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(54) Heat sealing and cutting device

(57) The present invention relates to a package (4) and a method and a heat-sealing device for forming said package (4). Particularly, the invention relates to a method and sealing device for providing a package (4) with at least one partially open seal, i.e. a vent (42), to permit venting of steam during a thermal treatment. The package (4) comprises at least one hole (43) on each side of the at least one vent (42) to allow precise positioning of the pouch (4) during the thermal treatment and the subsequent sealing of the vent (42).

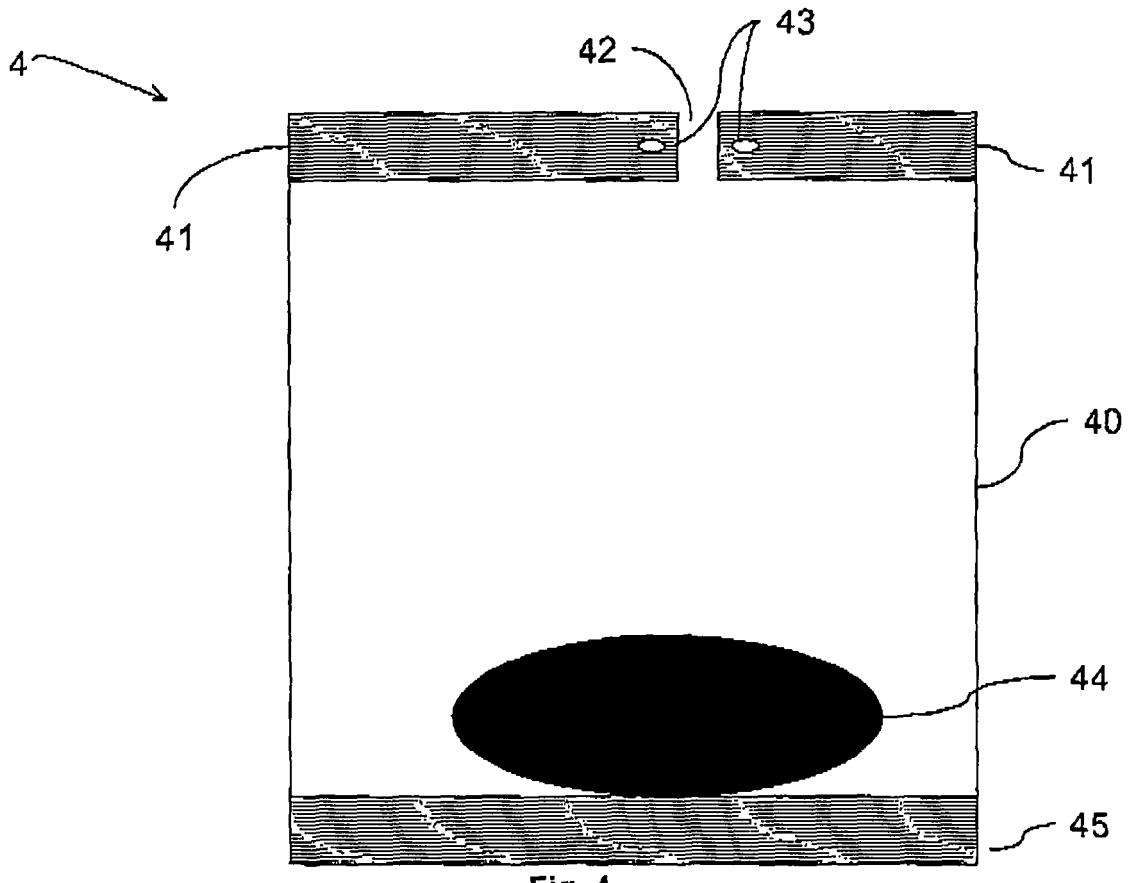

Fig. 4

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Description

Technical field

[0001] The present invention relates to a package and a method and a heat-sealing device for forming said package. In particular, the invention relates to a method and heat-sealing device for providing a package with at least one partially open seal, i.e. a vent, to permit venting of steam during a thermal treatment and wherein said package comprises a plurality of holes in the vicinity of the vent(s) to facilitate precise positioning of the package during the thermal treatment and the subsequent closing of the vent.

Background art

[0002] Many food products are sterilised or pasteurised by heat or other treatment before being offered for sale to eliminate bacterial contamination and increase shelf-life. In one method, the food product is passed through a microwave heating tunnel or chamber where the food product is heated to the desired temperature and retained at that temperature for a required period. To protect the food product against fresh contamination after the heat treatment it must be placed in a container for transport, storage and sale. If the food product is packed in the container after the heat treatment, there is a risk that the food product may pick up new contamination during the packing operation. On the other hand, if the food product is heat treated when sealed into its container, problems arise in that the heat treatment will cause the release of steam from the food product and expansion of air in the airspace around the food product within the container. This may cause the container to burst destroying the integrity of the container itself.

EP-A-395,317 and WO 2004/085254 both describe a method by which the problem of expansion can be reduced and the integrity of the container maintained wherein the food product is introduced in a packaging which is only partially closed so that steam can escape during the heat treatment step. After the heat treatment is completed the packaging is then fully closed by heat sealing. In particular WO 2004/085254 describes a method wherein the food product is introduced in a pouch made of a flexible material which is left partially unsealed in correspondence of one of the heat-seals to create a vent. The pouch is transported through the microwave heating tunnel by means of a conveyor and finally the vent is closed by heat-sealing before the contents are completely cooled down. During the transportation of the pouches through the heating tunnel to the heat-sealing station the pouches are free to move on the conveyor, for instance under the force of the steam being vented. As a consequence when the pouches arrive at the heat-sealing station the vent can be mispositioned with respect to the sealing bars. The pouches are then incorrectly sealed causing loss of efficiency in the process. Thus there is a need to provide a mechanism to hold the pouches in place while in transit through the heating tunnel to the heat-sealing station without hindering the release of the steam from the vent.

[0003] One solution to this problem comprises the use of a conveyor belt provided with pins which engage with corresponding holes present in each pouch during the transit through the heating tunnel to the heat-sealing station in the system. The pins can be either fixedly mounted in the conveyor belt or they can move in and out of its plane. Further means can be present to avoid disengagement of the pouches from the pins. With this mechanism it is possible to correctly hold the pouches aligned with the sealing bars, the vent being correctly positioned with respect to the sealing bar. The holes are conveniently positioned in the sealing area of the pouch on both sides of the vent so that, once inserted into the pins, they also help reducing the risk of the contents of the pouch being spilled on the conveyor belt.

[0004] It is therefore a first objective of the present invention to provide a heat-sealing device capable of forming a partial seal between two superimposed sheets of thermoplastic material, thus creating at least one vent in the seal, and also capable of cutting at least one hole in the area of the seal on each side of the vent(s).

[0005] A second objective of the present invention is a method of forming a partially opened package comprising at least one vent and at least one hole in the seal area on both sides of the vent(s).

[0006] A further objective of the present invention is a package comprising at least one vent and at least one hole in the seal area on both sides of the vent(s).

Disclosure of the invention

[0007] In a first aspect, the present invention comprises a heat-sealing device for making partial seals comprising a first bar and a second opposing bar, said first bar comprising spaced sealing portions and at least one non-sealing portion therebetween and means for cutting at least one hole on each side of the at least one non-sealing portion.

[0008] In a second aspect, the present invention comprises a method for making a filled package formed from superimposed sheets of thermoplastic material, said package comprising a central portion containing a product and at least one partial seal, said method comprising providing a first bar on a first side of superimposed sheets of thermoplastic material, said first bar comprising spaced sealing portions and at least one non-sealing portion therebetween and means for cutting at least one hole on each side of the at least one non-sealing portion; providing a second opposing bar on a second side of the superimposed sheets of thermoplastic material; closing the superimposed sheets of thermoplastic material between the first and second bar; forming a partial seal comprising spaced sealed portions and at least one vent in correspondence of said at least one non-sealing por-

tion in said first bar; cutting through the superimposed sheets of thermoplastic material with said means for cutting thereby creating at least one hole on each side of the at least one vent.

[0009] In a third aspect, the present invention comprises a filled package formed from superimposed sheets of thermoplastic material, said package comprising a central portion containing a product and at least one partial seal comprising spaced sealed portions and at least one vent therebetween characterised in that at least one hole is provided on each side of the at least one vent.

Brief description of the drawings

[0010] Fig. 1 is a schematic drawing of the sealing surface of first seal bar according to a first embodiment of the sealing device of the invention

[0011] Fig. 2 is a schematic drawing of the sealing surface of first seal bar according to a second embodiment of the sealing device of the invention

[0012] Fig. 3 is a schematic drawing of the sealing surface of first seal bar according to a third embodiment of the sealing device of the invention

[0013] Fig. 4 is a schematic drawing of a package of the invention

Best mode for carrying out the invention

[0014] Fig.1 shows a schematic view of the sealing surface of the first bar of the heat-sealing device of the present invention. First bar 1 shown in Fig. 1 comprises two spaced sealing portions 10 and one non-sealing portion 11 positioned between sealing portions 10. Sealing portions 10 may have a smooth sealing surface or a ribbed one.

[0015] Non-sealing portion 11 can be obtained by removing a surface portion from a conventional heat-sealing bar, creating a gap, so that sealing does not take place at the cut away portion. Other methods for creating the non-sealing portion 11 are possible, like for instance applying a thermally insulating material in corresonding of the non-sealing portion of the sealing bar.

[0016] Typically, the non-sealing portion 11 will be from 1 to 50 mm, 2 to 40 mm, 2 to 30 mm long to provide an adequate vent through which expansion can occur during the heat treatment stage. If desired, there may be more than one non-sealing portion 11, although one such non-sealing portion is generally sufficient to allow correct venting of the steam during the heat treatment of the product.

[0017] The optimum size of the non-sealing portion (or optionally of the non-sealing portions), and consequently of the vent 42 in package 4 (Fig. 4), will depend upon the nature of the food product within the package and also upon the rate and level of the temperature rise during the heat treatment.

[0018] First bar 1 is also provided with means 12 for cutting at least one hole on each side of the at least non-sealing portion 11. Cutting means 12 may be partially housed in first seal bar 1, partially protruding from its surface in a fixed relation with said surface. In operation cutting means 12 would cut through the superimposed sheets of plastic material when first seal bar and second opposing bar are moved towards each other for effecting the seal.

[0019] Alternatively, cutting means 12 may be completely housed inside first seal bar 1 on both sides of non-sealing portion 11. In operation, cutting means 12 would then need to be driven by a pneumatic cylinder or other suitable means for advancing, upon signal or by other synchronization means, in order to cut holes 43.

[0020] In the embodiment of the sealing device shown in Fig. 1 two cutting means 12 are shown, one on each side of non-sealing portion 11. However the number of cutting means 12, and consequently of holes 43 in package 4, can vary depending on the size and type of package, although at least one hole on each side of vent 42 is required to correctly maintain the position through the heating tunnel.

[0021] The distance of cutting means 12 from non-sealing portion 11 and consequently the distance of holes 43 from vent 42 may vary and is typically about 5 to 70 mm, 5 to 50 mm.

[0022] In order to provide sufficient mechanical resistance when the pins present on the conveyor belt of the heating tunnel are inserted into holes 43 of package 4, cutting means 12 are positioned within first seal bar 1 in such a way that holes 43 will be at a distance of not less than 1 mm, , generally not less than 4 mm, from the edge of the package.

[0023] Cutting means 12 can be made from any suitable material, preferably metallic; and can be of any suitable shape. Generally cutting means 12 are flat blades. The length of cutting means 12 typically ranges from 1 to 20 mm, 1.5 to 15 mm.

[0024] Holes 43 consequently have different shapes, like elliptical, round, triangular, square or can also be in the form of a cross or of an elongated slot.

[0025] The sealing device of the invention is not limited to the linear sealing device which has been described in detail. For instance the sealing device of the invention could be in the form of a sealing frame suitable for sealing a web of flexible thermoplastic material around the periphery of a rigid thermoplastic container such as a tray. In this case the sealing device would comprise a first sealing frame comprising spaced sealing portions and at least one non-sealing portion therebetween; means for cutting at least one hole on each side of the at least one non-sealing portion; and a second opposing frame or support. In the case of a sealing frame the spaced sealing portions can be in the form of a continuous sealing line following the periphery of the rigid thermoplastic container, interrupted only by the non-sealing portion.

[0026] Alternatively, the sealing device of the invention could be designed to comprise an irregular non-sealing portion to provide a tortuous path for the venting steam,

like non-sealing portion 21 shown in Fig. 2.

[0027] In its second aspect the present invention comprises a method for making a filled package formed from superimposed sheets of thermoplastic material, said package comprising a central portion containing a product and at least one partial seal, said method comprising providing a first bar on a first side of superimposed sheets of thermoplastic material, said first bar comprising spaced sealing portions and at least one non-sealing portion therebetween and means for cutting at least one hole on each side of the at least one non-sealing portion; providing a second opposing bar on a second side of the superimposed sheets of thermoplastic material, i.e. the side opposite said first bar; closing the superimposed sheets of thermoplastic material between the first and second bar; forming a partial seal comprising spaced sealed portions and at least one vent in correspondence of said at least one non-sealing portion in said first bar; cutting through the superimposed sheets of thermoplastic material with said means for cutting, thereby creating at least one hole on each side of the at least one vent.

[0028] In the method of the present invention the partial seal can be formed at the same time as other seals defining the package. An example of such a method is a so-called tray lidding process wherein a generally flexible cover is sealed around the perimeter of a tray (or similar container) by means of a heat-sealing frame.

[0029] Alternatively, the partial seal can be formed either before or after the formation of the the other seals defining the package.

[0030] The superimposed sheets of thermoplastic material used in the method of the invention can be either the same or different. When the superimposed sheets of thermoplastic material are the same they can be in the form of a seamless tube or they may have been joined at the edges by one or two seals. When two different sheets of thermoplastic material are used they can be both flexible or one flexible and one rigid or both rigid.

[0031] Although not limited to one packaging process the method of the present invention will be described in detail with respect to a method for forming a pouch in a form-fill-seal process.

[0032] In a form-fill-seal process a tube is formed from a thermoplastic film and the bottom end seal is made by transversely sealing across the tube with heated seal bars to form a wide heat seal and, consequently, producing a pouch ready to receive a product. After the heat seal is made, the pouch is filled and then another transverse heat seal is made across the width of the tube in a relatively wide band. This seal is transversely severed by means of a cutting blade to separate the filled pouch from the next pouch to be filled. Thus, one wide band seal serves as the top seal for one pouch and the bottom seal for the next one.

[0033] The tube of thermoplastic material can be either a seamless tube or, preferably, a tube formed from a sheet of flattened film by a longitudinal seal. The film material is preferably a relatively strong, heat sealable film having good seal strength and, if extended shelf life of the contents is desired, the film may have gas barrier properties.

[0034] In the method of the present invention the top seal is a partial seal and a plurality of holes are cut on both sides of the non-sealed area, i.e. the vent in the seal.

[0035] Thus a sealing device according to the first aspect of the present invention is used to make the transversal seal that corresponds to the top seal of the pouch.

[0036] In one embodiment of the method of the present invention this is accomplished by using two separate, parallel, sealing devices to make the transversal seal, the top one being a conventional sealing device producing a continuous seal, the bottom one being a sealing device capable of making a partial seal and which is provided with at least one cutting mean on each side of the vent in the seal. A cutting blade, to separate the filled pouch from the next pouch being filled, is housed in the space between the top and the bottom sealing devices.

[0037] In operation, the tube is clamped by squeeze rollers and filled with a charge of product. Below the squeeze rollers, first seal bar 1 and second opposing bar of the sealing device of the invention and at the same time first and second bar of the bottom sealing device are moved toward each other, to contact and flatten a portion of the pouch material. The thus flattened portion of the pouch material is then sealed: the partial seal for a lower or filled pouch is made by first seal bar 1 and second opposing bar of the sealing device of the invention whereas the continuous bottom seal for the next to be formed pouch is made by the top sealing device. Both sealing devices are heated to the heat welding temperature of the particular thermoplastic film from which the tube is formed. When the sealing device comprises fixed cutting means 12 protruding from the surface of first seal bar 1 the plurality of holes 43 is cut through the pouch material as soon as first seal bar and second opposing bar are moved towards each other. Then the cutting blade that separates one filled pouch from the next is advanced from its resting position by appropriate means for advancing, and through the pouch material, thus severing the pouch material. After the cutting of the pouch material is completed, the cutting blade is retracted back and the filled package 4 discharged from the machine.

[0038] When cutting means 12 are completely housed within first seal bar 1, then cutting means 12 and the cutting blade that separates one filled pouch from the next are advanced from their resting positions by appropriate means for advancing after the partial seal has been made, and through the pouch material, thus severing the pouch material and cutting a plurality of holes 43 on both sides of the vent in the top seal thus created. After the cutting of the pouch material is completed, cutting means 12 and the cutting blade are then retracted back and the filled package 4 discharged from the machine.

[0039] In an alternative embodiment schematically shown in Fig. 3, top and bottom sealing devices form one single sealing device 3 which comprises distinct sealing

areas 33 and 34. Sealing area 33 which forms the top seal of the filled pouch comprises two spaced sealing portions 30, one non-sealing portion 31 positioned between sealing portions 30 and cutting means 32 positioned on both sides of non-sealing portion 31. Sealing area 34, which forms the bottom seal in the next to be formed pouch, comprises a continuous sealing surface 35.

[0040] As outlined above, in operation, a tube of thermoplastic material is clamped by squeeze rollers and filled with a charge of product. Below the squeeze rollers, seal bar 3 and its opposing bar (not shown) are moved toward each other, to contact and flatten a portion of the pouch material. The thus flattened portion of the pouch material is then sealed: the partial seal for a lower or filled pouch is made by sealing area 33 whereas the continuous bottom seal for the next to be formed pouch is made by sealing area 34. Both sealing areas are heated to the heat welding temperature of the particular thermoplastic film from which the tube is formed. Cutting means 32 may be either fixedly protruding from the surface of sealing area 33 or in alternative completely housed within sealing area 33 as described above. Once cutting of the plurality of holes 43 on both sides of the vent is completed, filled package 4 is separated from the next pouch being filled by means of a cutting blade.

[0041] In its third aspect, the present invention comprises a filled package 4, shown in Fig. 4 in the form of a pouch, said package comprising a central portion 40 containing a product 44 and at least one partial seal comprising spaced sealed portions 41 and one vent 42. Holes 43 are provided on each side of vent 42.

[0042] The package shown in Fig. 4 further comprises continuous seal 45 opposite the partial seal. Depending from the source of material, in tubular form or a folded web, pouch 4 may also comprise a longitudinal seal (not shown) at the back of the pouch.

[0043] Package 4 could also be in the form of a tray with a cover lid sealed around the periphery of the tray, provided at least one vent and a plurality of holes on both sides of said vent(s) are provided in the seal.

[0044] Any type of thermoplastic material can be used for the packages of the invention depending on the type of food product and the required shelf-life, as it is well known in the art.

[0045] Once made the packages are fed to a heating tunnel in such a way that the at least one hole on each side of the vent of each package engages a corresponding number of pins protruding from the conveyor belt which carries the packages through the heating tunnel. Even though during such heat treatment steam is given off from the product within the package and the air in the head space above product expands leaving the package through the vent the packages will remain correctly positioned on the conveyor belt due to their engagement with the protruding pins. Once the heat treatment is completed the package is correctly positioned for the vent to be closed, for instance by sealing or welding, without any risk of mispositioning and possibly incorrect closure of the package.

Claims

1. A heat-sealing device for making partial seals between superimposed sheets of plastic material comprising a first bar (1) and a second opposing bar, said first bar (1) comprising spaced sealing portions (10) and at least one non-sealing portion (11) therebetween **characterised in that** means (12) for cutting at least one hole on each side of the at least one non-sealing portion (11) are provided in said first bar (1).

2. The heat-sealing device according to claim 1 wherein the means for cutting (12) are fixedly protruding from the surface of the first bar (1).

3. A method for making a filled package (4) formed from superimposed sheets of thermoplastic material, said package comprising a central portion containing a product and at least one partial seal, said method comprising providing a first bar (1) on a first side of superimposed sheets of thermoplastic material, said first bar comprising spaced sealing portions (10) and at least one non-sealing portion (11) therebetween and means (12) for cutting at least one hole on each side of the at least one non-sealing portion (11); providing a second opposing bar on a second side of said superimposed sheets of thermoplastic material; closing said superimposed sheets of thermoplastic material between said first and second bar; forming a partial seal comprising spaced sealed portions (41) and at least one vent (42) in correspondence of said at least one non-sealing portion (11) in said first bar; cutting through the superimposed sheets of thermoplastic material with said means (12) for cutting, thereby creating at least one hole (43) on each side of the at least one vent (42).

4. A filled package (4) formed from superimposed sheets of thermoplastic material, said package comprising a central portion (40) containing a product (44) and at least one partial seal comprising spaced sealed portions (41) and at least one vent (42) therebetween **characterised in that** at least one hole (43) is provided on each side of the at least one vent (42).

5. The package according to claim 4 which is in the form of a pouch.

6. The package according to any one of claims 4 or 5 wherein one hole (43) is provided on each side of one vent (42).

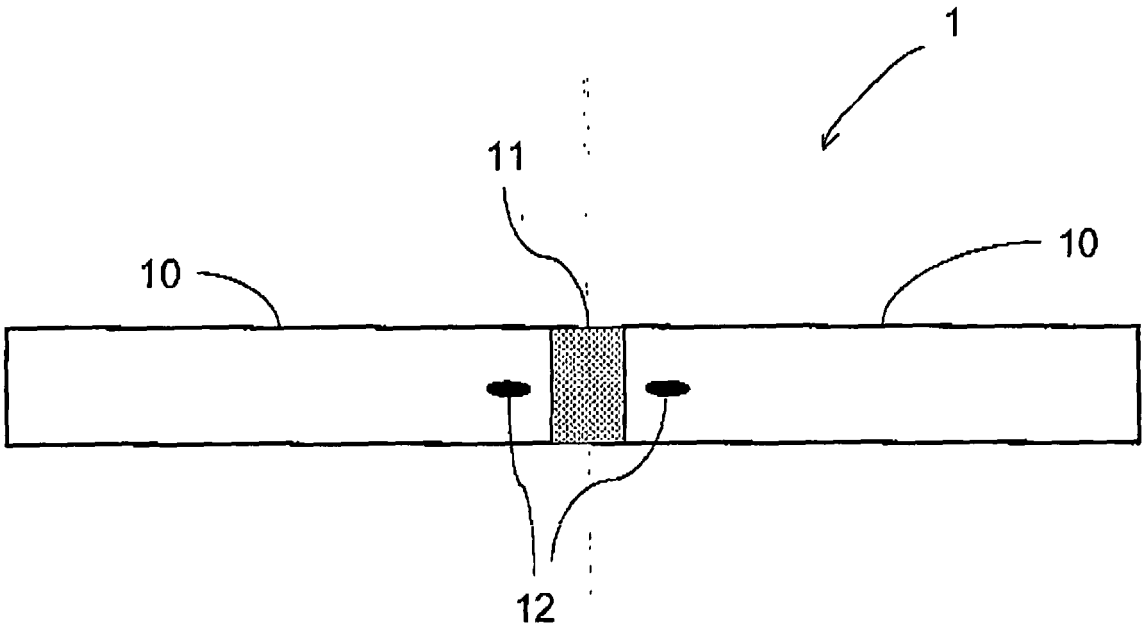

Fig. 1

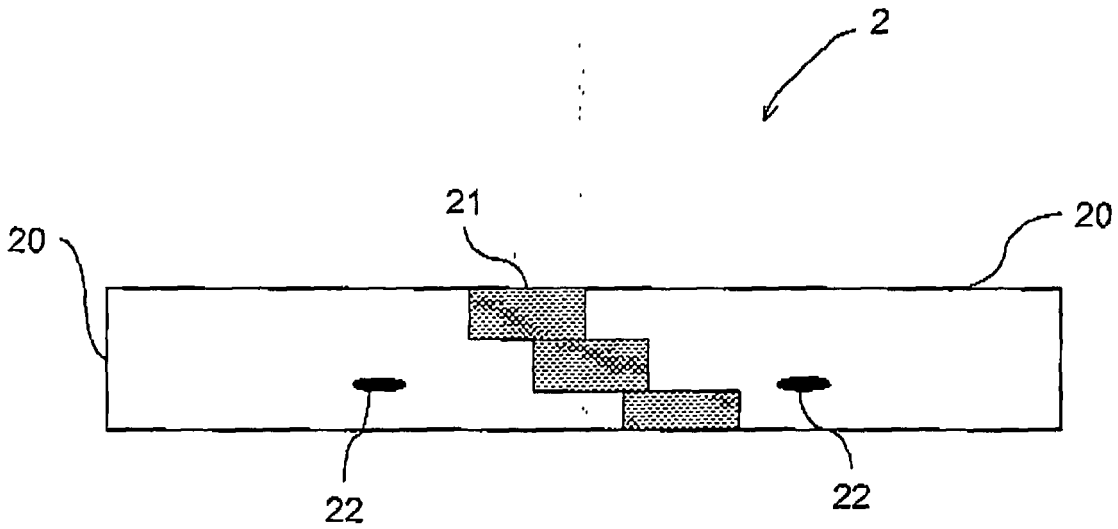

Fig. 2

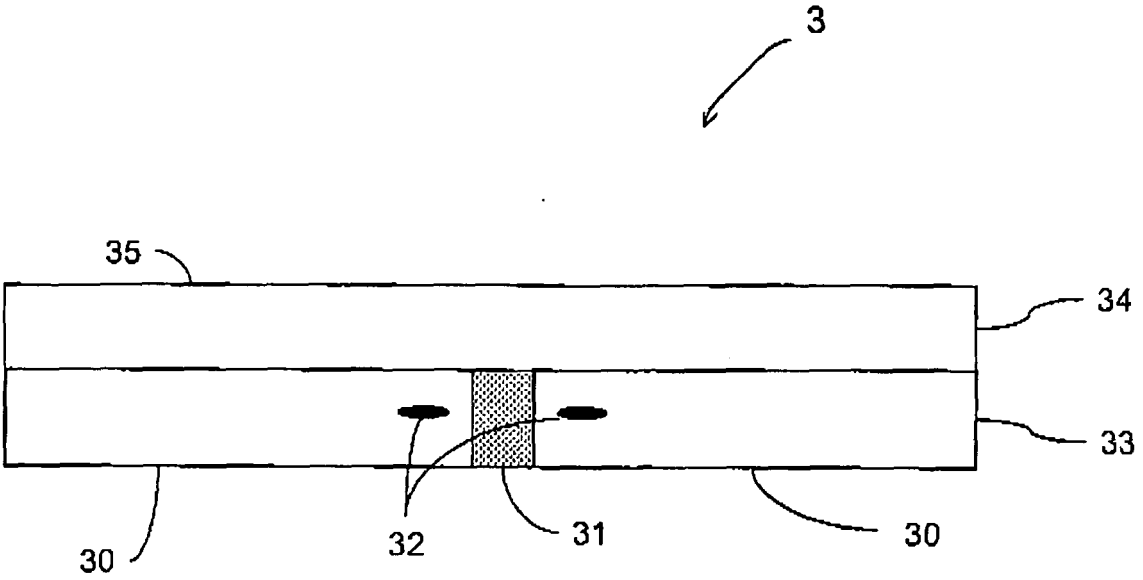

Fig. 3

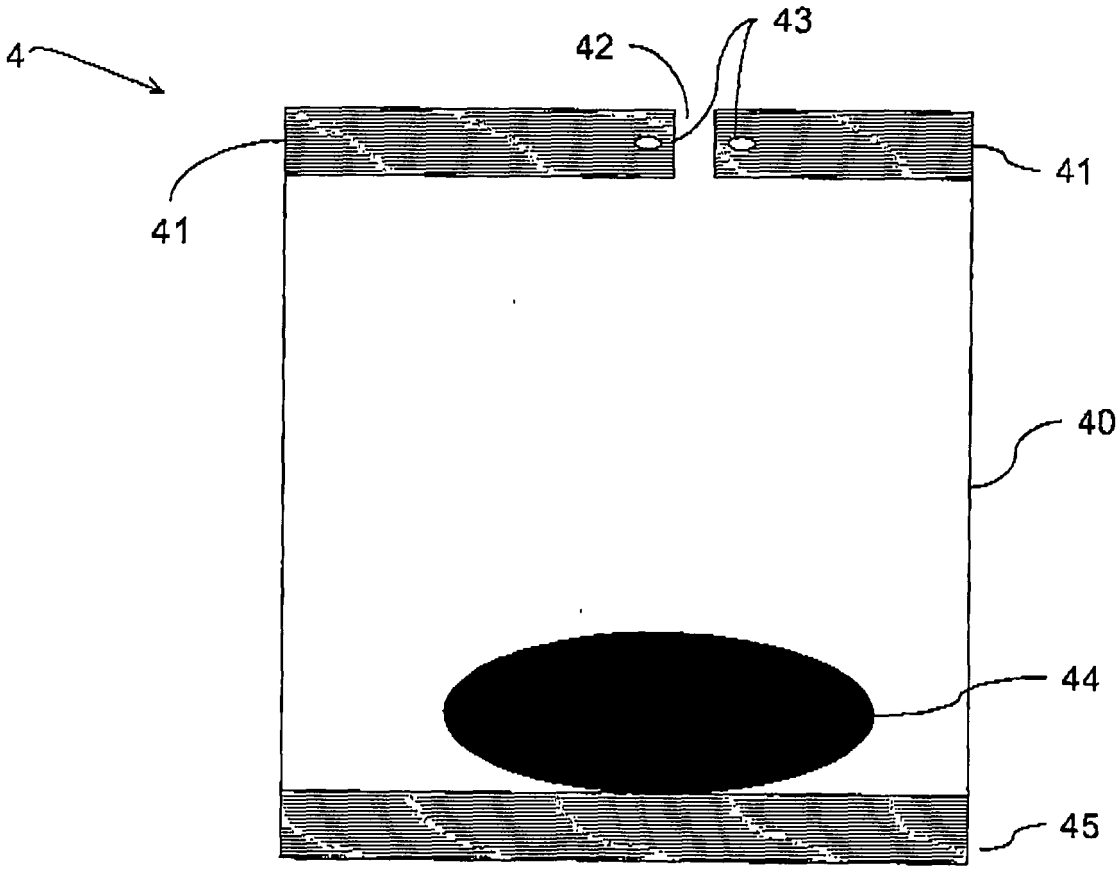

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 07 29 0688

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 3 133 691 A (CORBETT HERBERT O) 19 May 1964 (1964-05-19) * the whole document *	1,4-6	INV. B65B25/00 B65B51/10 B65B51/30 B65B55/06 B65B61/16 B65D33/01
A	GB 1 197 130 A (CELLOPHANE SA [FR]) 1 July 1970 (1970-07-01) * the whole document *	1-6	
A	WO 01/19683 A (NESTLE SA [CH]) 22 March 2001 (2001-03-22) * the whole document *	1-6	
A	US 3 261 140 A (LONG FLORREN E ET AL) 19 July 1966 (1966-07-19) * the whole document *	1-6	
A	WO 94/26605 A (JAMISON MARK D [US]) 24 November 1994 (1994-11-24) * the whole document *	1-6	

TECHNICAL FIELDS SEARCHED (IPC)

B65B
B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 October 2007	Vigilante, Marco

CATEGORY OF CITED DOCUMENTS

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26-10-2007

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3133691 A	19-05-1964	NONE	
GB 1197130 A	01-07-1970	BE 716333 A	04-11-1968
		DE 1767736 B1	13-07-1972
		FR 1533943 A	26-07-1968
		FR 93935 E	06-06-1969
WO 0119683 A	22-03-2001	AT 237502 T	15-05-2003
		AU 778236 B2	25-11-2004
		AU 6081599 A	17-04-2001
		DE 69907040 D1	22-05-2003
		DE 69907040 T2	16-10-2003
		EP 1214246 A1	19-06-2002
		MX PA02002521 A	30-07-2002
US 3261140 A	19-07-1966	GB 1027874 A	27-04-1966
WO 9426605 A	24-11-1994	AU 686171 B2	05-02-1998
		AU 6944694 A	12-12-1994
		CA 2162129 A1	24-11-1994
		CN 1127494 A	24-07-1996
		EP 0696992 A1	21-02-1996
		JP 3012882 B2	28-02-2000
		JP 8509939 T	22-10-1996
		SG 43156 A1	17-10-1997
		US 5419638 A	30-05-1995

EPO FORM P0459

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 395317 A **[0002]**
- WO 2004085254 A **[0002] [0002]**