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[33] Great Britain

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1967, 39,820/67, Aug. 1, 1967, 28,356/68

[51] Int. Cl. B65d 35/08

[50] Field of Search 99/171 B,
171 S, 171 C, 171 LP; 229/63; 53/14

[56] References Cited

UNITED STATES PATENTS

2,735,149	2/1956	Frank	99/171 X
3,274,004	9/1966	Curler et al.	99/171
3,290,854	12/1966	MacMurray	229/63 X
3,389,783	6/1968	Bjorkengren	99/171 X

FOREIGN PATENTS

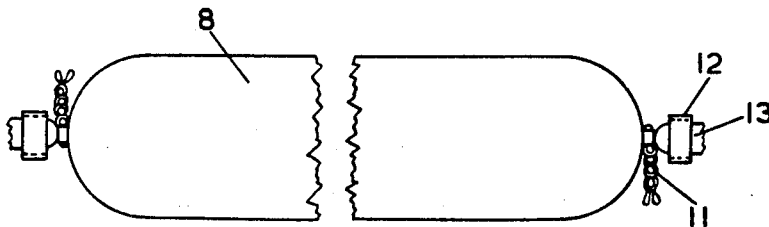
639,812	4/1962	Canada	99/171
926,159	5/1963	Great Britain	99/171

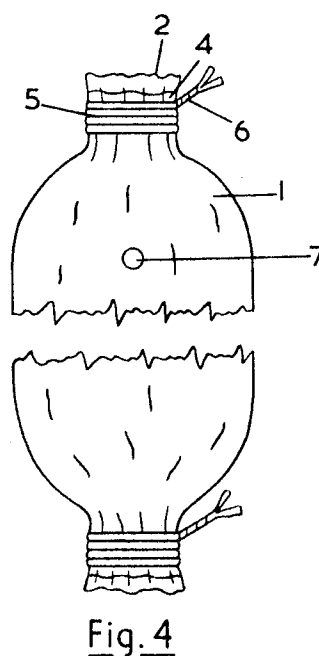
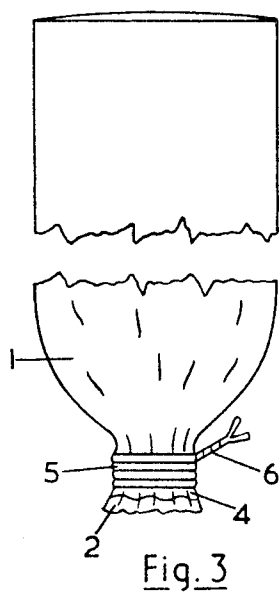
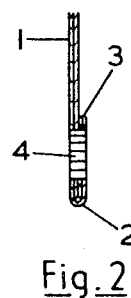
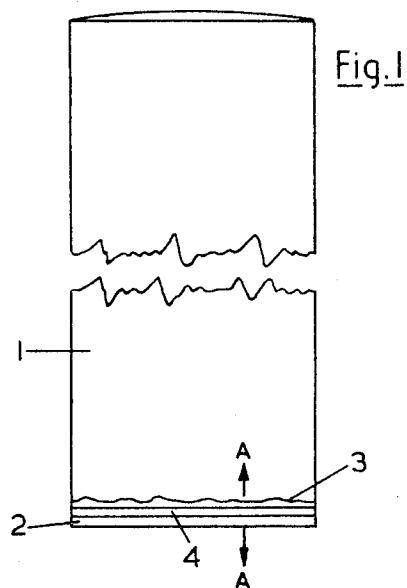
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[54] PLASTICS CONTAINERS AND PACKAGES
20 Claims, 15 Drawing Figs.

[52] U.S. Cl. 99/171 C,
229/55, 229/63, 99/171 B

ABSTRACT: A plastics film container containing a gas under superatmospheric pressure, e.g. beer or a soft drink, closed by a ligature applied to the sealed, bunched neck below a thickened region thereof.





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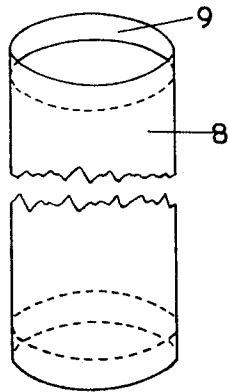


Fig. 5

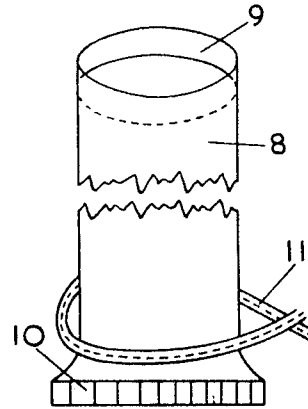


Fig. 6

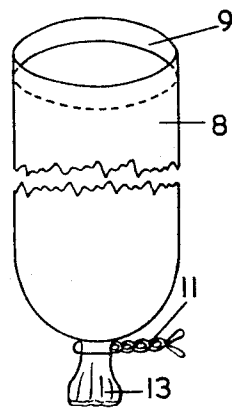


Fig. 7

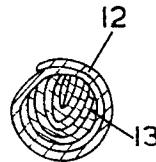


Fig. 9

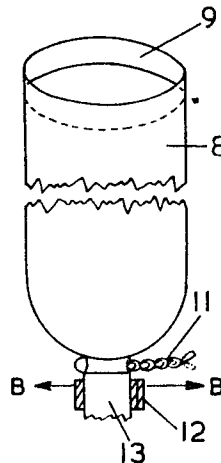


Fig. 8

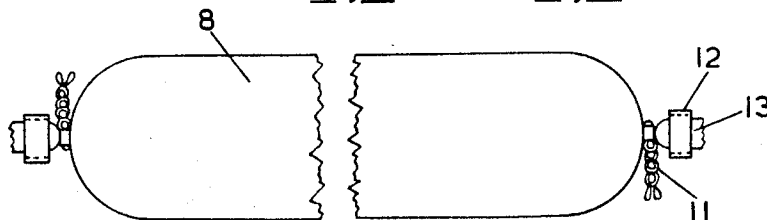


Fig. 10

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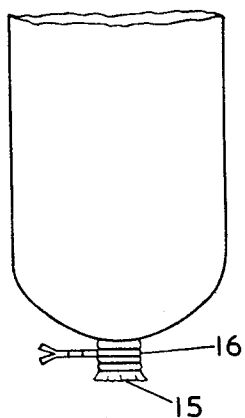
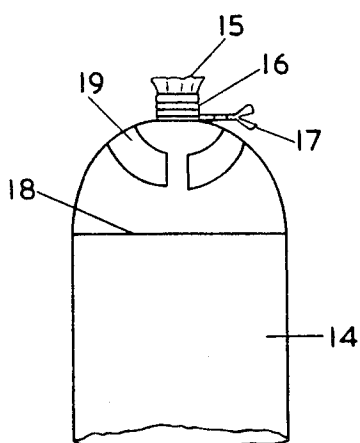


Fig. 11

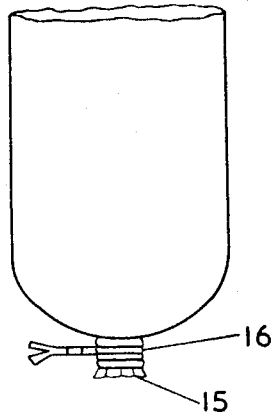
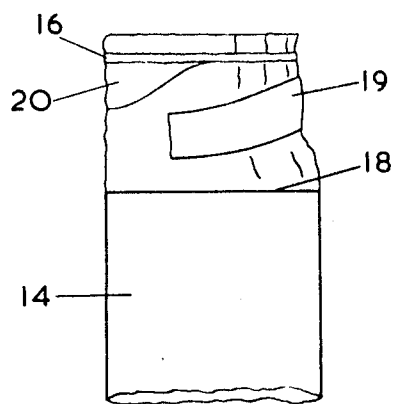


Fig. 12

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FIG. 14.

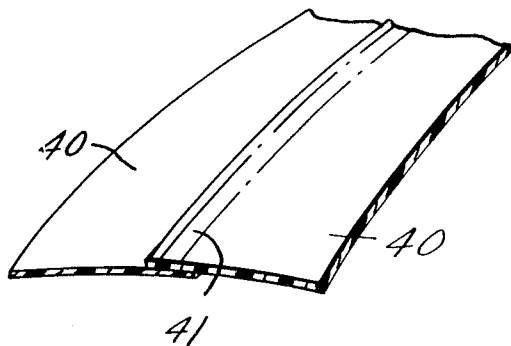


FIG. 13.

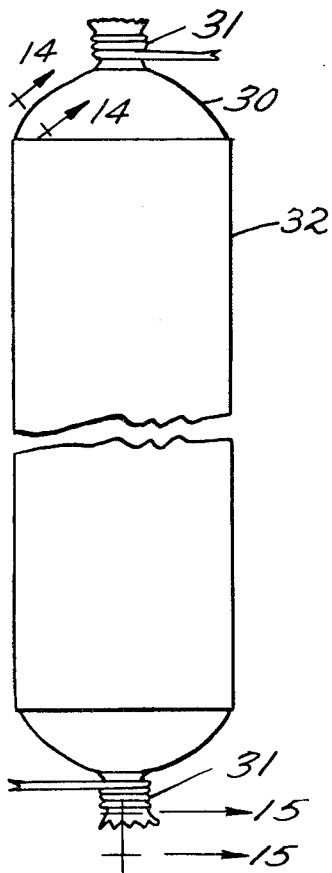
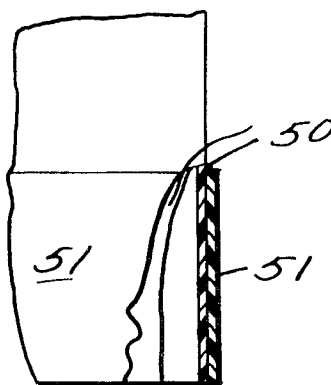


FIG. 15.



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PLASTICS CONTAINERS AND PACKAGES

This invention relates to packages comprising filled containers of plastics film with contents under superatmospheric pressure, and to the film containers for producing such packages.

The invention relates particularly to plastics film containers for gas-containing liquids, such as beer and carbonated soft drinks, and liquids packed under pressure of a gas. It may also be applied to the packaging of articles of solid substances in plastics film containers made rigid by enclosing a gas or vapor under pressure. It may also be used in packaging gases, alone, or low boiling liquids that generate pressure under normal storage conditions. In the term "gas" we shall hereinafter include vapors of low boiling liquids, e.g. aerosol propellants.

It has previously been proposed to package liquids in plastics film containers closed by heat sealing. Such packages, however, have not been satisfactory for applications in which the contents are under relatively high pressures; even pressures as low as 3 p.s.i. cause seal failures. Attempts to make a purely mechanical closure to contain the pressures generated by carbonated drinks have also been unsuccessful.

The present invention provides a plastics film container for contents including a gas under superatmospheric pressure, the container being closed by at least one bunched neck, with a ligature or other encircling closure applied to the bunched neck immediately below a region thereof that is of greater cross-sectional area than the region encompassed by the encircling closure, and all capillaries leading through the bunched neck from inside the container to the atmosphere are sealed against egress of gas from the container.

The invention further provides a package comprising a container as described, sealed from the atmosphere and with contents including a gas under superatmospheric pressure.

In referring to the "region of greater cross-sectional area" we mean that this region of the bunched neck has a greater cross-sectional area than the adjacent region, either through the inclusion of additional material, or through this portion being rendered less easily deformable by the force exerted towards it by the ligature when the container is pressurized. For example, the increase in cross-sectional area may be brought about by strongly crimping or embossing the film, particularly where it is sealed, as will be more particularly described hereinafter, and thus is not necessarily due to the presence of additional film or other material in the region. For simplicity, the region of greater cross-sectional area will be referred to hereinafter as the "thickened" region, and the "ligature or other encircling closure" will be referred to simply as the "ligature." By referring to the position of the ligature as being immediately "below" the thickened region, we mean that the ligature is immediately adjacent to the thickened region and on the same side thereof as the contents of the container. The neck of the container will generally be bunched simply by gathering it together, with the ligature or by other means. However, the closing of the neck may include a degree of systematic folding or twisting.

In one preferred form of the closure, a thickened region is provided by additional material or layers attached to the outer surface of the container wall in the region to be thickened. Methods of providing such additional layers include that of folding over the end of the flattened container upon itself and sealing all the layers of film together by heat and pressure or by adhesives, before the neck is bunched or twisted. Another method is by similarly sealing a separate strip or strips of material to the outer surface of the container walls, a seal also being formed between the inner surfaces of the container, beyond the intended position of the ligature, in respect of the contents, and preferably beneath the applied layers. We find that even a relatively weak and brittle seal between the inner surfaces, such as a heat seal formed between adjacent surfaces of oriented film of polyethylene terephthalate without a heat-seal coating, is sufficient to withstand the pressure of enclosed gas when the ligature is in position. Additional material may otherwise be attached to the outer surface of the container wall in the region to be thickened by coating it on to the walls,

or by depositing it discontinuously thereon, as a melt or from a solution or dispersion. Thus, hot melt compositions that will adhere to the film may be used for this purpose.

Additional material to provide the thickened region may alternatively be applied to the inside surface of the neck of the container. For example, a tape of film or other flexible sheet material may be bonded to the surface by heat sealing or by adhesive, or a plastics material may be melt coated on to the surface. The thickened region may further be provided by a layer of self-adhesive material coated on to one or both of the opposed surfaces of the film; for example, a wax, a low molecular weight polymer, or other material normally solid but capable of melting at a temperature below that at which the plastics film melts or becomes unserviceable, may be coated upon the appropriate parts of the film surface, or injected into the region of the closure.

Alternatively, as previously indicated, the thickened region may be a heat-seal, crimped, embossed, or otherwise formed in such a way that it is sufficiently less compressible than the adjacent regions to resist the force of the internal pressure upon the ligature, tending to push it along the bunched neck. The degree of incompressibility required in the seal will of course depend in part on the maximum pressure that will be developed in the package. It will also depend on the limpness of the film. Thus, if the film is of a limp sort, deep embossing on a wide seal is required to effect the desired increase in cross-sectional area. The provisional of a suitable seal will thus be a matter to be determined by experiment for any particular use of the container that may be envisaged. A further method of providing the thickened region by means of a heat seal is that of cutting the bunched neck just beyond the ligature by means of a hot knife, and pushing the fused, cut edges towards the ligature so that, on cooling, the seal serves to provide a thickened rim as well as to seal any capillaries through the bunched neck.

In a further form of the container, a suitable thickened region of the neck is provided by shrinking a portion of the walls of the neck by locally heating the film to a sufficiently high temperature. In this case the neck may be simultaneously or separately sealed, by heat sealing or by an adhesive, to close any capillaries that would otherwise remain through the bunched neck. Here also the degree of shrinkage that is required to provide sufficient thickening is a matter to be determined by experiment.

In general, it is preferred to provide the thickened region by the inclusion of additional material, rather than by the provision of a suitably modified heat seal or by shrinkage of the container neck, since the first method gives more reliable and consistent results, particularly for relatively high pressures such as those generated by beer and carbonated drinks.

The container is preferably a plastics film tube closed at each end by a closure as described. The containers are preferably formed without seams, but they may be formed with a seam or seams capable of withstanding the pressure of enclosed gas. It will be appreciated that internal pressures can be more easily withstood by, for example, a lapped seam in the wall than by a seal that is subject to a peeling force, as is the case with seals of the type normally used for closing filled bags and similar containers.

If desired, a mechanical closure may be placed upon the thickened region of the neck of the container, to provide additional security to the closure.

Particular forms of the container of the present invention as so far described will now be described by way of example with reference to FIGS. 1 to 10 of the accompanying drawings, of which:

FIGS. 1 and 3 show stages in the formation of a closure of a preferred type at one end of a length of tubular plastics film from which a container is to be formed, the thickened region of the neck being provided by the inclusion of additional layers in the seal;

FIG. 2 is a section through the line A-A in FIG. 1;

FIG. 4 shows a finished container with each end sealed and tied with a ligature; and

FIGS. 5 to 10 show stages in the formation and filling of a container with an alternative type of closure, in which the thickened region is provided by an additional layer of film applied round the inside surface of the container neck, FIG. 9 being a section through line B-B of FIG. 8.

In FIGS. 1 to 4: 1 represents a length of plastics tubular film, and 2 a fold by which an open end of the length has been turned over upon the tubular film, the trimmed edges of the end being shown (in FIGS 1 and 2) at 3; 4 is a heat seal between the 4 layers of film so brought together; and 5 (FIGS. 3 and 4) is a ligature of plastics coated wire which has been passed four times round the bunched neck, immediately adjacent to the thickened region provided by the four layers of film. The wire is pulled tight, and the ends twisted together at 6.

One preferred method of filling the containers is that described in our copending British application No. 9849/68. For this purpose, the container is preferably supplied in flattened form, closed at both ends, as shown in FIG. 4. The container is preferably provided with an aperture, shown at 7, which is formed before the second end of the tubing is closed. The container is then ready to be pressurized and filled with a liquid containing a gas under pressure, by the method described in the said application. The aperture is preferably punched in the wall of the container by means of a hot tool, or by a jet of hot air or a flame, so that the edges of the aperture become slightly thickened.

In FIGS. 5 to 9: 8 represents a length of plastics tubular film, which is provided at each end with a layer, 9, of tape (preferably a plastics film tape) coated on both sides with a contact adhesive, and adhered all round the inside surface of the ends of the tubing. The tubing is flattened at one end as shown at 10 in FIG. 6, to seal together the opposed surfaces of the tape and form the bottom of the container. A ligature, shown at 11 in FIGS. 6, 7 and 8, suitably of plastics coated wire, is then applied immediately above the tape, and is drawn tight and has its ends twisted together. A metal clip, 12 (FIGS. 8-10) is optionally applied upon the region, 13, thickened by the tape, as shown in FIG. 8, and in cross section in FIG. 9. The tube thus closed at one end is then filled, for example with a refrigerated carbonated liquid, suitably by the method described in our copending British application No. 35334/67, in which method the major part of the container is first brought to its fully inflated state by the application of differential pressure to the inner and outer surfaces of the container, and is maintained in such inflated state during filling and sealing. The top of the container is then closed in the manner described for the bottom neck. In this case the operation must be carried out quickly, before a large pressure is generated. The finished package is shown in FIG. 10.

The containers are preferably formed of oriented tubular film of polyethylene terephthalate. For the preferred tubular containers already described the polyethylene terephthalate film is preferably biaxially oriented in such manner that, where the circumferential draw ratio is $x:1$ and the longitudinal draw ratio is $y:1$, then the product xy is from 7 to 16, preferably from 12 to 15, and the ratio x/y is from 1.2 to 2.5, preferably from 1.3 to 1.8. By selecting draw ratios within this range, the thickness of film required to contain a given maximum pressure within the containers may be kept to a minimum, which gives an economic advantage. When the container is to be used in the packaging of beer or other carbonated drinks, it is preferably provided with a coating of a material highly impermeable to water vapor, carbon dioxide and oxygen. Suitable materials for such coatings include vinylidene chloride polymers and copolymers, particularly copolymers of vinylidene chloride with a lesser proportion of acrylonitrile, for example copolymers containing between 80 percent and 95 percent by weight of vinylidene chloride and up to 20 percent of acrylonitrile and, if desired, small proportions of other monomers such as itaconic acid or methacrylic acid. These polymeric materials are also particularly suitable for forming gas impermeable coatings on films other than polyethylene terephthalate which may be used for making the

containers. The coating may be applied to the inner or outer surface of the tubular film; it is usually more convenient to coat the outer surface. Such coatings have the additional advantage that they form strong heat seals.

Materials other than polyethylene terephthalate films that may be used for forming the containers include oriented or unoriented nylon films and oriented films of polypropylene, polyvinyl chloride, or copolymers of vinylidene chloride with minor proportions of other monomers, for example vinyl chloride, acrylonitrile or acrylic or methacrylic esters, the nature of the material, at least as to the inner wall of the container, being such as to have substantially no undesirable effect on the intended contents of the container.

While it is generally preferred to use a coating on the plastics film to provide the desired impermeability, the container may be a double-walled tube of plastics material to which one wall contributes high strength, and the other wall contributes a high impermeability to gases, and improved heat sealability if desired. Thus, for example, tubing having an outer wall of polyethylene terephthalate and an inner wall of vinylidene chloride polymer or copolymer may be used. Alternatively, a sufficient degree of impermeability to gases may be provided in, say, a container of polyethylene terephthalate film, by providing a tubular sleeve of an impermeable plastics material around substantially the whole of the cylindrical section of the container.

The use of a tubular sleeve around the container, of a material the same as or different from the walls of the container, can provide a number of further advantages. One particular advantage, especially for use at very high pressure, is that it gives added strength against radial stress, which is greater than the stress upon the end sections of the filled tubular containers. Thus, the addition of a tubular sleeve covering only the cylindrical portion will allow the use for the container of thinner film, down to about half the thickness, than would otherwise be needed to give a container of adequate strength. Not only does this give a saving of material; it also facilitates the closing of the container, since thin film can be more easily closed by bunching or twisting than can thick film, without capillaries being left through the closure. An ancillary use of the sleeve is to enclose a label or decoration between itself and the container, when the sleeve is transparent, or to provide protection for print on the wall of the container.

The sleeve, when in the form of plastics tubing, may be easily placed in position by slipping it over the container before it is filled. Alternatively, the sleeve may be formed by wrapping or winding round the cylindrical part of the container a sheet or strip of plastics film, paper, or other flexible material having properties desired for the intended function of the sleeve, and sealing it into tubular form by heat or adhesive. Thus, for example, when the pack contents are carbonated drinks, these may be chilled before being introduced into the pack, to reduce the pressure they initially exert. The sheet material may then be wrapped or spirally wound around the pack, and sealed while the contents are still chilled. When the pack reaches room temperature it expands so that the sleeve exerts a reinforcing action. The sleeve may be extended at one end to form a stand.

When a close-fitting sleeve is placed upon the cylindrical part of the container to provide increased bursting strength, and the container is formed of polyethylene terephthalate film, it is often preferred that the container be formed of film that is oriented to a higher draw ratio in the longitudinal than in the circumferential direction, while still having a product of draw ratios within the range 7 to 16. This will give improved bursting strength in the two ends of the container, which are not supported by the sleeve.

For opening the filled containers, they may be placed in a supporting tube, preferably self-standing, for example of cardboard (which may be reusable, or may be provided as a part of the package), and opened by cutting off the top of the container, preferably after pricking it to release the pressure, or by means of a tear tape or similar opening device. When the

container is formed of polyethylene terephthalate film, and closed with a wire ligature, one end of the ligature may be left of such length that the wire, bared of its plastics coating, may be used to prick the container to release the pressure before the container is opened. Polyethylene terephthalate film does not run from pinholes and the container does not burst during this operation. The slightly explosive opening of the container may thus be avoided.

In a further embodiment of our invention, however, we provide a package which, while being capable of withstanding high internal pressures, is nevertheless conveniently opened.

In accordance with this embodiment of the invention, we provide a package or container as already described, but in which a continuous seal is provided between the walls of the neck of the container to seal all capillaries through the bunched neck, and in which at least a part of said seal is of such strength that it will readily fail under pressure of the contents when the ligature is released.

The failure of the seal may be due to a peeling apart of the film layers at the seal, or to rupture of one or more of the film layers in the region of the seal, where they may have been weakened by sealing, when subjected to forces generated by the pressure within the container when the ligature is released. The failure of the seal results in the spontaneous (or readily assisted) opening of the container when the ligature is released, and so avoids any difficulty in opening that might otherwise arise in the absence of special opening devices.

The seal, which is preferably a heat seal, should be of such strength that it will readily fail spontaneously when the ligature or other closure is removed, or will fail when a shock is applied, for example by tapping the container upon a solid surface or by handling the seal. Preferably the strength of the seal is such that it will fail spontaneously, or readily if a small shock is applied, within about 10 seconds, preferably within 5 seconds, of release of the ligature. The shock applied should not be so great or of such nature as to cause the contents to spurt from the container. The seal should preferably not be so strong throughout its length as to prevent it from failing, or from being easily persuaded to fail, in a reasonably short time, or to allow only a pinhole failure to develop and not propagate, so that pressure is lost slowly from the container without a convenient emptying outlet being formed. However, even a slow loss of pressure provides some advantage, since the end of the depressurized container can subsequently be cut off, or a tear tape may be provided for the purpose, and an explosive "pop" is avoided. A very weak seal, such as the heat seal obtained between oriented, heat-set polyester film without a heat seal coating, is sufficient, in the presence of the ligature, to hold fast against pressure of the contents, and will generally fail spontaneously and almost immediately under pressure from the contents when the ligature or other closure is removed.

The strength of the seal, if it be a heat seal, may be modified in such ways as by varying the heating cycle in forming the seal, or by adjusting the pressure applied. If desired, heat seal coatings may be provided on the film surfaces to be sealed. The best conditions for forming a heat seal which will give a desired average interval between the removal of the closure and the failure of the seal may be determined by experiment, for any particular internal pressure desired in the container. Similarly, seals provided by pressure sensitive adhesives may be adjusted to give a desired bursting time, for example by selecting a suitable adhesive and by adjusting the width of the seal.

In a preferred form of this embodiment of the invention, the seal is stronger, or is reinforced, along a major portion of its length, so that a minor portion of the bunched neck is blown out on opening, at the position corresponding to the weaker section of the seal, to a greater extent than the remaining portion. This forms a spout or lip by which the container may be more conveniently emptied. It gives the further advantage that the "pop" which occurs on opening the container, and which may in some circumstances be regarded as undesirable, is reduced in volume.

Methods of providing a seal which is stronger along a major portion of its length include, in the case of seals that fail by peeling apart, those of making a double linear seal along the major portion of the width of the container, leaving a single seal over a short distance at one end, or making a wedge-shaped seal, or a seal that is wider along a major portion of its length than at one end thereof, so that the seal peels apart only at the thinner end, or progressively from the thinner end. Reinforced seals are usually preferred, however, since they are more easily controlled to provide a desired opening. Methods of reinforcing the seal include those in which, over a major portion of the circumference of the container, the creases in the dome at the end of the container, just below the bunched neck, are initially or wholly prevented from being opened out by pressure of the escaping gas. Thus, for example, strips or shapes of flexible sheet material such as adhesive tape, or a coating of a film forming material, may be adhered to the creased film around the dome of the container after filling. In a particularly preferred such method, an incomplete circle or U-shaped portion of adhesive tape is adhered around the dome. Such devices may form a part of the decoration or labelling of the container.

One preferred form of this embodiment of the present invention will now be described by way of example with reference to FIGS. 10 and 11 of the accompanying drawings, of which:

FIG. 11 shows the unopened container, and

FIG. 12 shows the container after opening.

In the FIGS.: 14 represents the body of the container, which is suitably formed of a length of biaxially oriented tubular film of polyethylene terephthalate 0.0008 inch thick; 15 are the ends of the container, which have been folded over a short distance from the edges and heat sealed, at 16, through the four film layers close to the cut edges of the tubing; 17 is a ligature closing the container between the contents and the seal at a position immediately adjacent to the seal; and 18 is the level of liquid contents under superatmospheric pressure. 19 is a horseshoe-shaped piece of adhesive tape stuck to the dome of the container around a major part of its circumference. 20, in FIG. 12, shows a pouring spout produced by spontaneous failure of the seal 16 (in this case, by rupture of the film immediately beside the seal), the failure having occurred in the region between the two ends of the horseshoe-shaped strip 19. The heat seals 16, for the 0.0008 inch thick polyethylene terephthalate film, may be suitably formed by pressing the layers together at a temperature of 280° C. for 4 seconds.

FIG. 13 shows the tubular film container 30 with closures 31 and a sleeve of flexible material 32 disposed around the cylindrical portion of the tubular film container 30 and the sleeve is sealed or adhered to the container 30.

FIG. 14 is an enlarged fragmentary cross section of a portion of container 30 and shows the film 40 having a lapped seam which has been heat sealed at 41.

FIG. 15 is an enlarged fragmentary cross section of a portion of FIG. 13 having the closure removed therefrom for the sake of clarity and shows the film 50 having a coating 51 on the outside thereof.

The pressure within the filled containers will usually be at least 1 p.s.i., because such pressure is required to give sufficient rigidity to the package when it is pressurized for this purpose. When the internal pressure is due to the nature of the contents (a carbonated drink, for example) it will generally be considerably in excess of 1 p.s.i., for example up to 30 p.s.i. or even above, 60 p.s.i. for example, in hot weather.

Our invention therefore further comprises plastics film containers for use in making a package according to the invention, the containers each having a bunched neck closed by a ligature or like removable closure device and by a seal beyond the closure device, with respect to the interior of the container, at least a part of the region of the seal having a strength, as shown by sampling, such that, in the absence of the ligature or like closure upon said neck, it will withstand for at least 2 minutes a static pressure of 1 p.s.i. within the con-

tainer, but will fail within 2 minutes when subjected to a static pressure within the range of from 3 p.s.i. to 30 p.s.i.

Containers intended for contents under a pressure as low as 1 p.s.i. may usefully be provided with a seal capable of withstanding a static pressure of 3 p.s.i. or a little above, since such a seal can be ruptured by shock waves applied to the contents, as, for example, by tapping or compressing the package, or by handling the seal. Containers with contents under relatively high pressure are preferably provided with a seal that will fail readily at a lower pressure, so that the containers will open spontaneously when the ligature is removed. The strength of the seal will thus be adapted, in practice, to a proposed use or uses of the container.

The ligature used for any of the containers of the invention is preferably formed of plastics coated wire passed at least once round the neck. If it is not sufficiently stiff to remain in place when wound round the neck without loosening under pressure of the contents, the ends of the ligature may be tied or twisted together, or the ligature may be provided with an adhesive coating, in which case the twist is not necessary, the ligature merely being passed more than once round the neck, and the adjacent turns being adhered together sufficiently to hold the ligature against loosening under the internal pressure, but not strongly enough to make the ligature difficult to unwind by hand. The adhesive coating may be a hot melt adhesive, caused to adhere by the external application of heat or by resistance heating applied through the wire; or it may be a pressure sensitive adhesive or a tacky material of the type which adheres to itself but does not adhere unduly to other materials. Ligatures secured in this way are particularly useful for the containers that are to be opened by removing the ligature.

Other types of ligature that may be used in accordance with the invention include metal clips capable of gripping the bunched neck, of types well known in the art and including, for example, U-shaped metal clips of the kind illustrated at 12 in FIGS. 8 to 10, although there placed upon, rather than below, the thickened region of the neck.

The containers are particularly useful for retailing beer and other gas-containing liquids, especially carbonated soft drinks, and for the packaging of other pressure-generating liquids, for example wines. They may also be used for the packaging of noncarbonated liquids under pressure of a gas, to give substantially rigid packs. Products that may be packed in such manner include: household products, such as liquid detergents, liquid bleach, fabric softeners, starch solutions, dry cleaning fluid, liquid waxes and polishes, window cleaners, disinfectants, paints, varnishes, linseed oil; adhesives; inks and other artists' materials; medical and pharmaceutical liquids such as blood, sterile water, medicines and alcohol; motor car products such as lubricating oil, thin oil, battery liquid, polishes and shampoos; fire extinguishing liquids; potable liquids such as milk and milk products, natural or synthetic cream and cream products, fruit squash, fruit juices, spirits; garden products such as insecticides, fungicides, herbicides, fertilizers; toilet and cosmetic products such as nail varnish, liquid shampoo, toilet water, hair setting lotion, hand creams; and food products such as canned fruit and vegetables, soups, ketchups, salad dressings, edible oils, salad oils, vinegar, syrup, coffee essences, flavorings. The containers may also be used for packaging solid articles, the pack being pressurized to make it rigid and thus to protect the contents or to improve the sales appeal of the pack. In this case, of course, the article or articles are inserted before the second closure is applied, and the package may, if desired, be pressurized by enclosing a little solid CO₂.

Our invention is further illustrated but in no way limited by the following examples.

EXAMPLE 1

A 9 inch length of biaxially oriented lay-flat tubing of polyethylene terephthalate, having a wall thickness of 0.0008

inch and a flat width of 2½ inches, was provided at one end with a closure in the manner described hereinbefore with reference to FIGS. 1 to 3 of the drawings. To seal the end of the tubing, the end portion of the flattened tube was folded over along a line parallel with, and about three-eighths inch from, the end, and a heat seal one-eighth inch wide was formed between the four layers of the folded portion, close to the fold and extending along the whole length of this portion, from side to side of the tubing. The excess film was trimmed off close to the seal. The seal was formed by an impulse heat sealer which reached a maximum temperature of about 280° C., using a sealing cycle of 5 seconds. The ligature, applied immediately below the heat seal, was of copper wire, 0.02 inch in diameter and bearing a plastics coating 0.01 inch thick. At the open end of the tube, a layer of tape coated on both sides with contact adhesive was applied round the inside surface of the mouth, as shown in FIG. 4. The tube thus closed at one end was opened out in a suction mould, as described in our copending application No. 35334/67, and was filled with one-half pint of beer chilled to a temperature of 2° C. The top of the container was then closed in the manner previously described with reference to FIGS. 4 to 8 of the drawings, except that the inner surfaces of the Scotch tape were caused to adhere by pressure, and no clip was applied to the neck above the ligature.

Packs filled with beer in this manner were stored for 14 days, during which time the storage temperature varied from 40° to 80° F. There was no leakage, and the beer, then sampled, was found to be in excellent condition.

EXAMPLE 2

A container was made and filled with beer in the manner described in example 1, except that the heat seal at the bottom of the container was made by means of an impulse sealer which reached a maximum temperature of 280° C., and the sealing cycle was of 4 seconds. After the container had been closed at the other end, the container was inverted and a horseshoe-shaped piece of adhesive tape was applied around the dome of the first closed end, as shown in FIG. 10. When the beer had warmed up to room temperature (65° C.) the container was placed in a tubular cardboard support, with the same end uppermost, and the ligature was removed. Almost immediately the container opened spontaneously, as shown in FIG. 9, with only a small "pop" and with the formation of a convenient pouring lip.

As indicated hereinbefore, instead of the containers being filled by the method described in the examples, they may be provided in the form shown in FIG. 4 and filled through the filling aperture by the method described in our copending British application No. 9849/68. The method comprises: locating the aperture over an orifice in a substantially smooth surface, said orifice being connected to a source of a gas under superatmospheric pressure; inflating the container by the introduction of said gas while the container wall surrounding said aperture is held substantially in gas-tight contact with said surface; and, while the container is still fully inflated, sliding it along relative to said surface to bring that portion of the wall of the container which surrounds the aperture into contact with a supported flexible sealing strip held in substantially continuous relationship to said surface; and applying heat if necessary to seal the sealing strip to the wall of the container around the aperture. In the term "over an orifice" is included any case where the container is located so that the aperture covers the orifice, irrespective of whether the surface containing the orifice is generally located above, beneath or beside the container.

We claim:

1. A package comprising a length of biaxially oriented tubular plastic film and contents therein under superatmospheric pressure, the tubular film being closed at each end by a bunched neck of the tubular film and an encircling closure applied as a tightly drawn ligature about the bunched neck, said

closure being disposed between the body portion of the tubular film and the end portion of the tubular film which end portion has a thickened region that is of greater cross-sectional area than the region encompassed by the encircling closure, and a seal at each end of the tubular film to prevent egress of the contents of the package through capillaries in the bunched neck

2. A package as claimed in claim 1 in which the plastic film is biaxially oriented film of polyethylene terephthalate.

3. A package as claimed in claim 2 having a coating of vinylidene chloride polymer or copolymer on the outer surface thereof.

4. A package as claimed in claim 1, having a tubular sleeve of the same or a different plastic film disposed substantially around the whole of the cylindrical portion of the tubular film.

5. A package as claimed in claim 1 in which the said thickened region comprises additional material disposed at the inner surface of the end portion of the tubular film.

6. A package as claimed in claim 5 in which said additional material is a flexible tape coated on both sides with adhesive and applied around the inner surface of the end portion of the tubular film.

7. A package as claimed in claim 1 in which the said thickened region comprises additional material applied to the outer surface of the end portion of the tubular film.

8. A package as claimed in claim 7 in which the additional layers of material are sealed to the surface of the tubular film.

9. A package as claimed in claim 7 in which the thickened region comprises the end of the flattened tubular film being folded over upon itself and all the layers of the folded over portion being sealed together.

10. A package as claimed in claim 7 in which the additional material is coated upon the outer walls of the tubular film.

11. A package as claimed in claim 1 in which the thickened

region comprises the walls of the tubular film which are bunched and sealed together by a crimped or embossed seal.

12. A package as claimed in claim 1, closed at each end by a bunched neck and provided with a filling aperture in the wall of the tubular film.

13. A package as claimed in claim 1, in which a continuous seal is provided between the walls of the neck of the tubular film to seal all capillaries through the bunched neck.

14. A package as claimed in claim 1 in which the tubular film is closed at each end by the said bunched neck and a tubular sleeve of flexible material is disposed around substantially the whole of the cylindrical portion of the tubular film, said flexible material being sealed or adhered to the tubular film by heat or adhesive.

15. A package as claimed in claim 1 in which the opposed inner walls at both ends of the tubular film are sealed together in flat contact and are gathered together to form a bunched neck, said neck being closely held by an encircling closure device located between the said seal and contents within the tubular film.

16. A package as claimed in claim 1, having a filling aperture in the cylindrical wall thereof sealed by a patch of flexible sheet material adhered to the wall of the container around the aperture.

17. A package as claimed in claim 1 in which the film bears a coating of a vinylidene chloride polymer or copolymer.

18. A package as claimed in claim 1 in which the package is formed of double walled tubing, the two walls being of the same or different plastics materials.

19. A package as claimed in claim 1 in which the encircling closure is a ligature formed of plastics coated wire.

20. A package as claimed in claim 1 which contains a carbonated drink.

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