

United States Patent

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[56]

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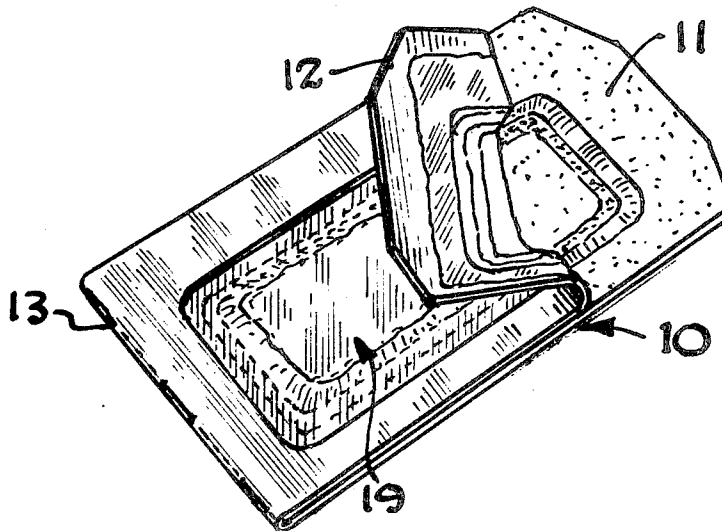
UNITED STATES PATENTS

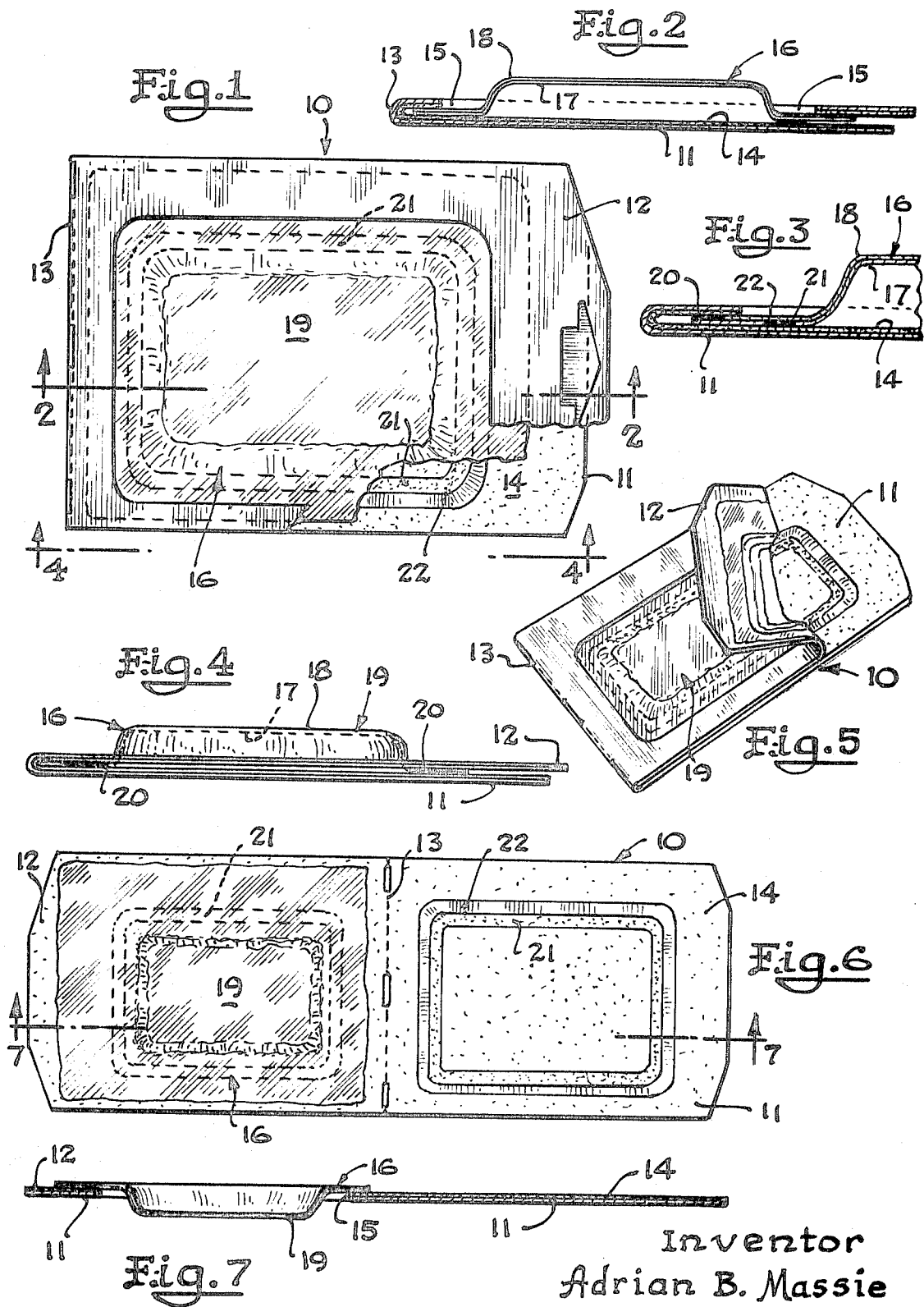
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- [54] **PEELABLE SEAL PACKAGE**
6 Claims, 7 Drawing Figs.
- [52] **U.S. Cl.**..... 206/56 AA,
99/171 S, 116/114.20, 206/63.2 R, 206/78 B,
229/48 T, 229/66
- [51] **Int. Cl.**..... **B65d 83/00**
B65d 85/70, B65d 65/14
- [50] **Field of Search**..... 229/48, 66;
206/63.2, 56 A, 56 AA; 99/171 S, 171 C;
116/114.20

ABSTRACT: A package having a peelable seal and constructed of a pair of superimposed sheets or films heat-sealed to one another around their edges. In its preferred embodiment, the film comprises a composite formed of a polyolefin, such as a low-density polyethylene, laminated to an ionomer film which is in turn sealed to a paperboard. The invention includes a temperature-sensitive ink, printed in the heat seal area, the activation temperature of the ink being selected in the lower portion of the sealing temperature range so that upon sealing, the color change will indicate the integrity of the package heat seal. The invention is particularly useful for sterile pharmaceutical packages in order to visibly indicate effective seals.





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PEELABLE SEAL PACKAGE

BACKGROUND OF THE INVENTION

It is desirable to provide surgical and medical supplies, for example, in peelable seal packages which essentially comprise a pair of superimposed sheets, sealed together to provide a good seal. At the same time, it is desirable to provide for peeling the sheets apart to make the article within the package readily accessible. A pocket or bubble is formed in one of the sheets for retention of the article. Such packages must protect the contents against the intrusion of moisture and contaminants and accordingly, must be impervious, have effective seals, and yet must be readily peelable without tearing and rupturing of the packaging materials which may result in contaminating fibers and the like. With medical and pharmaceutical supplies, particularly, it is desirable that the effectiveness of the heat seal be readily apparent in order to minimize the possibility of subsequent contamination.

SUMMARY OF THE INVENTION

The invention provides a package having a peelable seal and preferably constructed of a film heat-sealed to a paperboard which is treated to minimize tearing and rupturing when the seal is peeled to remove the article within the package. A temperature-sensitive ink is printed in the heat seal area for the purpose of indicating the integrity of the package heat seal. By selecting the activation temperature of the ink in the sealing temperature range of the materials being used, sealed packages in which the ink exhibits a color change will have strong, effective seals whereas seals made at temperatures below effective sealing temperatures will not exhibit the color change and will very likely have defective seals which will be visibly apparent. The ink also provides an aspect of tamper-proofing in that the appearance of the ink in or under the heat seal will change if the package is opened. While inks with low- or high-activation temperatures can be used, it is preferable that an ink activation temperature near the lower sealing range for the materials employed be selected in order to most readily reveal if adequate heat has been applied in order to effect strong seals.

In its preferred embodiment, the invention utilizes a composite film. The composite film provides a package having superior abrasion, flex fatigue and puncture resistance as well as minimizing the possibility of pinholes. An ionomer film, such as that sold under the trademark SURLYN, sealed to a treated paperboard, provides an effective seal which will readily peel with minimum tearing and rupturing of the paperboard which may produce contaminating fibers and the like. An ionomer film however, does not readily retain the shape of the vacuum-formed bubble or pocket for containing the article within the package and is susceptible to pinholes. By laminating to the ionomer film a polyolefin, preferably low-density polyethylene, rubber-modified high-density polyethylene ethylene vinyl acetate or ethyl acrylate, a composite film is provided which minimizes the disadvantages of the ionomer film. By sealing the ionomer film portion of the composite film to the paperboard, the advantages of the ionomer film are retained while at the same time its disadvantages are minimized.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top elevational view, partly cut away, illustrating a package of the present invention.

FIG. 2 is a side elevational view in cross section taken along the lines 2-2 of FIG. 1.

FIG. 3 is a partial side elevational view illustrating one end of the package of FIG. 1.

FIG. 4 is a side elevational view.

FIG. 5 is a perspective view illustrating opening of the package of FIG. 1.

FIG. 6 is a top elevational view showing the package of FIG. 1 in the completely open position.

FIG. 7 is a side elevational view in cross section taken along the lines 6-6 of FIG. 6.

DETAILED DESCRIPTION

Referring to the drawings, FIG. 1 illustrates a package indicated by the numeral 10 embodying a preferred form of the present invention and composed of a paperboard 11 having a projecting portion 12 which may be utilized for gripping when it is desired to open the package. At about the center of the paperboard is formed a scoreline 13 to facilitate folding of the board 11 to form a package 10. The paperboard 11 preferably has a clay coating 14 to minimize tearing and rupturing of the paperboard when the peelable seal is opened. An opening 15 is provided in one portion of the board into which opening is placed a bubble or pocket 19 formed of the composite film 16 by conventional vacuum-forming methods and for retaining an article within the package. Preferably, the composite film is formed of a lamination of an ionomer film 17 and a low-density polyethylene film 18. The bubble or pocket 19 is held in place in the opening 15 by means of adhesive 20 placed around the periphery of the bubble 19 as best illustrated in FIG. 3. After the package 10 is formed, the article (not shown) is placed in the bubble 19 and the package is sealed on conventional heat-sealing equipment. Prior to sealing, the package is printed in the heat seal area 21 with a thermoresponsive ink to produce an inkline or printed area 22. The activation temperature of the ink is selected in the sealing temperature range of the packaging materials so that upon sealing, the color change which is produced in the ink by the heat-sealing operation will indicate the integrity of the package heat seal.

Suitable temperature-responsive inks may be formulated of lead oxide or lead carbonate or other compounds of multivalent metals such as cobalt, bismuth, cadmium or copper which change color in the presence of sulfur as a function of time and heat. Such compounds can be mixed with sulfur or a sulfur-containing compound such as a thiocarbanilide and mixed in a vehicle or bonding agent such as an alkyd resin varnish or ethyl cellulose together with drying agents and anhydrous solvents. Other thermosensitive coloring materials are disclosed in U.S. Pat. No. 2,922,121 and comprise an oil-containing vehicle, at least one chromatic-colored coloring material and finely divided antimony in an amount sufficient to give satisfactory thermosensitivity by imparting infrared absorptive properties to the ink compound but insufficient to obscure the chromatic color of the compound.

As indicated, in its preferred embodiment, the package 10 comprises a composite film 16 sealed to a treated paperboard 11. As is readily apparent, sealing conditions and concomitantly, the activation temperature of the ink, can vary depending on the packaging materials selected. Suitable packaging material properties and characteristics as well as proper sealing conditions for the package of the preferred embodiment have been found to be as follows. As previously noted, to minimize tearing of the paperboard upon opening of the seal, which tearing may create contaminating fibers, it is desirable that the paperboard be treated. Accordingly, a clay-coated paperboard has been found to be satisfactory. Properties of a clay-coated paperboard which provide acceptable seal strength are as follows: porosity, 1,700-2,000 seconds; clay weight per 1,000 square feet, 1.5-2.0 pounds; binder, 50 percent polyvinylacetate; pigment to binder ratio, 2/1; density (clay plus paperboard), 4.43. All of these properties contribute, in varying degree, to an effective package. For example, a board of relatively low porosity is important in gas sterilization of the package and its contents in order to allow air to escape the package and gas to enter it, while too high a porosity may permit bacteria to pass through the board. Clay weight, method of clay application and paperboard density are factors affecting paperboard porosity. A fairly rough clay finish is desirable since roughness of clay finish aids seal strength by allowing the plastic film to penetrate more deeply into the clay coating. Binders used in the clay coating can be of considerable importance since it is believed that the seal mechanism is aided by the adherence of the plastic film to the binder. Care must be exercised in selecting binders which are

not destroyed by relatively high temperatures since such binders would be unsuitable for heat-sealing purposes. Pigments are added to clay coatings for the purpose of filling pores in the board surface, providing opacity, brightness, and ink receptivity. The pigment to binder ratio provides an indication of the strength of the bond of the pigment to the paperboard.

Sealing pressures, temperature and dwell time can vary depending on the packaging materials employed. Sealing pressure is the least critical of the sealing conditions. Only enough pressure is required to provide complete contact between the plastic films or the plastic film and the paperboard in the heat seal area. For the package of the preferred embodiment, using paperboards of 0.012 inch or 0.014 inch caliper thickness, a pressure range of 100 to 176 pounds per square inch (p.s.i.) was found to be sufficient. This range represents the actual pressure exerted by each square inch of the sealing die surface. The pressure range would necessarily have to be increased if the paperboard thickness were increased. With respect to temperature and dwell time; it has been found that a change in ink shade can be obtained over a wide range of these conditions. Of greatest significance, however, is the fact that a distinct change in shade of the ink takes place in the same temperature and dwell time ranges that provide acceptable seal strengths so that the color change, in effect, gives an indication of the integrity of the package heat seal. With a 0.014 caliper paperboard, a satisfactory time-temperature sealing range was found to vary from 320° F. at 2 seconds dwell time and 126 p.s.i. to 450° F. at 1.5 seconds dwell time and 152 p.s.i. as follows:

Pressure (p.s.i.)	126	Range of Settings		152	152
		152	152		
Temperature (°F.)	320	350	380	410	450
Dwell Time (secs.)	2.0	2.0	2.0	2.0	1.5

It should be noted that since temperature and time are inversely proportional, by increasing the dwell time satisfactory seals can be obtained at temperature settings below 320° F. A temperature range of 350°-450° F. was found to provide the most distinct color change of the thermosensitive ink is in direct proportion to the seal strength obtained.

The contents (not shown) of the package 10 can be sterilized by the use of gas, such as ethylene oxide, or other procedures well known in the art. Access to the contents is obtained by peeling the projecting portion 12 (as illustrated in FIG. 5) away from the opposing portion of the paperboard 11.

What is claimed is:

1. A peelable seal package comprising a pair of superimposed sheets heat sealed to one another around their edges to completely enclose and seal off a pocket between said sheets for retention of an article, said package having a thermoresponsive ink coated on the edge of one of said sheets coextensive with the portion of the sheets which are sealed together, the activation temperature of said ink being selected in the heat-sealing range of said sheets whereby upon sealing the sheets to one another, the effectiveness of the heat seal is readily apparent.
2. A peelable seal package comprising a pair of superimposed sheets, one of said sheets comprising a foldable paperboard, one portion of said paperboard having an opening therein, the other of said sheets comprising a composite film formed of a lamination of an ionomer film and a polyolefin film, the composite film projecting through the opening and attached to the periphery thereof to form a pocket for retention of an article when the paperboard is folded together, the ionomer film being sealed to the portion of the paperboard opposing the opening, and a thermoresponsive ink coated on the edge of one of said sheets coextensive with the portion of the sheets to be sealed together, the activation temperature of said ink being selected in the heat-sealing range of said sheets whereby, upon sealing the sheets to one another, the effectiveness of the heat seal will be readily apparent.
3. The peelable seal package of claim 2 wherein the composite film is formed of a lamination of an ionomer film and a low-density polyethylene film.
4. The peelable seal package of claim 3 wherein the foldable paperboard is coated on the side sealed to the ionomer film with a clay coating.
5. The peelable seal package of claim 3 wherein the activation temperature of the thermoresponsive ink is selected in the temperature range of about 320° F. to 450° F.
6. A peelable seal package comprising a pair of superimposed heat sealable sheets, one of said sheets comprising a foldable paperboard, one portion of said paperboard having an opening therein, the other of said sheets projecting through the opening in the paperboard and attached to the periphery thereof to form a pocket for retention of an article when the paperboard is folded together, and a thermoresponsive ink coated on the edge of one of said sheets coextensive with the portion of the sheets to be sealed together, the activation temperature of said ink being selected in the heat-sealing range of said sheets whereby, upon sealing the sheets to one another, the effectiveness of the heat seal will be readily apparent.

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