United States Patent [19]

Mahaffy et al.

[11] **3,903,309**

[45] **Sept. 2, 1975**

[54] **SELF-LEAK INDICATING PACKAGE**

[75] Inventors: **Reid A. Mahaffy**, Montclair; **Joel A. Hamilton**, Englewood, both of N.J.

[73] Assignee: **Mahaffy & Harder Engineering Company**, Totowa, N.J.

[22] Filed: **Mar. 13, 1974**

[21] Appl. No.: **450,764**

Related U.S. Application Data

[63] Continuation of Ser. No. 52,629, July 6, 1970, abandoned.

[52] **U.S. Cl.** ..... **426/129**; 220/85 B; 229/49

[51] **Int. Cl.** **B65b 25/06**

[58] **Field of Search** ..... 420/413, 126, 129, 122, 420/106; 73/49.3, 52; 229/43; 206/45.34; 220/85 B; 53/112 R, 112 A

[56] **References Cited**

UNITED STATES PATENTS

1,825,699	10/1931	Landrum	73/52 X
1,833,752	11/1931	Longchamp	220/42 B
2,621,129	12/1952	Rambbottom	426/127
2,754,959	7/1956	Mc Carty	426/129
3,047,993	8/1962	Robbins	73/49.3 X
3,087,823	4/1963	Mein	426/122
3,116,153	12/1963	Seiferth	426/106
3,214,221	10/1965	Finnegan	426/413
3,216,832	11/1965	King	53/112 X
3,226,236	12/1965	Weller	206/45.34 X
3,298,158	1/1967	Schmidt	53/112 A
3,396,899	8/1968	Strouse	229/43
3,467,244	9/1969	Mahaffy	206/45.34
3,498,018	3/1970	Seifeith	206/484 X
3,676,159	7/1972	Fallowfield	206/45.34 X
3,695,900	10/1972	Young	426/129 X
3,709,702	1/1973	Mahaffy	53/112 A X

Primary Examiner—Robert Halper

Attorney, Agent, or Firm—Parmelee, Johnson & Bollinger

[57] **ABSTRACT**

A composite evacuated package for meat products and comprising a cup-like container shell of transparent semi-rigid plastic material with its opening sealed by thin flexible film. The film is stretched into the shell to engage the product, and atmospheric pressure transmitted through the film holds the product firmly against the opposite surface of the container shell in any orientational position of the package. A semi-rigid cover is press-fitted into the container opening, and is adapted for ready removal and subsequent reclosure after a portion of the product has been removed. This cover includes a central portion spaced from the flexible film, thereby defining between the film and the cover a normally unoccupied space which, when the package is inverted, is directly below the product. When in this position, the pressure equalization due to a leak in the package will permit the product to be moved by gravity down into that originally unoccupied space, so that the product correspondingly drops away from the opposite (now upper) surface of the container. Since the container is transparent, this displacement of the food product away from the exposed upper surface can readily be observed visually to identify a leaky package.

7 Claims, 9 Drawing Figures

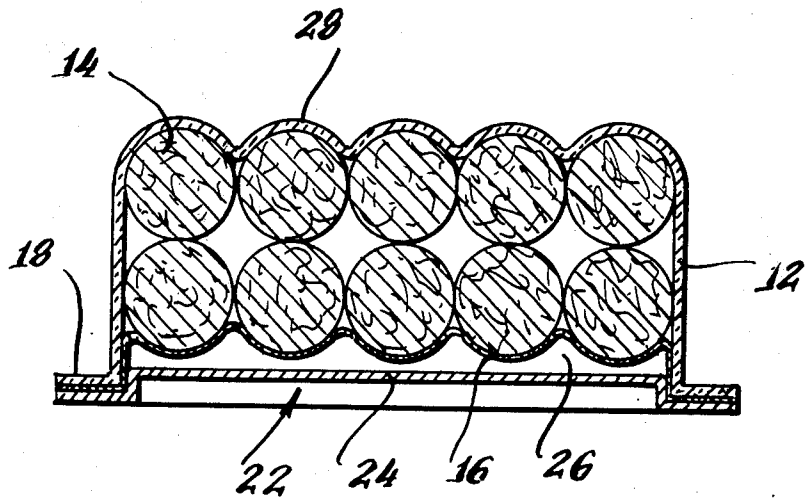
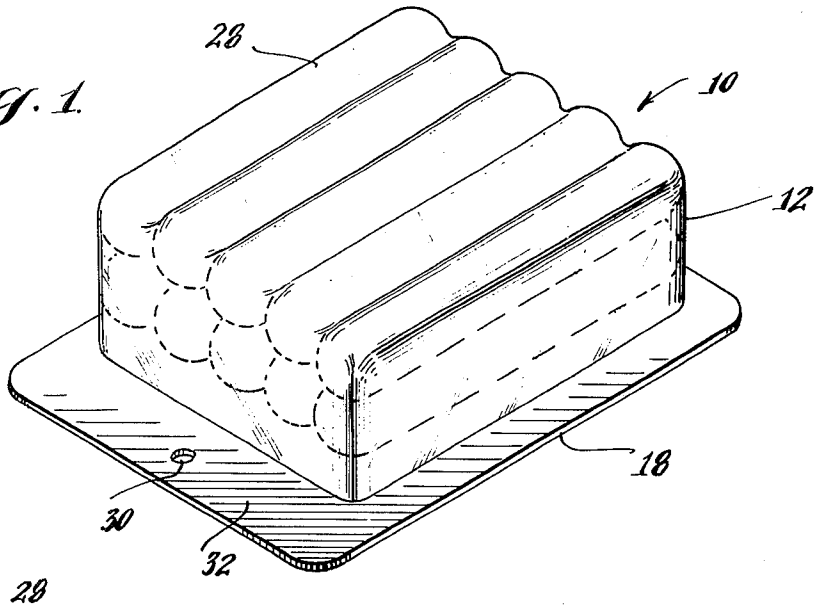


Fig. 1.



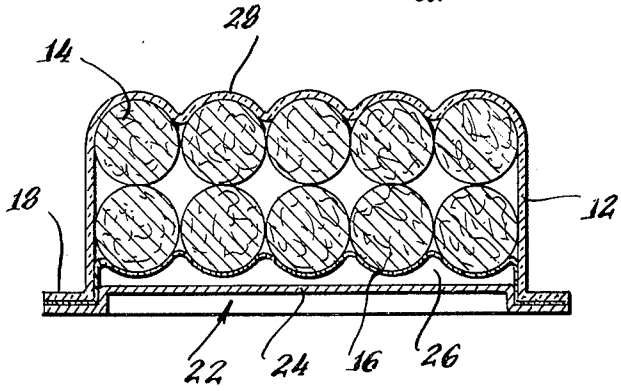
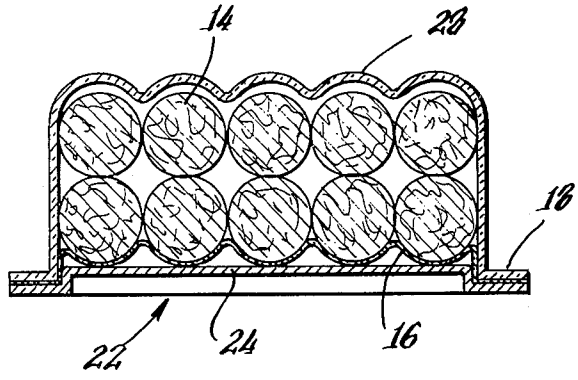


Fig. 2.

Fig. 3.



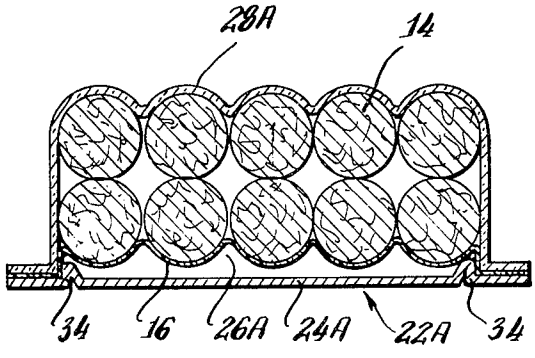


Fig. 4.

INVENTORS.
Reid A. Mahaffy
Joel A. Hamilton

BY

Bryan, Parmelee, Johnson & Bollinger
ATTORNEYS.

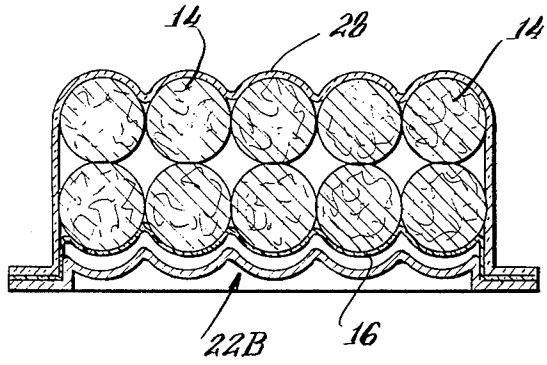


Fig. 5.

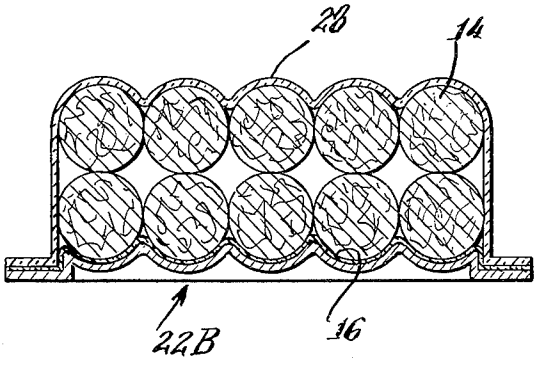


Fig. 7.

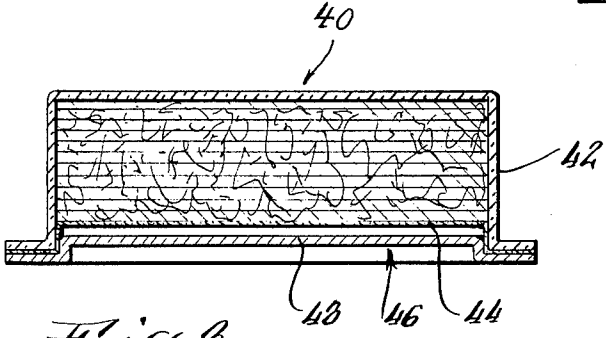


Fig. 8.

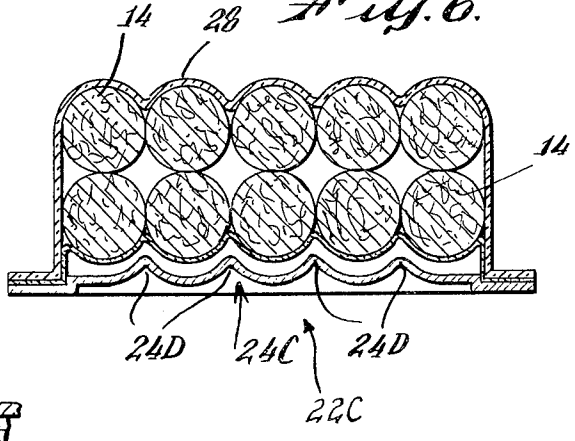


Fig. 6.

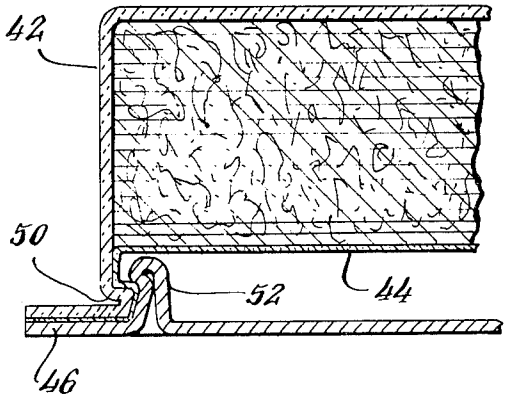


Fig. 9.

INVENTORS.
Reid A. Mahaffy
Joel A. Hamilton

BY

Bryan, Parmelee, Johnson & Bollinger
ATTORNEYS.

SELF-LEAK INDICATING PACKAGE

This is continuation, of application Ser. No. 052,629 filed July 6, 1970 now abandoned.

This invention relates to an improved package for sliced luncheon meats, frankfurters, sliced bacon and other perishable food products. More particularly, this invention relates to a self leak-indicating package with three elements: a semi-rigid cup, a thin flexible film for hermetic sealing, and a semi-rigid cover.

It is known to package meat products such as those mentioned above in a semi-rigid plastic package utilizing vacuum or inert gases as disclosed in copending applications Ser. No. 484,249 now abandoned, filed Sept. 1, 1965 by W. E. Young and Reid A. Mahaffy, and Ser. No. 484,284 now abandoned, filed Sept. 1, 1965 by Reid A. Mahaffy, et al., and as disclosed in U.S. Pat. No. 3,467,244, issued Sept. 16, 1969. Therein are shown unique packages consisting of thermoformed semi-rigid plastic shells, into which the food product is inserted, sealed with thermoformed flexible plastic film conforming generally to the shape of the products packaged therein.

Although such packages have found acceptance commercially, their structures have not been entirely satisfactory for some applications because: (a) the flexible film is sometimes damaged or otherwise destroyed during opening, thereby limiting the ability to reclose the package; and (b) in the case of packages with an added planar stiff cover, the closure combination of the flexible film and planar cover may not stay in place when reclosed.

It is desirable to provide vacuum packages having all of the advantageous features of the above-mentioned prior packages but also having the capability of being more readily reclosed after part of the product has been used. With the continuing increase in size or amount of food products held in a single package, the need for a good reclosure arrangement has become particularly important.

In addition, it is desirable to provide such packages with means to indicate visually if there has been a leak of air into the package interior.

Accordingly, it is an object of the present invention to provide improved semi-rigid packages. A more specific object is to provide such packages having improved reclosure means. Still another object is to provide a self-leak-indicating package having the aforementioned advantages. Yet another object is to provide such a package with increased puncture resistance. A more general object is to provide an improved package accomplishing the foregoing at low cost.

A preferred vacuum package in accordance with this invention comprises three elements: (1) a transparent semi-rigid cup-like container shell of oxygen-barrier plastic material for holding the food product, (2) a flexible plastic film of oxygen-barrier material sealed to the marginal flanges of the container and stretched downwardly into contact with the food product, and (3) a semi-rigid plastic closure member or cover of non-oxygen-barrier material, press-fitted into the container opening and providing protection from abuse, puncture, etc., for the flexible film. In use, the customer first peeels off the semi-rigid cover, then strips away the flexible film in the usual fashion, and thereafter removes the portion of the product desired. Subsequently, the semi-rigid cover can be refitted into place

in the container opening, to protect those portions of the product still remaining in he container.

The package is evacuated to such an extent that the product is held pressed at least lightly against the central face of the transparent shell (i.e. the bottom "bottom" of the cup), in any orientational position with respect to gravity. The semi-rigid cover is spaced a short distance away from the flexible film (where the latter contacts the product), thereby defining between the cover and the film a normally unoccupied region which is atmospheric pressure. When the package container is displayed inverted, (i.e. so that the "bottom" face of the container shell is the display face of the package), this unoccupied region will be directly beneath the product.

In that inverted display position, equalization of pressure across the flexible film resulting from a leak in the package will permit the product to be urged by gravity down against the flexible film (no longer held tautly against the product) and into the previously unoccupied region immediately above the semi-rigid cover. If that occurs, one can readily detect the event visually by observing through the transparent display face of the container shell that the product no longer is pressed against the inner surface of the display face. Thus the package includes self-indicating means automatically operative to show that the package integrity has been breached with a leak.

Other objects, aspects and advantages of the present invention will in part be pointed out in, and in part apparent from, the following detailed description considered together with the accompanying drawings, in which:

FIG. **1** is a perspective view of a semi-rigid frankfurter package in accordance with the present invention;

FIG. **2** is a vertical cross-section of the package of FIG. **1**;

FIG. **3** is a view like FIG. **2**, but showing the relative positions of the package elements after the package has developed a leak;

FIG. **4** is a vertical cross-section of a semi-rigid package showing a modified cover structure;

FIG. **5** is a vertical cross-section showing still another different cover structure;

FIG. **6** is a detail section showing a modified form of the package of FIG. **5**;

FIG. **7** is a vertical cross-section showing a package like that of FIG. **5**, but with the semi-rigid cover pressed against the film and product;

FIG. **8** is a vertical cross-section of a semi-rigid package containing sliced luncheon meat; and

FIG. **9** is a detail cross-section showing a detent holding arrangement for a package such as in FIG. **8**.

REferring now to FIGS. **1** and **2**, there is shown a three-element evacuated package **10** which includes as one element a thermoformed transparent plastic semi-rigid container shell in the form of an inverted cup-like member **12**. This shell is substantially filled with a food product **14**, illustratively frankfurters. The container is made of laminated oxygen-barrier plastic material, such as PVC, saran and polyethylene, and of sufficient thickness to be semi-rigid, i.e. form-retaining. The container preferably is formed with a shape matching that of the contained product.

Pressed up against the bottom surfaces of the product **14** is a flexible, oxygen-barrier plastic film **16**. This film

is heat-sealed to the marginal flanges **18** of the cup, and is stretched up into the container opening against the lower surfaces of the product. With the package evacuated, and thus at reduced internal pressure, the product is pressed up against the top face of the container shell by atmospheric pressure transmitted through the thin plastic film. The film also engages tightly the inner side walls of the container, and holds the product firmly in position. The flexible film may be made of a combination of thin flexible polyester with saran and polyethylene, and preferably includes a heat sealable and peelable overcoating applied to its sealing surface.

The package may after evacuation be partially filled with an inert gas, but at a pressure sufficiently low that atmospheric pressure, acting through the film **16,** will hold the product againt the inner surface of the semi-rigid container **12,** regardless of the positional orientation of the package with respect to gravity.

A pre-formed plastic semi-rigid cover or closure member **22** is press-fitted into the opening of the container **12.** This cover may, if desired, be secured to the flexible film **16** by heat sealing, by adhesive, or by any other convenient method, so that it will be held firmly in place through the merchandising cycle of the package. The cover is dimensioned to provide a close, friction-fit within the side walls of the semi-rigid container shell. Since the package is hermetically sealed by film **16,** this cover **22** need not be made of material having a low rate of oxygen permeability, but may advantageously be formed of relatively inexpensive plastic material such as polystyrene. The rigidity of the cover effectively prevents damage, such as puncture, to the somewhat fragile film **16,** and thus performs an important role in maintaining the package integrity, as well as affording a superior reclosure capability as will be described.

As shown particularly in FIG. **2,** the semi-rigid cover **22** is so proportioned and dimensioned that when it is fitted in place in the container **12,** its recessed central portion **24** is spaced a moderate distance away from the flexible film **16** in contact with the food product **14.** With this arrangement, a corresponding unoccupied region **26** is defined between the cover and the film. This region ordinarily will be at atmospheric pressure. In the horizontal inverted display position of the package (as shown), wherein the central face **28** of the container shell (i.e. what might be called the "bottom" of the cup-like shell) serves as the product display face, this unoccupied region **26** is directly beneath the product.

The packaged product **14** normally is held against the display face **28** by atmospheric pressure acting through the flexible film **16.** However, if the package leaks, so that the differential pressure across the flexible film becomes substantially reduced, the product will drop down into the region **26** due to the force of gravity. Under most circumstances, the product will move down sufficiently to come to rest against the central portion **24** of the semi-rigid cover **22,** as shown in FIG. **3.** In any event, the product will move down to a new position where it is out of contact with the inner surface of the display face **28,** and this abnormal condition will readily be apparent to an observer, e.g. the manager of the store, or a customer, because of the transparency of the display face. Thus the package provides in this manner an automatic tell-tale indication that a leak has occurred.

If the package is displayed in a vertical position, e.g., hung from a peg passing through a hole **30** in an extended flange **32** of the shell **12,** the same advantageous leak-indication will be obtained. This is because a component of the gravity force will tend to move the product back away from the display face **28.** That is, when the pressure differential across the film **16** is equalized by a leak, the product will fall away from the display face and into the region **26.**

FIG. **4** illustrates a modified semi-rigid plastic cover **22A** which may be used to enable a greater volume of the semi-rigid container shell to be filled with product. The central portion **24A** of the semi-rigid cover is not recessed, as in FIG. **2.** Instead, this central portion is aligned with the flanges of the container, i.e. in the plane of the container opening. However, the cover includes side wall projections **34** which extend into the interior of the container adjacent all four sides, to engage the container side walls in a friction fit as in the FIG. **2** arrangement. For some applications projections may be provided only along two opposite sides. The central portion **24A** is made sufficiently large to permit the packaged products **14** to move down into the region **26A** when the package develops a leak.

When the food product **14** consists of chunks or individual sausages, as shown in the illustrative embodiments described hereinabove, it often is desirable to use an inert gas to fill the voids between the products and between the products and the inner surfaces of the package. Still it is desirable, even when using inert gas, to hold as many products as possible, over as large an area as possible, in contact with the display face of the package. Thus the display face **28** (**28A**) is shaped to conform closely to the outlines of the products, and the flexible film **16** is thermoformed to fit snugly against the opposite surfaces of the products. FIG. **5** shows that the semi-rigid cover **22B** may also be shaped with a conformation matching the outline of these opposite surfaces.

Referring now to FIG. **6,** when using a product-conformed semi-rigid cover (like FIG. **5**), it may be advantageous for packages with rectangular plan outlines, to relieve the corners of the cover **22C,** i.e. so as to avoid forming elements which project inwardly any substantial distance towards the product in the corner regions. Although the cover does include a recessed central portion **24C** arranged to fit tightly against the side walls of the container opening, this portion is provided with inwardly projecting contour-matching elements **24D** only in the regions between pairs of frankfurters, not between a frankfurter and an adjacent wall of the container. This configuration minimizes any chance that the inwardly stretched corners of the flexible film might be punctured by projections on the semi-rigid cover. This can be of particular importance because it is difficult to stretch the film into precise conformation with the edge surfaces of the product in the corners of the shell.

Only a small amount of inert gas is inserted into the package, so that the pressure of atmosphere exerted through film **16** is sufficient to force the product against the display face **28** and hold the product securely in place when the package is oriented with the display face as the top of the package, as shown. For some product applications, it may be desirable to hold the product securely in position even though a leak occurs. This may be accomplished, as shown in FIG. **7,** by

shaping the semi-rigid cover in such a profile as to press the product against the display surface by mechanical pressure alone. When using this construction in a square or rectangular package configuration, the cover may be relieved in the corner regions (as illustrated in FIG. 6), for the same purpose of minimizing the possibility of puncturing the flexible film where it may not have been stretched entirely into conformity with the shell and product.

FIG. 8 shows a package 40 having a round outline in a plane view and adapted to hold sliced luncheon meat. This package comprises a semi-rigid container cup 42 of oxygen-barrier material, a flexible film 44 of oxygen-barrier material stretched inwardly into tight contact with the product, and a semi-rigid cover 46 of non-oxygen-barrier material. The cover has a recessed central portion 48 which is spaced a short distance away from film 44, to define a normally unoccupied region which serves the same leak-detecting function as region 26 previously referred to.

As shown in FIG. 9, the semi-rigid cup 42 and the semi-rigid cover 46 may be provided with interlocking detents 50 and 52 to hold the cover securely in position, after the package has been reclosed following removal of part of the product. For most circumstances, two such detents should be sufficient, on opposite sides of the package, but additional detents may be incorporated where appropriate. The flexible film 44 follows the profile of the cup detent allowing the matching detent of the cover to engage the cup detent with the flexible film in place. The formation of the flexible film is accomplished by methods and apparatus disclosed in the above-identified co-pending applications, and in co-pending application Ser. No. 849,248, filed on July 30, 1969 by Reid A. Mahaffy, et al.

Various modifications in the configuration and arrangement of the three-element plastic package forming the subject matter of the invention will be apparent to those skilled in the art and such are considered to be within the scope and spirit of the invention as recited in the description and set forth in the appended claims.

We claim:

1. A package for perishable food products comprising a semi-rigid plastic cup of oxygen-barrier material having marginal flanges and containing a food product filling only a portion of the cup volume below said flanges;

a thin flexible film of oxygen-barrier material peelably sealed to said flanges and stretched down into said cup along the side surfaces thereof, the interior portions of said flexible film serving to engage and press against the food products tightly across the full upper surface thereof, the interior of the cup being evacuated so that atmospheric pressure against the flexible film forces the food products against the bottom surface of the cup; and

a semi-rigid plastic cover of non-oxygen-barrier material comprising outer flanges and a recessed central section telescoped into the cup;

the outer side walls of said central section being tightly engaged in a friction-fit with the inner surface of said flexible film where it is stretched into the cup down towards the product, said central section being spaced a moderate distance from said flexible film;

the lateral dimension of said recessed central section being sufficiently large to provide a tight fit within said cup after (1) the cover has been removed, (2) the flexible film removed, and then (3) the cover has been replaced following removal of a portion of the product;

said recessed central section and said semi-rigid cup being constructed and arranged to provide interengageable means cooperatively operable after the cover has been reinserted with the flexible film removed from the region adjacent the side surfaces of said cup to provide a gripping fit effecting retention of the cover after said removal of said flexible film;

said plastic cover extending over the entire opening of said plastic cup, and cooperating with said semi-rigid plastic cup in providing physical protection for the contained product while said flexible film and said plastic cup cooperate to sealingly isolate said product from outside atmosphere.

2. A package as in claim 1, wherein said interengageable means comprises an outwardly extending lip on the interior surface of said recessed central portion and a cooperating inwardly extending ridge on the inner wall surface of said semi-rigid cup, said lip being located interiorly of said ridge when said cover is in place in said cup so as to provide engagement there between to retain said cover positively in position.

3. The method of detecting the leakage of an evacuated package containing a spoilable food product or the like, comprising:

inserting the product into a semi-rigid cup-like container having marginal flanges around the opening thereof and with the product lateral dimensions being so selected that the product will fall down away from the cup-bottom surface when the container is held in its inverted position; said cup-bottom surface being of non-opaque material;

positioning said product fully in engagement with said cup-bottom surfaces throughout the entire area of said surfaces, at least substantially free from any open-space regions between said product and said cup-bottom surfaces, thereby to ensure that the outside appearance of said cup-bottom surface distinctively indicates that said product is fully in engagement therewith;

sealing a flexible film to said marginal flanges and forcing said film by atmospheric pressure into said cup and against said product with the package evacuated;

placing at said cup opening a semi-rigid cover having a central portion spaced a significant distance from said flexible film where it is in contact with said product;

orienting the package with the food product forced by gravity down towards said flexible film and with said cup-bottom surface presented for inspection by an observer; and

detecting the occurrence of a leak by observing the difference in appearance between (1) the package cup-bottom surface as presented to the observer with the product fully in contact with said surface, and (2) the package cup-bottom surface as presented to the observer with the product spaced down away from said surface said significant distance as a result of gravity forcing said product down against said flexible film towards said semi-rigid cover.

4. The method of claim 3, wherein said product has an undulating surface facing towards said cup-bottom surfaces; and

forming said cup-bottom surfaces with undulations matching said product undulations, whereby to ensure that said product engages said cup-bottom surfaces throughout the entire area thereof.

5. The method of claim 3, wherein said semi-rigid cover is formed with a recessed section telescoped into the opening of said container and having side walls which are pressed outwardly against, and in friction-tight engagement with, the inner side wall surfaces of said container.

6. A package for perishable food products comprising a semi-rigid plastic cup of oxygen-barrier material having marginal flanges around the opening thereof and containing a product the upper surfaces of which are at least predominately below said flanges;

a thin flexible film of oxygen-barrier material sealed to said flanges and stretched down into said cup along the side surfaces thereof, the interior portions of said flexible film serving to engage and press against the upper surface of said product, the interior of the cup being evacuated so that atmospheric pressure against the flexible film forces the product against the bottom surface of the cup; and

a semi-rigid plastic cover comprising outer flanges matched with the flanges of said cup and having a recessed central section having outer side walls extending down into the cup;

said outer side walls of said central section being engaged in a friction-fit with the inner surface of said flexible film where it is stretched into the cup down towards the product, said central section being dimensioned so as to be located above the upper surfaces of said product and its engaging film for the range of product depths to be encountered;

the lateral dimensions of said recessed central section being sufficiently large to provide a close fit within said cup after (1) the cover has been removed, (2) the flexible film has been removed, and then (3) the cover has been replaced following removal of a portion of the product;

said recessed central section and said semi-rigid cup being constructed and arranged to provide interengageable means cooperatively operable after the cover has been reinserted to effect retention of the cover after said removal of said flexible film;

said plastic cover extending over the entire opening of said plastic cup to cooperate with said semi-rigid plastic cup in providing physical protection for the contained product while said flexible film and said plastic cup cooperate to sealingly isolate said product from outside atmosphere.

7. A package as claimed in claim 6, wherein said interengageable means comprises a detent arrangement with mating components on said cover and said cup respectively.

* * * * *