

⑫ **EUROPEAN PATENT SPECIFICATION**

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⑤④ **BOTTLES.**

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| ⑤⑥ References cited:
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GB-A-1 453 363
US-A-2 799 435 | |

EP 0 138 812 B1

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Description

This invention relates to bottles, and in particular to bottles for use in liquid carbonating machines to prepare carbonated beverages.

There is known, e.g. from patent specification GB—A—1453363, a type of liquid carbonating machine in which the liquid, generally water, is placed in a bottle and the bottle is then loaded into the machine. During the carbonation process the bottle is pressurised by the gas introduced into the liquid. Sometimes a defective or damaged bottle can shatter under this pressure. For this reason it is usual for the bottle to be housed within a strong shield to prevent injury to a person using the machine. Hitherto it has been the usual practice to use glass bottles since glass is non-porous, enabling carbonated drinks to be stored for lengthy periods, and the glass surface is very smooth which facilitates the carbonating process. Although many plastics materials are quite unsuitable, there are available plastics materials having such properties that they could be used for bottles to be used in a carbonating machine. Examples of such materials include polyethyleneterephthalate (PET), which is widely used for bottles for carbonated beverages, certain grades of nylon, polycarbonate and PVDC. Other materials are also possible and will occur to readers skilled in the art.

If a plastics bottle is pressurised until it bursts the material will normally split open to release the pressure, and it has been suggested that use of a plastics bottle in a carbonating machine would obviate the need for the protective shield since there would be no danger from flying bottle material. However, tests have shown that even some plastics bottles with a rigid moulded neck portion will in some instances burst with the neck shattering.

In US—A—2799434 there is proposed an aerosol container of composite construction and including an injection moulded nylon body having one or more lines of weakness extending along its length. As explained in the patent, nylon has a tendency to shatter like glass, and the weakness is intended to allow the container to split open upon the container bursting. Such a container is comparatively expensive to manufacture and has the disadvantage that the liquid contents will be sprayed out under the gas pressure when the container does burst because the weakness extends to the bottom.

The present invention aims at a solution to the above problem and provides a bottle to be used in a carbonating machine to carbonate liquid contained in the bottle to a given level, the bottle being of unitary plastics construction and including a neck comprising an integral portion of reduced thickness located above said given level and confined to an area extending around a minor part of the neck circumference, said reduced thickness portion defining a predetermined weakness at which the bottle is adapted to burst upon over-pressurisation to release the pressure in a

controlled manner without destroying the bottle integrity.

By locating the weakened portion above the normal level of liquid it is ensured that liquid is not sprayed out under pressure when a burst does occur, which would happen if the body of the bottle split open.

In a preferred embodiment of the invention the reduced thickness portion is formed during moulding of the bottle neck. In this way the thickness of the weakened portion is conveniently predetermined so that it will fracture by splitting at a desired pressure avoiding any danger of shattering.

The configuration of the reduced thickness portion is variable and as described in more detail below can, for example, take the form of a flat surface portion on the outside of the body, a disc of thinner material, or a groove in the external surface.

Three particular embodiments of the invention applied to bottles made of PET will now be described with reference to the accompanying drawing in which:—

Figure 1 is a front view of a bottle neck;

Figure 2 is a side view of the bottle neck;

Figure 3 is a part section along the line X—X of Figure 2;

Figure 4 is a front view of another bottle neck;

Figure 5 is a side view of the bottle neck;

Figure 6 is a part section taken along the line Y—Y of Figure 5;

Figure 7 is a front view of a further bottle neck; and

Figure 8 is a section taken along the line Z—Z in Figure 7.

A method often adopted in the manufacture of plastics bottles, e.g. PET, consists of producing by injection moulding a preform including a neck part and a body and subsequently blowing out the body into the final shape. During the step of blowing out the body the material is stretched substantially and its thickness is reduced. The shape and form of the bottle neck are unchanged by the blowing process and as a result the material at the neck of the finished bottle is relatively brittle despite being much thicker than the body.

Figures 1 to 3 show the neck portion of a PET bottle manufactured by the above method. The neck is formed with its final shape during production of the preform by injection moulding. As illustrated the neck includes a screw thread 1 and an integral ring 2 but these features are not essential to the invention. The neck includes also a weakened portion 3 of reduced thickness provided by a flat on the outside of the neck below the ring 2. The minimum thickness of the neck material at the portion 3 may be in the order of 0.1 to 0.25 mm. Some bottles of this form were made and tested and the portion 3 ruptured at between 200 and 250 p.s.i. (1.38 and 1.73 MPa) in each case and always before a shattering of the neck or splitting of the body.

The bottle illustrated in Figures 4 to 6 is essen-

tially the same as that of Figures 1 to 3 except that in this case the weakened portion takes the form of a circular disc or membrane 4 approximately 8 mm in diameter and of a uniform thickness which is selected in accordance with the required burst pressure. The disc 4 is formed by a cylindrical recess 5 moulded into the neck and ensures a controlled burst at a pressure which is safely below that at which the body could split or the neck shatter. Typically a carbonating machine bottle which would burst at 300 p.s.i. (2.07 MPa) should have a membrane which would burst at a pressure of between 200 and 240 p.s.i. (1.38 and 1.66 MPa) and it has been found that a membrane thickness of the order of 0.1 to 0.15 mm is appropriate in the case of PET.

The bottle shown in Figures 7 and 8 differs from the earlier embodiments in that the weakened portion comprises a groove 6 in the external surface of the bottle neck. The groove is V-shaped in cross-section and extends around a substantially closed path of square rectangular configuration. The groove is formed in the bottle neck during injection moulding of this bottle part. For the weakened portion to rupture at a desired pressure in the region of 200—240 p.s.i. (1.38—1.66 MPa) the thickness of the PET material at the bottom of the groove should be about 0.05 to 0.15 mm. Tests with this form of bottle embodying the invention have shown that the weakened portion will initially burst at one of the corners between adjacent portions of the groove 6.

Although specifically described in relation to bottles made of PET the invention is also applicable to bottles made of other plastics materials, including laminates. It is believed that the different forms of weakened neck portion described above will be practical for other materials although dimensions may need to be adjusted to achieve the desired bursting pressure.

A carbonating bottle made in accordance with the invention obviates the need for a strong protective shield in a carbonating machine by eliminating the risk of flying material in the event of the bottle bursting. If a burst does occur the pressure is released gradually in a controlled fashion rather than suddenly in an explosion.

For a bottle to be used in carbonating machines the reduced thickness portion will be arranged to rupture at a pressure greater than the normal operating pressure of the machine, preferably by about 20—60 p.s.i. (0.14—0.41 MPa).

Claims

1. A bottle to be used in a carbonating machine to carbonate liquid contained in the bottle to a given level, the bottle being of unitary plastics construction and including a neck comprising an integral portion of reduced thickness (3; 4; 6) located above said given level and

confined to an area extending around a minor part of the neck circumference, said reduced thickness portion defining a predetermined weakness at which the bottle is adapted to burst upon over-pressurisation to release the pressure in a controlled manner without destroying the bottle integrity.

2. A bottle according to claim 1, wherein the said reduced thickness portion is provided in a moulded part of the bottle neck and is formed during the moulding of said part.

3. A bottle according to claim 2, wherein said part is produced by injection moulding.

4. A bottle according to any one of the preceding claims wherein said reduced thickness portion is provided by a flat (3) on the exterior surface of the bottle neck.

5. A bottle according to any one of claims 1 to 3, wherein the reduced thickness portion comprises a membrane (4) formed by an external recess (5) in the bottle neck.

6. A bottle according to any one of claims 1 to 3, wherein the reduced thickness portion is provided by a groove (6) in the external surface of the bottle neck.

7. A bottle according to claim 6 wherein the groove has a substantially V-shaped cross-section.

8. A bottle according to claim 6 or 7, wherein the groove includes two portions which meet at an angle.

9. A bottle according to claim 8, wherein the groove extends around a substantially rectangular path.

10. A bottle according to any one of the preceding claims, wherein the reduced thickness portion is adapted to rupture at a pressure greater than the normal operating pressure of the carbonating machine, preferably by about 20—60 p.s.i. (0.14—0.41 MPa).

Patentansprüche

1. Flasche zur Verwendung in einer Karbonationsmaschine zum Versetzen einer in der Flasche bis zu einem gegebenen Füllstand enthaltenen Flüssigkeit mit Kohlensäure, wobei die Flasche einen einheitlichen Plastikaufbau hat und einen Hals enthält, der einen integralen Abschnitt (3; 4; 6) verminderter Dicke aufweist, der oberhalb des genannten gegebenen Füllstandes liegt und auf einen Bereich beschränkt ist, der sich um einen kleinen Teil des Halsumfangs erstreckt, wobei der Abschnitt verminderter Dicke eine vorbestimmte Schwachstelle definiert, an welcher die Flasche bei Überdruck aufbrechen soll, um den Druck in kontrollierter Weise abzulassen, ohne die Flasche in ihrer Gesamtheit zu zerstören.

2. Flasche nach Anspruch 1, bei der der Abschnitt verminderter Dicke in einem gespritzten Teil des Flaschenhalses angeordnet ist und während des Spritzens dieses Teils ausgebildet ist.

3. Flasche nach Anspruch 2, bei der der Teil durch Spritzformen erzeugt ist.

4. Flasche nach einem der vorhergehenden Ansprüche, bei der Abschnitt verminderter Dicke durch eine Abflachung (3) an der äußeren Oberfläche des Flaschenhalses gebildet ist.

5. Flasche nach einem der Ansprüche 1 bis 3, bei der der Abschnitt verminderter Dicke eine Membran (4) ist, die von einer äußeren Vertiefung (5) im Flaschenhals gebildet ist.

6. Flasche nach einem der Ansprüche 1 bis 3, bei der der Abschnitt verminderter Dicke durch eine Rille (6) in der äußeren Oberfläche des Flaschenhalses gebildet ist.

7. Flasche nach Anspruch 6, bei der die Rille einen im wesentlichen V-förmigen Querschnitt hat.

8. Flasche nach Anspruch 6 oder 7, bei der die Rille zwei Abschnitte enthält, die sich unter einem Winkel treffen.

9. Flasche nach Anspruch 8, bei der die Rille sich um einen im wesentlichen rechteckigen Weg erstreckt.

10. Flasche nach einem der vorhergehenden Ansprüche, bei der der Abschnitt verminderter Dicke dazu eingerichtet ist, bei einem Druck aufzureißen, der größer, vorzugsweise um etwa 20 bis 60 psi (0.14 bis 0.41 MPa) als der Betriebsdruck der Karbonationsmaschine ist.

Revendications

1. Bouteille destinée à être utilisée dans une machine de carbonatation, pour réaliser la carbonatation d'un liquide que cette bouteille contient jusqu'à un niveau donné, cette bouteille étant réalisée d'une seule pièce, en matière plastique, et comportant un col qui comprend une partie (3; 4; 6) d'un seul tenant avec lui, laquelle est dotée d'une épaisseur réduite, est située au-dessus dudit niveau donné et est restreinte à une surface s'étendant sur une portion peu importante du pourtour du col, ladite partie dotée d'une épaisseur réduite définissant un affaiblissement prédéterminé à l'endroit duquel la bouteille est adap-

tée pour crever à l'occasion d'une surpression et relâcher ainsi la pression de manière contrôlée, sans destruction de l'intégrité de la bouteille.

2. Bouteille selon la revendication 1, dans laquelle ladite partie dotée d'une épaisseur réduite est aménagée dans une partie moulée du col de la bouteille et est formée lors du moulage de ladite portion.

3. Bouteille selon la revendication 2, dans laquelle ladite portion est produite par moulage par injection.

4. Bouteille selon l'une quelconque des revendications précédentes, dans laquelle ladite partie dotée d'une épaisseur réduite est constituée par un plat (3) sur la surface extérieure du col de la bouteille.

5. Bouteille selon l'une quelconque des revendications 1 à 3, dans laquelle la partie dotée d'une épaisseur réduite comporte une membrane (4) formée par une dépression (5) aménagée dans le côté extérieur du col de la bouteille.

6. Bouteille selon l'une quelconque des revendications 1 à 3, dans laquelle la partie dotée d'une épaisseur réduite est constituée par une rainure (6) dans la surface extérieure du col de la bouteille.

7. Bouteille selon la revendication 6, dans laquelle la rainure possède une section droite sensiblement en forme de V.

8. Bouteille selon la revendication 6 ou 7, dans laquelle la rainure comporte deux parties qui se rencontrent en formant un angle.

9. Bouteille selon la revendication 8, dans laquelle la rainure s'étend sur un tracé sensiblement rectangulaire.

10. Bouteille selon l'une quelconque des revendications précédentes, dans laquelle la partie dotée d'une épaisseur réduite est adaptée pour se rompre à une pression supérieure, de préférence d'environ 0,14 à 1,41 MPa (20 à 60 psi), à la pression normale de fonctionnement de la machine de carbonatation.

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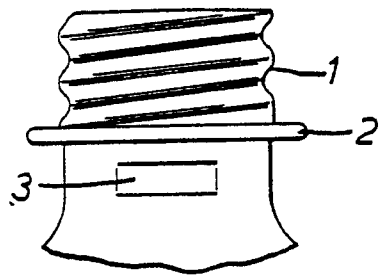


FIG. 1.

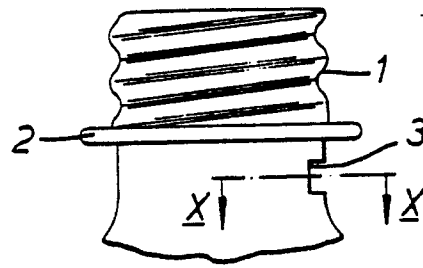


FIG. 2.

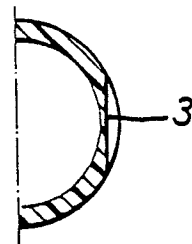


FIG. 3.

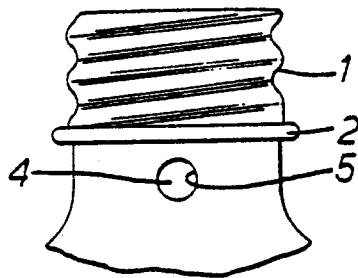


FIG. 4.

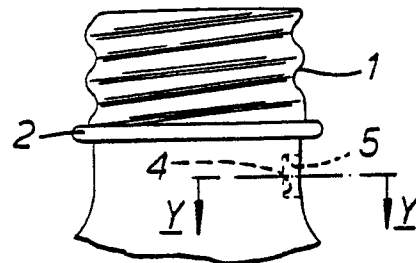


FIG. 5.

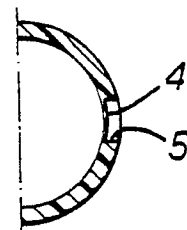


FIG. 6.

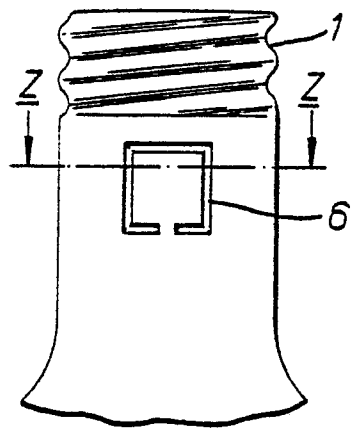


FIG. 7.

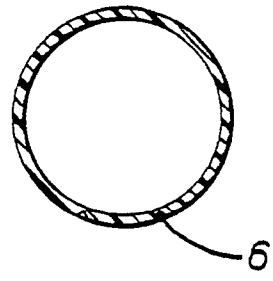


FIG. 8.