

PATENT SPECIFICATION

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(54) PACKAGING METHOD

(71) We, IMPERIAL CHEMICAL INDUSTRIES LIMITED, of Imperial Chemical House, Millbank, London, S.W.1, a British Company, 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 a method of forming packages comprising filling containers of plastics film with contents at super-atmospheric pressure.

The invention relates particularly to the packaging of gas-containing liquids at super-atmospheric pressure, particularly carbonated beverages.

There exists in particular a large potential market for beer and carbonated soft drinks and similar beverages packed in plastics film containers. The use of these containers instead of the non-returnable bottles and cans makes substantial savings in costs both of materials and transport.

It has previously been proposed, in U.K. Specification No. 957,408, to package aerated or carbonated beverages by filling them under counterpressure into a tube of plastics film, and forming the tube into a succession of liquid-tight receptacles joined by the intervening tube collapsed into a neck portion or otherwise sealed. In one method of carrying out the method, the beverage is filled into a freshly extruded tube of plastics material which is expanded while still in the softened, freshly extruded state, to the diameter required in the finished package. The necks dividing the filled tube into separate packages are formed below the level of the surface of the liquid.

An object of the present invention is to provide, for the packaging of such beverages in plastics film containers, a method that avoids the difficulties of forming gas-

tight seals between plastics film surfaces that are wet with the beverage.

In accordance with the present invention, a method of forming a package comprising a sealed tubular container of plastics film containing a gas-containing liquid at super-atmospheric pressure, comprises: using a container formed from a separated length of tubular plastics film having substantially the same diameter when fully inflated, as that of the completed package, and sealed from the atmosphere except at a filling opening; bringing the major part of the container to substantially its fully inflated state, by the application of differential pressures to the inner and outer surfaces of the container walls; and, while maintaining the container in such inflated state, incompletely filling it with the liquid and thereafter sealing the filling opening above a gas space in the container.

In the specification of our copending Application No. 35333/67 we have described a package comprising a plastics-film container with contents including a gas at super-atmospheric pressure, the container being tubular and closed at each end by a bunched neck, with a ligature or other encircling closure applied to the bunched neck immediately inwards of a thickened region thereof that is of a greater cross-sectional area than the region encompassed by the encircling closure, and all passages leading through the bunched neck from inside the container to the atmosphere being sealed against egress of gas from the container. The thickened region of the neck may be provided by various methods, among them that of including additional layers of film or other material in the seal closing the passages through the container neck. The container is preferably formed from a length of tubular plastics film, closed at both ends

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by a bunched neck. It is preferably formed of biaxially oriented tubular film of polyethylene terephthalate as described and claimed in copending Application No. 35335/67.

In the packaging of carbonated liquids, such as beer, in tubular plastics containers such as those described, it is desirable to transfer the liquid at low temperature into the container, and immediately to seal the filling opening at a position as close as possible to the top of the liquid, a small gas space being left so that the surfaces to be sealed may be kept dry. We have found, however, that, starting with the container in its normal, collapsed condition, a large gas bubble is formed when the temperature rises. Thus, as pressure is generated the container takes up a different shape, and the liquid may ultimately take up only about half the container, leaving the remainder as a gas space. The creases at the ends of the tubular containers are not fully opened by weight of the liquid alone, and even the intermediate part of the container is less than a perfect cylinder until an internal superatmospheric pressure develops. The presence of large gas spaces containing the gas under pressure is not desirable, particularly because the contents tend to go flat, and also because the gas escapes with a somewhat noisy explosion when the container is opened. Moreover, the use of a container that is only about half full means that space is wasted in transport and storage.

By using the method of the invention, which allows the container, being turgid, to be more completely filled while still leaving a gas space sufficient for sealing, the total gas space in the package may be reduced to an acceptable volume.

In a preferred method, the container is placed in an open-mouthed mould or the like having a cavity corresponding in shape to, and only marginally smaller than, the container when fully inflated, and the walls of the container are brought into contact with the mould by differential pressure and held in such contact during filling. Preferably the mould or the like is porous (or perforated or channelled) and the container walls are sucked into contact with it by a vacuum action through the walls. It is greatly preferred to assist contact with the walls by applying superatmospheric pressure inside the container. Once contact has been established, the film container may be held fully inflated by the vacuum, but it is difficult to obtain full inflation initially by the vacuum alone, partly because of the difficulty of sealing the gap between the edges of the container and the mould. The container is preferably inflated by a pressure of the same order as the pressure of the in-

tended contents under normal conditions of storage.

It will be appreciated that, in order to allow the container to be held with certainty by the vacuum, the mould must be marginally smaller than the fully inflated container. At the pressures of inflation, however, the difference is negligible compared with the difference in volume between the inflated and the relaxed container. The container may thus be regarded as being in "substantially its fully inflated state".

One preferred form of the invention will now be described by way of example with reference to the accompanying drawings, which show diagrammatically stages in a continuous process for the production, filling, for example with beer, and sealing of tubular containers.

In Figure 1 is shown a reel, 1, of tubular plastics film, from which the film, 2, is drawn through a pair of nip rolls, 3, and around a hollow, open-ended internal former, 4. This former, supported by the nip rolls, floats freely within the tubular film and is held in the vertical position by three rolls spaced around it, one shown at 5. The film is initially drawn by hand into the position shown in Figure 1. Vertically above the hollow former is a hollow, open-ended mandrel, 6, which carries around its circumference at its upper end an inflatable ring, 7, connected to sources of vacuum and pressure. The mandrel interior is also connected, through the tube 8, to a source of pressure. With the tubular film in the position shown in Figure 1, the mandrel 6 is moved vertically downwards, as shown in Figure 2, a vacuum being applied to the inflatable ring so that the mandrel assembly can be inserted into the open tubular film. The vacuum is now released from the inflatable ring and gas under pressure supplied. This inflates the ring so that the tubular film is firmly gripped internally around its circumference. The mandrel is then raised, as shown in Figure 3, drawing film with it. The film is cut as shown so that a container blank 9, is formed and the leading end of the remaining film is in a position where the cycle can be repeated.

The mandrel, with the film firmly attached, is now moved to an operational station where the film is turned back on itself, heat sealed at 10, and bunched, as shown in Figure 4, and then to a second station where a ligature, 11, is applied, as shown in Figure 5. The mandrel assists in the sealing and ligaturing operations by locating the film and supporting the body of the container in tubular shape, so that uniform bunching of the end is obtained.

The mandrel, with the partly formed container, is now inserted into a mould, 12, suitably a porous metal pot, to the walls of

which a vacuum can be applied, as shown in Figure 6. The mould is shaped so that it is only marginally smaller than the container when inflated at the working pressure.

5 There is, however, a recess, 13, at the bottom to take the sealed and ligatured projecting end of the container. Carbon dioxide pressure is now applied through the top of the mandrel, and a vacuum to the walls of the
10 mould, so that the container is inflated into contact with, and held against, the walls of the mould. The gas is prevented from escaping by the inflated tube around the mandrel. Chilled carbonated drink is now transferred
15 also through the top of the mandrel into the container, the carbon dioxide being displaced. The carbon dioxide is supplied from, and returned to, the top of the reservoir from which the liquid is supplied. When
20 the container has been filled to the required level the gas and liquid valves are closed, a vacuum is maintained in the wall of the mould, the gas pressure on the mandrel ring is released, and the mandrel assembly is with-
25 drawn. The vacuum through the mould holds the filled container firmly in position.

The mould, with the filled container and with the vacuum maintained, is now moved to a station at which the top of the film is
30 turned over and heat sealed at 14, and then bunched, as shown in Figure 7, and then to a second station, Figure 8, where a ligature, 15, is applied. The vacuum on the mould is now released, enabling the filled, complete
35 container, to be removed.

Various modifications may be made in the method particularly described. For example, the mould, instead of being a porous
40 pot, may be formed of a mesh surrounded by a space that may be evacuated, or may be channelled to allow a vacuum to be applied. Moreover, the inflatable ring may be replaced by a different means for gripping
45 the film around its circumference, such as, for example, external clamps to clamp the film against a soft rubber ring fixed around the mandrel.

In producing, by the method of the invention, filled containers each containing a
50 standard quantity of gas-containing liquid, the size of container required is considerably reduced compared with the size required when filling a free container, and the gas bubble that develops as the liquid warms is
55 thus much reduced. The method thus gives particular advantages in the packaging of beer and other carbonated drinks. Because of the reduction in the size of the package, however, the method may also be usefully
60 applied to the packaging of gas-containing liquids where loss of gas from solution is not material.

The containers may be enclosed in cartons, or otherwise provided with free-standing
65 supports, if desired.

Products that may be packaged by the method of the invention include, for example: household products, such as liquid detergents, liquid bleach, fabric softeners, starch solutions, dry cleaning fluid, liquid
70 waxes and polishes, window cleaners, disinfectants, paints, varnishes, linseed oil; adhesives, inks, and other artists' materials; medical and pharmaceutical liquids such as medicines; motor car products such as thin
75 oil, polishes and shampoos; fire extinguishing liquids; fungicides, herbicides, toilet and cosmetic products such as liquid shampoo, toilet water, hair setting lotion. By providing a releasably sealed tube passing through
80 a neck of the container, the packages may be adapted for use as aerosol containers, siphons or the like.

While the invention has been described with particular reference to tubular
85 containers sealed at a bunched neck at both ends, it may be applied to the filling of tubular containers of other end shape, using, of course, a mould of appropriate shape for
90 inflating them.

WHAT WE CLAIM IS:—

1. A method of forming a package comprising a sealed tubular container of plastics film containing a gas-container liquid at
95 superatmospheric pressure, that comprises: using a container formed from a separated length of tubular plastics film having substantially the same diameter, when fully inflated, as that of the completed package, and sealed from the atmosphere except at a filling
100 opening; bringing the major part of the container to substantially its fully inflated state, by the application of differential pressures to the inner and outer surfaces of the container walls; and while maintaining the
105 container in such inflated state, incompletely filling it with the liquid and thereafter sealing the filling opening above the gas space in the container.

2. A method as claimed in Claim 1 in
110 which the container is inflated into contact with an open-mouthed mould having a cavity corresponding in shape to, and only marginally smaller than, the container when fully
115 inflated.

3. A method as claimed in Claim 2 in which a vacuum is applied through the walls of the mould to draw and/or maintain the container in contact therewith.

4. A method as claimed in Claim 2 or
120 Claim 3 in which the container is inflated by superatmospheric pressure within it, into contact with the walls of the mould.

5. A method as claimed in Claim 4 in which the container is inflated into contact
125 with the walls of the mould by superatmospheric pressure within it and maintained in such contact by a vacuum applied through the walls of the mould.

6. A method as claimed in any one of the preceding claims in which the container is filled with a gas-containing liquid in a chilled condition.
- 5 7. A method as claimed in Claim 6 in which the gas-containing liquid is a carbonated drink.
8. A method as claimed in any one of Claims 1 to 5 in which the internal pressure is provided by enclosing within the container a substance that generates a gas on warming to 0°C at normal pressure.
- 10 9. A method as claimed in any one of the preceding claims in which the container is inflated by a pressure substantially equal to the pressure of the intended contents under normal conditions of storage.
- 15 10. A method as claimed in any one of Claims 2 to 9 that includes the steps of:
- 20 passing a length of plastics film in tubular form upwards over an internal former which opens the tubular film; drawing the film from the former by a gripping means inserted downwardly into the open end of the tubular film and there operated to grip the tubular film around its circumference, and then moved away from the former; cutting the tubular film transversely to leave the length required for the container suspended on the gripping means; sealing the cut end to close the bottom of the container; inserting the container, still held by the gripping means, into the mould, and inflating it into contact with the walls of the mould by pressure applied to the inside of the container; and thereafter filling the container and sealing its open end, while it is held in contact with the walls of the mould.
- 35 11. A method as claimed in Claim 10 in which the gripping means is an inflatable ring, inserted into the tubular film while deflated, and inflated into tight gripping and sealing contact with the internal surface of the tubular film around its circumference, and in which the container is inflated by pressure applied through the middle of the ring.
- 40 12. A method as claimed in Claim 10 or Claim 11 in which the gripping means is carried on the upper part of a hollow mandrel which is inserted into the tubular film and assists in locating the film during sealing.
- 45 13. A method of forming a package, substantially as hereinbefore described with reference to the accompanying drawings.
- 50 14. Apparatus for forming packages, substantially as hereinbefore described with reference to the accompanying drawings.
- 55 15. A package whenever produced by a method as claimed in Claim 6 or Claim 7.
- 60 16. A package whenever produced by a method as claimed in any one of Claims 1 to 5 or 8 to 13.

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