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(54) **Deep pressed tray**

(57) Deep pressed plastic coated tray (1) of any shape made from card board (2) with one or more compartments of any shape with at least rounded corners (9) or with a round or oval shape and a rim area (7) surrounding the tray (1) and/or the compartments (4), the rounded areas (9) having wrinkles (10), wherein in the rim area (7) the wrinkles (10) are flattened by melted plastic material from the coating (3).

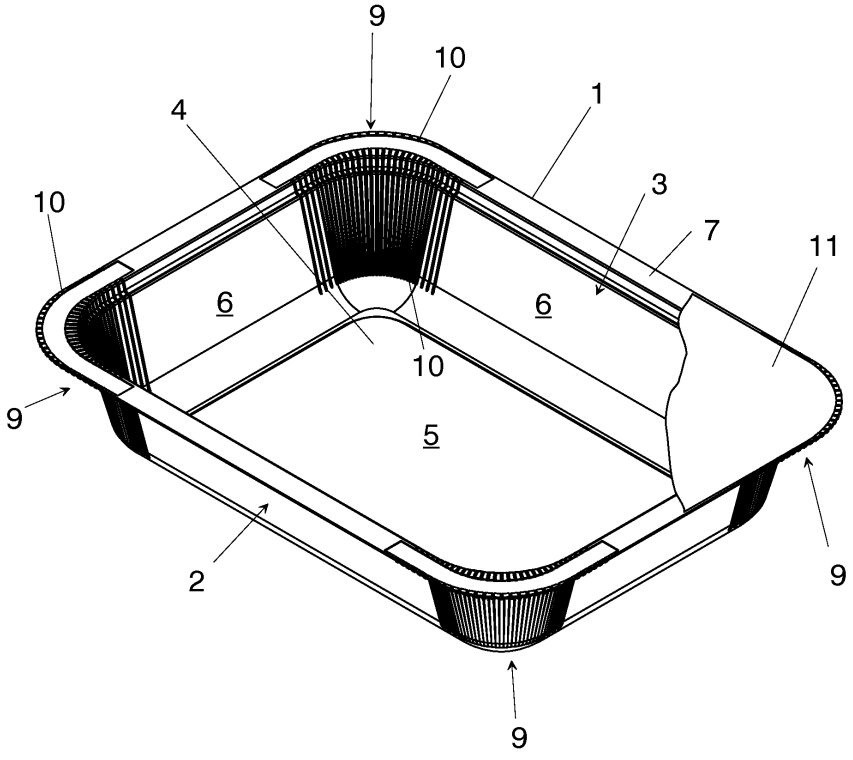

Fig. 1

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Description

[0001] The invention is directed to a deep pressed plastic coated tray of any shape made from card board with one or more compartments of any shape with at least rounded corners or with a round or oval shape and a rim area surrounding the tray and/or the compartments.

[0002] From the state of the art plastic trays are well known for packaging especially frozen food and modified atmospheric packaging (MAP) which could be able to be heated in an conventional or microwave oven.

[0003] These plastic trays are using a lot of raw material and are therefore expensive also according to the premium raw materials which have to be used to have temperature stability when the packaging is heated in an oven. Further the used plastic materials can not be based on renewable resources.

[0004] Such plastic trays are often made from crystallized polyester (CPET), polypropylene (PP) or other plastic materials and are normally sealed with a film and are often at least partially surrounded by a carton sleeve.

[0005] For MAP technology, which is well known from the state of the art, the packaged goods are hermetically sealed in a modified atmosphere so that it provides a longer shelf life for fresh food, e.g. for sliced meat, salad or prepared dishes. The packaging has to be gas, liquid and diffusion proof. The packaging material has to have high barrier characteristics and a low gas permeability.

[0006] To provide a more ecological packaging tries have been made to use deep pressed, plastic coated paper trays for packaging such delicate especially frozen foods and foods stored under MAP technology. The problem was that these trays had not been able to be closed in a tight way with a plastic lid / film by sealing.

[0007] In the corner areas of the trays there are always wrinkles also protruding in the rim area of the tray and/or compartments.

[0008] These areas are preventing a tight sealing. Therefore adhesives had to be used.

[0009] But adhesives are always problematic. To apply adhesives an additional production step has to be introduced. The adhesives themselves may also diffuse towards the packaged food and may contaminate the food. Further the adhesives may have a higher permeability and a lower barrier characteristic.

[0010] The purpose of the invention is to produce deep pressed card board trays which can be closed tightly by sealing a film or lid of plastic or plastic coated material to the top part.

[0011] In the solution to this problem proposed by the invention, the rounded areas having wrinkles, wherein in the rim area the wrinkles are flattened by melted plastic material from the coating.

[0012] Further it has been very advantageous in this context if a closing lid or film of plastic or plastic coated material is sealed to the rim.

[0013] With this solution a tight sealable card board tray is suggested. The plastic coated material can be extrusion or dispersion coated or treated with plastic materials with other means. Further the plastic coating can be produced by laminating a plastic film to another material, which could be selected from paper or cardboard or other materials.

[0014] It has also proved to be advantageous if the plastic coating is made from high temperature resistant plastic material.

[0015] With such a plastic coating the tray containing food can be heated in an oven.

[0016] In this context it is further very advantageous if the plastic coating is temperature resistant up to 250°C, preferably up to 220°C.

[0017] By using such a material normally occurring temperatures when heating food in an oven are not damaging the tray.

[0018] Another most advantageous embodiment of the invention is if the intersection between the rim and the tray walls and/or the intersection between the tray walls and the bottom walls is defined by a radius.

[0019] By using an radius damages to the plastic coating are avoided in the deep pressing process step.

[0020] Further it has been proved very advantageous if a printing is applied to the inside and/or the outside of the card board at least in the area of the bottom wall and/or the side walls of the tray.

[0021] A printing applied directly to the inside and/or the outside of the packaging saves an additional sleeve or label and therefore raw material and manufacturing steps. No protective packaging, labels, sleeves or the like are required for product information and protection of the packaging.

[0022] According to the present invention it has been proved to be a very advantageous process for forming a tray as described above if card board material is printed on the inside and/or outside, coated with plastic material, formed by deep pressing, cutting the trays out of the material and afterwards the rim is flattened in areas which having wrinkles from the forming process by ultrasonic treatment.

[0023] By such simple steps a plastic coated paper tray is formed which can be easily be tightly sealed with a film or lid of plastic or plastic coated material.

[0024] Further it is very advantageous according to the present invention if the plastic material is applied by extrusion coating or is laminated to the card board.

[0025] Hereby the plastic coating can be also applied after the printing has been applied.

[0026] In another advantageous embodiment of the present invention, the flattening process of the rim areas of the tray is performed by sonotrodes arranged in each of the corner areas and the plastic coating of the card board is melted precisely only in the wrinkled areas.

[0027] With such a flattening process step the wrinkles can be flattened within a single, production step not using a lot of time or energy. Further a tight sealing of the packaging gets possible enabling the packaging been used in MAP solutions.

[0028] It has further been proved to be very advantageous if a lid or film of plastic plastic coated materials, coated by extrusion or dispersions, wherein the coatings could be applied on paper or cardboard materials, or materials laminated with plastic materials by extrusion laminating or seperately laminating, whereby the materials laminated with the plastics could be selected from paper or cardboard is sealed to the rim area of the tray.

[0029] Herewith the tray is closed. The packaged stuff, e.g. food is protected against harmful influences.

[0030] Two embodiments of the invention are shown in the drawings.

Fig. 1 is a picture of a plastic coated card board tray with rounded corners having wrinkles which are flattened,

Fig. 2 is a cross section of this tray through a corner area before the ultrasonic treatment had been applied,

Fig. 3 is a cross section of this tray through a corner area after the ultrasonic treatment had been applied

Fig. 4 is a picture of another tray having two compartments and

Fig. 5 is a picture of a flattening process of the rim.

[0031] 1 in Fig. 1 is a tray formed from a layer of card board 2 to which a plastic layer 3 is coated. The plastic layer 3 is arranged on the inside of the tray 1. The tray 1 defines one or more compartments 4, in which food can be placed. The tray consists of a bottom wall 5, side walls 6 arranged around the bottom wall 5. On the free ends of the side walls 6 a rim 7 is linked to them. The rim 7 surrounding the tray 1 is defined to be the outer rim 7a. The rim 7 is aligned in an plane parallel to the the plane of the bottom wall 5.

[0032] Two compartments 4 are divided by a bar 8, which itself is formed by side walls 6 and probably by an intermediate rim 7b, directly connected to the outer rim 7a. They together are forming the rim 7.

[0033] The corners 9 of the tray 1 and the compartments 4 are rounded. In these areas wrinkles 10 occur due to the deep pressing process step. The material forming the rounded corners is larger than the corner itself. Therefore the additional material is pressed in those wrinkles 10. The wrinkles 10 are extending into the rim 7.

[0034] A plastic film 11 is sealed to the rim 7 to close the packaging.

[0035] In the corner areas 9 the rim 7 is flattened before the film 11 is sealed to it. By flattening the rim in the corner areas a gas and liquid tight sealing of the film 11 is guaranteed.

[0036] On the outside of the tray 1 printing 12 can be applied directly to the card board layer 2. An overlacquer 13 can cover the printing 12 to protect it against damage, especially mechanical damage. The overlacquer 13 also protects the card board layer 2 against moisture and liquids.

[0037] On the inside of the tray 1 a printing 14 can be arrange for example in the area of the bottom wall 5. This printing 14 is also directly applied to the card board layer 2. The plastic coating 3 is applied afterwards covering the printing 14 and therefore not allowing direct contact between the packaged goods and the printing colour used for the printing 14.

[0038] This helps to avoid contamination of the packaged goods, what is very important especially for food.

[0039] The printings 12 and 14 can be applied for example in a multicolour flexo-printing process.

[0040] The plastic layer can be extrusion coated to the card board-layer or can be laminated to it.

[0041] The intersection between the rim 7 and the side walls 6 is made out with a radius to avoid excessive stretching of the plastic layer 3 in these areas. This is also to avoid pinhole damages in the plastic layer 3.

[0042] The corner areas 9 of the rim 7 are flattened by an ultrasonic treatment only in these areas 15 by sonotrodes 16 having the shape of the corner areas 9. For each corner area a separate sonotrode 16 can be arranged.

[0043] By using separate sonotrodes 16 the flattening process is really fast and secure.

[0044] For the ultrasonic treatment a unit consisting of a generator, a converter, an amplifier, at least one sonotrode having the appropriate shape and a counter plate is used. The used frequency can be between 20 and 70 kHz. The used power is depending on the plastic material sealed together and has been adjusted in tests between 1 and 5 kW depending on the frequency. In these tests a frequency of 35kHz has been used with 1kW and a frequency of 20kHz has been used with 2, 4 and 5 kW.

[0045] Other powers and frequencies could be used.

[0046] Good results have been achieved when the amplitude of the ultrasound had been fixed to a constant value for each treatment.

[0047] Power, frequency, treatment time and pressure are controlled according to the plastic material used for the plastic coating and the width and length of the treatment area. Further the pressure of the treatment head against the rim can be controlled.

[0048] The treatment is not necessarily done over the whole width of the rim. In examples only part of the width had been treated with good results. In these examples only a width of 6 mm had been treated and thereby flattened.

[0049] A treatment head, containing the sonotrode is pressed against the product surface. E.g. mechanical or pneumatical means can be used for pressing the sonotrode against the product surface. With this treatment the plastic layer 3 is molten. The molten plastic material fills the vertically oriented channels of the wrinkles 10. A flat surface of the rim 7 is formed.

[0050] By using stationary ultrasonic treatment the produced heat is spread not only over the treated area. It also penetrates the channels and therefore produces a smooth filling of the channels.

[0051] A classical heat treatment does not penetrate the channels. Instead it causes burnings on the upper end of the plastic coating while the lower parts of the channels are not heated in such a way that the plastic material is molten.

[0052] It is not intended to treat other areas as the corner areas 9 to avoid unnecessary thinning of the plastic material.

[0053] Therefore the ultrasonic treatment according to the present invention causes a smooth and flat rim without thinning the plastic material too much. Tight sealable packages for food can be produced.

[0054] The sonotrodes can be arranged for example at a machine for deep pressing the tray or at the sealing apparatus. Therefore no separate machine has to be constructed. Further no separate handling for the ultrasonic treatment except of the treatment itself is necessary. The ultrasonic treatment can be carried out as a separate production step or inline with the deep pressing process. The ultrasonic treatment is directly linked to the forming apparatus.

[0055] The ultrasonic treatment can also be carried out in a separate ultrasonic treatment machine.

[0056] For the cardboard layer 2 pre coated board can be used. Solid bleaches sulphate board from virgin fibres has prooven good results. The grammages used are ranging from 170 to 600 g/m^2, preferably from 315 to 420 g/m^2. The card boards are selected according to their fibre content. Food approved grades are preferred.

[0057] For the coating 3 polyester, polyethyleneterephtalate or polybuteinterephtalate are preferred. Other plastic material or dispersion coatings can be used. The plastics can be transparent or pigmented. White or black pigmentation is a preferred embodiment. For inside printing 14 at least partly transparent plastic material should be used.

[0058] The plastic material is selected according to the intended use, their temperature resistance and their sealability.

[0059] A temperature resistance up to 220°C, extremely up to 250°C is preferred for ovenable packages.

[0060] The coating is applied in an amount of 5 to 100 g/m^2 in the extrusion coating process, preferably in an amount of 40 to 70 g/m^2. Examples have been made with a coating in an amount of 60 g/m^2. For example PET can be applied in an amorphous form, which chrystalized during the deep pressing process step according to the head used in this step.

[0061] When the plastic layer 3 is applied to the card board layer 2 by extruding or laminating thin plastic coatings between 5 and 100 microns, preferably between 17 and 50 microns can be applied. The plastic film can be oriented. It is adhered to the card board layer 2.

[0062] With very thin plastic coatings the radius of the intersection between the side walls 6 and the rim 7 and also between the bottom wall 5 and the side walls 6 has to be increased to avoid pinholes in the plastic coating.

[0063] The film 11 can be produced from plastic material or plastic coated materials, coated by extrusion or dispersions, wherein the coatings could be applied on paper or cardboard materials, or materials laminated with plastic materials by extrusion laminating or seperately laminating, whereby the materials laminated with the plastics could be selected from paper or cardboard. Instead of the film 11 a lid made from materials as described before could be used. Further it is imaginable that a combination of a film and a lid is used.

[0064] The use of barrier layers is possible. The film 11 and/or the plastic coating 3 multilayer films can be used.

[0065] The film 11 is sealed to the rim 7 by a well known sealing process. The main difference and advantage of the present invention is that the seal is also tight in the corner areas 9.

[0066] The new packaging according to the present invention has no need for separate labels or sleeves. Supplemental to the tray surfaces the film 11 gives an additional print area.

[0067] The packaging is resistant against damages. It has a rigid structure when closed, it is tamper evident, it possesses a good puncture resistance, it has a wide temperature resistance between around -40°C and over 200°C and it has -compared with aluminium and most plastic trays- good insulation properties during handling.

[0068] Further the packaging is mostly produced from renewable resources. The plastic part is only a minor part of the complete packaging. The empty package can be safely discarded via paper recycling or similar.

[0069] Sonotrodes according to the present invention are meant to be means for ultrasonic treatment.

Claims

1. Deep pressed plastic coated tray of any shape made from card board with one or more compartments of any shape with at least rounded corners or with a round or oval shape and a rim area surrounding the tray and/or the compartments, the rounded areas having wrinkles, wherein in the rim area the wrinkles are flattened by melted plastic material from the coating.

2. Tray according to claim 1, wherein an closing lid of plastic or plastic coated material is sealed to the rim.

3. Tray according to claim 1 or 2, wherein the plastic coating is made from high temperature resistant plastic material.

4. Tray according to claim 3, wherein the plastic coating is temperature resistant up to 250°C, preferably up

to 220°C.

5. Tray according to one of the previous claims, wherein the intersection between the rim and the tray walls and/or the intersection between the tray walls and the bottom walls is defined by a radius.

6. Tray according to one of the previous claims, wherein a printing is applied to the inside and/or the outside of the card board at least in the area of the bottom wall and/or the side walls of the tray.

7. Process for forming a tray with a rim according to one of the previous claims, wherein card board material is printed on the inside and/or outside, coated with plastic material, formed by deep pressing, cutting the trays out of the material and afterwards the rim is flattened in areas which having wrinkles from the forming process by ultrasonic treatment.

8. Process according to claim 7, wherein the plastic material is applied by extrusion coating, dispersion coating or is laminated to the card board.

9. Process according to claim 7 or 8, wherein the flattening process of the rim areas of the tray is performed by sonotrodes arranged in each of the corner areas and the plastic coating of the card board is melted precisely only in the wrinkled areas.

10. Process according to one of the claims 7 to 9, wherein a lid or film of plastic plastic coated materials, coated by extrusion or dispersions, wherein the coatings could be applied on paper or cardboard materials, or materials laminated with plastic materials by extrusion laminating or seperately laminating, whereby the materials laminated with the plastics could be selected from paper or cardboard is sealed to the rim area of the tray.

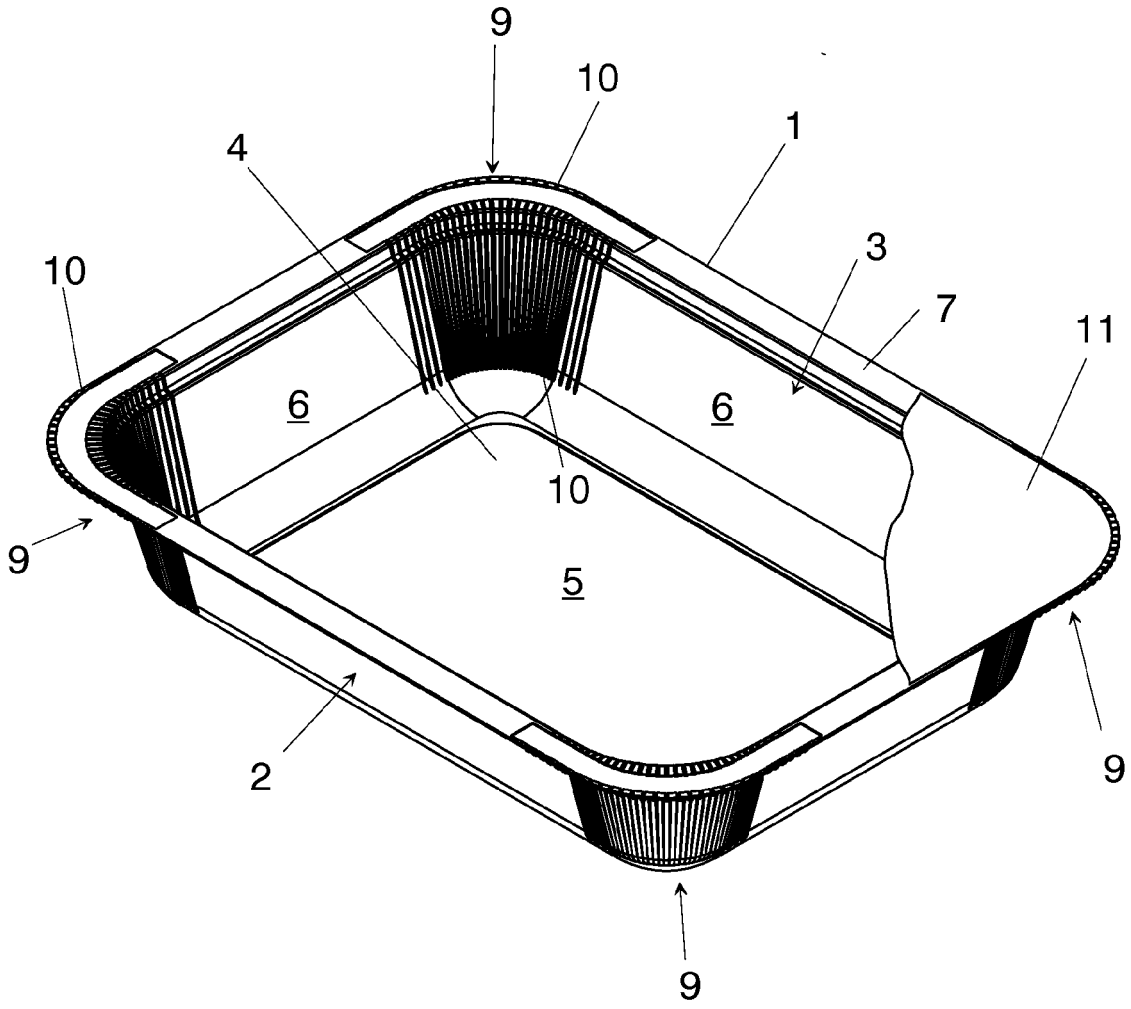

Fig. 1

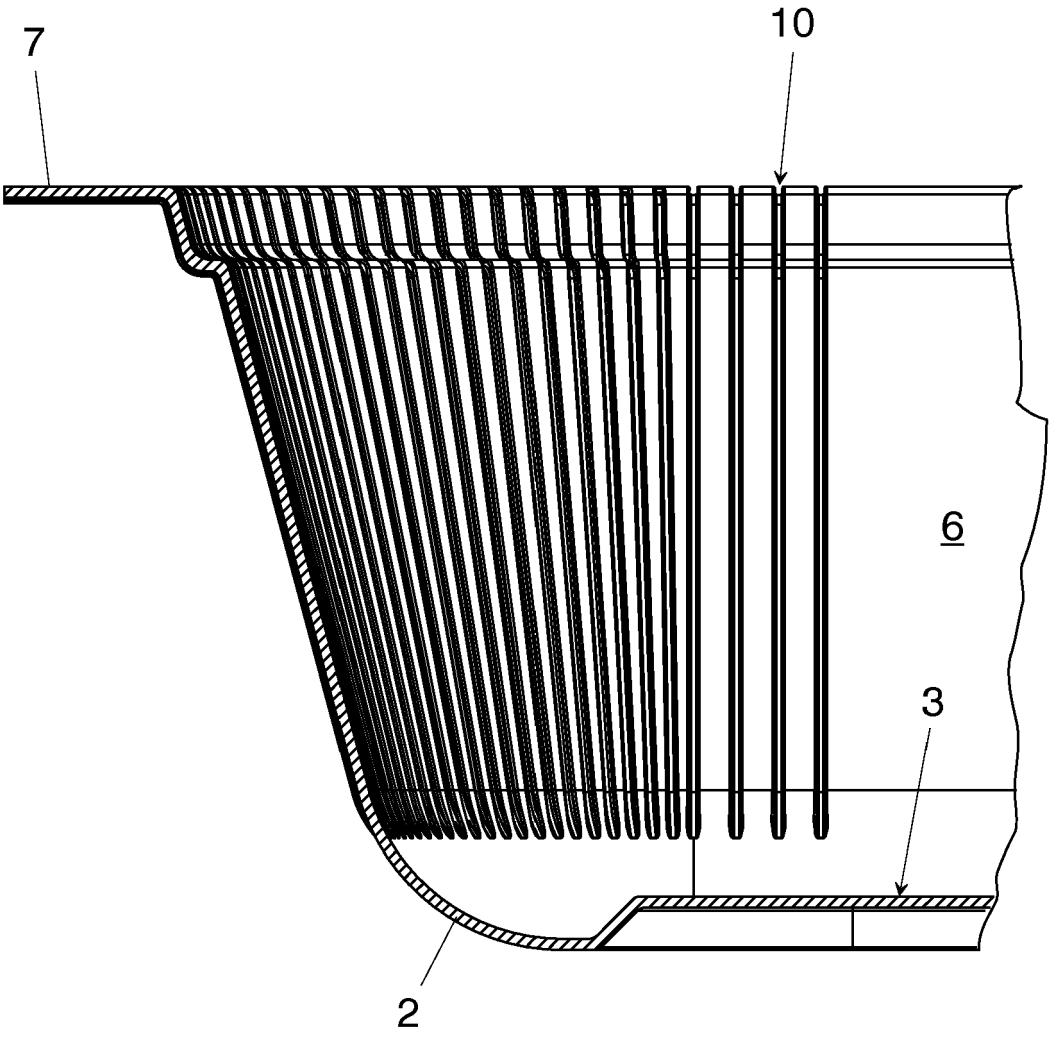

Fig. 2

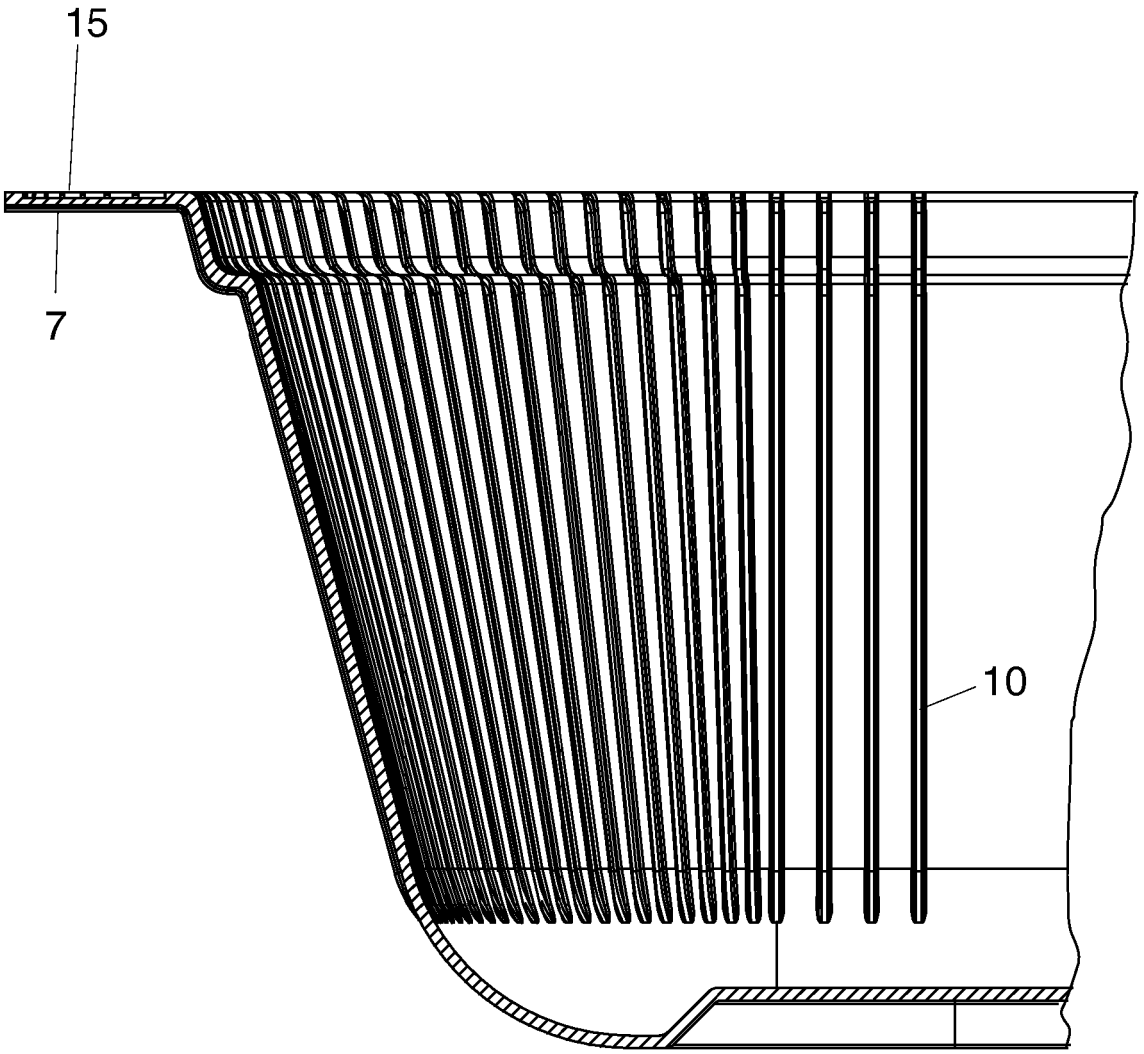

Fig. 3

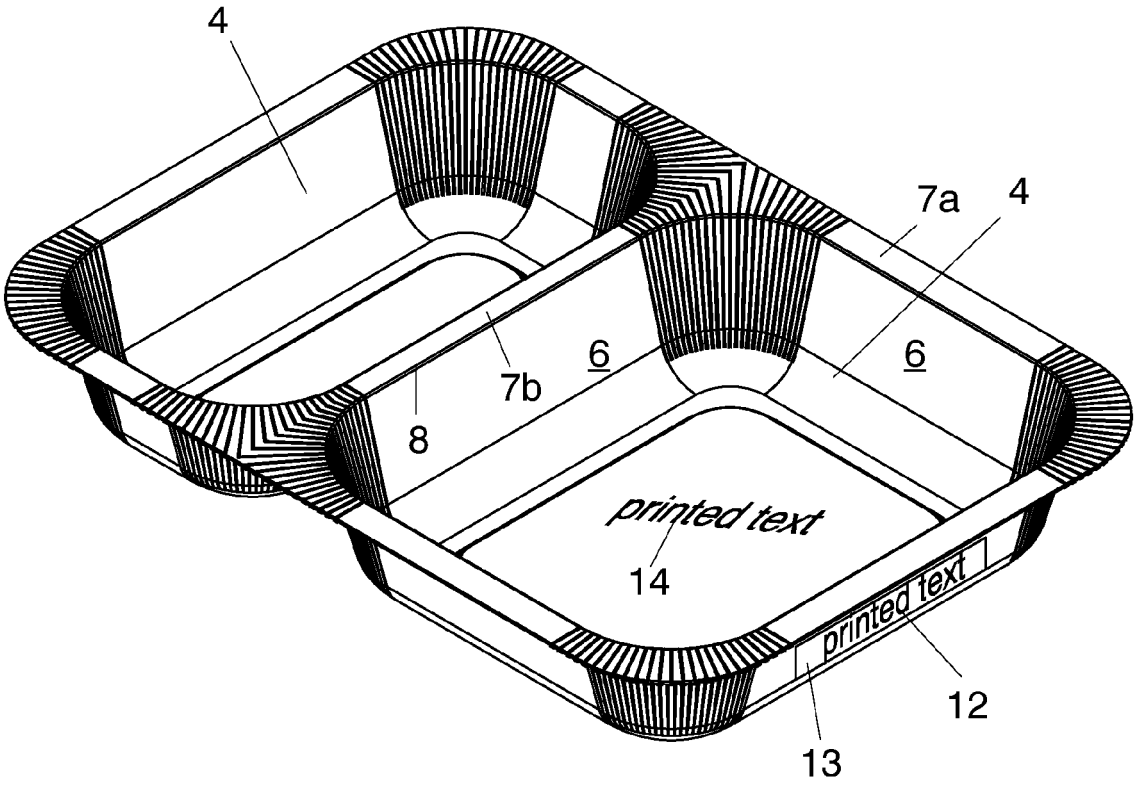

Fig. 4

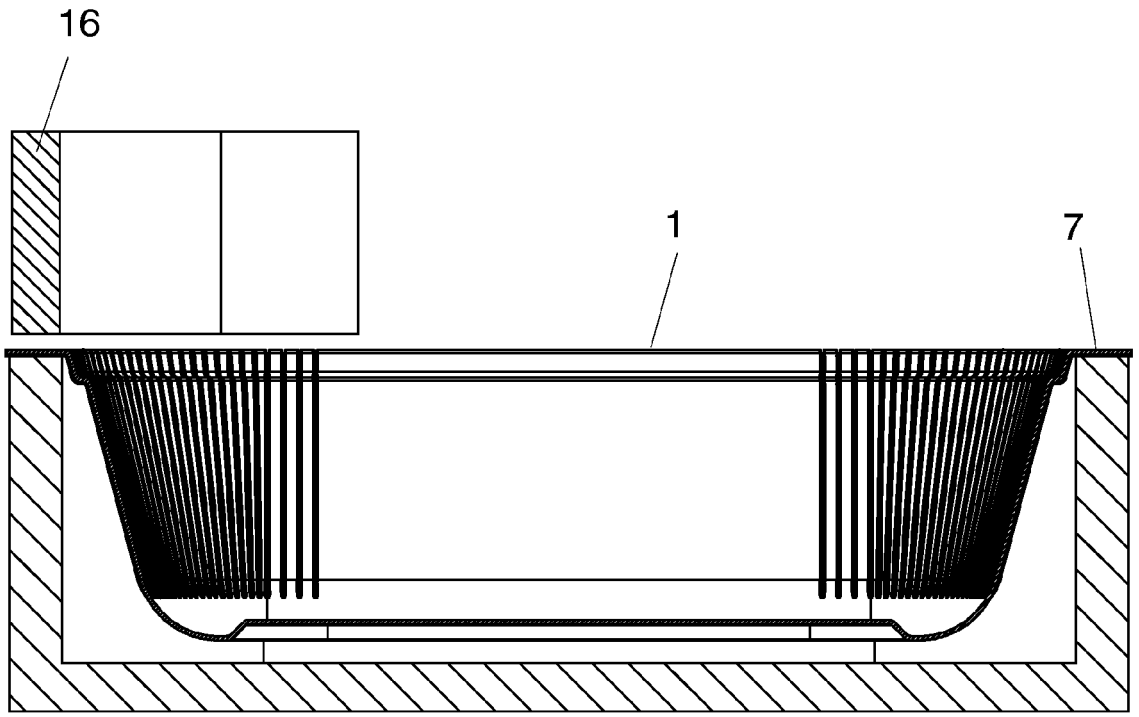

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 08 10 2814

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	JP 2000 033927 A (DAINIPPON PRINTING CO LTD) 2 February 2000 (2000-02-02) * abstract; figures 1-5 *	1-8,10 9	INV. B65D1/34
Y	WO 03/101839 A (TOPPAN PRINTING CO LTD [JP]; UEDA YOSHIKI [JP]; NAITO TOSHIYA [JP]; NA) 11 December 2003 (2003-12-11) * abstract; figures 6,7 *	9	
X	JP 2005 053554 A (TOPPAN PRINTING CO LTD) 3 March 2005 (2005-03-03) * abstract; figures 1,5,7 *	1-10	
A	US 5 234 159 A (LORENCE MATTHEW W [US] ET AL) 10 August 1993 (1993-08-10) * column 2, line 57 - line 59 * * column 5, line 16 - line 17 *	3,4	
			TECHNICAL FIELDS SEARCHED (IPC) B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 August 2008	Sundell, Olli

CATEGORY OF CITED DOCUMENTS

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2000033927 A	02-02-2000	NONE	
WO 03101839 A	11-12-2003	AU 2003241972 A1	19-12-2003
JP 2005053554 A	03-03-2005	NONE	
US 5234159 A	10-08-1993	NONE	

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