

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) PACKAGE AND METHOD OF PRODUCING SAME

(71) UNION CARBIDE CORPORATION, of 270, Park Avenue, New York, State of New York 10017, United States of America, a Corporation organized under the laws of the State of New York, United States of America, (Assignee of ELLSWORTH GEORGE MUNCK), do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an improved package of the kind wherein the package contents are enclosed by a sheet of heat shrunk thermoplastic material. The invention also relates to a method of producing such a package.

The term "thermoplastic" as used herein refers to a material which possesses the property of softening or melting when heated and of hardening again when cooled.

The term "heat shrinkable" as used herein refers to the property of a film whereby it contracts in length and/or width upon exposure to sufficient heat. Shrinking is generally attributable to a reorientation of molecules which were previously oriented by stretching the film either uniaxially longitudinally (machine direction) or horizontally (transverse direction) or biaxially (both directions). The term "heat shrunk" describes the condition of a heat shrinkable material after application thereto of heat sufficient to cause shrinkage.

It has heretofore been known to package an article by enclosing it in heat shrinkable thermoplastic material and applying heat to shrink the thermoplastic to form a tight package.

Packages of this kind possess several distinct advantages which are not present in packages having a covering sheet made from other common packaging materials, for example, paper or cardboard. Heat shrunk package sheets are typically made from a transparent film which allows the contents to be viewed as would be desirable in the case of a commercial package. The contents of the package are, at the same time, kept

clean and marketable even after continuous handling and examination. The instances of pilfering are reduced since several small items can be grouped together into a single larger, and therefore more conspicuous, package. These advantages are particularly desirable in the case of packages containing food products since the thermoplastic material is not weakened when wet and is not permeable to moisture. Also, the fact that the packaged article can be seen will sometimes eliminate the need for printing on a package if the article is readily identifiable when viewed or if the article itself contains descriptive printing or advertising.

These and other advantages have been obtained through the use of a heat shrinkable thermoplastic film. However, the use of such a film has traditionally made these packages difficult to open due to the fact that the thermoplastic sheet fits tightly about the packaged article and is difficult to grasp in a manner which will permit the sheet to be torn. Moreover, the thermoplastic used in such packages are typically plasticized and react elastically to an applied force thereby offering considerable resistance to tear.

According to the present invention there is provided a package having package contents and a thin heat-shrinkable thermoplastic sheet disposed about and heat shrunk around said contents, characterized by a heat seal in said thermoplastic sheet proximate to said contents forming an appendage extending from a main body portion of said package which, together with a header board of stiff sheet material in contact with said appendage and limiting shrinkage thereof, forms a gripping tab.

The method of producing the package of the invention comprises forming a loop of heat shrinkable thermoplastic material positioning a header board of stiff sheet material in contact with the loop, heat sealing the thermoplastic material proximate to the header board to form a gripping tab extending from a main body portion of the loop, positioning the package contents within the main body portion and heat shrinking the

thermoplastic material, the header board limiting the shrinking of the material in the region of the gripping tab. Preferably, the package contents are maintained in proper alignment and the tab in a position substantially perpendicular to the body of the package.

The invention will be more particularly described, by way of example, with reference to the accompanying drawings in which:

Figure 1 is an isometric view of a package in accordance with one embodiment of the invention;

Figure 2 shows the manner in which a header board and thermoplastic material are assembled to form the package of Figure 1;

Figure 3 shows the assembled package of Figure 1 prior to heat shrinking;

Figure 4 is an isometric view of a package in accordance with another embodiment of the invention;

Figure 5 shows the manner in which a header board and thermoplastic material are assembled to form the package of Figure 4;

Figure 6 shows a variation in the assembly of Figure 5;

Figure 7 is an isometric view of a package in accordance with another embodiment of the invention; and

Figure 8 shows the assembled package of Figure 7 prior to heat shrinking.

Referring in detail to the embodiment of Figures 1—3, there is shown in Figure 1 a package generally designated 10, comprising a strip or sheet of thin heat shrinkable thermoplastic material 12 heat shrunk around the package contents which, for purposes of exemplification, are depicted as flashlight batteries 14. The two end portions 16, 16¹ of the thermoplastic material 12 extend adjacent to each other from the main body portion of the package and are capped by a header board 18 of a stiff sheet material which is heat sealed to the end portions 16, 16¹. The thermoplastic end portions 16, 16¹ form an appendage extending from the main body portion of the package and header board 18 is heat sealed thereto forming a gripping tab 20 for use in opening the package, which tab also provides a convenient area for printing and for hanging the package from a display rack.

In the assembly of the package (Figure 2), the thermoplastic material 12 is folded upon itself in approximate end to end relationship forming a loop of thermoplastic having adjacent free end portions 16 opposite the loop. A sheet or stiff material, for example, cardboard, is folded upon itself in approximate edge to edge relationship to form the header board 18 and is positioned to

cap the adjacent end portions 16, 16¹ of the thermoplastic. The interior portion of the header board has previously been coated with a heat sensitive adhesive, for example, a vinyl adhesive. The header board 18 is heat sealed to the end portions 16, 16¹ to form the tab 20 which extends from the loop of thermoplastic. The thermoplastic sheet is heat sealed at the same time. The batteries 14 are then positioned in the loop (Figure 3) and the thermoplastic is heat shrunk by any convenient source of heat, for example, a heat tunnel.

The header board, which is bonded to the appendage of the package, limits or prevents the appendage from shrinking during the heating operation and thereby creates a stress between the shrunken thermoplastic material of the main body portion of the package and the unshrunk, heat sealed, thermoplastic material of the appendage. When the package is heat shrunk the header board is proximate the package contents. This stressed condition allows the thermoplastic material to be easily torn along the line of stress. This ease of tearing is also increased by the header board terminating at the line of stress thereby affording a cutting edge in contact with the stressed thermoplastic material.

To open the package it is necessary merely to hold the main body portion of the package in one hand and twist the tab 20 with the other.

Figure 4 shows a package according to another embodiment of the invention. In this embodiment the adjacent free end portions 22, 22¹ of the thermoplastic material are not encased within a fold of a header board 24, but rather are heat sealed to the exterior of header board 24. In the package of Figure 4 the free end portions 22, 22¹ are heat sealed to opposite sides of the header board 24 (see Figure 5 for detail of assembly). Figure 6 shows the assembly of a similar package but having both free end portions 22, 22¹ heat sealed to one another and the same side of the header board 24. The heat sealing in each instance is accomplished prior to heat shrinking, and the resulting stress is similar to that which develops in the package of Figures 1—3.

Figure 7 shows a package according to another embodiment of the invention. In this embodiment a header board 26 is encased within a tubular compartment 28 of a thermoplastic material film which is separated from a main body portion of the package by a heat seal 30.

The manner of assembling this package is shown in Figure 8. A tube of thermoplastic material is heat sealed longitudinally to form two tubular compartments, a first compartment 28 (corresponding to the appendage) for receiving the header board 26 and a

second compartment 32 (corresponding to the main body portion) for receiving the package contents which are again, for purposes of illustration, shown as flashlight batteries 34. The header board 26 and batteries 34 are positioned in their respective compartments and the thermoplastic film is heat shrunk to form a tubular compartment of thermoplastic material containing the package contents and a gripping tab extending from the compartment.

As in the other embodiments, the header board limits or prevents the shrinkage of the appendage and creates a stress along the line of the heat seal. This stress along the line of the seal is increased by the limiting effect the batteries have upon the shrinkage of the thermoplastic material of the second compartment. The net result is a package having a line of stress along the heat seal. Exerting a twisting force on the header board will tear the package open along the line of stress.

In each of these embodiments the resulting package will possess all the desirable characteristics of heat shrunk packages, which characteristics have hereinbefore been illustrated, and the package will be easy to open. Other advantages in this kind of packaging will be obvious depending upon the nature of the particular article being packaged. For example, when flashlight batteries are packaged in the manner previously described, the terminals of the batteries are kept clean and are protected by the thermoplastic material from corrosion.

The thermoplastic material useful in the present invention can be any thermoplastic polymer which, upon application of heat, will contract in length and/or width. The amount of shrinkability in the thermoplastic film is not critical, the only requirement being that the film fit closely to the package contents after shrinking. The thermoplastic material can initially be in the form of a sheet or tube. The thickness of the film is not critical and will depend upon the size, weight and shape of the package contents. It has been found in packaging flashlight batteries, for example, that 3 mil vinyl film is sufficient for a 2 battery package and 5 mil vinyl film is sufficient for a 4 battery package. The film may be one which, upon application of sufficient heat, will form a heat seal with itself, or may be one which, upon application of sufficient heat and use of a suitable heat reacting adhesive, for example a vinyl adhesive, will form a heat seal with the header board material. Adhesives of this kind and their use are well known in the art. The heat seal should preferably be flexible enough to permit the header board to fold flat against the body of the package during shipping and yet be brittle enough to allow the package to be torn open along the line

of stress upon application of a twisting force on the header board.

Particularly desirable packages have been obtained from polyvinyl chloride and its copolymer derivatives, especially copolymers of polyvinyl chloride and vinyl acetate or ethylene, films of which are highly strained in both directions at right-angles (i.e. biaxially oriented) and contain less than 5% plasticizer. By maintaining a low percentage of plasticizer, or preferably by eliminating the plasticizer entirely, a film is obtained which is more rigid than films which are commonly used for conventional packages. The rigidity of these films contributes to their ability to tear under a minimum of applied force and therefore enhances their utility in packages of the kind described.

The selection of the material from which the header board is made is not critical and, while paperboard or cardboard are preferred, the header board can be made from any sheet material which is stiff relative to the film material. The header board should preferably be of a size which permits it to be grasped easily and, if desired, used as a hanger for the package.

The method of producing the packages of the present invention involves two basic steps, heat sealing and heat shrinking. The method of forming the package of Figures 1-3 is described in detail in the following Example:

EXAMPLE 1

A sheet of unplasticized polyvinyl chloride-vinyl acetate film measuring approximately $3'' \times 9\frac{1}{2}''$ (7.5×24 centimetres) and having a thickness of 3 mils (.08 millimeters) is folded upon itself transversely in approximate edge to edge relationship. The adjacent end portions of the sheet are capped with a cardboard header board measuring approximately $3'' \times 2''$ (7.5×5 centimeters) and folded upon itself longitudinally. The inner side of the cardboard is coated with a heat sensitive vinyl adhesive and the cardboard is heat sealed to the end portions of the sheet. The heat sealing is accomplished by conduction bars coated with "Teflon" (Registered Trade Mark) supplying a temperature of 400°F . (205°C .) for 1 second at 25-35 p.s.i. Two size D (U.S. classification) batteries are positioned in the resulting loop and the package is heat shrunk in a heat tunnel. The shrinking temperature ranges from approximately 450°F . (232°C .) at the entrance of the tunnel to approximately 350°F . (177°C .) at the exit. The package remains in the tunnel for approximately 2 seconds. During passage through the tunnel, the batteries are maintained in alignment and the header board is supported in an upright position by two parallel guide rails. The heat shrinking is accomplished in so



short a period of time that very little heat is transferred to the package contents. The process can therefore be used to package articles which would be subject to damage by heat.

The packages shown in Figures 4—8 can be made in substantially the same manner described above. The variations involved in the process merely concern the manner of assembling the header board prior to the heat sealing operation.

EXPERIMENT 1

The following test was conducted to determine the resistance to breakage of packages according to the present invention compared to conventional paperboard packages.

One carton of 96 packages of two size D batteries each was prepared with packages according to the present invention and a similar carton of 96 packages was prepared using a commonly used paperboard gusset package. Both cartons were stored at a temperature of 0°F. (−18°C.) for 48 hours and were then dropped 10 times from a height of 18 inches (46 centimeters).

Upon examination of the cartons, it was found that there were no broken packages in the carton of packages in accordance with the present invention but that 8 of the 96 paperboard gussets were broken.

This test establishes the superior strength of packages in accordance with the present invention in relation to conventional paperboard packages. This strength, combined with the ease with which the package can be opened, has heretofore been unattained in packages of this kind.

WHAT WE CLAIM IS:—

1. A package having package contents and a thin heat-shrinkable thermoplastic sheet disposed about and heat shrunk around said contents, characterized by a heat seal in said thermoplastic sheet proximate to said contents forming an appendage extending from a main body portion of said package which together with a header board of stiff sheet material in contact with said appendage and limiting shrinkage thereof, forms a gripping tab.

2. A package according to claim 1 wherein said thermoplastic sheet is in the form of a tube, said heat seal divides said tube into two tubular compartments, said package contents being positioned in one of said compartments, and said header board being positioned in the other of said compartments, the said other compartment being the appendage, and said thermoplastic film is heat shrunk to tightly enclose said package contents and said header board.

3. A package according to claim 1 where-

in said thermoplastic sheet is folded upon itself in edge to edge relationship and the edge portions being heat sealed to said header board.

4. A package according to claim 3 wherein said edge portions are heat sealed to opposite sides of said header board.

5. A package according to claim 3 characterized by said edge portions heat sealed to one another and the same side of said header board.

6. A package according to claim 3 wherein said header board is folded upon itself in edge to edge relationship enclosing said edge portions.

7. A package according to claim 6 characterized by the ends of said header board terminating proximate to said package contents.

8. A package according to claim 6 characterized by said thermoplastic being a biaxially oriented copolymer derivative of polyvinyl chloride containing less than 5% plasticizer.

9. A package according to claim 8 characterized by said copolymer being an unplasticized polyvinyl chloride-vinyl acetate copolymer.

10. A method of producing a package which comprises forming a loop of heat shrinkable thermoplastic material, positioning a header board of stiff sheet material in contact with said loop, heat sealing said thermoplastic material proximate to said header board to form a gripping tab extending from a main body portion of the loop, positioning the package contents within the main body portion, and heat shrinking said thermoplastic, the header board limiting the shrinking of the thermoplastic material in the region of the gripping tab.

11. A package as claimed in claim 1, substantially as hereinbefore described in the foregoing Example.

12. A package as claimed in claim 1, substantially as hereinbefore described with reference to and as illustrated in Figs. 1 to 3, 4 and 5, 6 or 7 and 8 of the accompanying drawings.

13. A method of producing a package, substantially as hereinbefore described in the foregoing Example.

14. A method of producing a package, substantially as hereinbefore described with reference to and as illustrated in Figs. 1 to 3, 4 and 5, 6 or 7 and 8 of the accompanying drawings.

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Upon examination of the cartons, it was found that there were no broken packages in the carton of packages in accordance with the present invention but that 8 of the 96 paperboard gussets were broken.

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8. A package according to claim 6 characterized by said thermoplastic being a biaxially oriented copolymer derivative of polyvinyl chloride containing less than 5% plasticizer.

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