

[54] **FLEXIBLE POUCHES FOR CARBONATED BEVERAGES**

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[51] **Int. Cl.<sup>2</sup>**..... **B65B 31/02**

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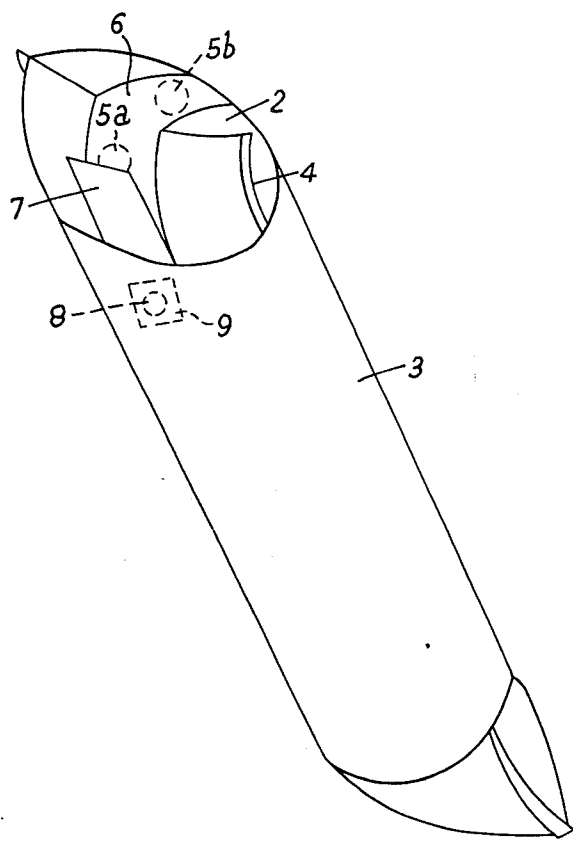
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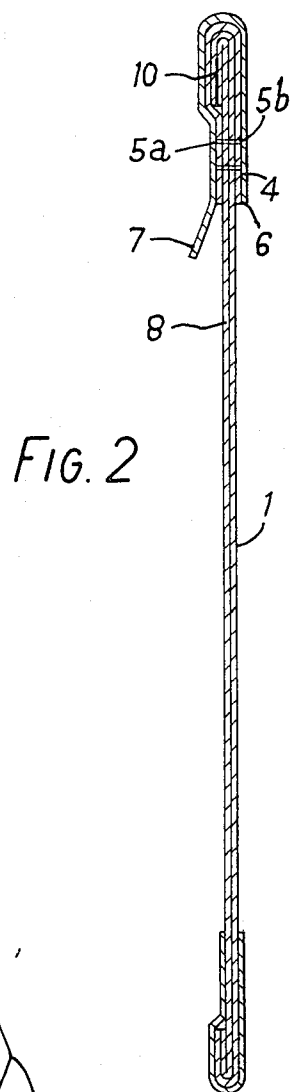
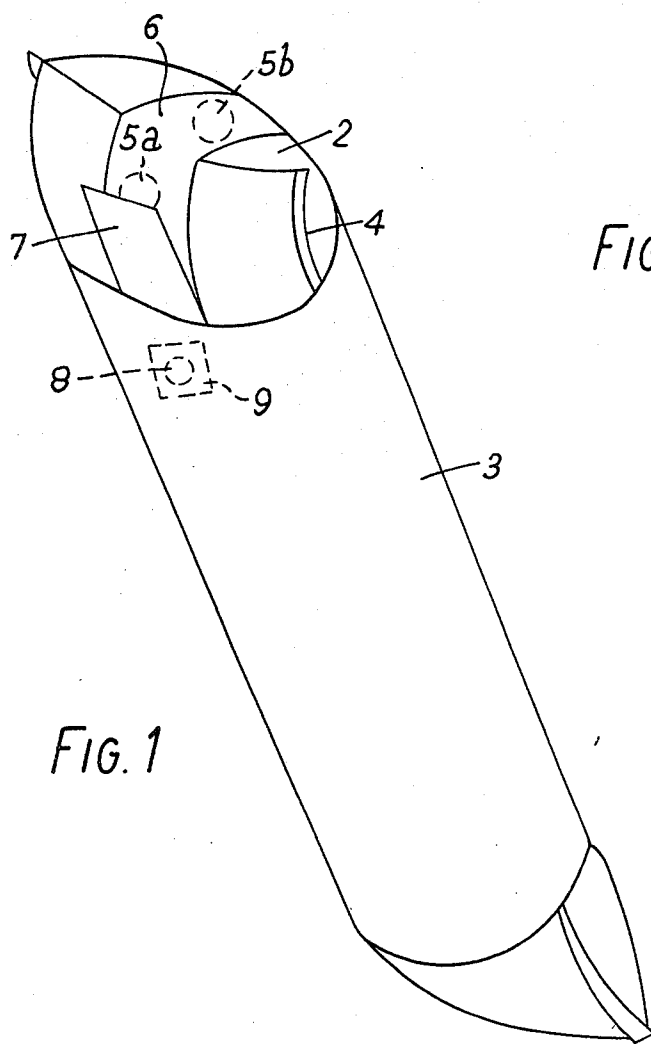
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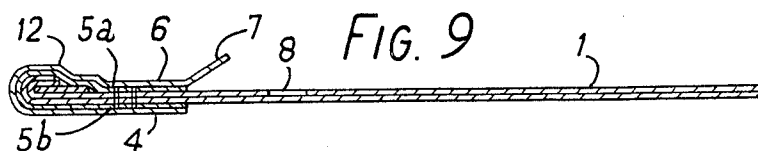
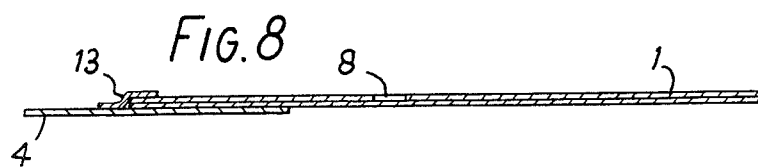
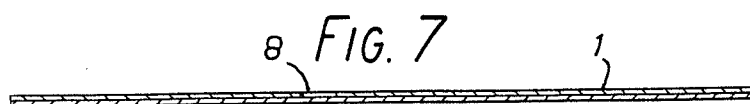
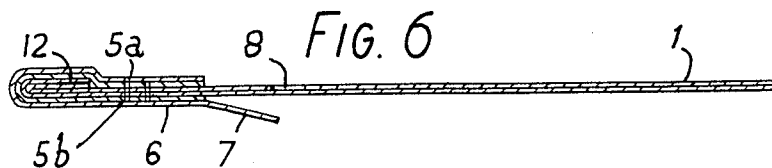
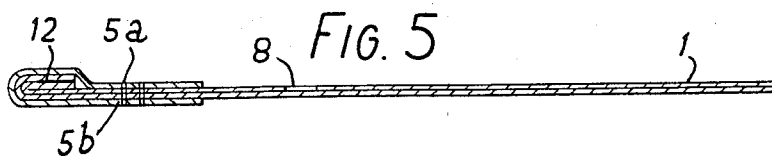
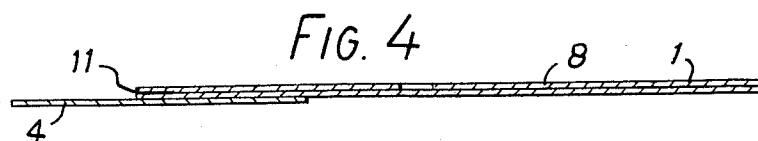
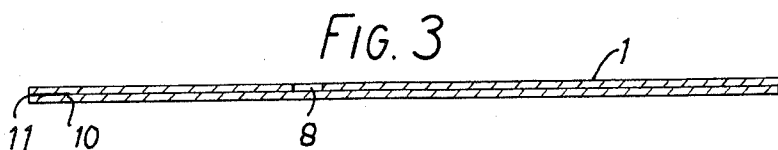
[57] **ABSTRACT**

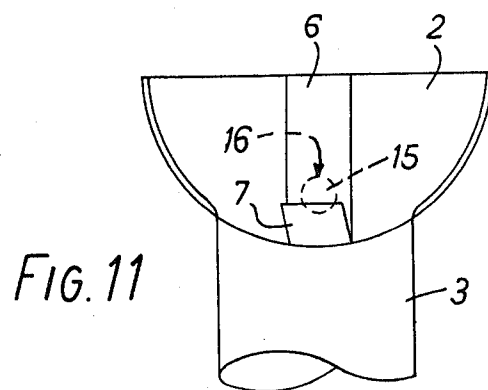
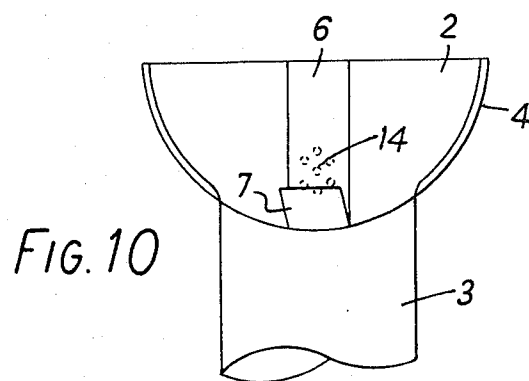
A package comprising a plastics-film tubular pouch with liquid contents at superatmospheric pressure, cylindrical and with a supporting sleeve over the major part of its length, but with saddle-shaped ends, one of which is provided with an emptying port.

**5 Claims, 11 Drawing Figures**









## FLEXIBLE POUCHES FOR CARBONATED BEVERAGES

This invention relates to a package with liquid contents at superatmospheric pressure, such as a package of beer or another carbonated beverage, and to plastics-film pouches for making such packages.

In U.K. patent specification No. 1,251,672 is described a method of producing a package comprising a sealed flexible plastics container, with contents including a gas at superatmospheric pressure, that comprises: locating an aperture in the wall of the closed container over an orifice in a substantially smooth surface, said orifice being connected to a source of a gas at 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 said container is still fully inflated and in gas-tight contact with said surface, sliding it along relative to said surface to bring that portion of the wall of the container which surrounds said aperture into contact with a supported flexible sealing strip held in substantially continuous relationship to said surface; and sealing the sealing strip to the wall of the container around said aperture, by applying heat if necessary.

The closed container used in the method more particularly described and illustrated in U.K. patent specification No. 1,251,672 is a tubular container closed at each end by a bunched seal held by a ligature or clip, and provided with a filling aperture in its wall, in the part of the container that is of cylindrical form when the container is fully inflated.

The present invention provides an improved package that may be produced by the method described in U.K. patent specification No. 1,251,672. It also provides a pouch formed of tubular plastics film, suitable for use in making the package.

In accordance with the present invention, a package comprises a plastics-film tubular pouch sealed at each end by a linear seal (as hereinafter defined), with liquid contents at sustained superatmospheric pressure, the pressurized pouch thus being of substantially cylindrical shape over the major part of its length with approximately saddle-shaped ends, the package having a supporting sleeve surrounding the substantially cylindrical part of the pouch, and having an aperture in at least one of the two faces of a saddle-shaped end, the aperture being sealed by a removably-adhered patch of gas-tight flexible material, to provide an emptying port for the package.

In accordance with a further feature of the present invention, a pouch for forming a package as just described comprises a length of flattened tubular plastics film sealed at each end by a transverse linear seal, such that the pouch on inflation assumes a substantially cylindrical shape over the major part of its length with approximately saddle-shaped ends, and having an aperture in at least one wall in a part of the pouch that forms a face of a saddle-shaped end, the aperture being sealed by a removably-adhered patch of gas-tight flexible material.

By the term "linear seal" we mean a seal formed by sealing together the edge regions of the opposed walls of the flattened pouch, without bunching or pleating. The seal may be a direct seal between the two walls; or it may be a seal in which the edges of the two walls are

held together by a tape (or tapes) or the like coated with adhesive, folded over or otherwise enclosing the said edges and bonded to the outer surfaces of the pouch in such manner that the adhesive completely surrounds and seals the opening between the said edges, including the two corners thereof.

When the pouch is to be filled by the method of U.K. patent specification No. 1,251,672, it will be provided with a filling aperture in its wall, in the part thereof that assumes a substantially cylindrical shape when the pouch is inflated.

It will be appreciated that, because of the geometry of the pressurized pouch, the form of the major part of the length of the pouch may depart somewhat from strictly circular cylindrical form. The filled pouch may however be urged into such form during the application of the supporting sleeve, which is preferably formed by winding and adhering a strip of paper or other flexible material around the filled pouch.

It is often advantageous to provide two emptying ports, one on each face of a saddle-shaped end, both covered by an adhered patch or by different adhered portions of the same patch, at least one patch or portion being removably adhered. This arrangement may facilitate emptying, one port being used as the outlet for the beer or other contents, and the other (when its covering patch is removable) to allow air to enter the package. Such an arrangement, whether one or both patches be removable, also allows the pouch to be more easily made, since the apertures may be cut in the flat pouch without the separation of its opposed walls that would be necessary if a single aperture were to be formed. At least one removably-adhered patch, or portion thereof, is preferably extended to provide an unattached tag to facilitate removal.

In a preferred form of the package, and of the pouch for producing it, the end portions are reinforced each by a band of the plastics film or other flexible sheet material, bonded to and extending over the saddle end from one side of the package, or pouch, to the other, the ends of the band preferably extending into the supporting sleeve, and the side edges of the band extending beyond the sides of the package, or pouch, and here being bonded together. In this form of the package, and pouch, the aperture providing the emptying port will be formed through both the wall of the pouch and the reinforcing band. If a second aperture is provided, it may extend through both the wall and the band, to provide a second emptying port; or the aperture may be formed in the pouch wall only, to facilitate production of the pouch, in which case the band will seal the aperture and no additional adhered patch will be required.

One preferred form of the package and pouch of the invention, and methods of making them, will now be described by way of example with reference to the accompanying drawings, of which:

FIG. 1 is a view in perspective of the finished package;

FIG. 2 is a longitudinal section of the flat pouch used to produce the package shown in FIG. 1;

FIGS. 3 to 6 show, in longitudinal sections, stages in the production of a pouch as shown in FIG. 2;

FIGS. 7 to 9 show an alternative method of making the pouch;

FIG. 10 shows a package where the emptying aperture is in the form of a plurality of small holes; and

FIG. 11 shows a package where the emptying aperture has a partially-severed flap which is removable by tearing off the adhered patch.

In FIGS. 1 and 2: 1 (FIG. 2) is the plastics-film pouch, suitably formed of seamless, biaxially-oriented, tubular film of polyethylene terephthalate having an external coating of a material highly impermeable to carbon dioxide and oxygen, such as a vinylidene chloride copolymer; 2 is a saddle-shaped end of the pack; 3 (FIG. 1) is a reinforcing sleeve around the substantially cylindrical part of the pack, suitably formed by winding around the pack a strip of paper coated, for example, with animal glue or other moisture-activated adhesive; and 4 is a reinforcing band, suitably of biaxially-oriented film of polyethylene terephthalate, adhered to the pouch across the saddle-shaped end, having its ends just covered by the sleeve 3, and having its side edges adhered together to form a fin at each side of the pack, as shown at 4 in FIG. 1. On each broad side of one saddle-shaped end is an aperture, 5a, 5b, both covered by a single length of tape, 6, which is adhered over the apertures to form a gas-tight seal and which crosses the saddle of the package to just within the sleeve at each side of the finished package, the tape having on one side a non-adhered extension, 7, which in the finished package is turned back upon the tape and projects from the sleeve to provide a tag for the removal of the tape. A similar tag may be provided also at the other end of the tape if desired. The portion of the tape that crosses the saddle of the package is also left unadhered, to facilitate removal. It is necessary only to provide block seals securely fastening the tape over the two apertures. 8 is the filling aperture in the pouch, sealed by a patch, 9 (FIG. 1), after filling. Beneath the adhered band, 4, the end of the pouch has been sealed at 10 (FIG. 2) and turned over upon one face of the pouch.

The package and pouch shown in FIGS. 1 and 2 have been described with reference particularly to the opening end of the package. The other end is similarly constructed, except that the apertures 5a, 5b, and the removably-adhered tape, 6, are omitted.

In the sequence shown in FIGS. 3 to 6, 1 is the pouch unit received from a device for forming the units from a continuous length of tubular film. By this device, the tubular film has been passed intermittently over and around a floating internal mandrel against which filling apertures, 8, have been punched at the desired intervals, and the tubular film has then been transversely heat-sealed at the required positions, and severed along the seals, as shown at 10 and 11, the punching and heat-sealing steps having been carried out during stationary phases of the film. After the transverse heat-seals have been formed, but before severance, a reinforcing strip of film coated with hot-melt adhesive is preferably sealed externally upon each heat-seal along the whole length of the heat-seal and extending beyond its edges. This reinforcing strip is not shown in the drawings. After severance, one side of the pouch end (the side carrying the reinforcing strip, if provided) is then sealed (FIG. 4) to one end of the reinforcing band, 4, preferably by heat-sealing; thus, the reinforcing band, which is suitably made of biaxially-oriented polyethylene terephthalate film, is preferably provided with a heat-seal coating for this purpose. The band is placed so that each of its edges extends somewhat beyond the side fold of the pouch. The free end of the reinforcing band 4 is then turned over upon the opposite side of the

pouch (FIG. 5), together with an end portion, 12, of the pouch, and similarly sealed to the pouch. The edges of the opposed halves of the reinforcing band are at the same time sealed together to form a fin, shown at 4 in FIG. 1, on each side of the saddle-shaped end. Apertures 5a, 5b are then formed (FIG. 5) by punching through all layers of the reinforced end of the pouch, and the length of tape, 6, is applied (FIG. 6), again by heat-sealing (a hot-melt adhesive of appropriate bonding strength being used on the tape), over the apertures. The end 7 of the tape, and the middle portion crossing the end of the pouch, are left free. The opposite end of the pouch is reinforced and sealed in a similar manner, except that the steps of punching the apertures and applying the covering tape are omitted. Should it be desired that only one of the apertures, 5b, be punched through the reinforcing band 4 as well as through the wall of the pouch, the apertures may be formed by punching through three thicknesses only at the stage shown in FIG. 4.

In the alternative method of sealing the pouch, shown in FIGS. 7 to 9, the pouch unit 1 is received unsealed at its ends, but with a filling aperture, 8, punched in its wall. One end of the reinforcing band, 4, is sealed to one side of the pouch end as before, but a second strip, 13, preferably of the same heat-sealable material as the band, 4, is sealed across the opposite side of the mouth of the pouch, as shown in FIG. 8. This strip also extends somewhat beyond the sides of the pouch, where its edges become bonded to the edges of the band 4. The free end of the band 4 is then turned over upon the opposite side of the pouch (FIG. 9) together with the end portion, 12, of the pouch, and sealed to the pouch. Apertures 5a, 5b may then be punched through the four thicknesses of the band and pouch, and the strip of adhesive tape, 6, applied to cover the apertures, in the manner previously described. Alternatively, the apertures may be punched at the stage shown in FIG. 8, so that one of them becomes sealed by the band 4.

When the removably-adhered patch (that is, the tape 6 in the drawings) is applied over the aperture, or apertures, care must be taken to prevent the patch from adhering through an aperture to the opposed wall of the pouch, or from adhering through both apertures, when two are provided, to the patch on the other side. We have found that complications in preventing this from happening may be avoided by forming the apertures by certain methods.

In one such method of forming the apertures, the (or each) aperture comprises a plurality of small (as hereinafter defined) holes in the pouch wall, which may be collectively covered by the patch. By the term "small" as used to describe the holes we mean sufficiently small, having regard to the nature of the wall of the pouch and of the adhesive used to secure the patch, to allow the patches to be adhered to the pouch wall while the wall is pressed against the opposite wall of the empty, flattened pouch without producing adhesion to the opposed wall of the empty pouch, or to the patch over the opposite aperture if present. Another advantage given by this form of opening aperture is that the pressure exerted through the small holes can be resisted by a patch sealed to the container with a lower bond strength than if a single hole of equal area were present; this lower bond strength allows the patch to be more easily removed. A further advantage obtained from the multiple-hole opening aperture is that the cov-

ering patch may be carefully removed to uncover only a small number of holes first, so that pressure is slowly released and a too vigorous release, resulting in excessive frothing, is avoided.

An aperture of this type is shown in FIG. 10, in which 14 is a group of seven holes forming the emptying aperture in the wall of the package, there being optionally a second similar (multiple) aperture (not shown), identical with and diametrically opposite the aperture 14. 6 is the patch covering the aperture (and optionally also covering the second aperture, if present) and adhered to the surrounding wall of the container, the patch again having its end, 7, free, to facilitate its removal. When the patch is removed, and particularly with the patch over a second aperture similarly removed to allow air to enter, the container is readily emptied by pouring.

In another method of forming the apertures to prevent undesired adhesion, the (or each) aperture comprises a partially severed flap of the pouch wall covered by the patch adhered externally to the wall, the flap being so shaped as to be removable by tearing of the pouch wall when the adhered patch is peeled off the wall from a predetermined direction. An aperture of this type is shown in FIG. 11, in which 15 is a circular flap partially severed from the wall of the reinforced pouch (there being optionally a second flap, not shown, identical with and diametrically opposite the flap 15) the part by which the flap is still connected to the wall being indicated at 16. 6 is again the patch covering the flap and adhered thereto and to the surrounding wall of the pouch, the patch having its end, 7, free, to facilitate its removal from the desired direction. When the patch is removed, a substantially circular aperture is formed, and, particularly with the patch over a second aperture similarly removed, the container is readily emptied by pouring. The container may of course alternatively be emptied through a drinking straw, in which case only one patch, with its adhered flap, will be removed.

As previously indicated, the supporting sleeve 3 is applied to the pouch after it has been filled. Preferably the strip from which the sleeve is formed has its side edges inwardly folded, to form a doubled edge region, suitably about 6.5 mm wide for a 17 cm wide strip. This provides an added support for the pressurized pouch. Because of the geometry of the system, the free end 7 of the tape 6 will adopt one of two stable positions in relation to the pressurized pouch: it may lie, downwardly facing, against the wall of the inflated pouch; or it may equally well lie folded back upon the adhered part of the tape, to point upwards as shown in FIG. 1. It is thus a simple matter to flick or fold the free end of the tape into the latter position after the pouch has been filled and before the sleeve is applied. The adhesive used to attach the sleeve is preferably such that it adheres strongly to the sleeve but is only weakly bonded to the pouch. This gives the advantage that, when the package has been partly emptied, the lower part of the pouch may readily be pushed up into the sleeve to form a free-standing container.

Many modifications may be made in the package and pouch particularly described. For example, other possible methods of filling can be thought of, in which case a filling aperture as shown at 8 in the drawings may not be required. As previously stated, only one emptying port need be provided in the saddle-shaped end of the package; or it would be possible, though generally less

convenient, to provide two emptying ports in positions not diametrically opposite one another. Other methods might be devised for sealing the ends of the pouches with a linear seal. Obviously, however, the seal must be capable of resisting the internal pressure, which for beer and other carbonated beverages may be of the order of 60 p.s.i. in hot weather. The sealing methods described avoid allowing any portions of the seal to be subjected to substantial peeling forces. Although it is much preferred to make the pouch of the invention form seamless tubular film, the tubular film may be produced by sealing flat film, especially if a lap seal is used. It is generally preferred to apply the patch covering the opening port, or ports, so that (as exemplified in the drawings) it may be removed by peeling in a direction parallel to the longitudinal axis of the package, and initially in a direction towards the upper end of the package. However, the patch may be peelable in a different direction if desired; for example, it may be removable in a transverse direction relative to the pouch. As previously indicated, separate patches may be attached to cover the opening ports when more than one port is provided. These may, for example, be diamond-shaped patches, left with at least one corner unadhered to provide a tag for removing the patch.

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

#### EXAMPLE

A 24.76 cm length of biaxially oriented lay-flat tubing of polyethylene terephthalate, having a wall thickness of 0.030 mm and a flat width of 6.90 cm, and coated externally with a vinylidene chloride copolymer, was used in forming a pouch by the method described hereinbefore with reference to FIGS. 3 to 6 of the drawings. The heat-seals 10 were formed by a constant-temperature heat-sealer at 245°C for 2 seconds. The bands 4 (and reinforcing strips attached over the seals as described) were of biaxially oriented film of polyethylene terephthalate 0.025 mm thick, 7.0 cm wide and 7.6 cm long, and had a heat-seal coating of hot-melt polyester adhesive. Each band was heat-sealed to an outer surface of one end of the container in the manner shown, the band being symmetrically arranged before sealing, with its longer sides parallel to the end edges of the tubing and its longer axis lying along the intended fold line; its shorter edges thus projected slightly beyond the side folds of the flat tubing. The end of the tubing was then folded over, together with the attached band, which was outermost, to form a fold along a line 3.17 mm behind the inner edge of the heat-seal closing the end of the container unit. The entire folded-over portion, except for a portion 1/16 inch wide at each side of the fold, was then pressed between heat-sealing jaws at 160°C for 5 seconds. The attached band became strongly adhered over its whole area to the walls of the pouch, and its edges projecting beyond the side folds of the pouch became adhered to each other. Sealing also took place between the vinylidene chloride copolymer layer of the folded-over portion of the end of the pouch. The attached strip extended for 3.5 cm down each wall of the pouch; this length had been pre-determined and was such that the longer edges of the strip would lie against the substantially cylindrical portion of the pouch when inflated.

The apertures 5a, 5b were then formed by punching through all thicknesses of one reinforced end of the

pouch, in a position as shown in the drawings. Each aperture was a multiple aperture comprising seven circular holes, 3.17 mm in diameter, spaced as shown in FIG. 10 over a circular area 12.1 mm in diameter. A strip of tape, 6, was then folded over the end of the pouch to cover both apertures; it was heat-sealed into the position shown in the drawings, by a pair of block seals each covering one aperture, with its end 7 left free, but with the block seal covering the second aperture extending to the end of the tape. The tape 6 was 0.05 mm thick, 25 mm wide and 10 cm long. It was coated with a coating of polyester adhesive, 0.012 mm thick.

A number of pouches made as just described were filled with beer each through the filling aperture, 8, in its wall, by the method described in U.K. patent specification No. 1,251,672. The beer was filled into the pouches at a temperature of 4°C, and the pressure within the pouches at the time of sealing the aperture was 20 p.s.i. (1.41 kg/cm<sup>2</sup>). Each pouch after filling was provided with a supporting sleeve formed by wrapping and securing a strip of paper round the substantially cylindrical part of the pouch while the beer was still chilled. The paper strip used for forming the sleeve was of 90 g.s.m. paper, 18.4 cm wide, with its side edges turned over (to the inside when the sleeve was in position) to form a doubled edge portion 6.5 mm wide, and 30.5 cm long, so that the strip was wound 2 1/4 times round the pouch in forming the sleeve. The adhesive coated on to the paper to secure the strips in position was an animal glue coated to a thickness of 25 g.s.m., activated by moistening before the sleeve was applied to the pouch. The end, 7, of the opening tape 6 of each pouch was flicked back, to face the end of the pouch, before the sleeve was applied. After 12 weeks' storage at an average room temperature of 21°C the packages were still completely sealed and the beer had retained a satisfactory degree of carbonation and a good flavour. The packs could be readily opened and emptied by removal of the opening tapes 6.

The invention has been more particularly described with reference to pouches formed of biaxially oriented polyethylene terephthalate film. Any other plastics film may of course be used for forming the pouches, provided that it has sufficient strength to resist the internal pressure expected in the package, and sufficient impermeability to gases, provided by a coating if necessary.

We claim:

1. A pouch for forming a pressurized package comprising a length of flattened tubular plastics film sealed at each end by a transverse linear seal, such that the pouch on inflation assumes a substantially cylindrical shape over the major part of its length with approximately saddle-shaped ends, and having an emptying port in each wall in an end part of the pouch, each port comprising a plurality of small holes in the wall of the pouch and each port being sealed by a removably-adhered strip of gas-tight flexible material extending across the end of the pouch, adhered across and around each emptying port to seal the holes but remaining substantially unattached to the pouch across the end thereof and the pouch having a filling aperture in its wall, in the part thereof that assumes a substantially cylindrical shape when the pouch is inflated.

2. A pouch as claimed in claim 1 having its end portions reinforced by a band of flexible sheet material bonded to and extending over the end of the pouch from one side to the other, the ends of the band extending to the portion of the pouch that assumes a substantially cylindrical shape on inflation, the side edges of the band extending beyond the sides of the pouch, and here being bonded together, and the emptying ports in the end part of the pouch being formed through both the wall of the pouch and the reinforcing band.

3. A package that comprises a pouch according to claim 1 with contents at sustained super-atmospheric pressure, the pressurized pouch thus being of substantially cylindrical shape over the major part of its length with approximately saddle-shaped ends and the package having a supporting sleeve surrounding the substantially cylindrical part of the pressurized pouch.

4. A package as claimed in claim 3 having its end portions reinforced each by a band of flexible sheet material extending over the saddle end from one side of the package to the other, the ends of the band extending into the supporting sleeve, the side edges of the band extending beyond the sides of the pouch, and here being bonded together, said apertures and said emptying ports being formed through both the wall of the pouch and the reinforcing band.

5. A package as claimed in claim 3 in which the strip of gas-tight flexible material extends into the supporting sleeve at each side of the pack, but at least one of its ends is turned back to project from the sleeve to form an opening tag for the package.

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