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(54) Multilayer tray with draining effect and related manufacturing method

(57) The present invention refers to a multilayer tray with draining effect having a base (2), lateral walls (3) and an upper rim (4), in which that said tray is formed of a multilayer material comprising, in succession from the outside inwards: one outermost layer of extruded expanded closed-cell polystyrene (XPS), one layer of a multilayer plastic barrier film with barrier-forming properties against the passage of gases, and one innermost layer

of expanded polyethylene (PE) having a plurality of perforations to be able to accommodate in its interior the fluids released by a food product placed in the tray, in which the thickness (d) of the layer of expanded PE exclusively along the upper rim (4) of the tray does not exceed half of the value of the thickness (D) of the layer of expanded PE of the base (2) and/or of the lateral walls (3) of the tray.

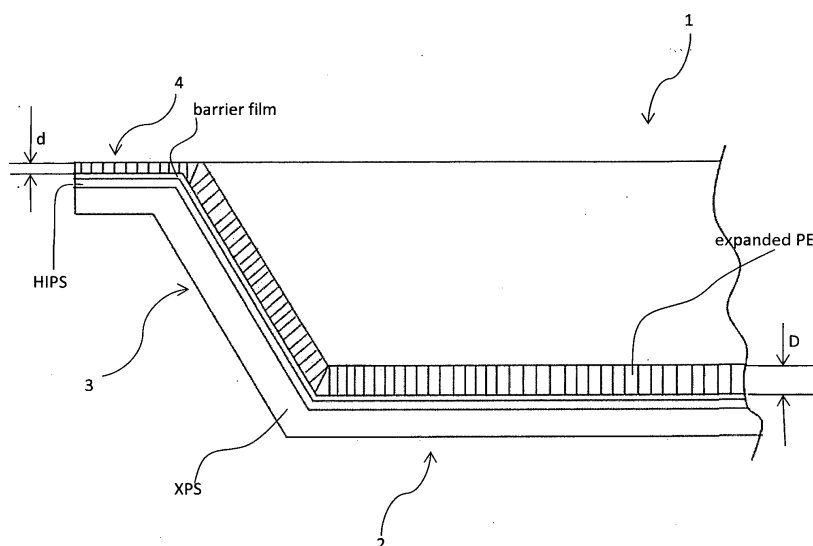


FIG. 1

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Description

Field of application

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

[0002] More particularly, the invention is concerned with a multilayer tray with draining effect and related production method of the same, as well as making packaging with a draining effect and gas barrier intended for the packaging of food products such as meat or fish that are prone to release fluids, and the packaging itself.

[0003] In the present description and the following claims the term "fluid" or "fluids" is intended to refer to any (exuded) fluid or liquid released by a foodstuff also during their preservation, for example humidity, fat, blood or similar.

Prior art

[0004] It is well known that certain food products, for example meat and fish, are prone to release fluids during their preservation, even over brief periods.

[0005] Packaging is known from the state of the art that is able to drain away and/or absorb the fluid released by the foodstuffs contained therein.

[0006] The prior art document WO 93/06026, for example, describes a recyclable tray that is able to drain fluids and contain them independently from the orientation of the tray.

[0007] In this tray a concave upper support surface provided with a conduit for fluids and a lower planar surface together define a cavity in which the fluid released by the foodstuff is contained.

[0008] The document US 5,705,213 describes a packaging comprising a tray and a plastic closing film.

[0009] The tray includes a first portion impermeable to liquid which has a set of corrugations forming a network of approximately parallel ribs, and a second portion comprising apertures that fits in the first portion and on which the food product rests.

[0010] The ribs and the second portion define a set number of closed chambers in which the fluid released by the foodstuff is collected.

[0011] Although advantageous the above inventions are not without drawbacks, among which the high production costs as a result of the structural complexity of the tray, which requires complex moulding for its production, with the resultant cost increase of the food product that is to be packaged.

[0012] Other packaging able to absorb fluids released by a food product are described in documents EP 1 285 861, EP 1 707 499 and EP 1 445 211.

[0013] These last documents describe packaging in which an absorbing pad is used in combination with a tray and a plastic closing film.

[0014] The absorbing pads described in these documents consist of several layers, usually of different ma-

terials, laminated together or joined by means of adhesives.

[0015] Although also advantageous these packages are not without drawbacks, among which, again, the elevated production costs due to the manufacturing of the multilayered pad, in addition to the costs of the separate manufacturing of the tray and the assembly steps needed to combine pad and tray, with the resultant increase of final production costs.

Summary of the invention

[0016] A first aim of the present invention is to provide a multilayer tray with draining effect that is easy to manufacture using traditional moulds for thermoforming and that at the same time allows traditional machinery to be used for the application of the standard closing film.

[0017] A second aim of the present invention is to provide a method for manufacturing packaging for food products that has good structural rigidity, such that it can withstand the packaging steps and adequately deal with transport and handling.

[0018] A third aim of the present invention is to provide packaging that at the same time ensures the correct draining of exuded fluids and provides good gas barrier capacity, reducing to a minimum the modifications of existing packaging plants, with resultant low manufacturing costs.

[0019] A further aim of the present invention is to provide packaging that is structurally simple and that is therefore an advantageous alternative to known packaging for food products that are prone to release fluids and that require conservation in a modified atmosphere, in particular a package that can be manufactured in a reduced time interval through the use of known machinery of the field.

[0020] These aims are obtained by a multilayer tray with draining effect in accordance with claim 1 of the present invention.

[0021] Furthermore these aims are obtained by a method for obtaining this tray, from packaging obtained on the basis of this tray and the related manufacturing method.

[0022] Further characteristics and advantages will become clear from the following detailed description of a preferred but non-exclusive embodiment of the present invention, with reference to the enclosed figures, given by way of non-limiting example.

Brief description of the figures

[0023]

- Figure 1 shows a schematic cross-section view along a vertical plane of a portion of the multilayer tray with draining effect according to the present invention;
- Figure 2 shows a schematic view of a multilayer

sheet used for the manufacturing of the tray of figure 1;

- Figure 3 schematically shows the tray of figure 1 after the closing film has been applied on top.

Detailed description

[0024] Figure 1 shows a multilayer tray, generally indicated by reference number 1, having a base 2, lateral walls 3 and an upper rim 4.

[0025] In accordance with the present invention the tray 1 is made with a multilayer material respectively consisting of, in succession from the outside inwards: one outermost layer of extruded expanded closed-cell polystyrene (XPS), one layer of a multilayer plastic barrier film with barrier-forming properties against the passage of gases, and one layer of expanded polyethylene (PE) that will be placed in contact with a food product placed in the tray. The layer of expanded PE is perforated in order to retain the fluid released by the food product. Only along the rim 4 of the tray 1, the thickness of the layer of expanded PE, indicated with d in figure 1, is less than at least half of the layer of expanded PE indicated with D in figure 1, measured at the base 2 and/or at the lateral walls 3 of the tray 1.

[0026] Basically, for the tray in accordance with the present invention, $d \leq 1/2 D$.

[0027] It is preferable, but not strictly necessary, to also have a layer of high-impact polystyrene (HIPS) placed between the outermost layer of XPS and the single layer of barrier film.

[0028] This layer of HIPS considerably improves adhesion between the barrier film and the layer of XPS.

[0029] In the following description reference will be made to this HIPS layer, even though this layer is not strictly necessary for the implementation of the present invention.

[0030] The tray 1 is made by means of thermoforming on the basis of a multilayer sheet, shown in figure 2.

[0031] This multilayer sheet is made by means of calendering to join the various layers that form tray 1, as will be better described in the following.

[0032] In the illustrated example, the thicknesses of the various layers used for the multilayer sheet with which tray 1 is made, are the following:

Layer	Thickness
Closed-cell XPS	2 - 6 mm
HIPS	20 - 120 micron
Barrier film	20 - 60 micron
Expanded PE	2 - 6 mm

[0033] The layer of extruded expanded closed-cell polystyrene (XPS) has a density comprised between 40 and 220 g/L. It is obtained by means of extrusion with direct

injection of expansive gases of the known kind, such as aliphatic hydrocarbons and atmospheric gases, through an annular die.

[0034] The layer of HIPS is obtained by extrusion through a flat-headed die at a temperature between 180°C and 220°C.

[0035] In accordance with the present invention the layer of barrier film has a sealing layer of PE on the side that comes in contact with the layer of expanded PE, to allow for the adhesion between these two layers.

[0036] Moreover the layer of expanded PE includes an antistatic additive to facilitate the absorption of liquids. This antistatic additive is added already at the extrusion step of the sheet of expanded PE.

[0037] The barrier film is of the kind known in the field. As an example it is possible to consider a multilayer plastic film in which at least one of the layers is composed of EVOH (ethylene vinyl alcohol) or PVDC (polyvinylidene chloride) or a polyamide or another type of polymer or polymer mix with low gas- and vapour-permeability, where the barrier layer has a thickness that is comprised between 2 and 12 micron for a multilayer film of an overall thickness comprised between 20 and 60 micron. The layer of expanded PE has a density comprised between 15 and 50 g/L.

[0038] This layer of expanded PE, preferably of the LDPE kind, is obtained by means of extrusion with direct injection of expansive gases of the known kind, such as aliphatic hydrocarbons and atmospheric gases, through an annular die. Moreover, during the extrusion of the expanded PE an antistatic additive of the known kind is added.

[0039] The layer of expanded PE can be either closed-cell or open-cell, but will prevalently be closed-cell.

[0040] The perforation of the PE is made by holes that can either be through holes or blind holes - blind holes are preferred - whose diameter is preferably comprised between 0.3 and 1 mm.

[0041] The multilayer sheet is obtained by passing the various layers between the two heated rollers of a calender, kept at a set distance so that each layer will have the same base thickness.

[0042] Basically the overall thickness of the multilayer sheet is equal to the sum of thicknesses of the various base layers that constitute the sheet.

[0043] The calender roller that comes into contact with the layer of expanded PE is kept at a temperature comprised between 80°C and 150°C, whereas the roller that comes into contact with the layer of XPS is kept at a temperature comprised between 60°C and 100°C. The HIPS is added to the calender immediately after having been extruded by means of the method known as extrusion coating.

[0044] The barrier film is fed to the rollers between the layer of expanded PE and the layer of HIPS.

[0045] Alternatively, the barrier film may also be coupled with the layer of expanded PE before being fed to the rollers.

[0046] The multilayer sheet thus obtained is rolled onto a spool for storage and subsequently thermoformed at the moment of manufacturing of the trays.

[0047] The thermoforming step is of the kind known in the field, wherein the sheet is preheated in an oven at a temperature that is above the glass transition temperature TG of the polymers of which it is made. Subsequently it passes through the mould where the trays are made.

[0048] The mould is made in such a manner that during the thermoforming of the tray an upper rim (4) is created that is subjected to such pressure that the thickness of the layer of expanded PE is reduced to at least a quarter of the thickness of the layer of PE of the sheet. By way of example, starting from a multilayer sheet wherein the thickness of the expanded PE is equal to approximately 4 mm, the thickness of the layer of PE along the perimeter edge of the tray will be equal to approximately 1 mm, i.e. a reduction of 3 mm.

[0049] In practice, during the thermoforming of the tray the mould exerts pressure onto the rim of the tray being moulded so that layer of expanded PE of the multilayer sheet is flattened along the rim itself.

[0050] If desired, it is also possible to increase the pressure for the flattening of the rim of the tray during the thermoforming of the latter, to reduce the thickness of the expanded PE to 1/10th of the thickness of the PE of the initial sheet.

[0051] It is preferable that the thickness of the expanded PE along the rim is not greater than 3 mm, and preferably not greater than 1.5 mm, after the thermoforming of the tray has ended.

[0052] It is preferable that the thickness of the expanded PE at the base 2 and at the lateral walls 3 is equal to at least 2 mm.

[0053] In accordance with the present invention, during the thermoforming of the tray the thickness of the layer of expanded PE in the areas other than the upper rim is kept at a thickness that is adequate to ensure the absorption of fluids, in order to obtain the draining effect.

[0054] This is because the mould is made in such a manner that it leaves a calibrated cavity during the thermoforming of the tray.

[0055] Usually during the thermoforming process of the trays the layer of PE at the base and the lateral walls of the tray undergoes a reduction of its thickness with respect to the thickness of that same layer in the initial sheet, but this reduction in thickness is never greater than 50%.

[0056] Overall the final thermoformed tray has a thickness along the rim that is half of the thickness of the layer of PE at the base and walls.

[0057] Naturally it is possible to employ methods that do not modify the thickness of the layer of expanded PE at the walls and base.

[0058] In the present invention the upper rim of the tray is intended to mean that perimeter portion that will be covered by a plastic closing film.

[0059] In practice the multilayer tray has a reduced

thickness along the rim of the layer of expanded PE, the topmost one, that is not greater than half of the thickness of the layer of expanded PE in the other areas of the tray.

[0060] Once the tray has been obtained by means of thermoforming in accordance with the present invention, it is ready to contain a food product that releases fluids, such as meat. The food product will be in direct contact with the layer of perforated expanded PE, which will collect the fluid exuded during the preservation period.

[0061] In order to ensure the food product is preserved, the tray containing the product is sealed with a plastic closing film 5 to form a closed package, generally indicated by 10 in figure 3.

[0062] The plastic closing film is applied to the tray along the upper rim through heat-sealing, by known technical methods of the field, with a heat-sealer.

[0063] The plastic closing film 5 consists of polyethylene PE or of multilayer barrier films of the kind usually employed in packaging in modified atmosphere (MAP) and with a sealing layer in PE.

[0064] The plastic closing film 5 preferably has a thickness comprised between 8 and 150 micron.

[0065] More particularly, during the steps of sealing the plastic sealing film 5 onto the rim 4 of the tray, the layer of expanded PE along the rim, already flattened following the step of thermoforming the tray, is compressed even more and heated up to the point where the expanded structure of the layer of expanded PE collapses and it fuses with the plastic closing film, thus creating a continuity of material between the layer of plastic closing film and the barrier film.

[0066] Basically only the layer of expanded PE along the rim of the tray is compressed in such a way that the plastic closing film and the barrier film of the tray are joined together with the layer of compressed and collapsed expanded PE placed in-between.

[0067] In this manner continuity is obtained between the barrier film and the plastic closing film that forms a kind of closed bag with the food product placed on the expanded PE inside it.

[0068] In effect the layer of expanded PE outside of the upper rim of the tray is not modified in any way during the sealing of the plastic closing film.

[0069] The layers underneath the barrier film - HIPS and XPS - in fact form a rigid external support to this closed bag.

[0070] With this configuration there is an ensured barrier against the passage of gas comprised between 0.02 and 1 cc/pack*day*bar OTR (oxygen transmission rate).

[0071] The liquid retention capacity of the layer of perforated PE is equal to approximately 200-3000 g/m² of water.

[0072] As will be appreciated from the above, the multilayer tray according to the present invention with draining effect for food products that exude liquids makes it possible to meet the requirements and overcome the drawbacks described in the introduction of this description with reference to the prior art.

[0073] In effect the tray according to the present invention makes it possible to retain fluids exuded by food products without the need to employ a pad inside the tray and makes it possible to perform the function of barrier through the application of a closing layer made of PE of the known kind, with a resultant cost reduction in comparison with prior methods.

[0074] Obviously, in order to meet specific and contingent needs it is possible for a person skilled in the art to apply to the findings described above numerous modifications and variations, which, however, all fall within the scope of protection of the invention as defined by the following claims.

Claims

1. Multilayer tray with draining effect having a base (2), lateral walls (3) and an upper rim (4), **characterized in that** said tray is formed of a multilayer material comprising, in succession from the outside inwards: one outermost layer of extruded expanded closed-cell polystyrene (XPS), one layer of a multilayer plastic barrier film with barrier-forming properties against the passage of gases, and one innermost layer of expanded polyethylene (PE) having a plurality of perforations to be able to accommodate in its interior the fluids released by a food product placed in the tray, in which the thickness (d) of the layer of expanded PE exclusively along the upper rim (4) of the tray does not exceed half of the value of the thickness (D) of the layer of expanded PE of the base (2) and/or of the lateral walls (3) of the tray.
2. Tray according to claim 1, wherein a layer of high-impact polystyrene (HIPS) is placed between the layer of expanded extruded polystyrene (XPS) and the layer of plastic barrier film.
3. Tray according to claim 1 or 2, wherein the layer of barrier film has a sealing layer of PE on the side that is placed in contact with the layer of expanded PE.
4. Tray according to any of the previous claims, wherein the thickness of the layer of expanded PE along the rim is less than 3 mm.
5. Tray according to any of the previous claims, wherein the thickness of the expanded PE at the base and walls is at least 2 mm.
6. Packaging with draining/blocking effect for a food product that is prone to release fluids, consisting of a tray in accordance with any of the previous claims and comprising a multilayer plastic closing film (5) with a sealing layer of polyethylene (PE) adhering to the entire upper rim of the tray, wherein exclusively along the rim of the tray to which the plastic closing

film (5) adheres, the layer of expanded polyethylene (PE) is compressed to such an extent that the layers of the closing film and of the barrier film, with the layer of compressed and collapsed expanded PE placed in-between, are joined together.

7. Method for the realization of a multilayer tray with draining effect comprising the steps of:

forming a multilayer sheet by feeding a calender, consisting of a pair of heated rollers, with the following layers placed face to face in the following order:

- expanded polyethylene (PE) having a plurality of holes;
- plastic barrier film having barrier-forming properties against the passage of gases, with a sealing layer of PE on the side placed in contact with the layer of expanded PE;
- extruded expanded closed-cell polystyrene (XPS);

once the multilayer sheet has been obtained, the next step is the thermoforming of the tray, wherein the multilayer sheet is fed into a mould where it is formed into a tray with a base, lateral walls and an upper rim, the mould exerting such pressure on the sheet during the forming of the tray that the thickness of the layer of expanded polyethylene (PE) exclusively along the upper rim of the tray, does not exceed half of the value of the thickness of expanded PE at the base and/or the lateral walls of the thermoformed tray.

8. Method according to claim 7, wherein the pressure exerted by the mould determines a thickness of the layer of expanded PE along the rim of the tray of less than 3 mm, and a thickness of the expanded PE at the base and/or lateral walls equal to at least 2 mm.
9. Method according to claim 7 or 8, wherein the roller of the calender that comes into contact with the layer of expanded PE is kept at a temperature comprised between 80°C and 150°C, whereas the roller that comes into contact with the layer of XPS is kept at a temperature comprised between 60°C and 100°C.
10. Method for the realization of multilayer packaging with draining/blocking effect comprising the realization of a tray according to the method of any of the previous claims 7-9, wherein to said thermoformed tray a plastic multilayer closing film (5) with a sealing layer of polyethylene (PE) is heat-sealed along the upper rim of the tray by means of a heat-sealing machine, during the heat-sealing step the layer of expanded polyethylene (PE) of the tray is compressed and heated so that the cellular structure of the ex-

panded PE is made to collapse and a continuity of material is created between the plastic closing film (5) and the barrier film, with the layer of compressed and collapsed expanded PE in-between.

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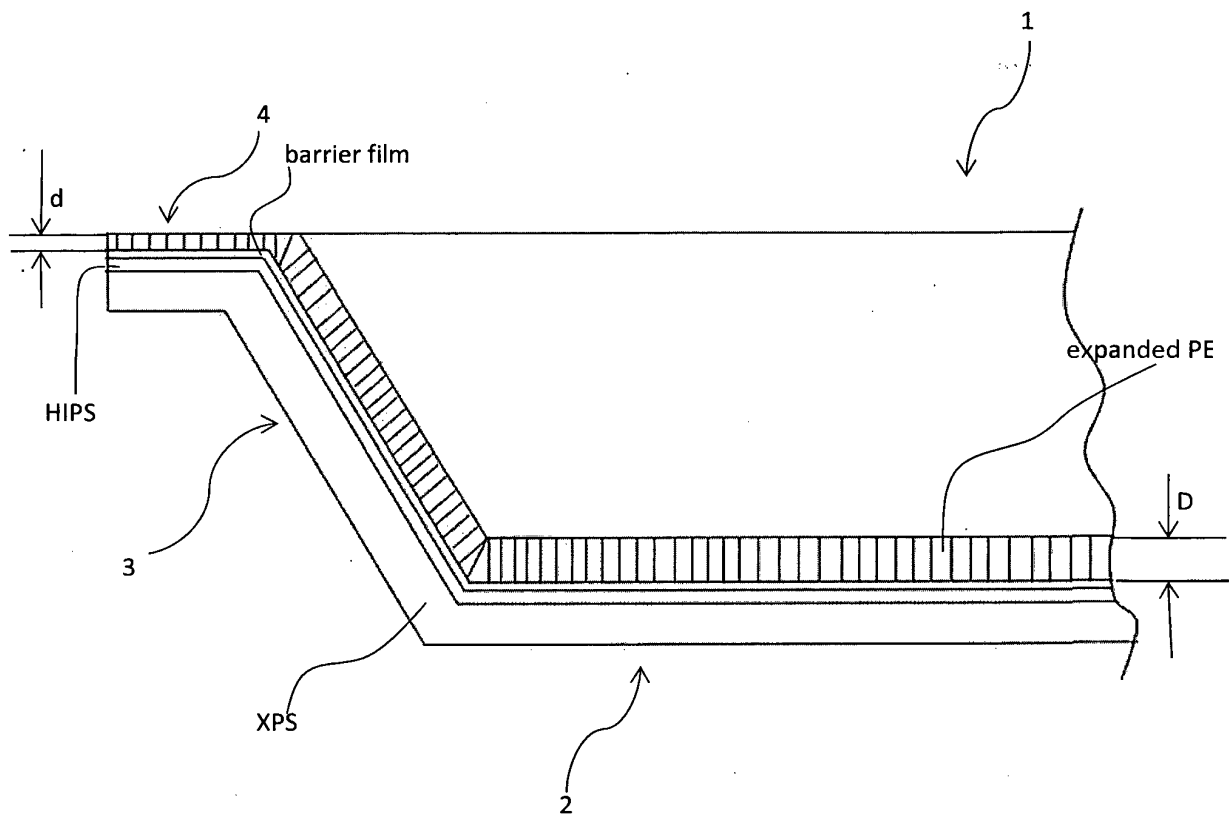


FIG. 1

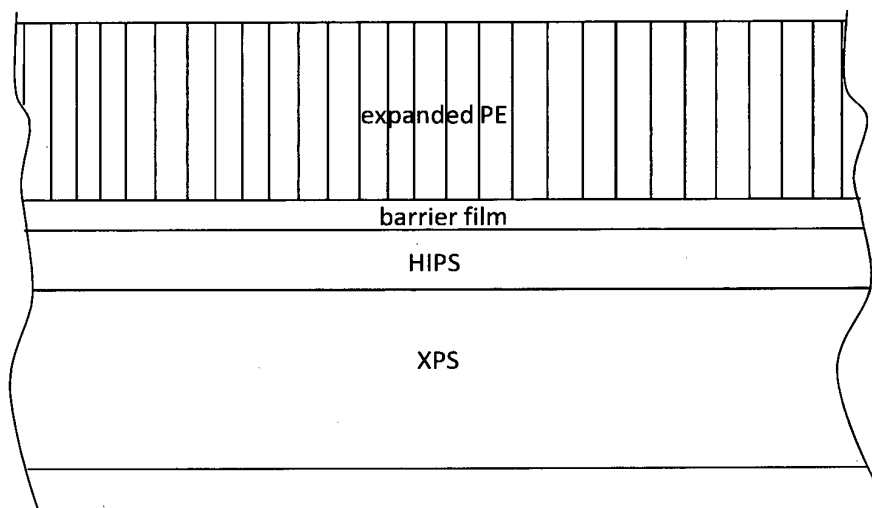


FIG. 2

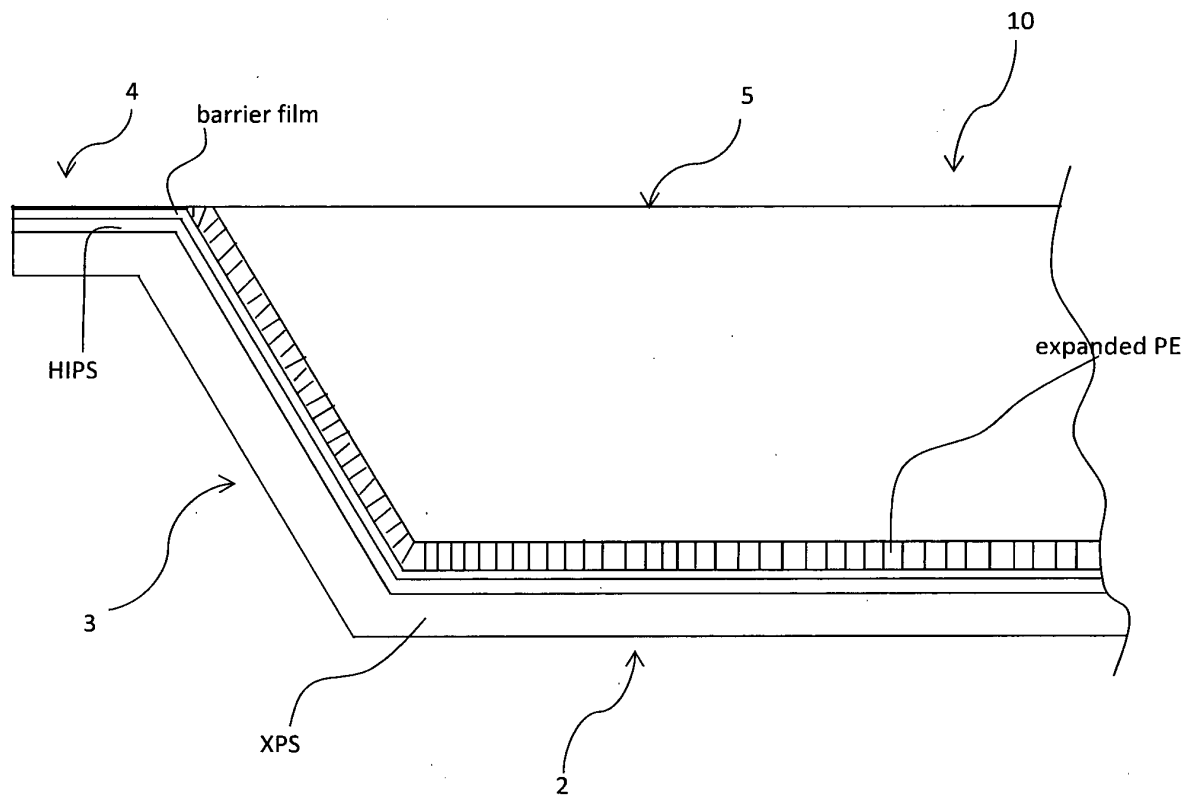


FIG. 3



EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 16 June 2015	Examiner Newell, Philip
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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