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

(11) **EP 2 540 634 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.01.2013 Bulletin 2013/01

(51) Int Cl.:
B65D 1/34 *(2006.01)* ***B65D 81/20*** *(2006.01)*
B65D 81/26 *(2006.01)*

(21) Application number: **11172001.7**

(22) Date of filing: **29.06.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(54) **Food packaging container**

(57) The present invention provides a food packaging container (10) for packaging a fluid-exuding and oxygen sensitive food item (5) in a modified atmosphere (4) and a method for packaging a food item (5) in a modified atmosphere (4). The food packaging container (10) includes a permeable film (2) positioned elevated above a bottom (11) of a tray (1) and a plurality of micro-perforations (21) created in the permeable film (2). By placing the food item (5) on the elevated permeable film (2) in contact with the micro-perforations (21), circulation of the modified atmosphere (4) within food packaging container (10) is improved as well as the contact of the food item (5) with the modified atmosphere (4), which leads to a suppression of bacterial growth on the food item (5) and, thus, to an extended shelf life and improved quality of food item (5).

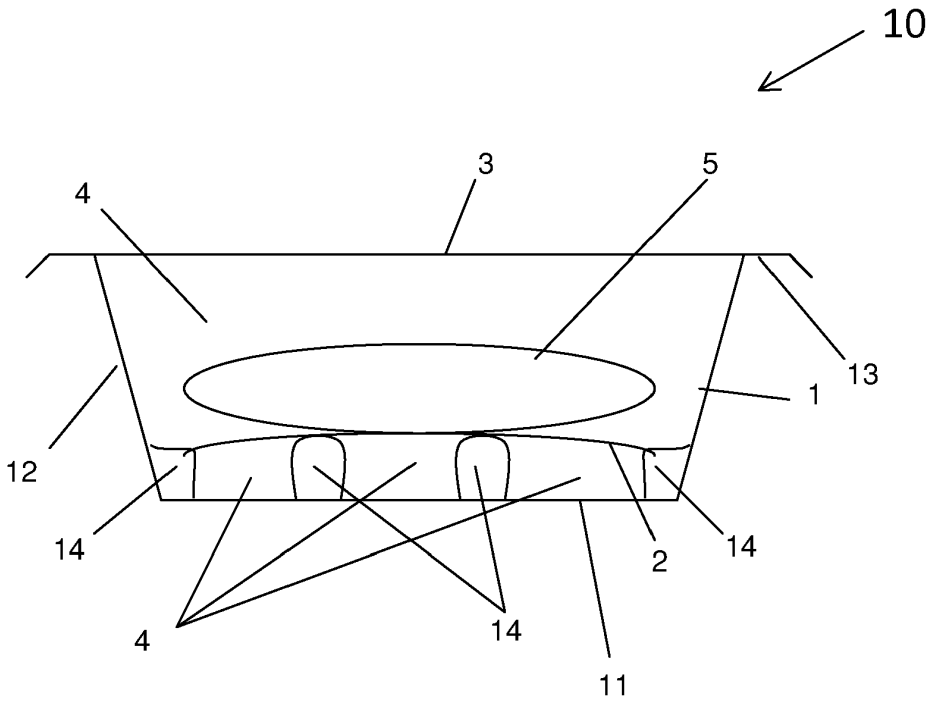

Fig. 1

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Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention relates to food packaging containers and, more particularly, to containers for packaging fluid-exuding and oxygen sensitive foods and a method for packaging food items in a modified atmosphere.

BACKGROUND OF THE INVENTION

[0002] It is common practice to store and display perishable food items, such as raw meat, fish, or fresh poultry, in individual packages, such as a container with an absorbent pad placed underneath the food item to absorb any juices or liquids, such as blood, exuded from the food product. Instead of the absorbent pad, such containers may contain a grid of relatively narrow grooves integrated into the bottom of the container that hold the exuded fluids through a capillary effect. In both cases, a relatively large area of the food item is in contact with the absorbent pad or the exuded fluids, respectively.

[0003] To avoid that, the European Patent EP 1 546 003 B1, for example, provides a membrane including perforations to allow liquid to flow through the membrane and then be absorbed by the pad. The membrane is positioned above the bottom of the container creating two chambers such that solid elements and liquid elements are separated from each other. The perforations are relatively large to allow an unrestricted flow of fluid and are preferably positioned in the vicinity of the container walls rather than the central portion of the membrane.

[0004] Since the use of an absorbent pad suffers from various disadvantages from adding extra cost intensive steps into the production line to aesthetic and hygiene concerns, receptacles for packaging food products exuding fluids manufactured as a laminate have been introduced, for example, in the European Patent EP 1404 589 B1. Here, an absorbing layer is positioned on top of a support layer or between a support layer and a food-contact perforated layer.

[0005] Often, food packaging containers are top sealed with a transparent or translucent thermoplastic film and may possess gas-barrier properties. Before sealing the container, air is typically suctioned out und a gas mixture is introduced into the container to create a modified atmosphere. It is well known that the shelf life of perishable foods can be extended by packaging them in a modified gaseous environment. For example, packaging fresh meat products in an oxygen poor gaseous environment can extend their shelf life. For fresh cut meats, exposure to an ambient oxygen atmosphere causes the proteins contained in the meat to oxidize, thus, turning the meat color from a bright red to a brown color. In addition, the growth of bacteria is enhanced by the presence of ambient oxygen. This combination of color change and bacteria growth renders the meat product unfit for sale typically after 3-5 days. The shelf life of the meat product can be extended by storing the fresh cut meat in an atmosphere of combinations of carbon dioxide and nitrogen as well as high and low levels of oxygen in combination with nitrogen. A problem with packaging containers commonly used is that the gas only reaches the parts of the food item that are not in contact with the packaging.

SUMMARY OF THE INVENTION

[0006] It is an object of the present invention to provide a modified atmosphere food packaging container and method of making the same useful for an improved preservation and shelf life extension of fluid-exuding and oxygen sensitive food items. An advantage of embodiments of the present invention is that the food item in the container has a prolonged shelf life. An advantage of embodiments of the present invention is that the food item is elevated above any exuded fluid by providing a permeable film within the container. A further advantage of embodiments of the present invention is that the gas mixture creating the modified atmosphere comes in contact with the food item almost entirely by providing the relatively thin permeable film including a relatively high number of relatively small apertures, such as laser-cut micro-perforations, that allow the gas to flow through while the food item is supported by the film. A still further advantage of the present invention is that the exuding fluid flows into the space below the permeable film through openings between the film and the walls of the container. The exuding fluid is there contained by a capillary effect in a grid of relatively narrow groves.

[0007] By placing a food item on a permeable film in an elevated position above the bottom of a tray and in contact with perforations included in the permeable film, circulation of a modified atmosphere within the food packaging container in accordance with embodiments of the present invention is improved as well as the contact of the food item with the modified atmosphere, which leads to a suppression of bacterial growth on the food item and, thus, to an extended shelf life and improved quality of the food item, and prevents discoloration.

[0008] Embodiments of the present invention utilize a permeable film positioned elevated above a bottom of a tray and a plurality of micro-perforations created in the permeable film. A food item is placed on the permeable film in contact with the micro-perforations such that the modified atmosphere is in contact with the food item via the micro-perforations.

[0009] Preferably, the bottom of the tray includes a plurality of supports or feet extending upwards into a chamber for receiving the food item. The permeable film is preferably positioned on top of the supports or feet and attached to the feet. A gas transport layer is provided by these means underneath the permeable film.

[0010] Preferably, the permeable film is a peelable film having a thickness of less than 100 microns. The permeable film has preferably a thickness from about 30 to

about 50 microns. In embodiments of the present invention, the permeable film has a surface area that is smaller than the surface area of the bottom of the tray for creating openings between the outer circumference of the permeable film and the side walls of the tray. The permeable film is preferably curved such that the median of the film is the highest point.

[0011] Preferably, the micro-perforations are produced by laser perforating. For example, about five million micro-perforations are preferably placed per square meter. Alternatively, other methods may be used.

[0012] In embodiments of the present invention, the bottom of the tray includes a grid of narrow grooves holding fluid exuded from the food item through a capillary effect. Furthermore, the tray includes side walls circumferentially and upwardly extending from the bottom and the side walls include a rim. A sealable film is preferably attached to the rim.

[0013] Preferably, a gas mixture is introduced into a chamber formed by the tray to create the modified atmosphere.

[0014] In accordance with embodiment of the present invention, bacterial growth on the food item is suppressed due to circulation of the gas mixture through the micro-perforations, the food item maintains its color in the areas where the food item is in contact with the permeable film, and the food item has a prolonged shelf life. The gas circulation occurs through the gas transport layer.

[0015] The present invention further provides a method for packaging a food item in a modified atmosphere, the method comprising the steps of: placing the food item on a permeable film positioned elevated within a food packaging container to thereby form a gas transport layer, the permeable film including a plurality of micro-perforations; introducing a gas mixture to create the modified atmosphere within the food packaging container; and contacting the food item with the gas mixture via the gas transport layer and through the micro-perforations.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a schematic side view of a food packaging container, in accordance with an embodiment of the present invention;

Fig. 2 is a schematic view of a permeable film, in accordance with an embodiment of the present invention;

Fig. 3 is a graph of the total bacterial count over time of various chicken pieces packaged in a prior art container; and

Fig. 4 is a graph of the total bacterial count over time of various chicken pieces packaged in a container, in accordance with an embodiment of the present invention.

[0017] Corresponding reference characters indicate corresponding parts throughout the several views. The exemplification set out herein illustrates exemplary embodiments of the invention, in one form, and such exemplification is not to be construed as limiting the scope of the invention in any manner.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0018] The present invention will be described with respect to particular embodiments and with reference to certain drawings, but the invention is not limited thereto but only by the claims. The drawings described are only schematic and are non-limiting. In the drawings, the size of some of the elements may be exaggerated and not drawn on scale for illustrative purposes. Where the term "comprising" is used in the present description and claims, it does not exclude other elements or steps. Furthermore, the terms first, second, third and the like in the description and in the claims, are used for distinguishing between similar elements and not necessarily for describing a sequential or chronological order. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other sequences than described or illustrated herein.

[0019] Referring to Fig. 1, a food packaging container 10 is illustrated in accordance with an embodiment of the present invention. Food packaging container 10 includes a tray 1 having a bottom 11 and side walls 12 circumferentially and upwardly extending from bottom 11. Bottom 11 and side walls 12 form a chamber for receiving a food item 5. The upper end of side walls 12 may be formed as a flat rim 13. Bottom 11 may have a substantially rectangular, square, round, or oval shape. A grid of relatively narrow grooves (not shown) is preferably integrated into bottom 11 to enable capturing and holding fluids exuded from food item 5 through a capillary effect, as is well known in the art. The use of an absorbent pad for collection of the exuded fluids may not be desirable in order to enable a better control over the gas concentration within tray 1. Tray 1 may further include a plurality of supports or feet 14 attached to, resting on, or integrated into bottom 11, supports or feet 14 extending upwards into the chamber for receiving food item 5. All supports or feet 14 may have the same height or the supports or feet 14 positioned in the proximity of the center of bottom 11 may have a greater height than the supports or feet proximate to the edges of bottom 11. Tray 1 may be made from a thermoplastic polymer resin, such as polystyrene PS, polyethylene terephthalate PET (including amorphous APET and PETG) or polypropylene PP by a thermoforming process, vacuum forming or injection molding or any other plastic processing method suitable for food packaging. A preferred material in accordance with embodiments of the present invention is a barrier against oxygen, water, carbon dioxide, and nitrogen, for example

PET. PET is known to be an effective barrier against oxygen, water, carbon dioxide, and nitrogen. Food item 5 may be a perishable food item and, especially, a fluid-exuding and oxygen sensitive food item, such as, for example, raw meat, fish, or fresh poultry.

[0020] Still referring to Fig. 1, food packaging container 10 may further include a permeable film 2 positioned on top of the supports or feet 14 and bonded to the supports or feet 14. Any suitable bonding technique that is compatible with food packaging. Thermal bonding is a preferred method but other methods can be used such as ultrasonic welding. Permeable film 2 may be a peelable or non-peelable film. Depending on the height of the supports or feet 14, permeable film 2 may be straight or curved (as shown in Fig. 1). Food packaging container 10 is adapted so that a food item 5 may be placed on permeable film 2. Food packaging container 10 may still further include a sealable film 3 that may be a transparent or translucent thermoplastic film, for example. Sealable film 3 may be attached to rim 13 by any suitable means that is compatible with food packaging, such as thermobonding to seal tray 1. Before completely bonding sealable film 3 to rim 13, the air may be suctioned out from the chamber formed by bottom 11 and side walls 12 of tray 1 and a gas mixture may be consecutively introduced into the chamber to create a modified atmosphere 4. The introduced gas mixture may contain carbon dioxide, oxygen, and nitrogen. A preferred gas mixture in accordance with the embodiments of the present invention may contain about 70-76% of oxygen and about 24-30% of carbon dioxide. Other gas mixtures are contemplated within the scope of the present invention if food regulations so require.

[0021] Permeable film 2, as illustrated in Fig. 2, in accordance with an embodiment of the present invention, may include a plurality of perforations 21 and may have a shape similar to that of bottom 11. When food item 5 is placed on permeable film 2, food item 5 comes in contact with perforations 21. Permeable film 2 may be relatively thin by having a thickness of less than 100 microns. A preferred thickness of permeable film 2 is about 30 to 50 microns. Perforations 21 may be positioned over the entire surface area of permeable film 2. Perforations 21 may be micro-perforations produced by laser perforating. Alternatively, other methods may be used. For example, about five million micro-perforations are preferably placed per square meter.

[0022] Perforations 21 are preferably too small for fluids such as meat fluids, blood, aqueous food exudates, water etc. to flow through and are, therefore, only used for the gas circulation. By providing many perforations 21 and at a high density, the gas circulation through the permeable film 2 is improved and modified atmosphere 5 will come in contact with substantially the entire surface area of food item 5 positioned on permeable film 2. This leads to an improved quality and increased shelf life of food item 5.

[0023] Permeable film 2 may be sized to have a slightly smaller surface area than bottom 11 of tray 1 leaving openings between the outer circumference of permeable film 2 and side walls 12. The fluid exuding from food item 5 may flow through these openings into the space between bottom 11 and permeable film 2. It may be advantageous if the height of supports or feet 14 is arranged in a matter that permeable film 2 is curved such that the median of film 2 is the highest point, as indicated in Fig. 1. Accordingly, fluids exuded from food item 5 may be relatively quickly drained into the space below permeable film 2 where they may be captured and held by a grid of grooves through capillary effects.

[0024] As can be seen by comparing the total bacterial count over time of various chicken pieces packaged in a prior art food container, (as shown in Fig. 3), with the total bacterial count over time of various chicken pieces packaged in food container 10 in accordance with an embodiment of the present invention, (as shown in Fig. 4), the bacterial growth in food packaging container 10 in accordance with an embodiment of the present invention can be suppressed or reduced. Thus, the shelf life of the examined food items 5 (chicken filet, chicken wings, chicken sausages, and chicken gyros) can be prolonged. The gas mixture used in the experiments to create modified atmosphere 4 contains about 70-76% of oxygen and about 24-30% of carbon dioxide. While the food items packaged in the prior art food container reached a critical count of the total bacterial count of 10,000,000 after 8 to 9 days and would need to be taken off the shelves at this point of time, the food items 5 packaged in the food container 10 in accordance an embodiment of the present invention did not reach the critical count of the total bacterial count of 10,000,000 even after 11 days. Further experiments have shown that the shelf life of food items 5 packaged in the food container 10 in accordance with embodiments of the present invention may be extended up to 16 days. This may be considered an unexpected result. Accordingly, using the food packaging container 10 in accordance with embodiments of the present invention for packaging and displaying food items 5 in modified atmosphere 4 increases the shelf life and, therefore, the quality of food item 5 due to bacteria growth suppression. Additionally, no discoloration of food item 5 in the areas where contact was made with permeable film 3 was observed. This improves the aesthetic appearance of food item 5. Therefore, by placing food item 5 on permeable film 2 in an elevated position above bottom 11 of tray 1 and in contact with perforations 21, circulation of modified atmosphere 4 within food packaging container 10 is improved as well as the contact of food item 5 with modified atmosphere 4, which leads to a suppression of bacterial growth on the food item 5 and, thus, to an extended shelf life and improved quality of food item 5.

[0025] The invention is not limited to the embodiments described herein, which may be modified or varied without departing from the scope of the invention.

Claims

1. A food packaging container (10) for packaging a fluid-exuding and oxygen sensitive food item (5) in a modified atmosphere (4), comprising:

   a permeable film (2) positioned elevated above a bottom (11) of a tray (1);
   a plurality of micro-perforations (21) created in said permeable film (2);
   wherein food packaging container (10) is adapted so that the food item (5) is placeable on said permeable film (2) within the container (10) in contact with said micro-perforations (21);and
   wherein the modified atmosphere (4) is contactable with the food item (5) via said micro-perforations (21).

2. The food packaging container (10) of claim 1, wherein said bottom (11) of said tray (1) includes a plurality of supports (14) extending upwards into a chamber for receiving said food item (5), and wherein said permeable film (2) is positioned on top of said supports (14) and attached to said supports (14).

3. The food packaging container (10) of claims 1 or 2, wherein said permeable film (2) is a peelable or non-peelable film.

4. The food packaging container (10) according to any previous claim, wherein said permeable film (2) has a thickness of less than 100 microns.

5. The food packaging container (10) according to any previous claim, wherein said permeable film (2) has a thickness of about 30 to about 50 microns.

6. The food packaging container (10) according to any previous claim, wherein said permeable film (2) has a surface area that is smaller than the surface area of said bottom (11) of said tray (1) for creating openings between the outer circumference of said permeable film (2) and side walls (12) of said tray (1).

7. The food packaging container (10) according to any previous claim, wherein said permeable film (2) is curved such that the median of said permeable film (2) is the highest point.

8. The food packaging container (10) according to any previous claim, wherein said micro-perforations (21) are produced by laser perforating.

9. The food packaging container (10) according to any previous claim, wherein about five million of said micro-perforations (21) are placed per square meter.

10. The food packaging container (10) according to any previous claim, wherein said bottom (11) of said tray (1) includes a grid of narrow grooves for holding fluid exuded from the food item (5) through a capillary effect.

11. The food packaging container (10) according to any previous claim, wherein said tray (1) further includes side walls (12) circumferentially and upwardly extending from said bottom 11, wherein said side walls (12) include a rim (13), and wherein a sealable film (3) is attached to said rim (13).

12. The food packaging container (10) according to any previous claim, wherein a gas mixture is in a chamber formed by said tray (1) to create the modified atmosphere (4).

13. The food packaging container (10) according to claim 12, wherein bacterial growth on the food item (5) is suppressed due to circulation of said gas mixture through said micro-perforations (21).

14. The food packaging container (10) according to any previous claim, wherein the said permeable film is adapted so that the food item (5) maintains its color in the areas where the food item (5) is in contact with said permeable film (2).

15. A method for packaging a food item (5) in a modified atmosphere (4), comprising the steps of:

   placing the food item (5) on a permeable film (2) positioned elevated within a food packaging container (10) to form a gas transport layer, the permeable film (2) including a plurality of micro-perforations (21);
   introducing a gas mixture to create the modified atmosphere (4) within said food packaging container (10); and
   contacting the food item (5) with said gas mixture via said gas transport layer and through said micro-perforations (21).

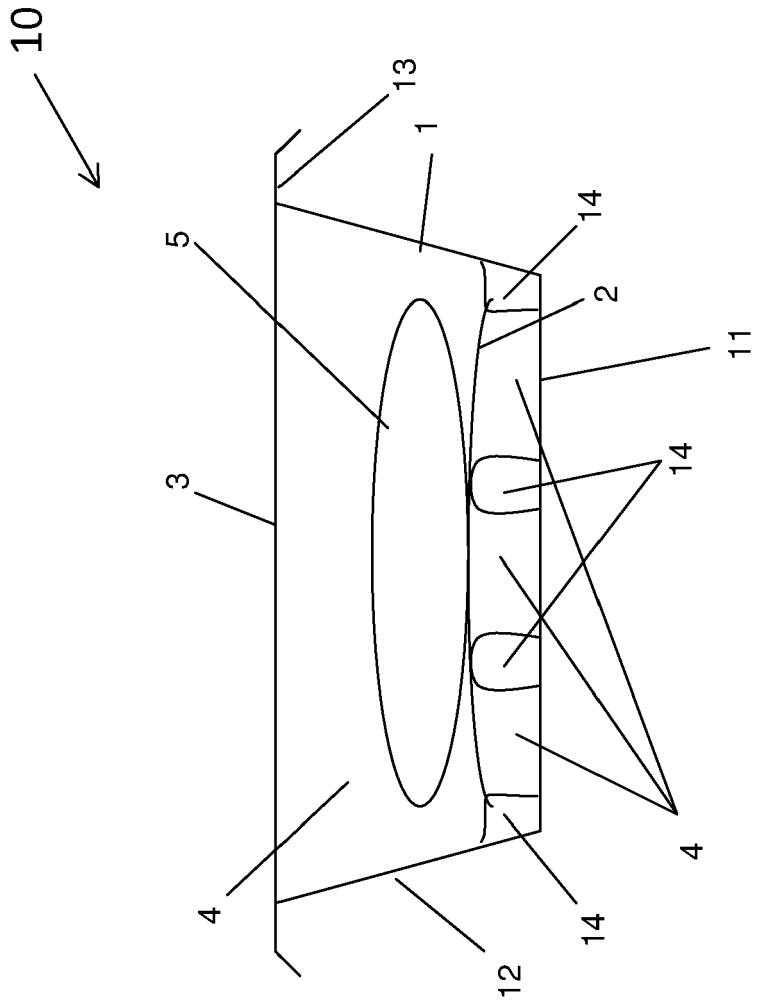


Fig. 1

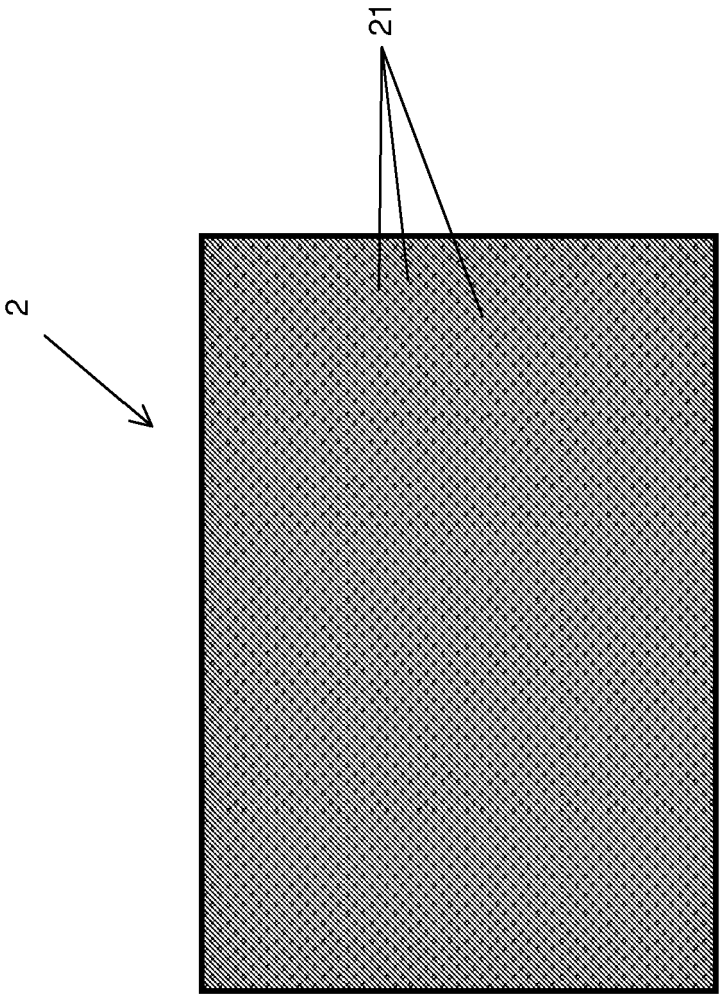
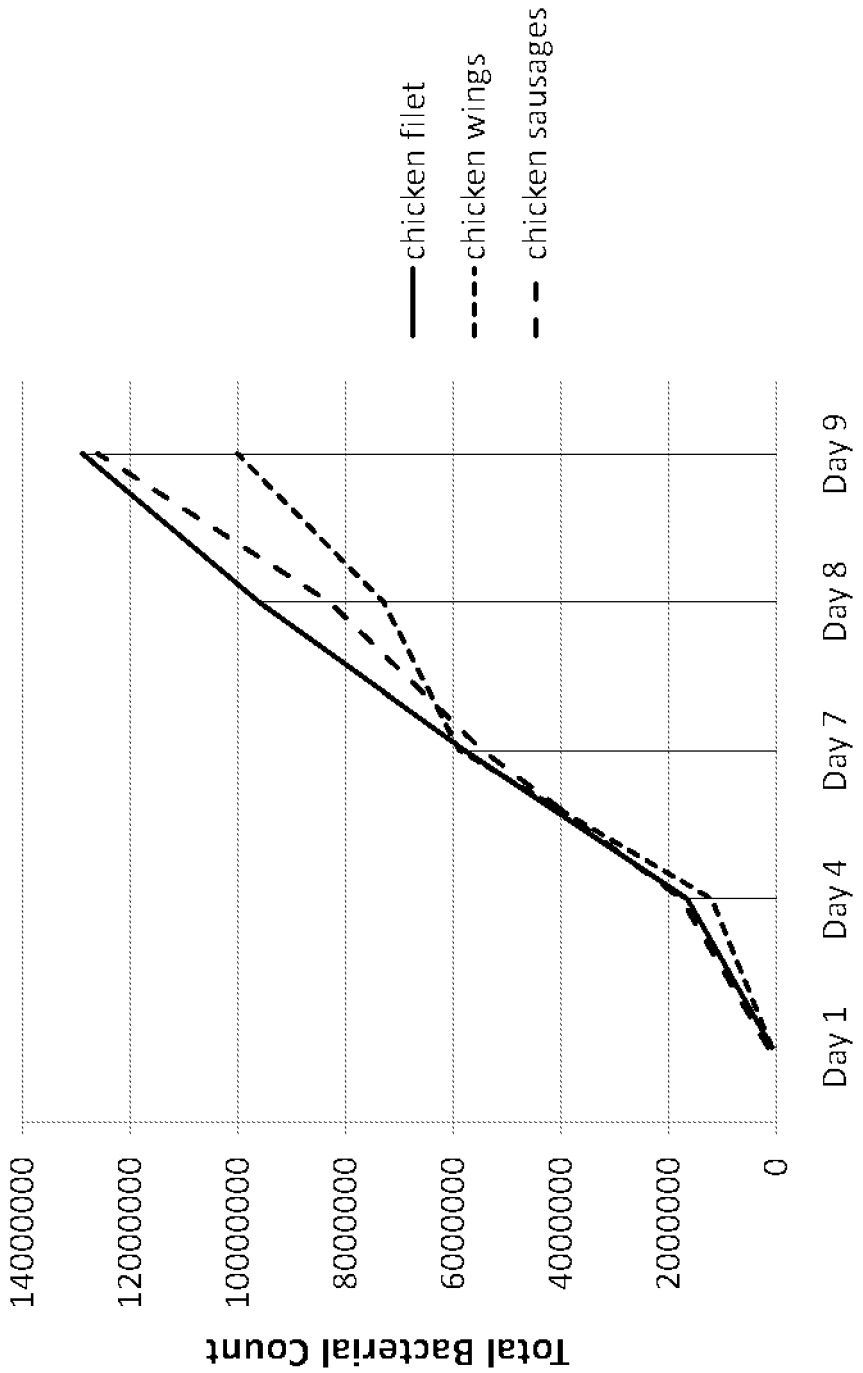


Fig. 2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chicken wings
chicken sausages
Total Bacterial Count
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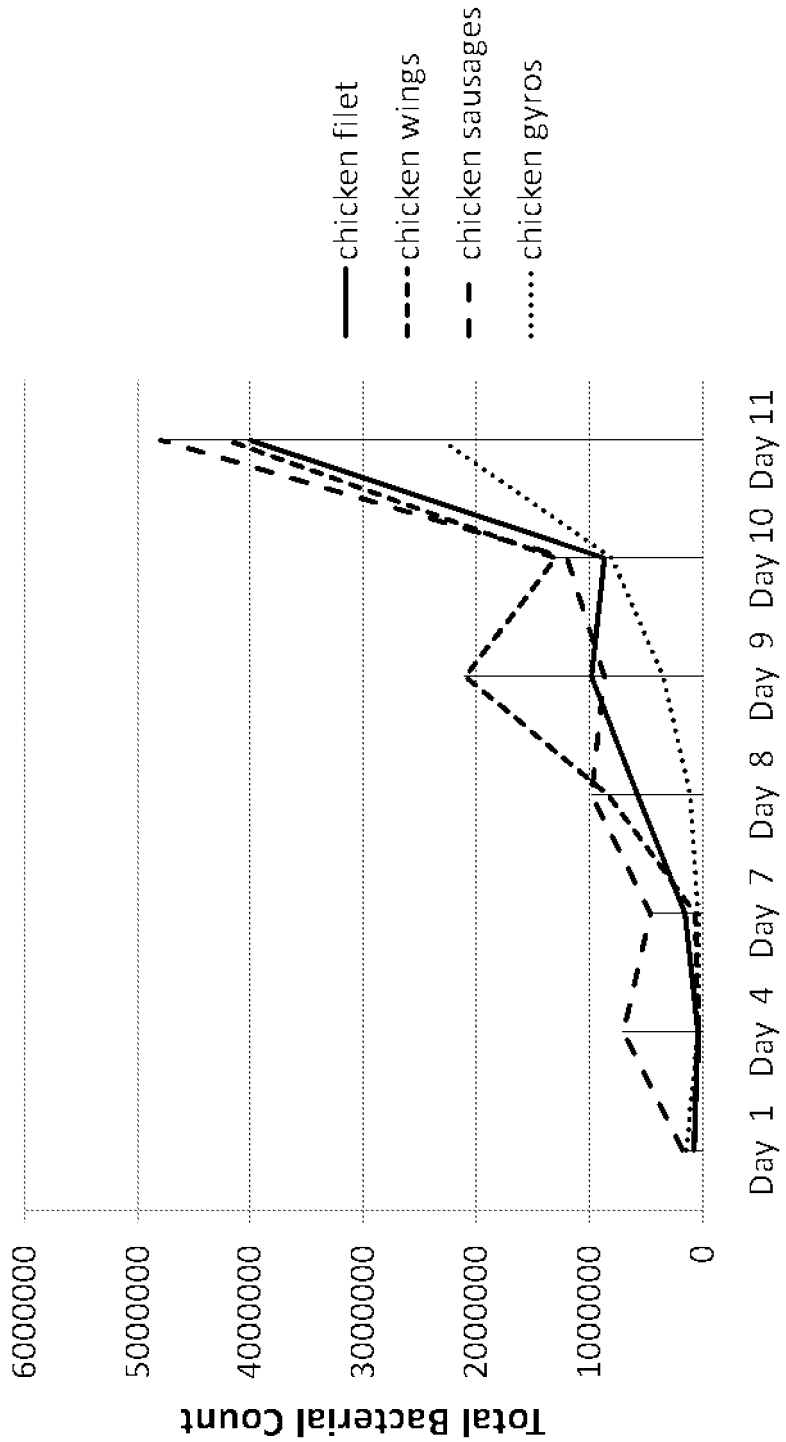
8000000
6000000
4000000
2000000
0
Day 1
Day 4
Day 7
Day 8
Day 9
Time

Fig. 3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chicken sausages
chicken gyros
Total Bacterial Count
6000000
5000000
4000000
3000000
2000000
1000000
0
Day 1
Day 4
Day 7
Day 8
Day 9
Day 10
Day 11
Time

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 11 17 2001

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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	28 November 2011	Jervelund, Niels

CATEGORY OF CITED DOCUMENTS

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