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

(11) Publication number: **0 145 500**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **84308719.8**

(22) Date of filing: **14.12.84**

(51) Int. Cl.⁴: **B 65 D 81/34**

(30) Priority: **15.12.83 US 561824**

(43) Date of publication of application: **19.06.85**
Bulletin 85/25

(84) Designated Contracting States: **AT BE CH DE FR GB IT LI LU NL SE**

(71) Applicant: **ETHYL CORPORATION, Ethyl Tower 451 Florida Boulevard, Baton Rouge Louisiana 70801 (US)**

(72) Inventor: **Goodrum, Richard Warren, 11821 Rolling Brook Drive, Richmond Virginia 23235 (US)**
Inventor: **Bechtold, Thomas Earl, 14008 Whispering Oaks Road, Midlothian Virginia 23113 (US)**
Inventor: **Klimek, Albert Adam, 13808 Barnes Spring Road, Midlothian Virginia 23113 (US)**

(74) Representative: **Bizley, Richard Edward et al, BOULT, WADE & TENNANT 27 Furnival Street, London EC4A 1PQ (GB)**

(54) Infusion package.

(57) An infusion bag (10) for particulate food products (P) such as tea or coffee, constructed of a tube of perforated thermoplastic film (10) or other porous material having a central product-containing portion and flattened end portions (16, 17) on each end thereof, the perforated thermoplastic film (11) or other porous material having a multiplicity of minute holes or openings which are sufficiently small in size to prevent the migration of the particulate product therethrough but which are sufficiently large in size and number to permit adequate fluid flow therethrough. Joining together of the flattened end portions (16, 17) forms a flow-through or dual container type infusion bag and a handle for extending over the side of a cup or pot. The film is substantially odorless and tasteless.

EP 0 145 500 A2

INFUSION PACKAGE

The present invention is directed to infusion packages, especially tea packages and the like, and more particularly to an infusion package constructed of a non-woven, fiber-free, perforated thermoplastic film or other porous material.

The invention is particularly concerned with an infusion package constructed of a coextruded multilayer perforated thermoplastic film having a plurality of uniform minute holes or openings therein, which has a relatively flat configuration for packing and which can be readily converted to a dual chamber or flow-through type bag.

At the present time, most tea bags or packages commercially marketed are either the "pillow" pack type or the dual bag or Flo-thru type. The bags are made of paper and the latter have strings and tabs attached thereto by staples or glue. Although a considerable degree of success has been achieved with these two types of bags, they have poor wet strength. The single compartment or "pillow" tea bag is a flat bag of liquid pervious material which contains sufficient tea for an individual serving or for multiple servings in the case of the larger packages used by food service industries. The tea spreads the sides of the bag to accommodate the contents. When the tea is wet, it forms a swollen compacted mass that may fill the bag. The swelling tea presses outwardly against the inside walls of the bag.

Squeezing or other external pressure on the bag may cause it to break open or split or otherwise undesirably dispel its contents. To overcome this swelling, some bags have been constructed with pleats therein. Although effective to some degree, they have a lack of wet strength and present other problems.

The art is replete with infusion packages containing two or more fill containing segments. The connected segments permit liquid flow between the segments and expose a greater bag surface area to liquid for extraction therethrough. Although such bags may improve brewing, they have the same lack of wet strength of the "pillow" type bags, and present other problems, such as assembly and packaging.

Infusion-type tea packages are usually rectangular packets or sachets made from single or multiple pieces of paper crimped or otherwise sealed along the edges. In another type, a single strip of paper is folded twice longitudinally to form an inner centrally disposed double fold joining the two meeting edges. In a type of flow-through tea bag, a triple transverse fold intermediate the length of the folded strip forms two pockets which are partially filled with tea before the open ends thereof are folded over and stapled to a strand of string usually having a tag on the end thereof.

Over the years, a wide variety of infusion packages or bags, usually for containing tea for subsequent brewing, have been developed. The packages are usually constructed of filter paper or some other type of porous material.

An infusion package which has a natural, expanded or unflattened condition and which is folded to a flattened configuration for packing is disclosed in U.S. 4,290,521. A pull strip with a tab on one end is adhesively attached to the upper part of the package for causing the package to be expanded from its flattened configuration when the strip is pulled.

A type of dosage pack or infusion package having two permeable bags joined to each other along a common seam and arranged in a face-to-face relationship by folding the bags onto one another along a fold line extending in the common seam is described in U.S. 4,055,668. A holder string is positioned between the two bags with one end attached to one of the bags and the other end attached to a tag positioned externally of the two bags.

U.S. 3,899,599 discloses a single chamber or dual chamber tea package which has a flexible strip attached to an exterior chamber side which can be partially removed to provide a hanger for holding the package in place in a container.

An infusion packet having two oppositely disposed, rigidly separated pockets of tea joined together by two tapering end portions which form a narrow, triangular shaped porous cup is shown in U.S. 3,597,222.

U.S. 3,653,913 discloses an infusion bag made from a rectangular strip of porous fibrous material, the longitudinal margins of which are folded together so as to form a longitudinal

joint consisting of three layers which are knurled together. The tube is divided by a transverse bend so as to form a pair of chambers for holding an infusible substance, and the opposite ends of the tube are connected to each other so as to close the package.

An early type of tea bag or tea ball wherein the bag is a triangularly-shaped pocket formed from a rectangular strip of perforated aluminum foil is described in U.S. 1,581,578.

Other types of filter paper tea bags or the like with a variety of handles are illustrated in U.S. 2,328,017; U.S. 2,359,292, U.S. 3,566,573; U.S. 4,153,153 and Great Britain 2,087,350. Great Britain 2,053,668 discloses a tea bag having an accordion fold.

Infusion bags with positioning means and flotation means are disclosed in U.S. 3,797,642 and U.S. 3,809,215, respectively. The tea bags themselves may be made of various materials including paper, plastics such as nylon, perforated plastic film, e.g., polyester, or woven or non-woven fabric of natural or synthetic origin.

A percolatable porous bag constructed of a blend of individualized textile or cellulosic fiber and a small amount of thermoplastic fiber is disclosed in Canadian patent 802,720.

Various degrees of success have been achieved with the foregoing infusion bags or packages, with paper or fibrous bags presently dominating the market place. One of the problems with

paper bags is lack of wet strength. Paper packages do not have the strength to withstand squeezing or other pressures commonly applied by consumer or other users.

An infusion bag for items such as tea, coffee or similar food products for brewing must have a number of qualities. It must have an inability to impart a taste factor to the liquid product after brewing. In effect, it must be substantially odorless and tasteless. It must also be sufficiently strong to contain the brewing product in boiling water, e.g., in the steeping of tea, coffee, and similar liquid beverages. The bag must also be porous enough to permit liquid diffusion therethrough, but the pores or openings must be of such size that migration of the beverage material therethrough is inhibited, both when the bag is dry and when the bag has been immersed in a liquid. It is also important that infusion begins to take place within a few seconds and be completed within a few minutes. It is further desirable that a package, bag or sachet, such as a tea sachet, retain sufficient stability that it can be compressed after brewing is completed without destruction of the container.

Thermoplastic films such as polyethylene and polypropylene are common packaging materials. Multilayer films of various types are also quite common packaging materials. The films are generally non-porous and impervious to water and other inert liquids. At least one of the layers of film has strong adhesive qualities. Examples of such multilayer films may be

seen in U.S. 4,254,169; U.S. 4,239,826; U.S. 4,233,367; U.S. 3,908,070; U.S. 3,423,231; U.S. 2,817,124 and U.S. 2,817,123.

Perforated thermoplastic films have many useful applications, including packaging of food products such as cheese, gardening and farming to prevent growth of weeds while permitting moisture to be transmitted through the film to the soil beneath and for making absorptive structures such as disposable diapers, for example, see U.S. 3,814,101.

Perforation of thermoplastic films is generally achieved by vacuum perforation of thin plastic films which involves the extrusion of molten polymeric materials such as polyethylene through a slot die. The hot melt web of film exiting the die impinges on a form through which a vacuum is drawn causing the film web to be perforated and holes formed therein. Depending upon the form used, films can be produced which have as few as 50 holes per square inch or which have thousands of holes per square inch. One of the earlier methods for vacuum perforation of plastic film is disclosed in U.S. 3,054,148.

The present invention provides an infusion package or sachet which meets the requirements for tea brewing and additionally overcomes the problems of lack of wet strength and packaging associated with the prior art.

The infusion bag of this invention is of a poriferous, non-woven, non-fibrous construction of a multilayer coextruded perforated thermoplastic film or other porous material having a

multiplicity of fine holes or openings. The thermoplastic film is a multilayer coextruded film with one outer layer being heat resistant and the other outer layer being somewhat less heat resistant and heat sealable. The openings in the perforated thermoplastic film or porous material are sufficiently small in size to retain particulated products such as tea, coffee or the like within the package and to inhibit or prevent migration of the particles through the holes when the particles are either dry or wet. The holes or openings in the perforated thermoplastic film or porous material are also sufficiently large in size and in number to provide the desired degree of infusion. One outer layer of the perforated thermoplastic film is polyester or propylene or other heat resistant thermoplastic. The other outer layer is polyethylene or other somewhat less heat resistant thermoplastic. The perforated thermoplastic film or porous material is substantially odorless and tasteless.

Fig. 1 is a top plan view of an embodiment of the invention;

Fig. 2 is a side elevational view of the embodiment of Fig. 1;

Fig. 3 is an end view of the embodiment of Fig. 1;

Fig. 4 is a sectional view taken across line 4-4 of Fig. 1;

Fig. 5 is a top view taken across line 5-5 of Fig. 1;

Fig. 6 is a view of the embodiment of Fig. 1 illustrating one means of joining together the ends of the package; and,

Fig. 7 is a view similar to that of Fig. 6 illustrating another means of joining the ends of the tea bag.

Referring now to the drawings, an infusion package or bag of the present invention is illustrated generally at 10. The bag or packet 10 is constructed of a rectangular strip of a perforated plastic film 11 which is described in more detail hereinafter. For simplicity of illustration, perforations in the film are not shown. The strip of film 11 is folded longitudinally at 12, sealed at intermediate locations 13 and 14 and filled with a particulated product P which can be seen through the film 11 between the sealings. After the product P is inserted in the sachet 10, the edge 15 is sealed, thereby encasing the product P within the package 10.

The intermediate sealings 13 and 14 provide tabs 16 and 17 on either side of the product P. Conveniently, slits or longitudinal slots 18 and 19 are formed in each of the tabs 16 and 17, respectively.

The infusion package 10 of the present invention is illustrated in its simplest form. Such packages can be readily made on existing filling and packaging machines with minimal modification. The relatively flat shape of the bags permits easy packaging or boxing in a fashion similar to that of boxing cigars.

Figs. 6 and 7 illustrate two means by which the package 10 is readily converted to a flow through or dual container infusion bag. In Fig. 6, tab 16 is inserted through slot 19 of

tab 17. Tabs 16 and 17 are of sufficient length to provide a handle which can readily be extended over the side of a cup or brewing pot.

In Fig. 7, the slots are not used and the tabs are assembled in a half knot or full knot, if desired. The tabs 16 and 17 are sufficiently long to easily provide the desired handles.

The infusion bag or package 10 is preferably constructed of a coextruded multilayer film 11 comprising an outer layer of a heat resistant thermoplastic such as polyester or polyolefin, for example, with polyester being preferred, and an inner sealant layer of a somewhat less heat resistant thermoplastic such as polyethylene, for example. The film 11 has a multiplicity of fine holes which may be in the form of capillaries which are of a somewhat tapered construction with the larger capillary opening being in the outer layer and the smaller one in the inner layer, the holes being more or less in the form of a truncated cone when the holes are round or oval.

For simplicity of illustration, the holes or openings in the film are not shown. It can be appreciated that the openings may be of any desired shape such as round, oval, rectangular, pentagonal or hexagonal, for example. It is desired that the holes be uniform and that they be sufficiently large in size and number to provide adequate infusion and be sufficiently small in size to prevent the migration of particles therethrough such as the particulate product P.

In the packaging of an item such as tea, a preferred hole size is from two to 10 mils (0.00508-0.0254 cm), in diameter or across the opening, with a size of three to four mils (0.00762-0.01016 cm) being most preferred. The film preferably has a thickness of 0.25 mil to two mils (0.000635-0.00508 cm). The preferred hole density is 500 holes per square inch (77.5 holes per square centimeter) or more. From 1800 to 4200 holes per square inch (279 to 651 holes per square centimeter) are more preferred, with about 2900 holes per square inch (449.5 holes per square centimeter) being most preferred. The porosity of the film is preferably 50 to 500 cubic feet per minute (CFM) (23,597 to 235,973 cubic centimeters per second).

The outer layer of the coaxial or coextruded perforated thermoplastic film of the bag is preferably a heat reistant polyester film having a melting temperature of 425°F to 600°F (218.83°C to 315.56°C) with about 525°F (273.89°C) being most preferred. The inner sealant layer of the coextruded perforated thermoplastic film of the bag is preferably a somewhat less heat resistant polyethylene film having a melting temperature of 180°F to 250°F (82.22°C to 121.11°C) with 220°F (104.44°C) being most preferred. The use of an outer polyester layer enables a sealing/melting temperature differential of about 150°F (65.56°C) to be obtained. The film has a desired seal strength of 3/4 lb. per inch (133.9 grams/centimeter) width.

A temperature of about 240°F (115.56°C) is required to melt the preferred polyethylene film for sealing. To prevent sticking of the outer layer of thermoplastic film to the steel jaws of the sealing device or heat sealing machine, it is generally important that the melting temperature of the polyethylene be kept below about 260°F (126.67°C). It can be appreciated that particular polyolefin resins or other film forming resins may have higher or lower melting temperatures; however, it is essential that a melting temperature differential be obtained between each layer to achieve the desired seal without a deleterious effect on the film.

The edges of the bags and the intermediate sealing areas may be readily heat sealed using standard sealing and automatic bag making machines. The edges and intermediate sealing areas may also be effectively sealed with use of impulse or band type sealers, hot wires, hot air or other suitable apparatuses or techniques.

The longitudinal edge of the film is heat sealed to complete the package. The melt flow of the outer layer must be sufficiently high to prevent the film from sticking to the sealant jaws. The melting temperature of the inner sealant layer must be less than the melting temperature of the outer layer, but sufficiently high to melt the inner layer and achieve the desired seal.

For the packaging of a typical commercial tea for brewing, a perforated thermoplastic film suitable for constructing the infusion bag is a coextruded polypropylene/polyethylene perforated thermoplastic film formed from a high density polyethylene resin and a polypropylene resin. The resins are odorless and tasteless and approved for food packaging.

The film is preferably clear in color, but may be manufactured in its natural color or a variety of colors as desired or permitted by governmental regulations, etc.

The film has a dry surface and has no tendency to stick, cling or "block".

Perforated thermoplastic films suitable for use in the invention have a male side and a female side. In construction of infusion bags, the male side of the film is on the inside of the bag. This relationship effectively seals the tabs of the package which are positioned on either side of the product containing pocket or area.

The invention is illustrated in its simplest form, and as a typical small size infusion bag for the packaging of individual servings of tea for brewing. Larger size packages, such as those customarily used in the food services industry, can also be constructed. Such larger bags can be similarly constructed or constructed of two rectangular strips of film and sealed on all four edges. The bags or packages of the invention can be constructed in other geometrical configurations as desired, but

rectangular shaped packages are generally more suitable for boxing or other type of group packaging and can usually be more easily fabricated.

The product is confined to the center portion of the tube and the ends are heat sealed to form the tabs. Other sealing methods can be used if desired, but heat sealing is preferred. The flat tabs also provide a good surface for logos, advertising, instructions or for other printing.

Although the cross-sectional geometry of a filled bag is somewhat circular or oval, it can be of any desired geometrical configuration, for example, a star shape to promote flow and greater surface exposure. In another form of the invention, two narrow strips or ribbons of thermoplastic film are aligned male side to male side. The product, such as tea, is deposited in a thin layer on the top (male) surface of the bottom ribbon. The top ribbon is then laid over the product, sealed along each edge and intermittently spot sealed between the edges in a regular pattern or an irregular pattern. The spot seals hold the two ribbons together in close proximity and prevent the product from bunching. The male surfaces of the film are effectively utilized to prevent the tea or other product from bunching thereby keeping maximum tea surface exposed for brewing.

In addition to the advantages set forth hereinbefore, the present invention also provides improved product distribution, offers the possibility of rapid filling, eliminates strings, staples or other extraneous matter. A unique means of

squeezing a bag is provided by simultaneously pulling collapsed ends of the tube or package.

Although a coextruded multilayer perforated plastic film is preferred, other types of perforated thermoplastic films may be used. Such films, of course, must provide adequate infusion and sufficient strength for the purposes intended.

Some examples of film forming resins suitable for making the perforated thermoplastic films of which the infusion packages of this invention are constructed are polyethylene (PE), polypropylene (PP), crystalline polyester (CPE), amorphous polyester (APE), polycarbonate (PC) and nylon (N).

Some examples of multilayer films suitable for use in constructing the infusion packages of the invention are, in addition to CPE/PE, as follows:

PP/PE	PC/PE	N/PP
CPE/PP	PC/PP	N/PE
CPE/APE	PC/APE	N/APE

In addition to dual layer thermoplastic films, triple layer films or films having as many layers as desired can be used. Such films, of course, must be of the perforated type and meet desired infusion rates and packaging requirements.

Although the invention is particularly directed to infusion packages or bags constructed of perforated thermoplastic films, it is suitable for use with other types of porous materials including paper, cloth or other similar type materials.

These porous materials must also provide adequate infusion and sufficient strength for the purposes intended.

Although the invention is particularly suitable for the packaging of tea, it can be used for packaging of other types of finely ground or particulate food products such as coffee and grits. The bags may be used for packaging of any items in which infusion of liquids is desired.

The infusion bags of the present invention have excellent wet strength and will not deteriorate in boiling water. The bags themselves are odorless and tasteless and do not impart any foreign taste to the item being packaged. They are, in effect, substantially inert.

It will readily be appreciated that the present infusion bags, although ideally suited to the food industry, are not necessarily limited in terms of uses thereto.

CLAIMS:

1. An infusion package for particulate or finely ground products comprising a tube of porous material having a central product containing portion and a flattened end portion on each end thereof, said porous material having a multiplicity of fine openings or holes therein each of which is sufficiently small in size to inhibit migration therethrough of a particulate product contained in the container portion and is sufficiently large in size to permit the flow of liquids therethrough.

2. A package as claimed in claim 1 wherein each of the flattened end portions has a slot or opening therein which enables one flattened end portion to be inserted through the other flattened end portion, thereby forming a flow through type of bag with an integrated handle thereon.

3. A package as claimed in claim 1 or claim 2 wherein the porous material is paper, cloth or the like.

4. An infusion package as claimed in claim 1 or claim 2 wherein the porous material is thermoplastic film having said multiplicity of minute holes or

openings therein.

5. A package as claimed in claim 4 wherein the perforated thermoplastic film is a polyester film, a polycarbonate film, a polypropylene film, a polyethylene film, a nylon film or a combination of such films.

6. A package as claimed in claim 4 wherein the perforated thermoplastic film is a coextruded multilayer perforated thermoplastic film having an outer layer of a heat resistant polycarbonate and an inner sealant layer of a somewhat less heat resistant polyethylene, polypropylene or polyester.

7. A package as claimed in claim 4 wherein the perforated thermoplastic film is a coextruded multilayer perforated thermoplastic film having an outer layer of a heat resistant nylon and an inner sealant layer of a somewhat less heat resistant polyethylene, polypropylene or polyester.

8. A package as claimed in claim 4 wherein the perforated thermoplastic film is a coextruded multilayer perforated thermoplastic film having an outer layer of a heat resistant crystalline polyester and an inner

sealant layer of a somewhat less heat resistant amorphous polyester.

9. A package as claimed in claim 4 wherein the perforated thermoplastic film is a coextruded multilayer perforated thermoplastic film having an outer layer of a heat resistant polyolefin or polyester and an inner sealant layer of a somewhat less heat resistant polyolefin.

10. A package as claimed in claim 9 wherein the outer layer of film is polyester or polypropylene and the inner sealant layer of film is polyethylene.

11. A package as claimed in any one of claims 4 to 10 wherein the film has from 1800 to 4200 holes per square inch (279 to 651 holes per square centimeter) thereof.

12. A package as claimed in any one of claims 4 to 11 wherein the holes of said film are round, oval, rectangular, pentagonal or hexagonal.

13. A package as claimed in any one of claims 4 to 12 wherein the holes of said film are tapered capillaries with the larger capillary opening being in the outer layer and the smaller capillary opening being in the inner layer.

14. A package as claimed in any one of claims 4 to 13 wherein the openings or holes of said film are 2-10 mils (0.00508 to 0.0254 centimeters) across at their widest point.

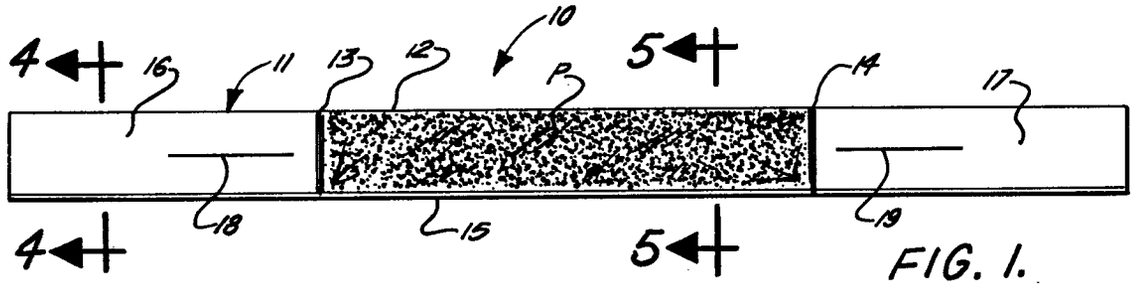

FIG. 1.

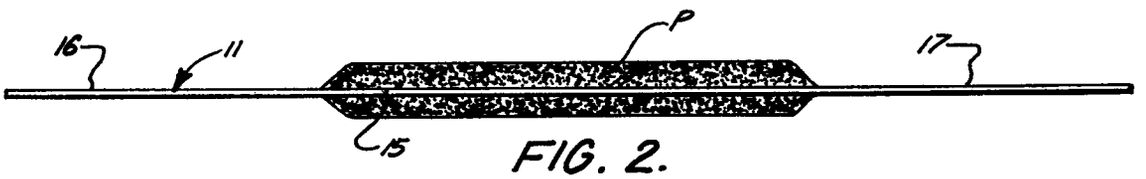

FIG. 2.

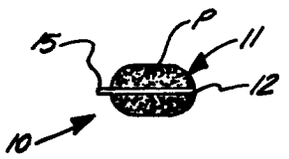

FIG. 3.

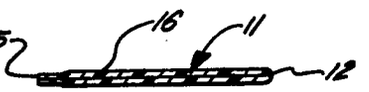

FIG. 4.

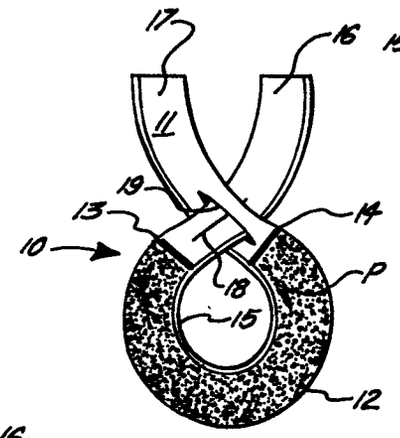

FIG. 6.

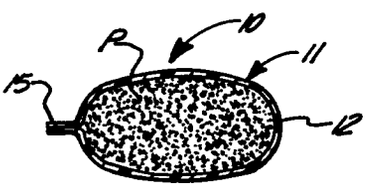

FIG. 5.

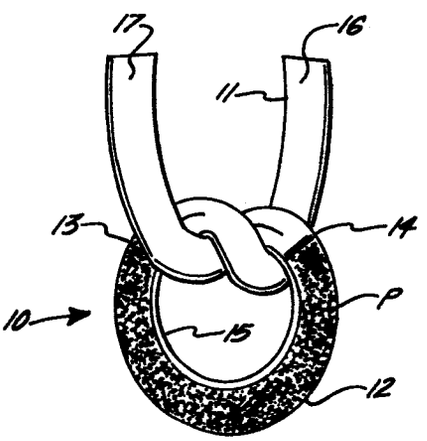

FIG. 7.