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(54) Heat sealed sack of flexible film comprising a relief valve

(57) A heat sealed sack (1) of flexible film of weldable plastic for airtight packaging of foodstuff to be warmed before consuming it, has a valve (2) for releasing pressurized vapors and/or gases in form of an insert of localized detachment of seal surfaces at a point along a weld seam joining juxtaposed edges of said flexible film of weldable plastic. The insert of localized detachment is in the form of a sticker pre-applied at a precisely determined location on the inner surface of said flexible film, in an area of the film destined to be welded for sealing the sack. The sticker comprises a flexible film of weldable plastic having a surface treated to render it peelable and a layer of a pressure activated adhesive over said peelable surface of application of the sticker onto the inner surface of said flexible film of the sack, or a multilayer laminate comprising a flexible film of a peelable film, a layer of pressure activated adhesive on the surface of application onto the inner surface of said flexible film of the sack and a solvent free layer of a weldable laquer or a second flexible film of weldable plastic first film.

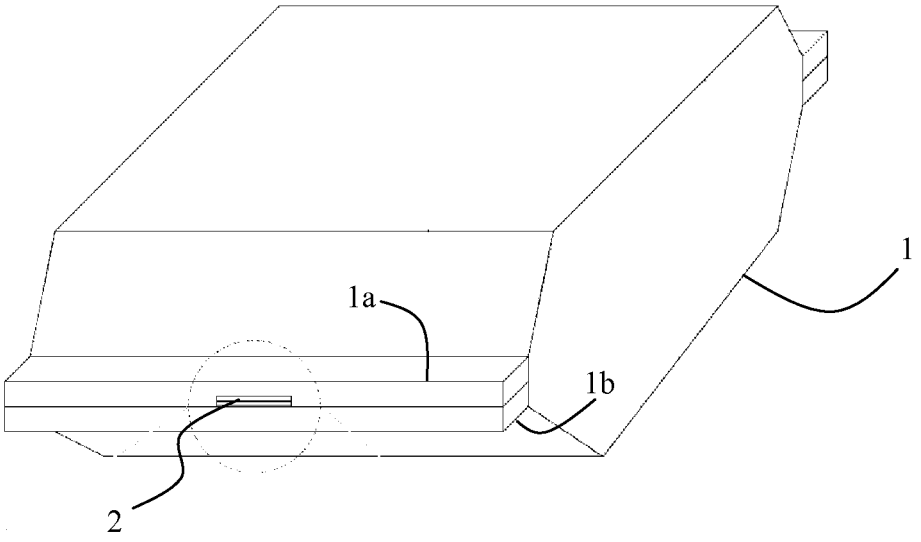

FIG. 1

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Description

TECHNICAL FIELD

[0001] The present disclosure relates in general to packaging techniques of foodstuff and in particular in sacs of flexible film heat sealed by welding, adapted to permit to warm up the packaged food before eating it.

DISCUSSION OF KNOWN TECHNIQUES

[0002] It is common the practice of packaging foodstuff in heat sealed sacs of mono or multilayer film impermeable to fluid exchanges with the exterior in order to prevent contaminations and favor conservation of the foodstuff. This type of packaging, commonly used in the commerce and/or dispensation of edible foodstuff must often be suitable to permit the heating of the food content in thermal or microwave oven before delivering or serving the warmed up food still contained inside a substantially unbroken sac.

[0003] This practice is common in snack bars, fast food restaurants, mess rooms automatic food dispensing machines, and foodstuff packaged in this manner are also on sale in self-service shops and supermarkets.

[0004] When heating those hermetically sealed packages an overpressure may develop inside the package due to the evolution of vapors (typically water vapor) and/or gases from the edible foodstuff. In absence of means of controlled release of overpressure, the hermetically sealed sac would swell to the point of rupturing.

[0005] Uncontrolled rupturing of the sac when it occurs with an abrupt uncontrolled detachment of an edge heat welded perimeter of the sac, determines an aspect of lack of integrity of the packaged foodstuff, beside complicating a neat opening of the sac by the customer/user which are undesirable.

[0006] With an aim of preventing these occurrences when heating the content of an airtight package in a sac of a flexible film sealed by heat welding, have been developed so called release valves of pressurized gaseous substances to be applied to the film with which the sac airtight package is formed upon exceeding a preset maximum limit overpressure shot of being able to cause uncontrolled rupturing of the film or detachment of a heat welded perimeter seam.

[0007] External valves are validly used in sacs of heat welded flexible film, applied onto the outer surface of the film in form of preconstituted stickers sealing holes or cuts made through the flexible film with which the heat sealed sac is made.

[0008] These external sticker valves must ensure on one side airtightness and anti-tamper features character of the package and on the other side an effective isolation of the edible content of the package from direct contact with the pressure activated adhesive of the sticker, typically of material unsuitable to come in contact with food. The anti-tampering is generally implemented by common breakable cuts in the sticker film that would make permanently evident any attempt to remove it by lifting it off an edge and tearing it off the outer surface of the sac, whilst isolation from contact with the adhesive material of the valve sticker is implemented by applying a disc or polygonal patch of film of a material compatible to contact the packaged aliment, disposed on central area of the adhesive face of the valve sticker, such that the patch bonded at the center of the face of application of the valve stickers, be comfortably masking the hole or cut purposely formed through the sac film through which eventually releasing pressurized fluids. Airtightness remains ensured by the circular crown or annular area of adhesion of the valve sticker onto the outer surface of the sac, around the masking central patch disc covering the release hole or cuts in the sac film.

[0009] The ability of releasing pressurized fluids upon reaching a certain overpressure inside the airtight package is given by dimensioning for a resisting force to detachment of the adhesive from the outer surface of the film of the sac to the point of eventually creating a release path of the internal pressurized fluid through at least a certain arc or region of the crown or ring of adhesion of the valve sticker. As may be easily recognized by a technician, precisely applying external valve sticker over release holes or cuts purposely formed through the flexible film with which the packaging sacs will be made by hot welding the film along predefined lines of the flexible film commonly produced in reels of continuous film ribbon, requires definition of their geometry using distinct cutters and/or die punches for defining the shape of the centrally adhered isolating patch and the outer perimeter of the valve sticker, respectively, on a multilayered ribbon. Cut out parts of a self-adhesive multilayered ribbon in which are defined the valve stickers that are surrounded and wasted, while the stickers will be individually lifted off from a supporting film of a peelable material to be finally applied over fluid release holes or cuts made through the continuous flexible film with which the hot welded sacs will be fabricated.

[0010] It is evident as this type of architecture of external valve is costly both in terms of the investment in definition tools and machines as well as in terms of cost of the multilayered ribbons in which the single valve stickers are geometrically defined, a considerable large part of it is wasted.

SUMMARY

[0011] The present invention overcomes the complexities of the required tooling the wasteful use of relatively costly materials besides eliminating the need of making release holes or cuts through the flexible film with which the sacs are made.

[0012] Basically, the novel solution found by the applicant consists in realizing an effective and reliable release valve of pressurized fluids that may form within an airtight sac of hot welded flexible film at a point along a perimeter

weld seam of the sac.

[0013] The vapor or other fluid release valve consists in a thin insert of relatively small dimensions, sandwiched between juxtaposed edges welded one to the other of the flexible film of heat weldable material constituting the sealed sac.

[0014] The insert is adapted to create a tract or segment of a perimeter seam of the sac amenable to undergo detachment of adherent surfaces for creating a release flow path of any pressurized fluid upon reaching a certain maximum limit pressure inside the airtight sac.

[0015] The only action of predisposition of the flexible film with which will be formed the heat welded sacs consists in applying onto the surface of the inner side of the flexible film with which the sacs will be formed, in an area of the flexible film destined to be welded, a multilayered valve sticker, a back layer of which (outermost layer of the sticker) is of a heat weldable material compatible with or identical to the heat weldable material of the inner side of the flexible film of fabrication of the hot sealed sacs.

[0016] In this manner, the welding together of superimposed edges or perimeter sides of the sac may be carried out without any regard of the weld seam side along which the valve sticker is applied, as if there wasn't any insert.

[0017] In practice, the weld seam will appear substantially free of discontinuities and retain a substantially uniform thickness along all the weld lines.

[0018] This is due to the fact that the back of the valve sticker applied onto the inner surface of the flexible film with which the hot sealed sac is fabricated, welds to the save inner surface of the flexible film of the edge portion brought against a juxtaposed edge portion onto which the valve sticker had been adhered.

[0019] Reliability and repetitively of the condition at which release of over pressurized fluids inside the sealed sac occurs are outstandingly high, being possible to vary case by case dimensions and shapes of the insert of prearranged "detachment" represented by the valve sticker, at a point along a weld seam of the airtight sac, depending from the mechanical characteristics of flexibility and plasticity of the flexible film with which the sacs are made and from the maximum limit internal over pressure at which a breakdown of the airtight adhesion occurs in correspondence of the insert along a weld seam constituted by the valve sticker "welded" between opposite edge portions of the flexible film of the sac.

[0020] The valve sticker to be applied at a precisely define point onto the inner surface of the heat weldable flexible film with which the sacs are formed, may be defined in the desired geometrical shape by a simple die-cutting operation of a multilayered laminate.

[0021] According to a first exemplary embodiment, the multilayered laminate consists of a flexible film or a weldable plastic material one surface of which is treated such to be "peelable" and on which is thereafter applied a layer of a common pressure operated adhesive, the valve stickers die cut therein to be thence simply applied "on-register" at precisely defined points onto the inner surface of the flexible weldable film with which the sacs are going to be formed.

[0022] By the term "peelable" as commonly used by operators in the technical field of reference, it is intended a flexible film typically of polymeric nature, at least a surface of which is made compatible to adhere to a pressure activate adhesive though remaining detachable by tearing it off without dragging along residues of adhesive. A treatment often used to render peelable the surface of a weldable plastic film, consists in exposing the film to a plasma, generated for example by corona effect between a pair of electrodes, though other techniques may be followed as industrially used by manufacturers of plastic films.

[0023] According to an alternative embodiment, the valve sticker is composed by a flexible film of peelable plastic material with layer of pressure activated adhesive over the side of application and having a layer of hot weldable laquer on the opposite side or back of the self-adhesive film, which may be of a plastic material that is not per se weldable or not compatibly weldable to the flexible film with which the sacs are going to be made.

[0024] According to a third alternative embodiment, the weldability property of the back of the valve sticker, instead of being provided by a layer of heat weldable laquer is provided by a second flexible film of plastic material heat weldable to the material of the flexible film of the sac, which is bonded (laminated) by interposing an aqueous base or solvent free polyurethanic glue over the first adhesive carrying plastic film.

[0025] The different aspects and peculiarities of the gas-vapor release device from goods packed in airtight heat welded sacs of flexible weldable film of the present disclosure will be described in greater detail by referring to a number of attached drawings that illustrate several embodiments.

[0026] The invention is defined in the annexed claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027]

Figure 1 is a schematic three-dimensional view of an airtight sac of heat welded flexible film.

Figure 2 is an enlargement of the weld seam in which is present the detachment insert of the present disclosure.

Figures 3 and **4** show alternative ways of the creation of inner overpressure release vias by controlled detachment of surfaces originally bonded together.

Figure 5 shows a first embodiment of adhesive insert constituted by a peelable film with a layer of pressure activated adhesive, of a plastic material weldable to the flexible film of the sac.

Figure 6 shows an alternative embodiment of an adhesive insert of this disclosure composed of a peelable flexible film with a layer of pressure activat-

ed adhesive and back covered by a layer of heat weldable laquer.

Figure 7 shows a third embodiment of an insert of this disclosure constituted by a first peelable film, a layer of pressure activated adhesive and second film of a material heat weldable to the flexible film of the sac, laminated therewith.

Figures 8, 9 and **10** are respectively a sectional view, a side view and an exploded detail view of a sac of heat welded flexible film with release device of pressurised vapor and/or gas according to an exemplary embodiment.

Figure 11 schematically illustrates a possible fabrication process of an airtight sac of heat welded flexible film with pressure release device according to the present disclosure.

Figures 12-15 are schematic views of different types of sacs of heat welded flexible film with insert of localized detachment between welded edge portions of the flexible film of the sac along a tract of a weld seam of airtight sealing of the sac.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0028] **Fig. 1** shows a sac 1 of flexible film heat sealed by welding together juxtaposed perimeter edges 1a and 1b of the heat weldable film. Normally, there may be present also a longitudinal weld seam (not visible nor shown in the drawing) of juxtaposed edges brought one against the other of the flexible film ribbon of heat weldable material, such as for example polypropylene (PPcoex, PPcast). The film of the sac may also be a multilayered laminate comprising for example an outer layer of polyethylene, optionally including an intermediate layer containing oxygen barrier substances, such as for example SiOx or other material adapted to stop diffusion of molecular oxygen therethrough.

[0029] Along the bottom sealing weld seam of the sac 1, an insert 2 is present placed at a point in which a localized detachment of bonded surfaces should reliably occur, such to ensure airtightness of the heat sealed sac and a controlled release of internal overpressure upon reaching an established maximum limit value by creating a fluid release path for vapors and/or pressurized gas.

Fig. 2 is an enlarged detail view of the point of introduction of the insert 2 between the heat welded edges 1a and 1b of the flexible film of the sac.

Fig. 3 illustrates a first way of creating a release path of vapors and/or pressurized gases determined by a breakdown of adhesion between the inner surface of the edge portion 1b of the film of the sac from a layer of pressure activated adhesive present on the application surface of the insert 2 onto the flexible film. A suitable pressure activated adhesive may be for example the commercial product RC10 UV of RAFLATAC, though other commercial products with equivalent characteristics may be alternatively used.

Fig. 4 shows a different way of detachment of the adhesion surface of the inner surface of the edge portion 1a of the sac film through failure of the weld seam occurring between the heat weldable inner layer of the edge portion 1a and a layer of heat weldable laquer applied on the surface of the back of the insert 2, which, though ensuring airtightness of the heat sealed sac under conditions of absence of a substantial internal overpressure, has a limited mechanical resistance such that upon reaching an established maximum internal overpressure in said the airtight sac, the tract of the weld seam over the back of the insert 2 fails thus allowing creation of a release path of pressurized fluids.

[0030] **Fig. 5** shows in an exploded fashion and as a composite assembly a valve sticker 2 of localized detachment applicable onto the flexible film with which the sacs will be formed, according to a first embodiment. In this embodiment the insert sticker 2 consists of a film 2' of a heat weldable material, for example of PPcoex or PPcast adapted to weld to the material constituting the inner portion of the flexible film with which the sacs are going to be formed, the surface of application of which is treated such as to receive and adhere to a layer of pressure activated adhesive 2a to constitute the insert sticker 2, applicable at pre-ordered locations of the ribbon of flexible film of fabrication of the heat sealable sacs, and the back of which will weld the other edge portion of the flexible film of the sac, thus preordering an eventual localized release of pressurized vapors and/or gases, as represented in **Fig. 3.**

[0031] Alternatively, by making the surface of application of the film 2' of weldable material peelable, the eventual detachment may alternatively occur between the peelable surface of the film 2' and the layer of pressure activated adhesive 2a, which in this case would remain adherent to the surface of the edge portion 1b of the flexible film with which the sac is formed.

[0032] An exemplary alternative embodiment of the insert sticker of controlled detachment in which the film 2' is of material not compatibly weldable to the material constituting the inner layer of the flexible film of formation of the hot sealed sacs is shown in Fig. 6. In this case, on the back of the film 2' is applied a layer of heat weldable laquer 21, for example a commercially available heat weldable laquer such as the product WP 7200 MI of the company FLINT or equivalent commercial products of producers such as for example HENKEL. The load of heat weldable laquer may generally be comprised between about 5 g/m^2 and 10 g/m^2 though may even be greater. The application of the heat weldable laquer may be carried out with a common printing technique, with a doctor blade, by contact or painting, to which may generally follow an oven treatment for evaporating off completely the solvent of the heat weldable plastic material

thus distributed in a fluid state.

[0033] In this case, the controlled detachment mechanism with creation of a release path of vapors and/or gases may be pressurized inside the sac may occur indifferently either through the mechanism of **Fig. 3** or through the mechanism of **Fig. 4** in which the bonded surfaces more likely to detach from one another because of a raising inner overpressure are the hot welded surfaces of the inner layer of the edge portion 1a of the flexible film of the sac and of the layer of heat weldable laquer 21 that is applied on the back of the self-adhesive film 2' constituting the insert sticker of controlled detachment.

[0034] **Fig. 7** shows the structure of a controlled detachment insert sticker according to a further alternative embodiment.

[0035] In this case, instead of a layer of heat weldable laquer, the heat sealing of the edge portion 1a of the flexible film of the sac over the insert is ensured with a multilayered structure of the insert sticker that comprises a second film 2s of the same heat weldable material of the inner portion of the flexible film of the sac or compatibly weldable to it, laminated over the first film 2', using to this end a common aqueous base or polyurethanic glue free of solvent. The glue load (identified in the drawing by the layer 2c) before laminating the multilayer and curing it, may generally be comprised between 10 and 40 g/m^2.

[0036] The total thickness of the controlled detachment insert sticker 2 is preferably comprised between 10 and 30 μm. It may generally be thinner than the flexible film 1 of formation of the heat sealed sacs (as represented in Figures 1-4) or substantially equal to or even slightly greater than the thickness of the flexible film of formation of the sacs. In any case, the presence of the control detachment insert along a perimetral weld seam does not affect continuity and dimensional uniformity (overall thickness of the weld seam that is normally formed upon forming the sac which eventually will be completely sealed after introducing the content).

[0037] In the example shown in **Figures 8, 9** and **10**, that are respectively a sectional view, a side view, and an exploded detail view of a sac of heat sealed flexible film, the pressurized inner vapor and/or gases release device is constituted by the controlled detachment insert 2 between juxtaposed surfaces of edge portions of the flexible film 1 with which the sac is formed.

[0038] In this example, the controlled detachment insert has a shape of an isosceles trapezoid, the major base of which is toward the inner side of the sac and the minor base of which coincides or slightly protrude from the outer perimeter of the hot sealed edge portions of the flexible film of the sac. The shape of the insert sticker 2 may even be different, for example of different polygonal, round or elliptical form, though it extends for the whole height (width) of the weld seam and eventually may even protrude from the weld seam internally or externally of the airtight sac. Preferably, the height (width) of the weld seam should not be lesser than about 10 mm and may even be useful that the weld seam may have a height (width) of at least 15 mm in order to provide for a broader range of sizing of the controlled detachment insert and ensuring an enhanced repeatitivity of the limit value of release of inner overpressure.

[0039] The length of the insert 2 (meaning the dimension along the longitudinal axis of the weld seam) may be of one or more cm. The length, together with the adhesion characteristics of the interface destined to fail upon reaching the established maximum limit of inner overpressure, and the flexibility characteristics of the film with which the sacs are made that must determine the creation of a passage way of release of inner pressurized vapors and/or gases, are main parameters for dimensioning the controlled detachment insert sticker of this disclosure. By increasing the length of the insert, the limit value of inner overpressure at which the release through the localized breakdown of the adhesion between hot sealed edge portions of the sac thus preordered to breakdown at a certain overpressure, restricts notwithstanding the other above-mentioned parameters remain the same. Normally a major base or length of the inner edge of the insert 2 may be between 15 and 30 mm.

[0040] A trapezoidal or triangular shape with major base exposed to the inner pressurized fluid of the sac is preferred because it facilitates the correct sizing of the weld seam insert for achieving an enhanced repeatitivity of the maximum limit value of overpressure that causes the release.

[0041] A possible fabrication process of a heat sealed sac of flexible film will pressurize inner fluid release device according to the present disclosure, may preliminarily include that over one side of a continuous ribbon of flexible film 1 be applied, precisely at preestablished positions, insert stickers 2, the ribbon thus provided with the insert stickers adherent thereto may be rewound in reels to be stored and eventually transported, which will serve for feeding a common automatic sac forming machine.

[0042] The phase of forming the sacs is schematically illustrated in the diagram of **Fig. 11.**

[0043] The ribbon of flexible film 1, already carrying adherent insert stickers 2, is unwound from the feed reel of the machine and common handling members provide to juxtapose one over the other the longitudinal edge portions of the ribbon and to weld them together along a longitudinal weld seam 3, thus forming a hot welded tubular article.

[0044] In correspondence of each insert sticker 2, is thereafter carried out a transversal heat weld 4 of the tubular article, which may have a width (height) about twice the width (height) of the insert sticker 2. By cutting along a median line the transversal weld seam 4, the sac extending from a heat welded end is separated from a successive sac.

[0045] Of course, many other forming schemes of heat sealable sacs may be followed according to needs and characteristics of the forming machine and of the devices

of filling the individual sacs with products.

[0046] Fig. 12-15 are schematical views of several common types of heat welded flexible film sacs showing how sacs of different shape and structure may be equipped with the insert 2 of the present disclosure, for ensuring a controlled and localized detachment in a hot sealed seam of edge portions of the flexible film of the sacs along any one of the perimeter weld seams of an airtight flexible sac package.

Claims

1. Heat sealed sack of flexible film of weldable plastic for airtight packaging of foodstuff to be warmed before consuming it, having means for releasing pressurized vapors and/or gases, comprising a relief valve in the form of an insert of localized detachment of seal surfaces at a point along a weld seam joining juxtaposed edges of said flexible film of weldable plastic.

2. The sack according to claim 1, wherein said insert of localized detachment is in the form of a sticker pre-applied at a precisely determined location on the inner surface of said flexible film, in an area of the film destined to be welded for sealing the sack, comprising
a flexible film of weldable plastic having a surface treated to render it peelable;
a layer of a pressure activated adhesive over said peelable surface of application of the sticker onto the inner surface of said flexible film of the sack.

3. The sack according to claim 1, wherein said insert of localized detachment is in the form of a sticker pre-applied at a precisely determined location onto the inner surface of said flexible film, in an area of the film destined to be welded for sealing the sack, comprising
a flexible film of a peelable film of unweldable material;
a layer of pressure activated adhesive on the surface of application onto the inner surface of said flexible film of the sack;
a solvent free layer of a weldable laquer on the opposite surface of said film of said unweldable material.

4. The sack according to claim 1, wherein said insert of localized detachment is in the form of a sticker pre-applied at a precisely determined location onto the inner surface of said flexible film, in an area of the film destined to be welded for sealing the sack, comprising
a flexible film of a peelable film of unweldable material;
a layer of pressure activated adhesive on the surface of application onto the inner surface of said flexible film of the sack;
a layer free of solvent of a water base glue or of a polyurethanic glue over the opposite surface of said flexible film of unweldable material;
a second flexible film of a weldable plastic laminated over the layer of solvent free glue.

5. The sack according to anyone of the preceding claims, wherein said insert of localized detachment has height equal or greater than the height of the sealing weld of a perimeter side of the sack and length dimensioned in function of a pre-established internal overpressure of breaking open of the relief valve.

6. The sack according to claim 5, wherein said insert has a trapezoidal profile with major base exposed to the interior of the sack and minor base coinciding with or extending out of the outer rim of the sealing weld of a perimeter side of the sack.

7. The sack according to claim 1, wherein said insert of localized detachment sandwiched between seal surfaces of the flexible film of the sack welded one to the other, has a thickness comprised between 30 and 100 μm..

8. The sack according to claim 3, wherein said flexible film of the label is of a material belonging to the group composed of polypropylene, polyester and polyamide, and said weldable laquer is a commercial product uniformly distributed in form of a fluid solution over the surface of the flexible film at a load comprised between 5 and 10 g/m^2 and treated in oven for removing the solvent.

9. The sack according to claim 4, wherein said flexible film of the sticker is of a material belonging to the group composed of polypropylene, polyester and polyamide, and said weldable film is of the same plastic material constituting the inner surface, weldable on itself, of the flexible film of the sack or compatibly weldable thereto.

10. The sack according to claim 2, 3 and 4, wherein said pressure activated adhesive is an acrylic adhesive.

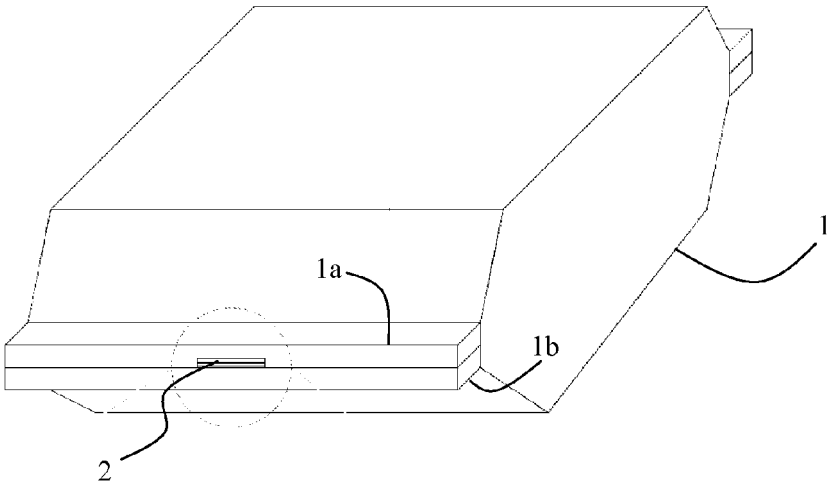

FIG. 1

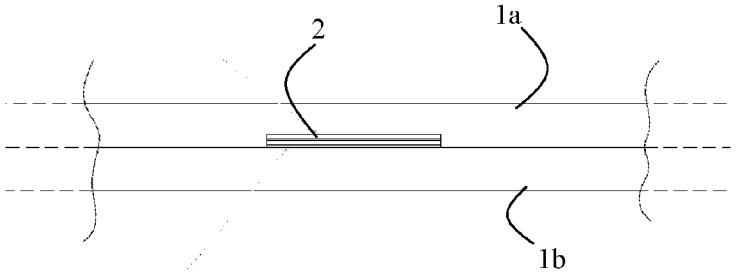

FIG. 2

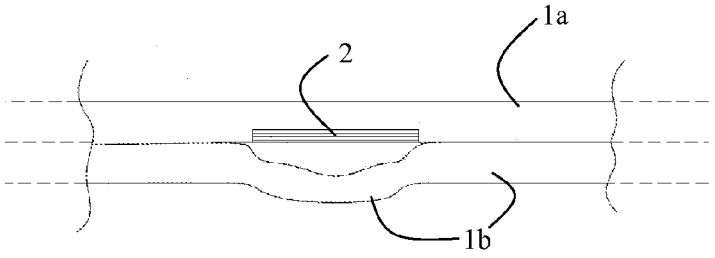

FIG. 3

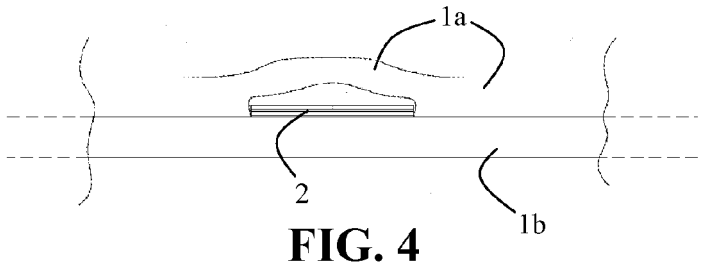

FIG. 4

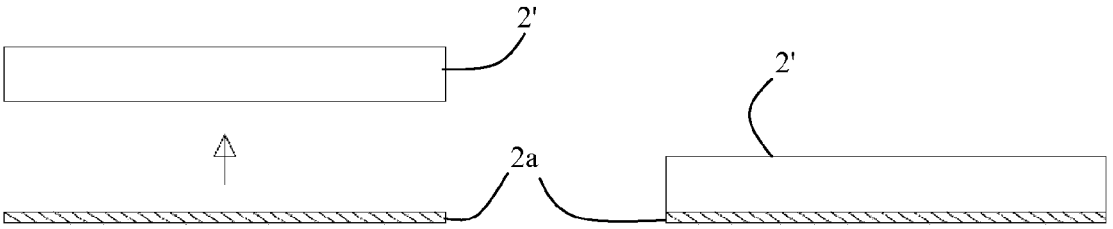

FIG. 5

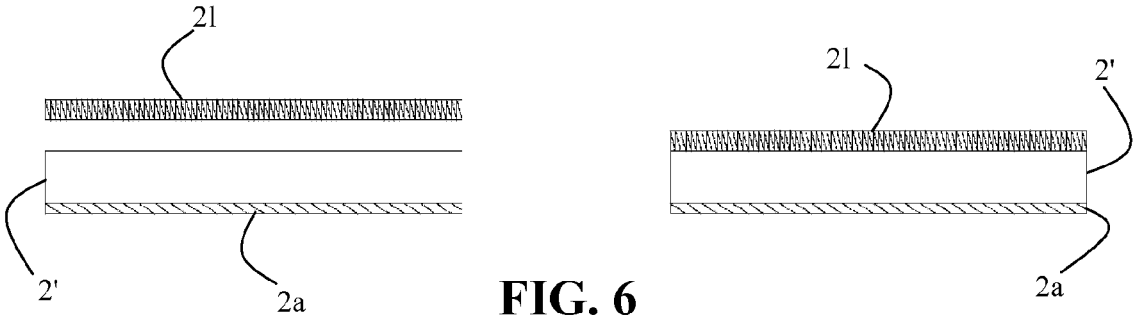

FIG. 6

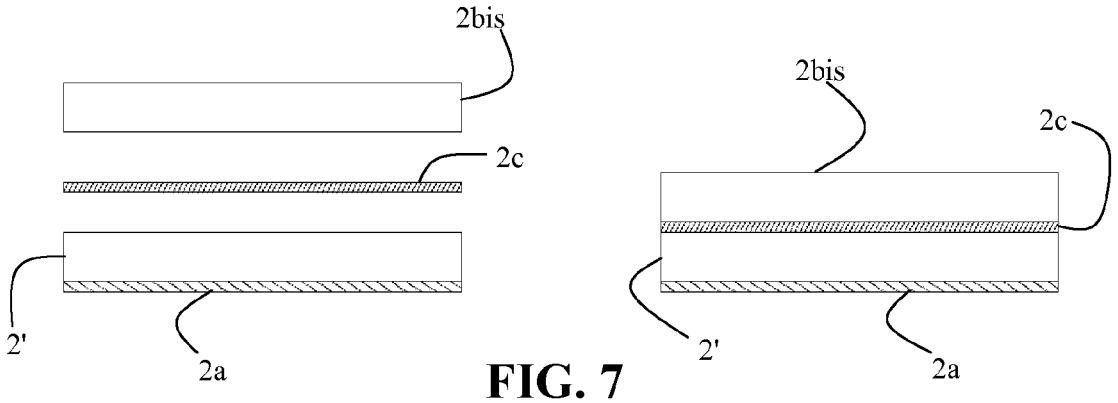

FIG. 7

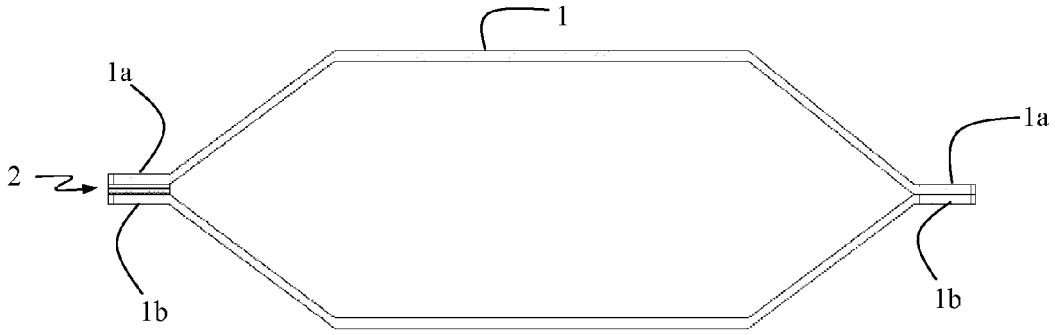

FIG. 8

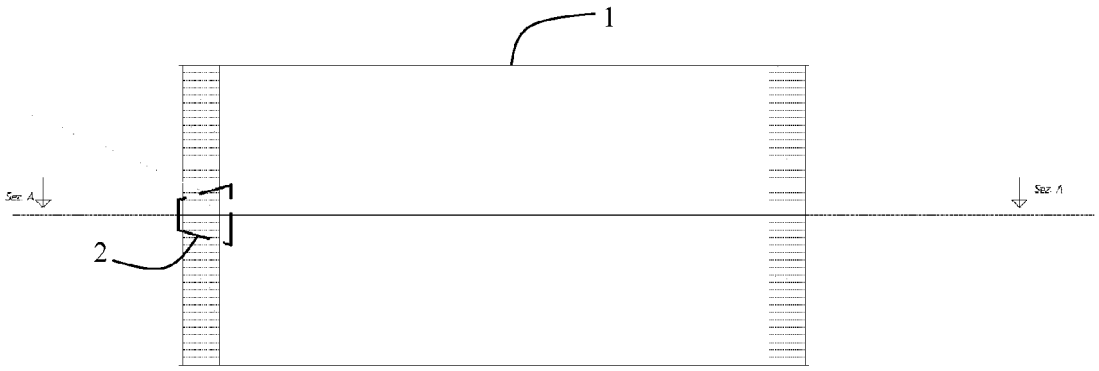

FIG. 9

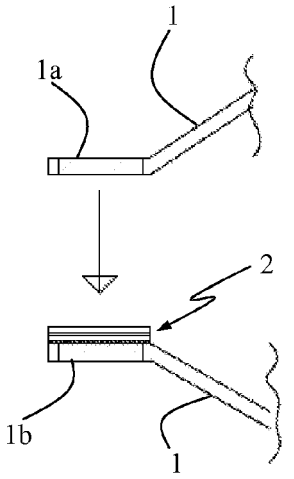

FIG. 10

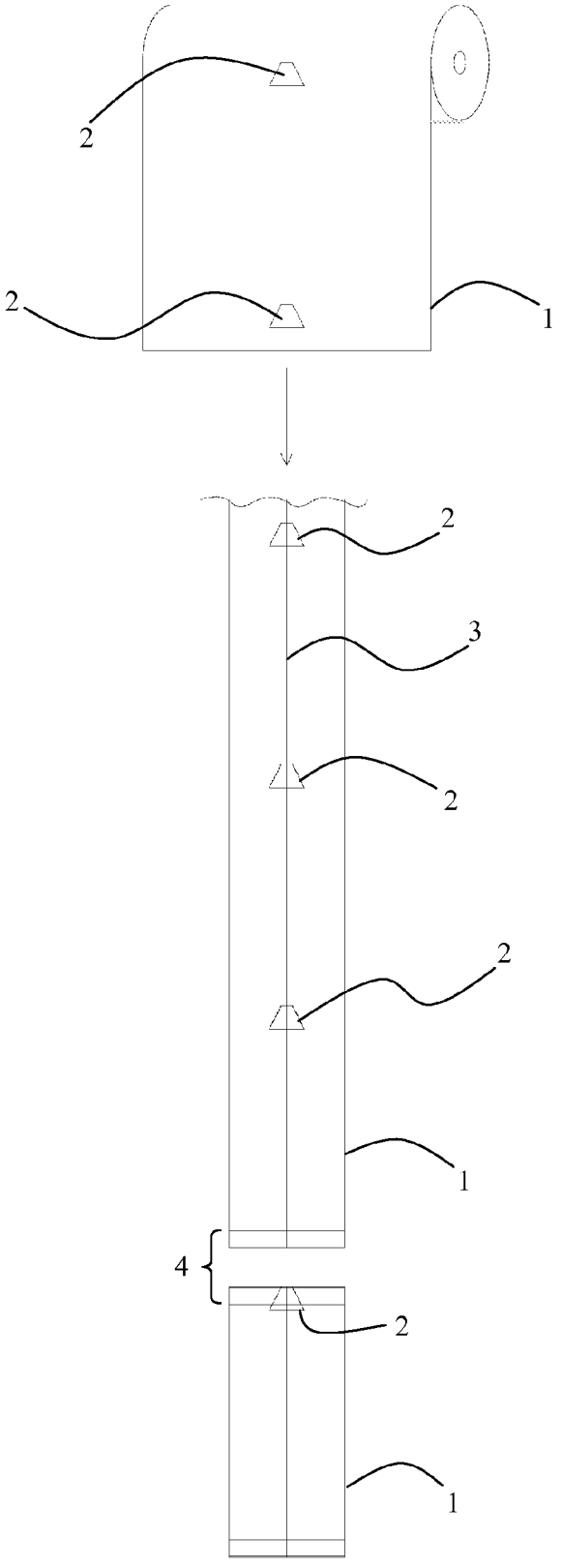

FIG. 11

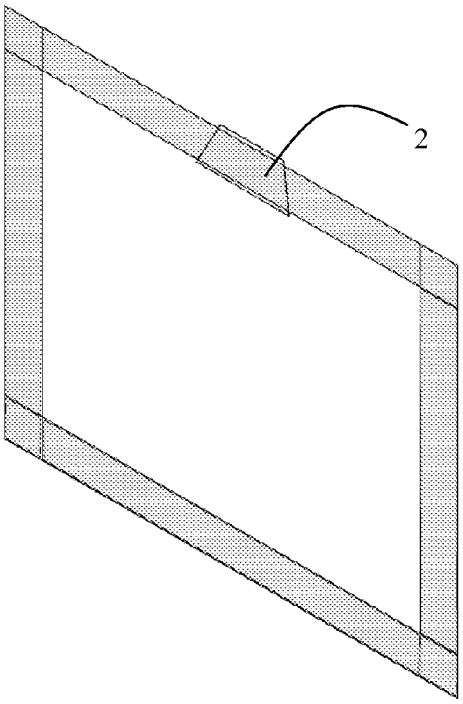

FIG. 12

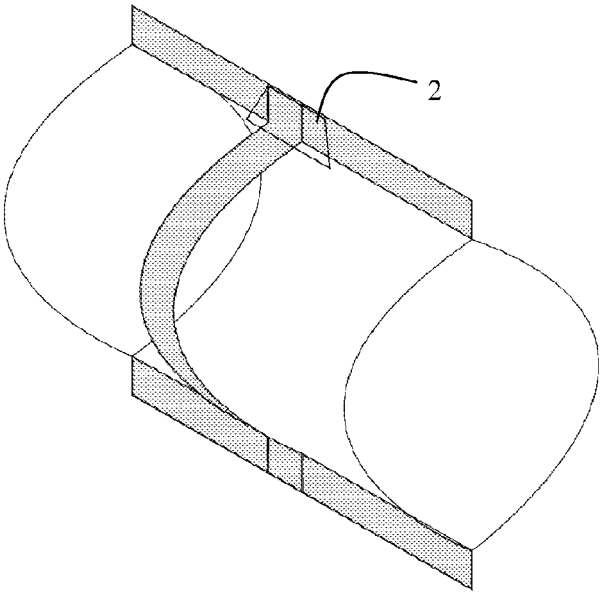

FIG. 13

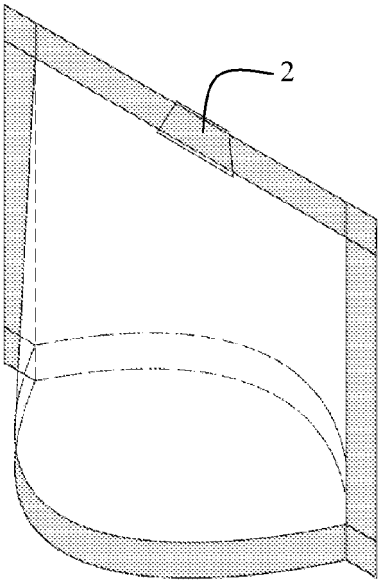

FIG. 14

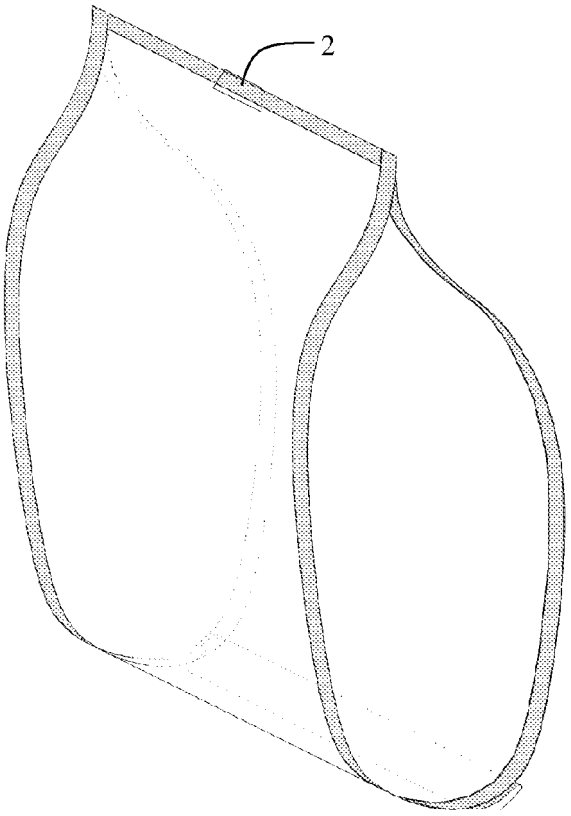

FIG. 15

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EUROPEAN SEARCH REPORT

Application Number
EP 10 16 0992

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Place of search	Date of completion of the search	Examiner
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