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(54) Tray in plastic material for the packaging of foods susceptible of releasing liquids

(57) The use of a tray (V) in plastic material is described for packaging foods susceptible of releasing liquids, in which such tray (V) is made of a sheet (4) of an expanded plastic material of high water permeability, preferably open-celled, as well as a modified atmosphere packaging comprising such tray and a method for manufacturing such packaging.

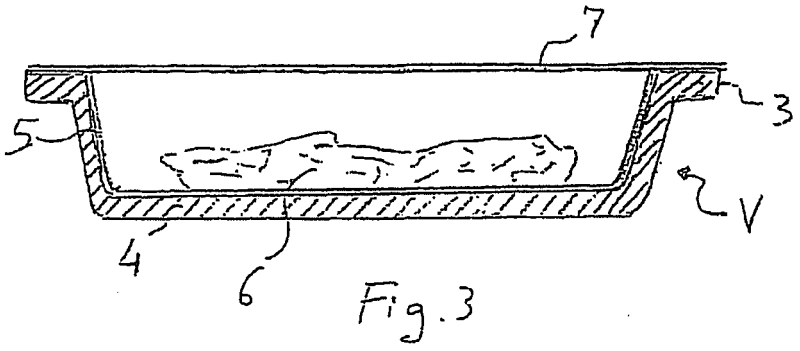

Fig. 3

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Description

Field of application

[0001] The present invention refers in general to the food packaging industry.

[0002] In particular, the invention relates to a tray for the packaging of foods susceptible of releasing serum, such as for example meat and fish.

Prior art

[0003] The packagings for meat and fish mostly used in supermarkets, composed of a tray of plastic material containing slices or pieces of meat or fish enclosed in a film of transparent plastic material, are well known. It is also known that such foods release serum and that the presence of serum inside the packaging makes the same of little appeal to the customer.

[0004] Therefore a number of ways have been devised to separate or hide the serum released by the food.

[0005] One of the first systems adopted in the prior art was that of utilising a pad or a layer of absorbing material, generally paper. One such solution is described for example in patent applications EP-A-0 182 139 and EP-A-0 544 562.

[0006] The absorbing layer may be placed on the inner surface of a plastic material tray or interposed between two sheets of plastic material, and in this latter case the sheet in contact with the food is provided with holes for the passage of the serum released by the food in the direction of the interposed absorbing layer.

[0007] The above trays suffer however the drawback of being composed of materials of a different nature and this leads to problems in waste separation for recycling.

[0008] More recently, trays in expanded polystyrene have been made available, capable of absorbing the serum released by meat or fish. The absorption of the serum is due to the presence of a high percentage of open cells in the expanded foam structure, which function as receptacles for the liquids which penetrate into the foam through holes made on the bottom of the tray.

[0009] Trays of this type and the sheets of open-cell expanded plastic material from which they are made are described in various patent applications, including for example EP0642907, EP0754632 and EP0965426.

[0010] The trays in open-cell expanded plastic material suffer however the drawback of absorbing only a limited quantity of liquid per volume unit and it is thus necessary to use a rather thick sheet, obtained by drastically reducing the density of the starting sheet, with consequent increase in size of each single tray as well as of storage and transport costs.

[0011] Moreover, in order to obtain the absorption of the liquid inside the expanded foam, it is necessary to make holes on the inner surface of the tray. This reduces the mechanical strength of the tray, complicates its production and makes it impossible to package the food under modified atmosphere, since a watertight seal cannot be achieved, if not by resorting to rather complicated solutions of uncertain feasibility and in any case characterised by high costs, such as those described for example in patent applications EP 1 211 193 and WO 0046125.

[0012] In the light of the above illustrated prior art, the problem at the basis of the present invention was that of making available a tray of plastic material suitable for the packaging of foods susceptible of releasing liquids, for example serum, such as meat and fish, which could enable to remove the released liquid even at small thicknesses of the plastic material sheet and which could enable to package such foods under modified atmosphere in a cost effective manner and without resorting to complicated technical solutions.

Summary of the invention

[0013] According to a first aspect of the present invention, the aforementioned technical problem is solved by the use of a plastic material tray for packaging foods susceptible of releasing liquids, in which such tray is made of a sheet of an expanded plastic material of high water permeability.

[0014] Preferably the aforementioned expanded plastic material is polylactic acid (PLA) or a polymeric mixture containing PLA.

[0015] Preferably, the aforementioned sheet is substantially open-celled.

[0016] In one of its further aspects, the present invention provides a tray of the type described above, which has a bottom and side walls and is made of a sheet of an expanded plastic material of high water permeability coupled with a film of the same hydrophilic polymeric plastic material, the aforementioned film constituting the food-facing surface of the bottom and of the walls.

[0017] Also in this case the sheet of high water permeability expanded plastic material is preferably composed of PLA or of a polymeric mixture containing PLA and is conveniently substantially open-celled.

[0018] The tray according to the invention has the advantage of enabling a greater liquid removal, compared to known

trays of open-cell plastic material, typically polystyrene, of the same sheet thickness. This is due to the fact that the liquid is not simply absorbed and retained within the structure of the expanded sheet but can also partly evaporate out, by virtue of the intrinsic properties of the high water permeability polymeric material.

[0019] This makes it possible to manufacture trays of a smaller thickness than those of the state of the art, with consequent production, storage and transport cost reductions.

[0020] Furthermore, it is not necessary to make holes on the bottom of the tray since the liquid can permeate through the film into the expanded sheet, thanks to the particular physio-chemical properties of the polymer used.

[0021] According to a further aspect of the present invention, a modified atmosphere packaging is made available for a food susceptible of releasing liquids, comprising

a tray in plastic material, having a bottom and side walls, made of a sheet of expanded polymeric plastic material of high water permeability,

a food susceptible of releasing liquids and

a gas-impermeable plastic material film fixed to the tray at the edges of the side walls.

[0022] The aforementioned expanded polymeric plastic material of high water permeability is preferably PLA or a polymeric mixture containing PLA.

[0023] The aforementioned sheet is preferably substantially open-celled and is conveniently coupled to a film of the same high water permeability polymeric plastic material, which forms the inner surface of the bottom and walls.

[0024] The gas-impermeable film is preferably composed of PLA.

[0025] Such packaging is accomplished with a method which comprises the steps of providing a tray of plastic material, having a bottom and side walls, made of a sheet of an expanded polymeric plastic material of high water permeability,

placing a food susceptible of releasing liquids on the bottom of said tray,

seal-closing the tray after having introduced a modified atmosphere gas mixture, by means of a gas-impermeable film welded or glued at the edges of said side walls of the tray.

[0026] Preferably the aforementioned sheet is substantially open-celled and is conveniently coupled with a film of the same high water permeable polymeric plastic material, which forms the inner surface of the bottom and of the walls.

[0027] The expanded polymeric plastic material of which the sheet and the film coupled to it are made is preferably polylactic acid or a polymeric mixture containing polylactic acid.

[0028] The gas-impermeable film may be any film with gas barrier properties used in modified atmosphere packaging but is preferably a film also of PLA or of a polymeric mixture containing PLA.

[0029] With the modified atmosphere packaging according to the present invention it is no longer necessary to resort to the complicated technical solutions of the state of the art, due to the holes found on the bottom of the tray, because the absorption of the liquid released by the food occurs by permeation through the film coupled to the expanded sheet or through the superficial layer of the sheet.

[0030] In this case also, the water contained in the liquid absorbed inside the expanded sheet can partly evaporate out, thus increasing the ability of the packaging to remove the liquid discharged by the food.

[0031] The tray therefore permits a certain outward evaporation of the water while having a good gas-impermeability (typically oxygen and carbon dioxide) which constitute the modified atmosphere within the packaging. This guarantees a good preservation of the organoleptic properties of the food and its best appearance throughout the conventional keeping times at refrigerator temperatures.

[0032] The present invention will be further described with reference to several drawings provided for illustrative and not limiting purposes.

Brief description of the drawings

[0033]

Figure 1 is a perspective view of a tray according to the invention.

Figure 2 is a cross-section view of a tray according to an embodiment of the invention, taken along the line A-A of Fig. 1.

Figure 3 is a cross-section view of a packaging according to the invention.

Figure 4 is a cross-section view of a packaging according to an alternative embodiment of the invention.

Detailed description

[0034] With reference to figure 1, a tray V according to the present invention comprises a bottom 1 and side walls 2, provided with a perimeter edge 3.

[0035] With reference to figure 2, it is shown that both the bottom and the side walls of the tray V are composed of a sheet 4 of open-cell expanded PLA coupled to a PLA film 5, which covers the inner surface of the tray V.

[0036] In figure 3 a modified atmosphere packaging is illustrated according to the present invention comprising a tray V like that illustrated with reference to figures 1 and 2, consisting of a sheet 4 of open-cell expanded PLA, coupled to a PLA film 5, a food 6 susceptible of releasing liquids and a film 7 which constitutes a barrier to gases, of PLA also, sealed on the edges 3 of the tray V to provide a watertight seal.

[0037] In figure 4 is illustrated an alternative embodiment of the packaging according to the present invention, in which the PLA film 7, which forms a barrier to gas, is sealed on the edges 3 of the tray V, which exclusively consists of a substantially open-celled expanded PLA sheet.

[0038] To illustrate the functionality of the tray according to the invention reference will be made to the following non-limiting examples provided hereunder.

EXAMPLE 1

[0039] Trays according to the embodiment of the present invention illustrated in figure 2 were prepared by thermoforming starting from a sheet of expanded PLA of 1 mm in thickness and containing approximately 70% of open cells (measurement carried out with an Ultrafoam pycnometer model by Quantachrom), coupled with a PLA film of 30 μm in thickness and having a water vapour permeability of 55g/m^{2}day.

[0040] The trays had the following dimensions: 205 mm in length, 160 mm in width, 35 mm in height and displayed the PLA film placed so as to cover the inner surface of the bottom and of the walls.

[0041] Ten of these trays were utilised to package 200 g of red beef each. Each tray was sealed with a PLA film 30 μm in thickness, sealed on the edges of the tray, utilising a protective atmosphere packaging machine produced by Caveco, utilising the following modified atmosphere to prolong the shelf-life of the product: O_2 60%, CO_2 30%, N_2 10%.

[0042] The packagings thus prepared were placed in a refrigerator at approximately 4°C for a week. After such period the meat still exhibited a pleasant appearance and, surprisingly, no liquid deposits could be observed.

[0043] This occurred thanks to the high water permeability of the PLA film coupled to the sheet.

[0044] As the trays have a surface plan area of approximately 205x105 = 21525 mm^2, or 0.021525 m^2, the theoretical permeability of the tray is 55g/m^{2}day x 0.021525 m^2 = 1.18 g/day (without accounting for the additional permeability effect due to the surface of the side walls and that due to the upper enclosing PLA film). Considering an overall liquid release of 2% of the weight of the meat occurring gradually over 4 days, a quantity of approximately 1 g of released liquid per day is calculated, for a total of 4 g over the four days. Consequently all of the liquid released by the food can permeate through the film and reach the underlying open-cell structure, even in the absence of holes along the tray bottom.

EXAMPLE 2

[0045] Trays according to the present invention were prepared by thermoforming starting from a sheet of expanded PLA 1 mm in thickness and containing approximately 70% of open cells (measurement carried out with an Ultrafoam pycnometer from Quantachrom).

[0046] The trays had the following dimensions: 205 mm in length, 160 mm in width, 35 mm in height.

[0047] Such trays were utilised as they are, without being internally covered with PLA film, to package fresh beef. The packaging was carried out by placing meat portions of approximately 250 g in weight inside each tray and closing it all with a PLA film 30 μm in thickness, heat-sealed on the edges of the tray.

[0048] It was observed also in this case that the quantity of liquid found inside the packaging after 2 days of preservation at refrigerator temperatures was less than that released by the meat, since a part of the water contained in the liquid had permeated and then evaporated out.

[0049] The following table reports the most important parameters of the test:

		Meat Initial Weight	Meat Weight after 48 h	Difference	% Variation	Empty Tray Weight	Tray Weight after 48 h	Difference
		g	g	g		g	g	g
LOIN	Tray 1	289.6	284.1	5.5	1.9%	12.1	12.8	0.7
	Tray 2	246.4	241.4	5.0	2.0%	12.6	13.8	1.2
	Tray 3	283.5	276.8	6.7	2.4%	10.7	11.2	0.5
SCOTTONA	Tray 1	298	292.6	5.4	1.8%	12.1	13.1	1.0
	Tray 2	257.6	252.6	5.0	1.9%	12.8	13.7	0.9
	Tray 3	288.5	282	6.5	2.3%	12	12.8	0.8

[0050] As seen in the table, the meat lost an average of 5.5 g of weight in 2 days, while the trays increased their weight by approximately 1 g on average.

[0051] This shows that with the above described packaging some 4.5 g of water permeated out, since residual liquid was not present in the packagings.

EXAMPLE 3:

[0052] A further experiment was carried out utilising PLA trays of 223 mm in length, 152 mm in width and 30 mm in height, produced as in example 2. Such trays were filled with approximately 250 cc of water and seal-closed by means of a plate of water-impermeable material attached to the edges with silicon. The weight variation of the packaging over time thus obtained was then observed. The weight variation of the packaging thus obtained is to be exclusively ascribed to the phenomenon of permeation through the walls and bottom of the tray. Such experiment was carried out for comparison with trays made of polystyrene (PS) of the same dimensions of those in PLA described above.

[0053] The obtained values are illustrated in the table below:

Time (h)	PLA Tray + Water + Cover (g)	Weight Variation of the PLA Tray from the Initial Weight (g)	PS Tray + Water + Cover (g)	Weight Variation of the PS Tray from the Initial Weight (g)
0	502.15		484.2	
8	501.15	-1	483.8	-0.4
24	499.8	-2.35	483.5	-0.7

[0054] As observed from the data of the table, after 24 h the PLA tray shows a weight reduction of more than triple that of the equivalent PS tray.

Claims

1. Use of a tray (V) in plastic material for packaging foods susceptible of releasing liquids, wherein such tray (V) is made of a sheet (4) of an expanded plastic material of high water permeability.

2. Use according to claim 1, wherein said expanded plastic material is polylactic acid (PLA) or a polymeric mixture containing PLA.

3. Use according to claim 2, wherein said sheet (4) is substantially open-celled.

4. Tray (V) in plastic material for foods susceptible of releasing liquids, having a bottom (1) and side walls (2) made of a sheet (4) of an expanded polymeric plastic material of high water permeability, coupled to a film (5) of the same plastic material, said film (5) constituting the food-facing surface of the bottom (1) and of the walls (2).

5. Tray (V) according to claim 4, wherein said sheet (4) is substantially open-celled.

6. Tray (V) according to claim 4 or 5, wherein said expanded polymeric plastic material is polylactic acid or a polymeric mixture comprising polylactic acid.

7. Modified atmosphere packaging for a food susceptible of releasing liquids, comprising

a tray (V) in plastic material having a bottom (1) and side walls (2), made of a sheet (4) of an expanded polymeric plastic material of high water permeability,
a food (6) susceptible of releasing liquids and
a film (7) of gas-impermeable plastic material, fixed to the tray (V) at the edges (3) of said side walls (2).

8. Packaging according to claim 7, wherein said expanded polymeric plastic material of high water permeability is PLA or a polymeric mixture containing PLA.

9. Packaging according to claim 7 or 8, wherein said sheet (4) is substantially open-celled.

10. Packaging according to any one of claims 7 to 9, in which said sheet (4) is coupled to a film (5) of the same polymeric plastic material of high water permeability, which constitutes the inner surface of the bottom (1) and walls (2).

11. Packaging according to any one of claims 7 to 10, wherein said gas-impermeable film (7) is made of PLA or a polymeric mixture containing PLA.

12. Method for packaging in modified atmosphere a food susceptible of releasing liquids, comprising the steps of:

providing a tray (V) in plastic material having a bottom (1) and side walls (2), made of a sheet (4) of an expanded polymeric plastic material of high water permeability,
placing a food (6) susceptible of releasing liquids on the bottom (1) of said tray (V),
seal-closing the tray (V) after having introduced a mixture of modified atmosphere gases, by means of a gas-impermeable film (7) welded or glued to the edges (3) of said side walls (2) of the tray (V).

13. Method according to claim 12, wherein said sheet (4) is substantially open-celled.

14. Method according to claim 12 or 13, wherein said sheet (4) is coupled to a film (5) of the same polymeric plastic material of high water permeability, which constitutes the inner surface of the bottom (1) and of the walls (2).

15. Method according to any one of claims 12 to 14, wherein said expanded polymeric plastic material is polylactic acid or a polymeric mixture containing polylactic acid.

16. Method according to any one of claims 12 to 15, wherein said gas-impermeable film (7) is made of PLA or of a polymeric mixture containing PLA.

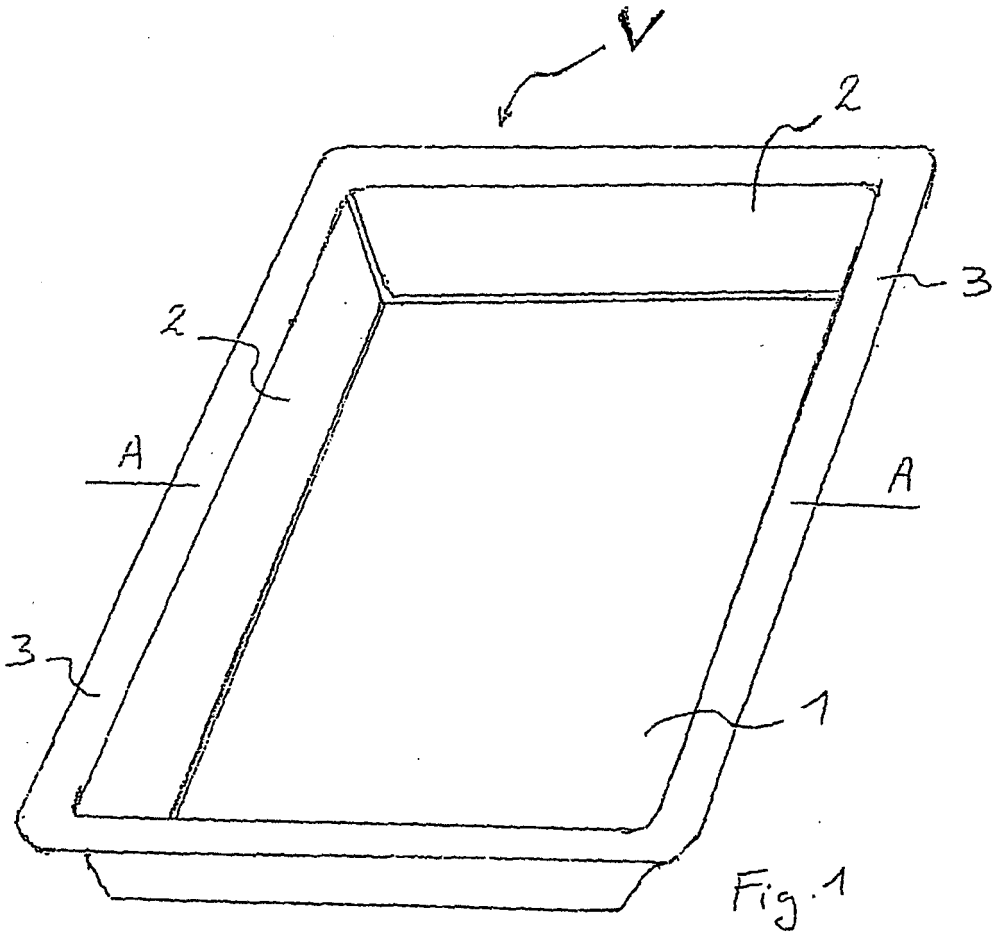

Fig. 1

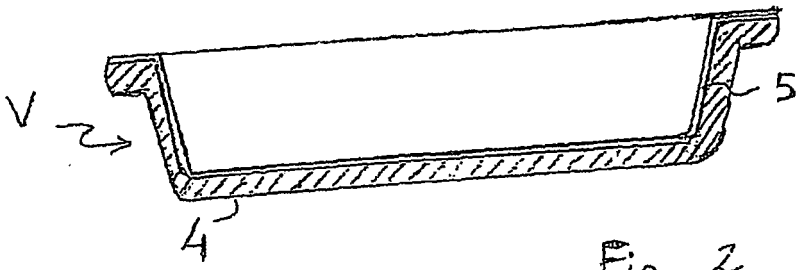

Fig. 2

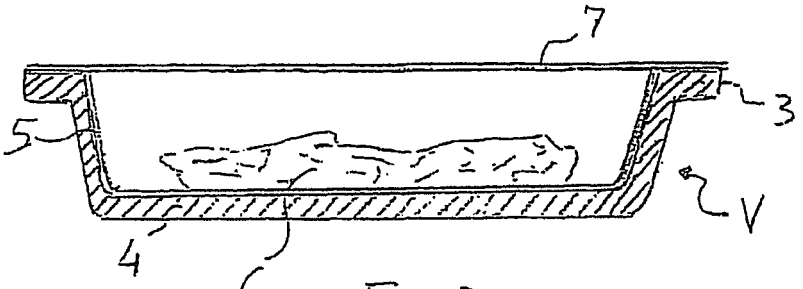

Fig. 3

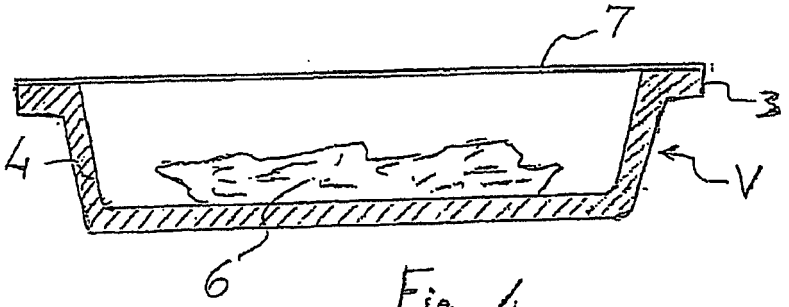

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 05 02 5100

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	12 January 2006	Cazacu, C

CATEGORY OF CITED DOCUMENTS

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