4, line 15; figure 1 *	1-5,7-10	B65D81/02
Y	EP 0 716 144 A (UNILEVER) 12 June 1996 * page 7, line 44 - page 10, line 38 *	1-5,7-10	
Y	WO 90 11887 A (ENSO-GUTZEIT) 18 October 1990 * the whole document *	1-5,7-10	
A	EP 0 231 082 A (CARMEL CONTAINER SYSTEMS) 5 August 1987 * column 1, line 6-26; figures 5-7 *	1,6	
A	EP 0 711 828 A (UNILEVER) 15 May 1996 * page 6, line 34 - page 9, line 6 *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27 August 1998	Lenoir, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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