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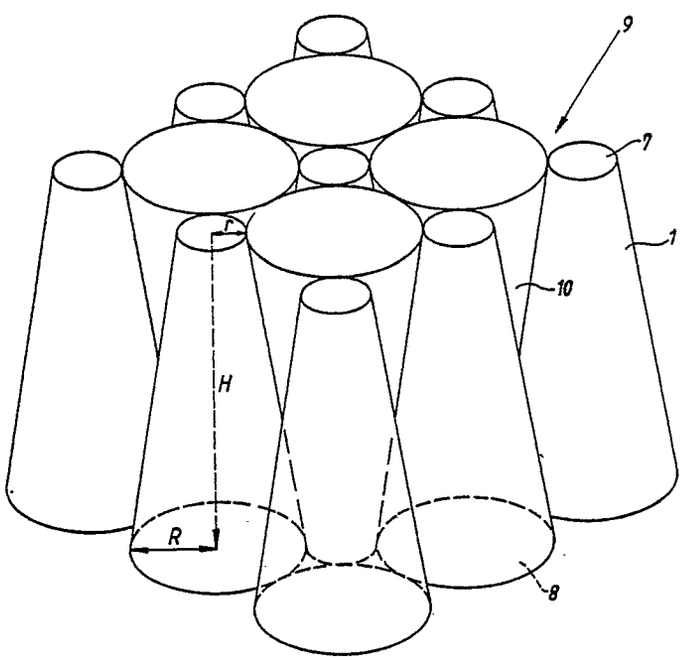
(54) A liquid package for pressurized contents.

(57) The invention relates to a liquid package for pressurized contents manufactured from thin metal foil laminated with plastic material and in the shape of a truncated cone where the ratio of the bottom radius R of the cone to the top radius r of the cone is $r \approx 0.4\ R$.

Fig. 3



EP 0 362 541 A1

A LIQUID PACKAGE FOR PRESSURIZED CONTENTS

The present invention relates to a liquid package for pressurized contents.

A demand has existed for a long time for inexpensive and ecologically beneficial packages for pressurized, carbonated beverages. The packages found on the market to-day are glass bottles, aluminium cans and plastic bottles. Each of these has some advantages and disadvantages.

Glass has good properties permitting a gas-tight package which withstands the inner pressure the contents exercise on the package and which does not affect the taste of the liquid contents. Glass bottles can be cleaned and refilled or crushed when the raw material is to be used anew for bottle manufacture. To wash and refill may be considered advantageous but the washing process entails undesirable expense and an appreciable consumption of energy. Conventional glass bottles, moreover, are heavy and require a large volume in transport. The weight makes them also less attractive for the consumer.

The aluminium cans discussed in recent times, are also eminently suitable for recycling. The main disadvantage of aluminium as packing material, however, is the expensive and energy-demanding manufacture of aluminium, which also tends to become more expensive still with rising energy prices. A further disadvantage of this type of packages is that their inside are varnished and that this varnish contains solvents which negatively affect the taste of the liquid. Furthermore, empty packages which are transproted to the brewery cannot be stacked into one another, so that the transport becomes inefficient and expensive.

Plastic bottles which are also encountered on the market for carbonated beverages are expensive. The plastic raw material may be reused, however, for another manufacture, such as e.g. insulating padding in clothing.

For a development of a wholly new packaging for pressurized contents all the abovementioned aspects have to be weighed up carefully. The packaging should be inexpensive and the manu facture should not be too energy-demanding or require an expensive raw material. The package should be recoverable. Moreover, it should be light from a point of view of the consumer and of transport and, in particular, it should be stackable for a more efficient transport in empty state. The packing material should protect the product and it should not affect its taste and quality. The material also should be gas-tight and withstand the internal pressure which the liquid exercises on the package.

It is an object of the present invention to make possible the manufacture of a cheaper and ecologically more beneficial package for pressurized contents which possesses the properties enumerated above.

It is a further object of the present invention to provide a package where the contents are in contact with a thermoplastic material which, differently from varnish, does not affect the quality of the liquid contents and in which the liquid is protected from light, which also contributes to the retention of the quality and taste of the liquid contents.

It is a further object of the present invention to provide the package with a characteristic and attractive appearance in a form which contributes to a good utilization of volume during distribution.

These and other objects have been achieved in accordance with the invention in that a liquid package of the type described in the introduction has been given the characteristic that the package is in the shape of a truncated cone where the relationship between top radius and bottom radius can be expressed by the formula $r \approx 0.4R$, where r designates the radius of the top surface and R designates the radius of the bottom surface.

The invention will now be described in more detail with reference to the attached drawings wherein

Fig.1 shows the packages as whole

Fig.2 shows the relationship between the top radius and the bottom radius

Fig.3 shows a conceivable packing pattern as a distribution unit.

As is evident from Fig.1 the package 1 in accordance with the present invention is in the shape of a truncated cone, with a shell surface 2 manufactured from a thin metal foil,e.g. thin sheet steel, laminated at least on one side with a thermoplastic material. The metal foil has good gas-tightness properties. The thermoplastic material is chosen so that it has good welding characteristics. Moreover, it should have good adhesion capacity to metal and it should be ecologically beneficial. If a choice is made to manufacture the shell surface 2 of thin sheet steel, it is possible already from the start to make use in the manufacture of recycled scrap and thus make the manufacture less expensive. The sheet steel too may possibly be recovered.

The stamped out sheet is rolled round to a cone and the thermoplastic material on its surface is welded with overlap to a longitudinal joint 3. The joint 3 coincides with a generatrix on the truncated cone.

The package 1 is provided with bottom 4 and top 5. The bottom 4, which may be manufactured

of thermoplastics or sheet metal, may be wholly closed or it may comprise an opening device. The bottom 4 should be designed so that it can withstand the pressure from the enclosed liquid. If it is chosen to make the bottom 4 of sheet metal it should be covered at least on one side by means of lamination with, or application of, a thermoplastic material and be welded together with the thermoplastic layer of the shell surface 2 by heating.

To the top 5 or bottom 4 an opening device 6 is fitted in a tight manner which on opening of the package 1 is intended to be torn off so that the enclosed liquid becomes accessible for consumption.

The truncated cone is characterized by the relationship between the radii of its top and bottom surfaces which can be expressed by the formula $r = (\sqrt{2} - 1) R$, which corresponds to $\approx 0.4R$, where R designates the radius of the top surface 7 and R the radius of the bottom surface 8, which is illustrated in Fig.2.

The bottom radius is chosen so that it fits the module used in the handling of distribution and transport. The top radius then can be calculated according to the aforementioned formula $r = (\sqrt{2} - 1)R$. The height of the package, and with it also the cone angle, is determined by the volume, bearing in mind the product volume, head space, that is to say splash space, and bottom and top design. The height, and the cone angle connected therewith, are limited by practical considerations in respect of the ease of handling and the desire that the packages should make the best possible use of the distribution units. The enclosed volume is calculated by the formula $\frac{\pi H}{3} R^2 (3 - \sqrt{2})$ where H represents the height and R the radius of the bottom area 8.

Fig.3 shows a distribution unit 9 comprising 13 off packages 1,10. With different package dimensions, of course, a great number of other packing patterns may exist taking into consideration the transport and distribution modules.

Fig.3 demonstrates also that if a package 10 with an aforementioned relationship between the radii of top and bottom surfaces is positioned upside down, that is to say reversed between 4 adjoining packages 1 positioned the right way up, the reversed package 10 will rest on its top surface 7, that is to say wholly on a level with the bottom surfaces 8 of the four packages 1 which are positioned the right way up. At the same time a tangential touch is obtained along four whole generatrices on the shell surface 2 of the reversed package 10 and one whole generatrix on each shell surface 2 of the four packages 1 which are positioned the right way up. Thus a good utilization is obtained of the space which the packages 1 occupy in their distribution unit 9. The packing pattern is held together e.g. by being shrink-wrapped or enclosed, in some form, by the distribution unit. To hold the units 9 together the space can be utilized better, moreover, by turning every other unit 9 upside down. The units 9 can also be stacked in vertical direction, since their surfaces are wholly plane and the internal pressure of the packages 1 imparts to them great strength and endurance against the effect of external pressure.

As is evident from the above description, a liquid package is provided by the present invention which complies with the demands regarding gas tightness and strength for carbonated beverages and which is cheaper than the liquid packages for pressurized contents on the market at present. The liquid packages in accordance with the present invention, moreover, are ecologically more beneficial, since they can be manufactured mainly from recycled material which can be recovered again. The manufacture, moreover, is not as energy-demanding as e.g. that of aluminium cans. By means of the present invention, moreover, a package is obtained which in an improved manner preserves the quality and taste of the enclosed beverage, as the enclosed beverage is in contact with a thermoplastic material and as it is protected against light by the metal foil.

Claims

1. A liquid package for pressurized contents, **characterized in that** the package is in the shape of a truncated cone, where the relationship between top radius and bottom radius can be expressed by the formula $r \approx 0.4R$, where r designates the radius of the top surface 7 and R designates the radius of the bottom surface 8.

2. A liquid package 1 for pressurized contents in accordance with claim 1, **characterized in that** a package 10, placed in reversed position between four packages 1 which adjoin one another and are positioned the right way up, touches along four generatrices of its shell surface 2, tangentially, one generatrix on the shell surfaces 2 of each of the four packages positioned the right way up, and that the top surface 7 of the reversed package 10 is wholly on a level with the bottom surfaces 8 of the four packages 1 positioned the right way up.

3. A liquid package 1 for pressurized contents in accordance with claim 1, **characterized in that** the shell surface 2 of the package 1 is manufactured from thin metal foil, laminated at least on one side with a thermoplastic material, and that the package is provided with top 5 and bottom 4.

4. A liquid package 1 for pressurized contents

in accordance with claim 1,
characterized in that the top 5 or the bottom 4 of the package comprises an opening device 6 which is fitted in a tight manner to the package 1 and is intended to be torn off wholly or partly on opening of the package 1.

Fig. 1

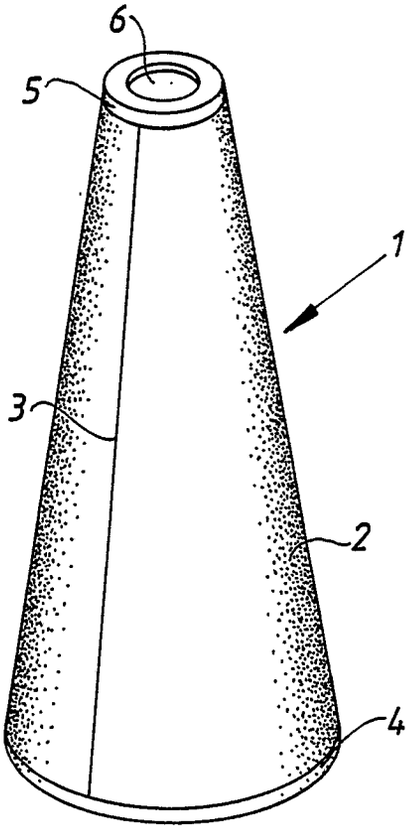


Fig. 2

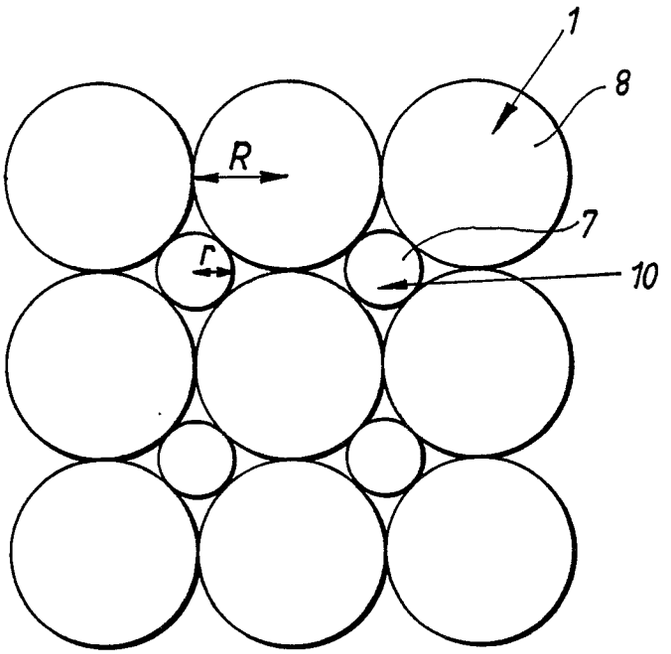
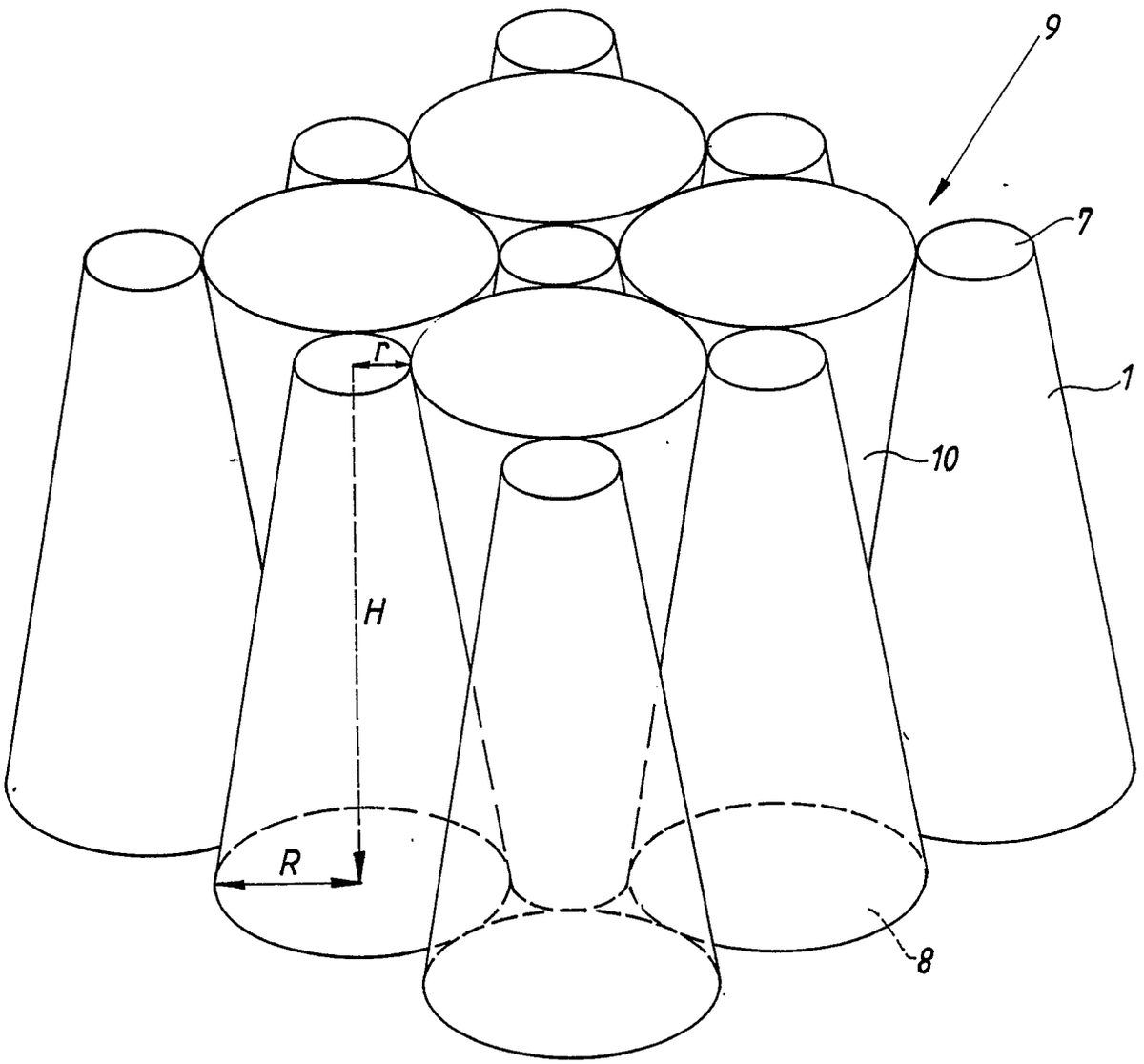


Fig. 3



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EUROPEAN SEARCH REPORT

Application number
EP 89115690.3

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US-A-4 049 122 (MAXWELL) 20 September 1977 *Claim 1; Fig. 1 and 2*	1,4	B 65 D 21/02 B 65 D 85/72
Y	- - -	1,3	
Y	US-A- 4 023 700 (BUQUET ET AL) 17 May 1977 *Col. 2, lines 25-43; fig 3* - - -	1,3	
A	DE-A1-2 727 461 (MAIDHOF AUTOMATEN) 4 January 1979 *Figs. 1 and 2* - - -	2	
A	US-A-4 067 433 (PHIPPS) 10 January 1978 *See figs. 1 and 3* - - -	2	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)
B 65 B B 65 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
STOCKHOLM	19.12.1989	ÅKERLUND H.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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