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(54) Method for valve protection during heat-treatment process and self-venting pouches with valve-protection mechanism

(57) The present invention relates to a method for the protection of self-venting packaging for shelf-stable products that will be subjected to a heat treatment process in an autoclave, said packaging comprising an overpressure valve, said method comprising the steps of maintaining the overpressure valve closed by protection means during the heat treatment process.

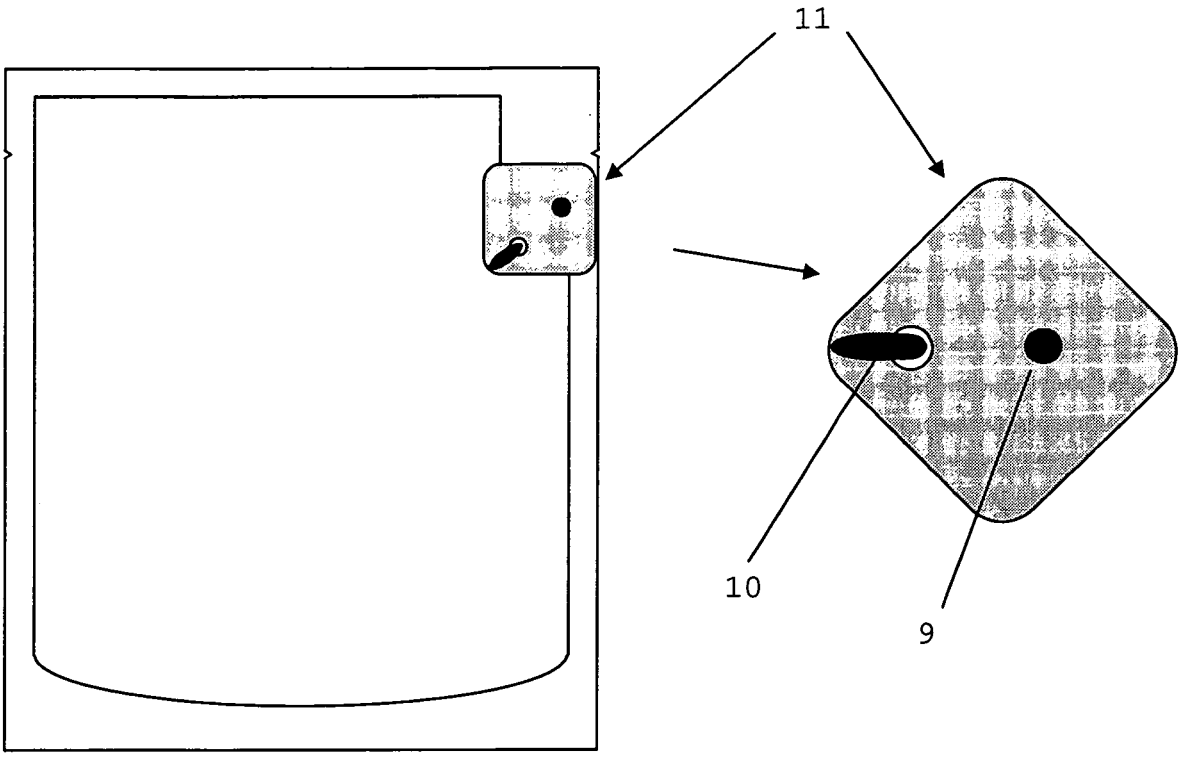

Fig. 4

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Description

Field of the invention

[0001] The present invention relates to self-venting packaging, in particular to a method for the protection of overpressure valves on packaging that will be subjected to a heat treatment in autoclaves.

State of the Art

[0002] The demand for ready meals which only have to be reheated is constantly growing. Such ready meals are often packed in suitable packaging such as trays with a lidding film or in pouches.

[0003] For reasons of convenience, microwave heating is the preferred way to reheat this kind of meals.

[0004] To avoid bursting when the hermetically packed product is heated, conventional trays or pouches have to be at least partially opened or for instance perforated to allow the steam to escape when the meal becomes hot and the contained water transforms to vapour.

[0005] Mainly to avoid the necessity of opening before heating, several valve systems integrated in the packaging (in the laminate, add-ons or additional seals) have been developed, which allow heating for example vegetables or ready-meals just by putting them in the microwave oven. These systems have advantages like a steam-cooking effect, less humidity loss or an indication that the product is hot by an opening noise of the valve.

[0006] WO 2004/048225 describes a valve system which is integrated in the laminate and opens in a non-destructive way via steam pressure building up in the pack during heating.

[0007] In EP1357054, plastic valves are described which are for example sealed on a lidding film. The valves can open and close in a non-destructive way as well at a defined overpressure in the packaging. Those systems are sensitive and open at overpressures typically well below 100 mbar and as the tightness of the valve is based for instance on a liquid between two films or a gasket. Therefore, those valve systems are not suitable for sterilisation in an autoclave as for shelf-stable products since any stronger deformation caused by mechanical forces or by heat can cause burst packs.

[0008] Although self-venting packs for chilled or frozen food are already well established, only very few ready meals which are typically sterilised in an autoclave have been introduced in the market. The difficulty involved with these packs is that a valve for such an application has to stay closed during the autoclave operation at about 100 to 130°C, preferably at about 120 to 130°C, where overpressures are much higher than 100 mbar.

[0009] At the same time, the basic request for a self-venting pack is to open at temperatures above 100°C by the water vapour pressure inside the pack created during microwave heating. In general, the opening pressure of the valve has to be significantly lower than the burst pressure of the pack under the same conditions, otherwise the pack would break.

[0010] It is therefore difficult to conciliate a good resistance of the overpressure valve during a sterilisation process and an easy opening of the same valve during microwave reheating.

[0011] To get a shelf-stable and safe product (commercial sterile), the temperature in an autoclave is typically higher than 121°C (Buchner N.: Verpackung von Lebensmitteln, Berlin: Springer, 1999).

[0012] To avoid that the flexible packs expand and even burst during the heat treatment, an appropriate counterpressure is generally applied. As the water vapour pressure in the autoclave is changing during the sterilisation cycle (heating-up, sterilisation at constant temperature and cooling), the counterpressure has to be adjusted in order to avoid the blowing up and collapsing of the packs as much as possible to prevent any damage (Campden & Chorleywood Food Research Association Group: *Guidelines on good manufacturing practice for heat processed flexible packaging*, Guidelines No. 50, Chipping Campden: 2006).

[0013] Beside the pressure control, the right filling - not too much air and/or product - as well as an appropriate positioning of the packs in the retort trays is essential as this can create uncontrolled overpressure inside the packs. It is therefore difficult to regulate all the parameters to avoid any opening of self-venting pouches.

[0014] Because of the potential stress due to the pressure during processing, valve systems for retort applications have nevertheless higher opening overpressures (significantly above 100 mbar) because of the compromise between functionality (opening in the microwave at lower pressure) and potential risk of preopening during the sterilisation process.

[0015] Despite several solutions for self-venting packs that can be processed in an autoclave, the problem of the compatibility of overpressure valves with changing sterilisation conditions are still not completely solved. The main reason is the high sensitivity to pressure, which makes sterilisation processing very demanding and can cause significant amounts of waste.

[0016] In addition to the waste caused by open or nearly-open packs, food safety can become an issue in case that open pouches are not detected and released into the market.

Aims of the Invention

[0017] The present invention aims to provide a solution that overcomes the drawbacks of the prior art, and in particular a method for the protection of overpressure valves on shelf-stable self-venting packs subjected to a sterilizing heat treatment.

[0018] The present invention also discloses a packaging comprising a one-way valve protection clamp for a sterilizing heat treatment, said packaging keeping its self-venting function after unlocking the clamp.

Summary of the Invention

[0019] The present invention discloses a method for the protection of self-venting packaging for shelf-stable products that will be subjected to a heat treatment process in an autoclave, said packaging comprising an overpressure valve, said method comprising the steps of maintaining the overpressure valve closed by protection means during the heat treatment process.

[0020] Particular embodiments of the method of the present invention comprise at least one or a suitable combination of the following features:

- the protection means are compression means;
- the compression means are brackets arranged on a compartment of two trays suitable to receive the packs to be heat-treated;
- the compression means are reusable clamps;
- the compression means are one-way clamps staying on the packaging after the heat treatment;
- the one-way clamps comprise interlock means that are activated before said heat treatment and deactivated by the end user before said self-venting packaging is reheated for the meal preparation;
- the one-way clamps comprise a handle;
- the heat treatment is a sterilisation process at temperatures above 100°C;
- the heat treatment is a sterilisation process at temperatures above 121°C.

[0021] The present invention also discloses a self-venting packaging for shelf-stable products that will be subjected to a heat treatment in an autoclave, said packaging comprising an overpressure valve and a one-way protection means which, in use, protects said overpressure valve against opening.

[0022] Particular embodiments of the self-venting packaging of the present invention comprise at least one or a suitable combination of the following features:

- the one-way protection means of the packaging is a mechanism wherein an upper plate cooperates in use with a lower plate via an interlock mechanism for the compression of the overpressure valve between those plates;
- the one-way protection means of the packaging is a clamp;
- the one-way clamp of the packaging comprises interlock means allowing, in use, a locking of said clamp before said heat treatment and an unlocking of said clamp by the end user by deactivating said interlock means before said self-venting packaging is reheated for the meal preparation;
- the one-way clamp of the packaging comprises a handle.

Brief Description of the Figures

[0023] Figure 1 shows an open self-venting pouch with overpressure valve and a typical positioning of filled pouches in a tray.

[0024] Figure 2 shows stacked trays with pouches, the overpressure valve being protected with brackets.

[0025] Figure 3 shows a detailed view of a compartment of one pouch between two trays with brackets to prevent damage to the overpressure valve.

[0026] Figure 4 shows a stand-up pouch with steam valve and removable protection plates cooperating via an interlock mechanism.

[0027] Figure 5 shows protection plates as during retort and after breaking the activation lock (deactivating of the interlock mechanism) to remove the upper plate before microwave heating.

[0028] Figure 6 shows a stand-up pouch with steam valve and a valve-protection clamp with a handle - opened for microwave heating and a detailed view of the open clamp with handle.

[0029] Figure 7 shows a profile view (A-A) of the detailed view of Figure 6 of a closed protection clamp.

[0030] Figure 8 shows a view of a reusable clamp arranged on the self-venting valve of the packaging as well as a profile view (B-B) of said reusable clamp.

[0031] **Keys**

1	packaging (self-venting stand-up pouch)
2, 2'	tear notch
3	seals
4	sealed overpressure valve
5	unsealed area with hole
6,6'	trays
7	stacked trays
8	brackets
9	activation lock
10	mechanical interlock
11	valve-protection means
12	front side of the valve protection plate
13	back side of the valve protection plate
14	handle
15	fastening of the protection clamp with handle to the sealed film
16	mechanical interlock that can be opened
17	reusable valve protection clamps
18	fixation of the reusable clamp

Detailed Description of the Invention

[0032] In a sterilisation process at about 120C° to 130°C, any heavy expansion of a self-venting pouch can damage the valve 4 according to the same mechanism than in a microwave oven.

[0033] A potential damage of a valve during the sterilisation process in an autoclave can be prevented by modifying the sterilisation process according to the present invention, namely by mechanically protecting the

overpressure valve.

[0034] Figures 1 and 2 show how pouches 1 for sterilisation are typically placed in trays 6 and how the trays are stacked 7 before going into the autoclave.

[0035] During a sterilisation process, pouches are placed between two trays 6 and every pouch 1 has a limited space for movements as caused by expansion for instance. In case of inadequate overpressure control in the autoclave or because of too much air or to much product content, there is not enough space for the additional volume and the pouch surface will be pressed against the walls of the trays.

[0036] In this case a potential damage of the valve can be prevented by introducing brackets 8 fixed to the trays on both sides next to the valve that prevent a movement of the pouch around the valve opening area and therefore a damage of the valve 4 as shown in Fig. 3. This is the first embodiment of the present invention wherein the brackets 8 have to be constructed according to the shape and position of the valve 4.

[0037] Another embodiment of the present invention is to apply reusable protection means 17 directly on the pouch around the valve zone to prevent expansion in the sensitive area, before placing the pouches into the trays 6. In this case the mechanical protection means 17 can be applied before and removed after sterilisation, this embodiment is represented in Fig. 8.

[0038] In another embodiment of the present invention, the protection means 11 are part of the packaging and protects them during sterilisation and remains on it after sterilisation. In this case, the end user breaks the protection off before he heats it up in a microwave oven. In this embodiment, the protection means are one-way clamps or one-way cooperating plates with an interlock mechanism (9,10,16,18).

[0039] In a particular embodiment of the present invention, the clamp comprises a handle 14 allowing the end user to take the pouch out of the microwave oven without burning danger. Such a one-way clamp can be made of any heat-resistant material, but preferred materials for such clamps are polypropylene, polyester, polycarbonate and polyamide.

[0040] It is also possible to protect in similar ways valve systems of trays or cups that are processed in an autoclave or pasteurised in a heating tunnel.

EXAMPLES

Example 1

[0041] A laminate PETP-AlOx 12μm/OPA 15μm/PP 70μm produced from aluminium oxide coated 12μm polyester (Camclear 800) adhesive laminated (Adcote 811 with Cat F) to a 15μm biaxially oriented polyamide (Biaxis 15) again adhesive laminated (Adcote 811/Cat F) to a 70μm polypropylene film (Groflex 0969.000) was converted to stand-up pouches (width 140mm, height 190mm, round gusset 40mm) with an additional steam valve seal as shown in Fig. 1. The pouches 1 were filled with 250ml water to be processed in an autoclave. The headspace (air) was kept as small as possible (< 50ml). In some pouches the headspace was kept around 100ml to test the effect during sterilisation.

[0042] Pouches with a headspace below 50ml and around 100ml were sterilised in an autoclave (Varioklav Typ 400EC) at 125°C for 30 minutes by using standard trays (6 compartments). The counterpressure was regulated to 2.5 bar. While the pouches with the low headspace withstand the retort process without any damage, the valve 4 of the other pouches opened.

[0043] The standard trays were therefore modified with additional brackets 8 as shown in Fig. 3 to prevent expansion of the pouches around the steam valve seal. The same sterilisation process was carried out with similar pouches. As a result, the pouches with a headspace below 50ml and the pouches with the 100ml headspace withstood the retort process and showed an intact valve.

Example 2

[0044] The steam valve zones of similar pouches filled as in Example 1 were protected with a clamp 17 as in Fig. 8 to prevent expansion of the pouches around the steam valve seal during sterilisation.

[0045] The pouches were sterilised under the same conditions as in Example 1. The pouches with a headspace below 50ml withstood the retort process. The pouches with the 100ml headspace showed an intact valve after the removal of the clamp 17. The mechanical protection means can also stay on the pouch as described above and be used as a handle.

Example 3

[0046] The steam valve zones of similar pouches filled as in Example 1 were protected with a clamp 11 as in Fig. 4 to prevent expansion of the pouches around the steam valve seal during sterilisation.

[0047] The pouches were sterilised under the same conditions as in Example 1. The pouches with a headspace below 50ml withstood the retort process. The pouches with the 100ml headspace showed an intact valve after removal of the clamp 11. In this example, the upper plate 12 was removed while the activation lock 9 was broken.

[0048] After a sufficient cooling time the pouch was placed in a microwave oven for 2 minutes at 700W and the overpressure valve operated normally and opened after 1.5 minutes.

[0049] A similar trial was performed with a polypropylene clamp 11 represented in Fig. 6 and 7. The clamp was unlocked after the sterilisation process and no damage of the valve was observed. During the reheating in a microwave oven under the same conditions than in Example 3, the overpressure valve worked similarly than in Example 3. The pouch could be removed from the

microwave oven by the handle 14 which was not hot.

[0050] The method of the present invention allows to produce sterilised shelf-stable goods in packs and in particular self-venting pouches without additional waste rate and risk in food safety comparable with standard retort pouches.

Claims

1. Method for the protection of self-venting packaging (1) for shelf-stable products that will be subjected to a heat treatment process in an autoclave, said packaging (1) comprising an overpressure valve (4), said method comprising the steps of maintaining the overpressure valve (4) closed by protection means during the heat treatment process.

2. Method for the protection of self-venting packaging (1) according to Claim 1, wherein said protection means are compression means (8).

3. Method for the protection of self-venting packaging (1) according to Claim 2, wherein said compression means (8) are brackets arranged on a compartment of two trays (6,6') suitable to receive the packs (1) to be heat-treated.

4. Method for the protection of self-venting packaging (1) according to Claim 2, wherein said compression means (8) are reusable clamps (17).

5. Method for the protection of self-venting packaging (1) according to Claim 2, wherein said compression means (8) are one-way clamps (11) staying on the packaging after the heat treatment.

6. Method for the protection of self-venting packaging (1) according to Claim 5, wherein said one-way clamps (11) comprise interlock means that are activated before said heat treatment and deactivated by the end user before said self-venting packaging (1) is reheated for the meal preparation.

7. Method for the protection of self-venting packaging (1) according to Claim 5 or 6, wherein said one-way clamps (11) comprise a handle (14).

8. Method according any of the previous claims, wherein the heat treatment is a sterilisation process at temperatures above 100°C.

9. Method according any of the previous claims, wherein the heat treatment is a sterilisation process at temperatures above 121°C.

10. Self-venting packaging (1) for shelf-stable products that will be subjected to a heat treatment in an autoclave, said packaging (1) comprising an overpressure valve (4) and a one-way protection means (11) which in use protects said over-pressure valve (4) against opening.

11. Self-venting packaging (1) according to Claim 10, wherein said one-way protection means (11) is a mechanism wherein an upper (12) plate cooperates in use with a lower plate (13) via an interlock mechanism (10) for the compression of the overpressure valve(4) between those plates (12,13).

12. Self-venting packaging (1) according to Claim 10, wherein said one-way protection means (11) is a clamp.

13. Self-venting packaging (1) according to Claim 12, wherein said one-way clamp comprises interlock means (9,10,15,16) allowing in use a locking of said clamp (11) before said heat treatment and an unlocking of said clamp (11) by the end user by deactivating said interlock means before said self-venting packaging (1) is reheated for the meal preparation.

14. Self-venting packaging (1) according to Claim 12, wherein said one-way clamp (11) comprises a handle (14).

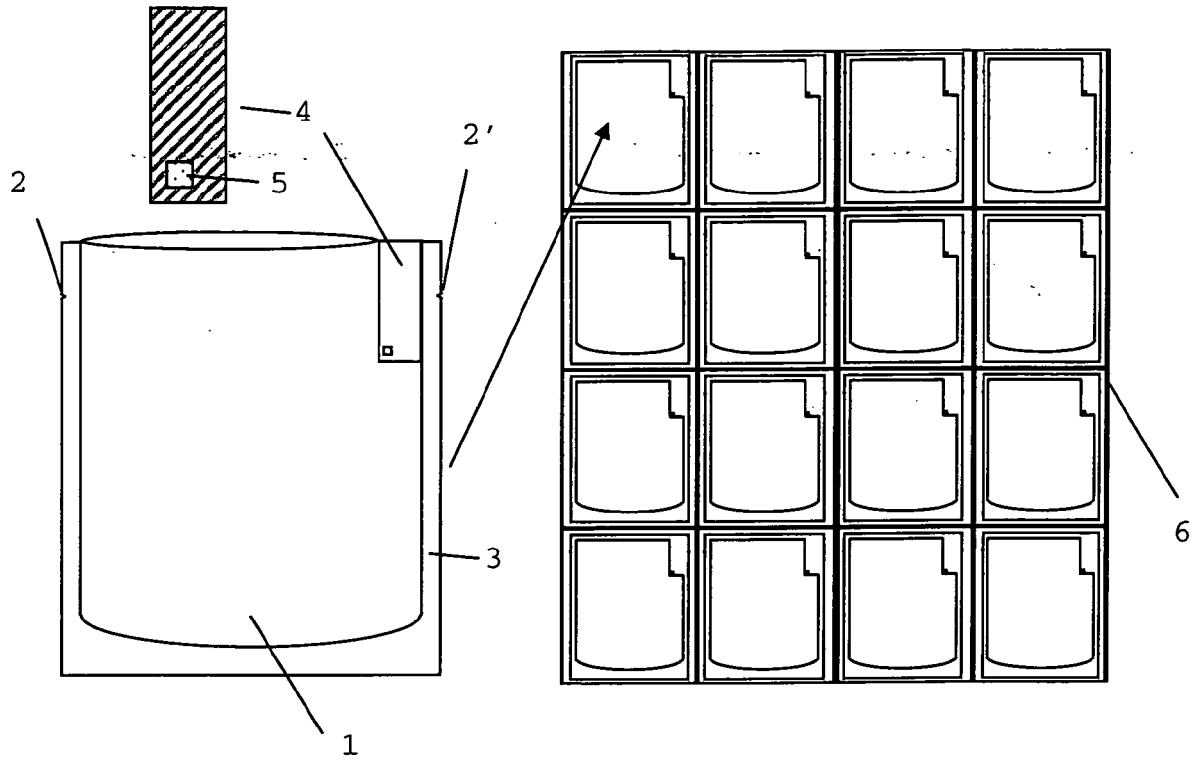

Fig. 1

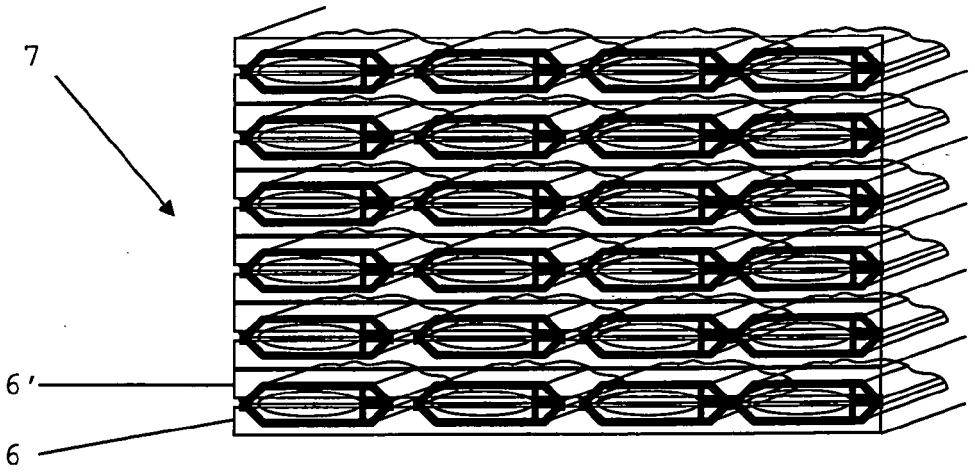

Fig. 2

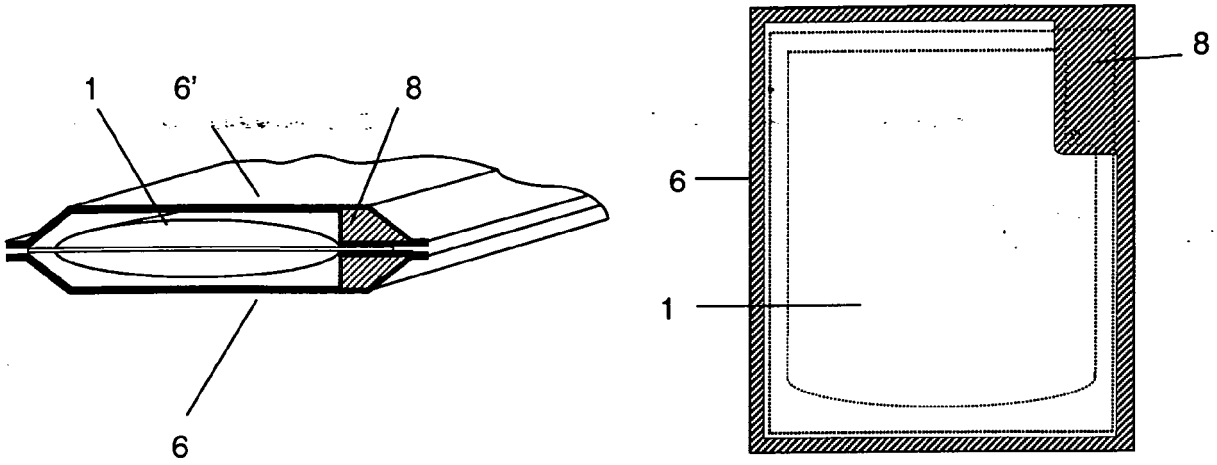

Fig. 3

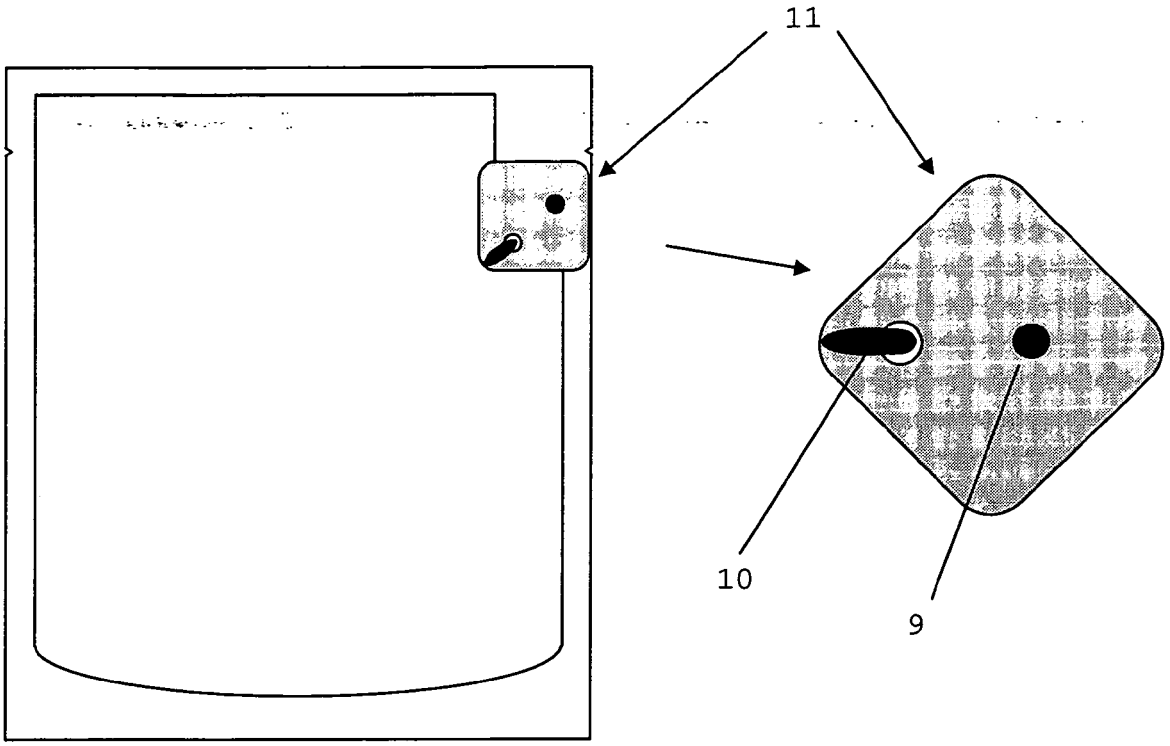

Fig. 4

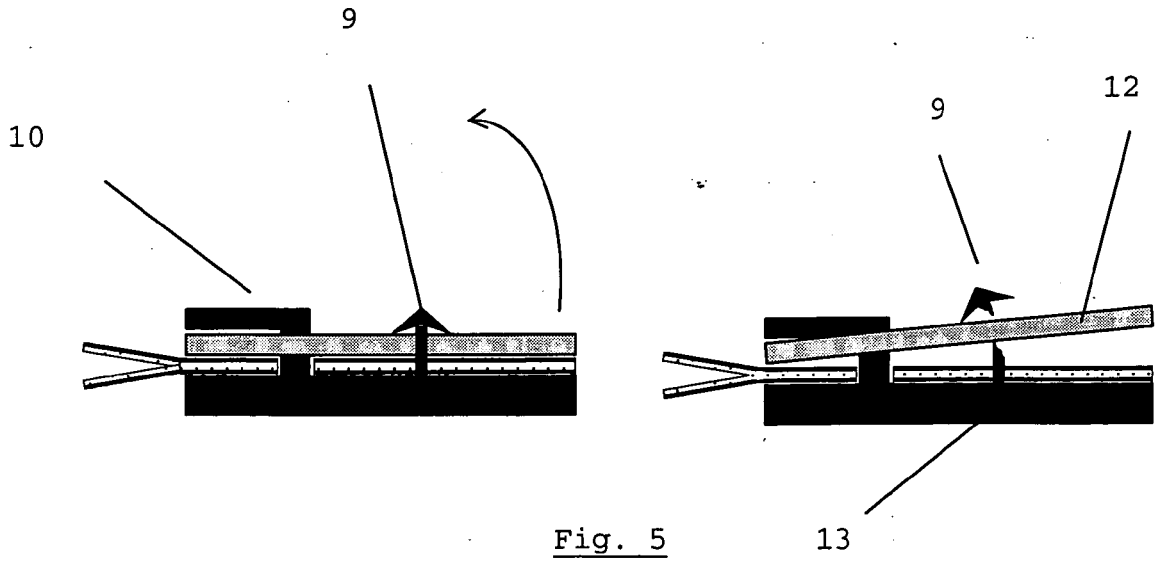

Fig. 5

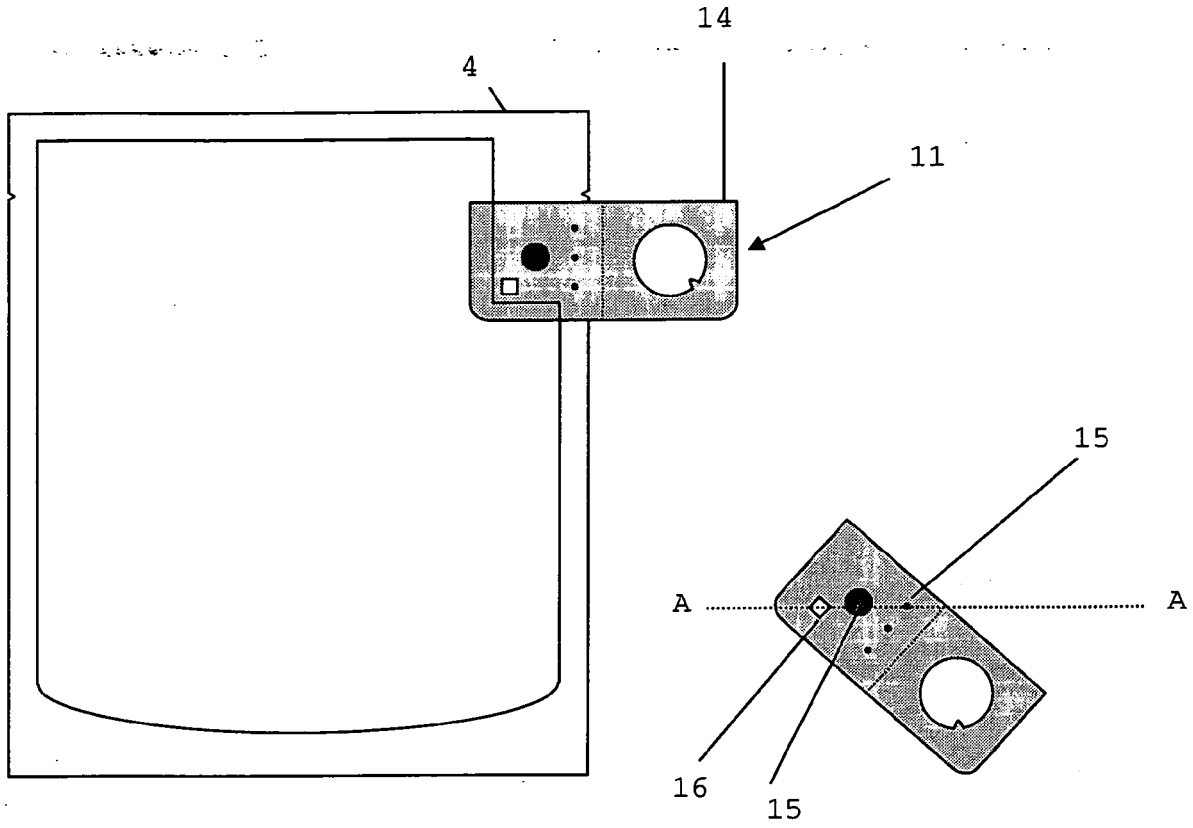

Fig. 6

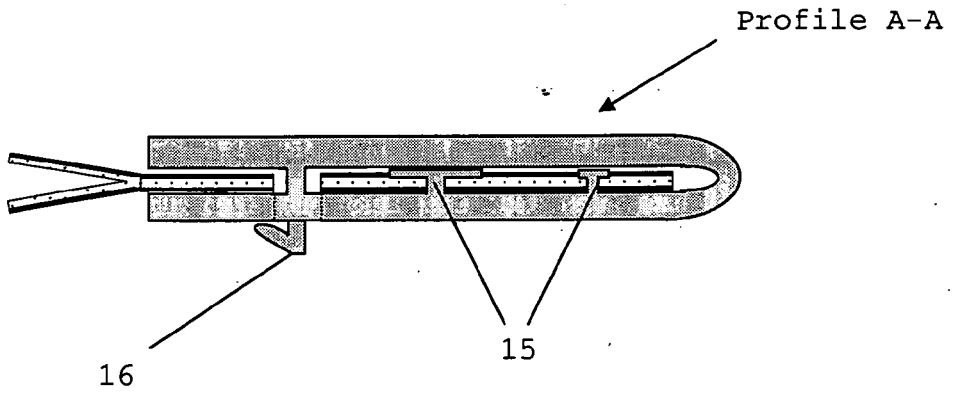

Fig. 7

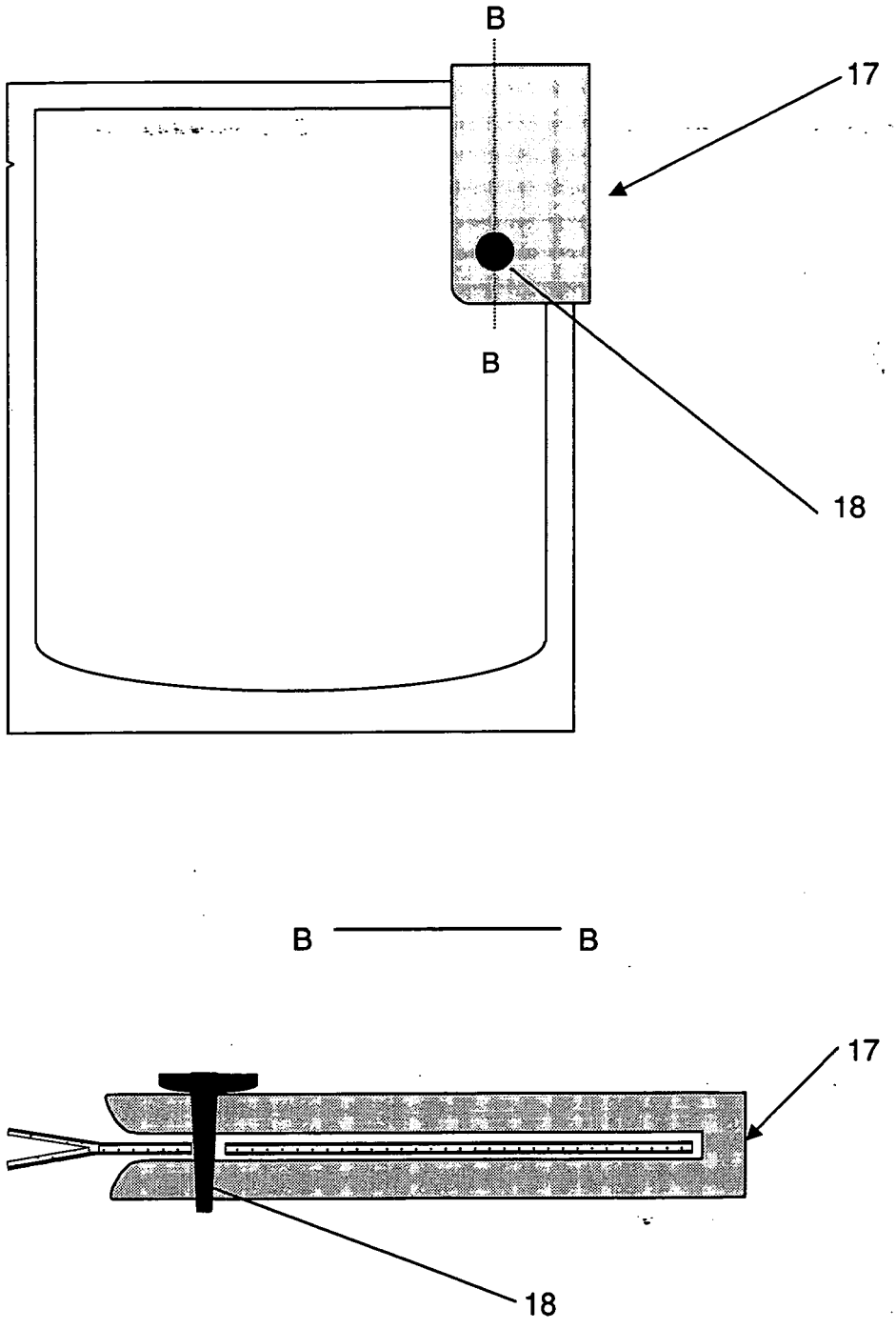

Fig. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 08 44 7041

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
D,A	EP 1 422 163 A (AMCOR FLEXIBLES EUROPE AS [DK]) 26 May 2004 (2004-05-26) * paragraphs [0035], [0036]; figure 2 * -----	1-14	INV. B65D77/22 B65D81/34

TECHNICAL FIELDS SEARCHED (IPC)

B65D
F16K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	6 November 2008	Cazacu, Corneliu

CATEGORY OF CITED DOCUMENTS

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EP 1422163 A	26-05-2004	AU 2003280319 A1	18-06-2004
		WO 2004048225 A1	10-06-2004

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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