WINDOW BAG FOR LIQUIDS.

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References cited:
GB-A-2 048 703
US-A-1 814 967
US-A-2 750 096
US-A-2 752 085
US-A-3 386 645
US-A-3 387 640
US-A-3 759 379
US-A-3 938 659
US-A-3 937 728
US-A-4 267 960

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Description

Background of the Invention

This invention relates to providing a bag of heatsealable construction which comprises at least one ply of an opaque barrier sheet peelable from the remaining structure, preferably to allow viewing of the contents of the bag. The bag is characterised by good strength and the fact that it can be thermally sterilised without substantially interfering with the heatseal.

Window-type constructions of plastic packages are known in the prior art. For example, such constructions are disclosed in DE-A-26 39 351. This discloses a flexible pouch comprising a first opaque barrier ply heat-sealed at its periphery to a window ply in the form of a permeable layer, such as net, to constitute an interior bag; and a second opaque barrier ply sealed at its periphery to the interior bag so as to cover the window ply. A somewhat similar construction is shown in US-A-4 015 771.

It has remained a problem to provide a thermally-sterilised bag with a peelable window construction that is desirably strong. In some instances it may be desirable for such a bag to withstand a 1.8 m (six-foot) drop to a floor while containing a litre of liquid. To provide such a bag while, at the same time, providing a peelable, window-revealing member in the construction is a problem to which the invention is directed.

Summary of the Invention

It is a principal object of the invention to provide a flexible package for liquid which comprises a peelable layer to make the contents of the package visible.

The above object has been substantially achieved by constructing a flexible pouch characterised in that the pouch is heat-sterilisable, that the window ply is constituted by a transparent film which is heat-sealed about its periphery to the first opaque barrier ply with a minimum seal strength of 2000 grams per inch (79 g/mm) and that the second opaque barrier ply is heat-sealed at its periphery to the interior bag with a peel strength of not more than 1800 g/inch (63 g/mm).

Preferably the seal strength between the window ply and the first opaque barrier ply is at least three times the peel strength between the second opaque barrier ply and the window ply. Such a pouch may comprise a polyolefin-based interior bag and a heat-sealed but peelable panel which is an opaque gas-barrier, usually of the type bearing a metal-foil ply.

Preferred polyolefins are those which are modified to have relatively high impact strength. However, the principal object of the invention can be achieved utilising polypropylene or any other polyolefin film which can be suitably processed, i.e. heat sterilised, for a period of time at a temperature of 121°C to 135°C to sterilise the contents of a package. The most advantageous olefin polymer films are those modified as copolymers or polyisobutylene, or other such impact-strength-improving polymers, such that the impact strength of the composite material is improved to the point that the liquid will be retained even when a package containing about a litre of liquid is dropped six feet onto a concrete floor. A particularly favourable film in view of its strength and heat-sealing characteristics is a blend of polypropylene and polyisobutylene. Such a blend suitably contains from about 10 to 60%, by weight, of polyisobutylene. About 30 to 50% of polyisobutylene in polypropylene is a preferred composition.

The heat-seal by which the removable window is affixed to the polyolefin film has a number of important attributes. Not only must it withstand the heat treatment of sterilisation, but it must do so with little effect on its peel strength. Advantageously, this effect on its peel strength should be less than 20%. In the context of this application, the ability to be heat-sterilised assumes that the peel strength will not be affected by as much as 20% by the 121°C to 135°C sterilising temperature. Moreover, the peel strength is preferably within the range of about 600 to 1800 grams per linear inch (24—63 g/mm), depending on the application. Bags made according to the invention are particularly useful for IV’s and other pharmaceutical liquids.

This heat-seal has been dependably achieved by heat-sealing, to the polyolefin or to the modified polyolefin, a modified maleic anhydride adduct of polyolefin.

The modified polyolefin-based composition which is heat-sealed to said transparent panel is such that, after heat-sterilisation at 121°C to 135°C (250° to 270°F), has a peel strength of from 24 to 63 g/mm (from 600 to 1600 grams per linear inch) of width of the heat-seal. The heat-seal itself is normally about 6.4 to 10 mm (0.25 to 0.4 inch) wide.

Illustrative Example of the Invention

In the application and accompanying drawings, there is shown and described a preferred embodiment of the invention and various alternatives and modifications thereof.

Figure 1 is a perspective view of a pouch formed according to the invention;

Figure 2 illustrates, schematically and in section, a package formed according to the process of the invention;

Figure 3 illustrates the plies of Figure 2, schematically but in more detail; and

Figure 4 is a perspective view of another pouch formed according to the invention.

Referring to Figure 1, it is seen that a bag comprising an intravenous solution 12 is shown with one panel 14 partly peeled away along heat-sealed line 16, thereby revealing solution 12.

Figure 2 shows, schematically and in section, a typical pouch construction useful in forming the package of the invention. The pouch is formed of the basic panels:

— an opaque barrier back panel 20;
— a transparent front panel 22;
— an opaque, pealable barrier panel 24. All of the panels 20, 22 and 24 are heat sealed along the edges 26 thereof to form a pouch. As is well known in the art, the final closing of the pouch is carried out only after filling and by heat-sealing (or otherwise sealing) a fill opening, which is not shown in the drawings, but which opening will be well understood by those skilled in the art.

Peelable panel 24 comprises a biaxially-oriented film ply 26, e.g., of the type sold under the trade designation MYLAR, which is 0.012 mm (0.00048 inch) thick. This ply is coated with about 4.9 g/m² (one pound per 1000 square feet) of an adhesive such as the thermosetting adhesive sold under the trade designation 506 by Morton Chemicals Co. The adhesive-coated surface of the polyester is bonded to one side of an aluminum foil 30 of 0.025 mm (0.0010 inch) thickness. The replacement (foil) is coated with 1.0 to 3.9 g/m² (0.2 to 0.8 pounds per 1000 square feet) of a modified maleic anhydride adduct of polypropylene 32, which is sold under the trade designation Morprime by Morton Chemical, and which provides the desirable peelable heat seal to a polypropylene layer, 34. Layer 34, which constitutes panel 22, is about 0.10 mm (0.004 inch) thick, and is formed of a polypropylene (or a polyisobutylene blend, as described above, having a nominal molecular weight of from about 80,000 to 140,000). Materials sold under the trade designation Vistanex by Exxon are suitable (with those of about 100,000 to 120,000 being preferred).

Opaque panel 20, which is to be permanently heat-sealed to transparent panel 22, is formed of a polyester/aluminum foil/polypropylene sheet, for example 0.10 mm (0.004 inch) thick polypropylene layer 38 is bonded to the 0.018 mm (0.0007 inch) thick aluminum foil 40, and the 0.012 mm (0.00048 inch) thick polyester 42 is an exterior ply.

When the heat sealing of the pouch perimeter takes place, polypropylene panel 22 will bond to the polypropylene 38 of ply 20 with a seal strength of over 79 g/mm (2,000 grams per linear inch) of seal width. However, panel 24 will be bonded to panel 22 with a peel strength of only about 31 g/mm (800 grams per inch). Therefore, panel 24 can be readily and selectively peeled from the package when it is ready for use so that the solution will be visible.

In practice, it is desirable to havePortica printed on the external side of polypropylene 22 as shown in Figure 1. (However, the indication could be printed on other external surfaces such as polyester 42 on the polyester film facing polyester 42.

In another embodiment of the invention, about 50% of polyisobutylene (sold by Exxon Inc. under the trade designation Vistanex L100) is blended in a Banbury mixer with about 50% of polypropylene. A film is extruded therefrom and used as a replacement for polypropylene in ply 22 and 24. Again, excellent pealability is achieved. Moreover, when a one-liter package is dropped from 1.8 m (6 feet) onto a concrete floor, there is no rupture.

In still another embodiment of the invention, the polyisobutylene blend is reduced to about 20%. Again, a package is formed having substantially greater resistance to falling than does the package with unblended polypropylene.

Figure 4 shows another pouch using the improved window-seal aspect of the invention.

In this aspect of the invention, there is a wrap-around construction whereby the first and second opaque barrier layers of the embodiment of Figures 1 and 2 are formed of a single laminate 50. A relatively narrow window ply 52 is sealed on the interior bag wall formed of sheet 50. A peelable window strip 54 which may be of aluminum foil is fixed to the lateral perimeter 56 of the laminate 50 using the 50%-polyisobutylene peelable seal. It is also possible to modify this structure by sealing directly to the lateral areas of the polypropylene window. However, it is believed to be desirable to place a thin coating of polypropylene over the 0.0048 inch thick polyester of laminate 50 to obtain good bonding to laminate 50 of the window strip 54.

This configuration is heat-sealed as at 60, as desired for a particular application, to yield strong polypropylene heat seals.

The term “opaque barrier ply” in this application defines metal-foil-bearing laminates together with at least one polymeric coating such as polyester or polypropylene thereover.

It will be understood that a dual-window container can be made by replacing a unitary barrier layer with a readily-peelable, 2-ply construction comprising a polyolefin window ply and a peelable barrier layer adhering to the window ply.

Also, it is noted that the “periphery” of the plys which form the pouch will not in every case correspond directly to the periphery of the entire pouch assembly. In many cases, some additional extension of the plys beyond the pouch itself is desirable to provide material by which to suspend or otherwise handle the pouch.

Claims

1. A flexible pouch comprising:
   a first opaque barrier ply (20, 50) heat sealed at its periphery to a window ply (22, 52) to constitute an interior bag;
   and a second opaque barrier ply (24, 54) sealed at its periphery to the interior bag so as to cover the window ply;

2. Characterized in that the pouch is heat sterilizable, that the window ply is constituted by a transparent film (34) which is heat-sealed about its periphery to the first opaque barrier ply with a minimum seal strength of 2000 grams per inch (79 g/mm) after sterilisation, and that the second opaque barrier ply is heat-sealed at its periphery to the interior bag with a peel strength of not more than 1600 g/inch (63 g/mm).

3. A pouch as defined in claim 1, wherein the seal strength between the first opaque barrier ply
and the window ply is at least three times the peel strength between the window ply and the second opaque barrier ply and the peel strength is from 800 g/inch to 1600 g/inch (24 to 63 g/mm) after sterilisation.

3. A pouch as defined in claim 1 or 2 wherein the heat-seal between the window ply and the second opaque barrier ply is made by heat-sealing the window ply to a modified maleic anhydride adduct of polypropylene (32) coated on the second opaque barrier ply (24).

4. A pouch as defined in any of claims 1, 2 or 3 wherein said first opaque barrier (20) comprises a blend of polypropylene and polyisobutylene.

5. A pouch defined as in claim 1 or 2 wherein a heat-seal is formed between a blend of polypropylene and polyisobutylene in the window ply and a modified maleic anhydride adduct of polypropylene coated on the second opaque barrier ply.

6. A pouch as defined in claim 5, wherein said polyisobutylene has a nominal molecular weight of from 100,000 to 120,000.

7. A pouch as defined in any of claims 1, 2 and 4, wherein the pouch comprises indicia on the external surface of one or more of said transparent window ply and opaque barrier ply.

8. A pouch as defined in claim 1, wherein the interior bag comprises a polypropylene window ply (52) adhered to lateral edges of said first opaque barrier ply (50); and in which the second opaque barrier ply (54) comprises aluminum foil which is preferably sealed to the interior bag proximate to said lateral edges.

9. A pouch as defined in any preceding claim in which the first opaque barrier ply comprises a laminate of:
   a) polypropylene interior ply (38);
   b) an aluminum foil layer (40); and
   c) a biaxially oriented polyester sheet (42).

**Patentansprüche**

1. Flexibler Sack bestehend aus:
   — einer ersten undurchsichtigen Sperrlage (20, 50), die an ihrem Rand mit einer Fensterlange (22, 52) heißverschweißt ist, um einen Innensack zu bilden;
   — einer zweiten undurchsichtigen Sperrlage (24, 64), die an ihrem Rand mit dem Innensack verschweißt ist, um die Fensterlange zu bedecken, dadurch gekennzeichnet,
   — daß der Sack heiß sterilisierbar ist,
   — daß die Fensterlängen aus einem transparenten Film (34) besteht, der an seinem Rand an der ersten undurchsichtigen Sperrlage heißverschweißt ist, mit einer minimalen Schweißfestigkeit von 2000 g/ver inch (79 g/mm) nach der Sterilisation, und
   — daß die zweite undurchsichtige Sperrlage an ihrem Rand am Innensack mit einer Abschließfestigkeit von nicht mehr als 1600 g/inch (63 g/mm) heißverschweißt ist.

2. Sack nach Anspruch 1, dadurch gekennzeichnet, daß die Schweißfestigkeit zwischen der ersten undurchsichtigen Sperrlage und der Fensterlange zumindest dreimal so groß ist wie die Schließfestigkeit zwischen der Fensterlange und der zweiten undurchsichtigen Sperrlage, und die Schließfestigkeit zwischen 600 g/inch bis 1600 g/inch (24 bis 63 g/mm) nach der Sterilisation beträgt.

3. Sack nach Anspruch 1 oder 2, wobei die Heißversiegelung zwischen der Fensterlange und der zweiten undurchsichtigen Sperrlage durch Heißverschweißen der Fensterlange auf ein modifiziertes Maleinsäureanhydrid-Addukt von Polypropylen (32) geschieht, das auf die zweite undurchsichtige Sperrlage (24) geschichtet ist.

4. Sack nach einem der Ansprüche 1, 2 oder 3, wobei die erste undurchsichtige Sperrlage (20) aus einer Mischung aus Polypropylen und Polyisobutylen besteht.


6. Sack nach Anspruch 5, wobei das Polyisobutylen ein nominales Molekulargewicht von 100,000 bis 120,000 aufweist.

7. Sack nach einem der Ansprüche 1, 2 oder 4, wobei der Sack auf der Außenoberfläche einer oder mehrerer Lagen, bestehend aus der transparenten Fensterlange und der undurchsichtigen Sperrlage, Anzeigenmarken aufweist.

8. Sack nach Anspruch 1, wobei der Innensack eine Polypropylenfensterlange (52) aufweist, die an Seitenrändern am ersten undurchsichtigen Sperrlage (50) anhaftet, und wobei die zweite undurchsichtige Sperrlage (54) eine Aluminiumfolie aufweist, die vorzugsweise mit dem Innensack nahe der genannten Seitenränder verschweißt ist.

9. Sack nach einem der vorangehenden Ansprüche, wobei die erste Sperrlage aus folgendem Laminat besteht:
   a) Innenlage (38) Polypropylen;
   b) Aluminiumfolie (40); und
   c) biaxial gerichtete Polyesterlage (42).

**Revindications**

1. Poche souple comprenant:
   un premier pli opaque d’arrêt (20, 50) thermoscellé à sa périphérie sur un pli formant fenêtre (22, 52) pour constituer un sac intérieur;
   et un second pli opaque d’arrêt (24, 54) scellé à sa périphérie sur le sac intérieur afin de couvrir le pli formant fenêtre;
   caractérisée en ce que la poche est stérilisable à chaud, en ce que le pli formant fenêtre est constitué d’un film transparent (34) qui est thermoscellé le long de sa périphérie sur le premier pli opaque d’arrêt, avec une résistance minimale du joint scellé de 2000 grammes par inch (79 g/mm) après stérilisation, et en ce que le second pli opaque d’arrêt est thermoscellé à sa
périphérie sur le pelage ne dépassant pas 1600 g/inch (63 g/mm).

2. Poche selon la revendication 1, dans laquelle la résistance du joint scellé entre le premier pli opaque d’arrêt et le pli formant fenêtre est d’au moins trois fois la résistance au pelage entre le pli formant fenêtre et le second pli opaque d’arrêt et la résistance au pelage est de 600 g/inch à 1600 g/inch (24 à 63 g/mm) après stérilisation.

3. Poche selon la revendication 1 ou 2, dans laquelle le joint thermoscellé entre le pli formant fenêtre et le second pli opaque d’arrêt est formé par thermoscellage du pli formant fenêtre sur un produit d’addition d’anhydride maléique modifié sur du polypropylène (32), appliqué en revêtement sur le second pli opaque d’arrêt (24).

4. Poche selon l’une quelconque des revendications 1, 2 ou 3, dans laquelle ledit premier pli opaque d’arrêt (20) comprend un mélange de polypropylène et de polyisobutylène.

5. Poche selon la revendication 1 ou 2, dans laquelle un joint thermoscellé est formé entre un mélange de polypropylène et de polyisobutylène dans le pli formant fenêtre et d’un produit d’addition d’anhydride maléique modifié sur du polypropylène, appliqué en revêtement sur le second pli opaque d’arrêt.

6. Poche selon la revendication 5, dans laquelle ledit polyisobutylène possède un poids moléculaire nominal de 100 000 à 120 000.

7. Poche selon l’une quelconque des revendications 1, 2 et 4, dans laquelle elle comporte des repères sur la surface extérieure d’un ou plusieurs dudit pli transparent formant fenêtre et dudit pli opaque d’arrêt.

8. Poche selon la revendication 1, dans laquelle le sac intérieur comprend un pli (52) formant fenêtre en polypropylène collé à des bords latéraux dudit premier pli opaque d’arrêt (50); et dans laquelle le second pli opaque d’arrêt (54) comprend une mince feuille d’aluminium qui est avantageusement scellée, au sac intérieur à proximité desdits bords latéraux.

9. Poche selon l’une quelconque des revendications précédentes, dans laquelle le premier pli opaque d’arrêt comprend un stratifié de:
   a) un pli intérieur (38) en polypropylène;
   b) une couche (40) formée d’une mince feuille d’aluminium; et
   c) une feuille (42) de polyester orienté biaxiallement.