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| <b>(51) International Patent Classification <sup>7</sup> :</b><br><b>B65D 1/28</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>A1</b> | <b>(11) International Publication Number:</b> <b>WO 00/51896</b><br><b>(43) International Publication Date:</b> 8 September 2000 (08.09.00)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| <b>(54) Title:</b> PLASTICS-WALLED CONTAINER<br><br><b>(57) Abstract</b><br><br>A plastics walled product, such as a plastics bottle for containing a carbonated beverage, having a wall (12) which is moulded from plastics material and which includes discrete flakes (18) of impermeable material e.g. glass flakes distributed throughout the wall in order to resist migration of gas through the wall.                                                                                                                                                                                                                 |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

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## PLASTICS-WALLED CONTAINER

This invention relates to a plastics-walled product, such as a plastics bottle for containing a carbonated beverage. Traditionally, glass bottles have been used to contain carbonated beverages, such as lemonade, but the heavier weight and brittleness of glass (compared with plastics) has resulted in increased usage of plastics-walled bottles for beverages in recent years.

Typical plastics material used include polyethylene, polyester and acetal, and which can be moulded into required shapes of bottle by blow moulding, or injection moulding.

However, in the storage of a carbonated beverage, although moulded plastics is liquid-tight i.e. substantially impermeable to liquids, over a period of time gases are able to diffuse through the wall of a plastics bottle. In the case of lemonade, or a carbonated "cola" type of drink, the diffusion of carbon dioxide gas through the wall results in loss of gaseous content of the beverage, so that there is a limit to the commercially acceptable "shelf life" of drinks of this nature.

It is believed that the diffusion of gas under pressure through a plastics wall is not because of any leakage path through the wall, but more by reason of the much larger molecular size of the constituents of the plastics material compared with the molecular size of the gas, and which allows the gas molecules to diffuse slowly, over a period of time, between adjacent molecules of the plastics material and between the inner surface and the outer surface of the wall.

The present invention seeks to solve this problem of gas diffusion through a wall of a plastics-walled product, by providing an additive which can be moulded with the plastics material so as to be distributed throughout the moulded wall, and so as to form a barrier to passage of pressurised gas through the wall from one face to the opposite thereof.

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According to the invention there is provided a plastics-walled product which is moulded from plastics material which includes discrete flakes of impermeable material distributed throughout the wall in order to resist migration of gas through the wall.

Any suitable plastics material may be used in the moulding of the product, and including polyethylene, polyester and acetal. The product may be formed by injection moulding, or by blow moulding.

One preferred plastics-walled product to which the invention may be applied is a container for a gasified liquid e.g. a carbonated beverage, in which the wall of the container is moulded of plastics material which includes said discrete impermeable flakes distributed throughout the wall in order to resist migration of gas from the inner face of the container wall to the outer face and subsequent escape to atmosphere.

However, it should be understood that the invention has general application to plastics-walled products, and for use in situations in which it is a requirement to prevent, or at least minimise the diffusion of gas through the wall, from one side to the opposite side.

Therefore, in a particularly simple application of the invention, it may be applied to a moulded sheet of plastics material, and which is intended to be incorporated in, assembled with, or otherwise fabricated to form an enclosure, and in which it is a requirement to prevent migration of gas through the sheet from one side to the other i.e. from external atmosphere to the interior of the enclosure or vice versa.

The preferred flake material is glass flake, but it should be understood that other flake material may be used, provided that it is substantially impermeable to gas so that the flakes form barriers to diffusion of gas through the walls. Conveniently, any other flake material selected will

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be a material which is readily available at an economic cost, and which is capable of being moulded within the plastics wall.

The glass (or other) flakes can be introduced into the plastics material from which the wall is moulded, and typical size of the glass flakes could be about 300 microns diameter, and 2 microns of thickness. However, other sizes of glass flakes may be used to advantage in the invention, and typically coming in a range up to 300 microns in diameter, and thickness in the range 0.6 to 2 microns.

It has been found that, by the incorporation of the glass flakes into the moulded plastics wall, the distribution can be such that the glass flakes form a barrier to passage of pressurised gas through the wall from one face to the opposite face thereof. Gas attempting to permeate through the wall will try to migrate between adjacent molecules (long chain molecules) of the plastics material, and in so doing will find a barrier to their passage being provided by the glass flakes distributed throughout the wall. This then causes the attempted permeating gas to follow an alternative path, in seeking to move through the wall from one face to an opposite face, and by this means the glass flakes have the effect of diverting the possible flow of the gas through the wall and considerably increasing any possible path which the gas has to follow, if it is to succeed in passing right through the wall.

Therefore, whereas a typical moulded plastics wall e.g. of a container might have a thickness of, say, 1 to 2mm, so that in the absence of the glass flakes the possible flow path for the gas going straight through the wall is not much more than the wall thickness, with the distribution of glass flakes throughout the moulded wall, the potential escape flow path for the gas can be increased by a considerable multiple of the wall thickness.

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It is envisaged that incorporation of glass flakes into the plastics material in a percentage by weight of as little as 2% (or less) will have a substantial effect on inhibiting passage of pressurised gas through the wall.

Therefore, by relatively simple means, the storage or "shelf life" of a carbonated beverage can be considerably increased, with self evident commercial advantage to the supplier of the beverage, and also the stockist.

A preferred embodiment of the invention will now be described in detail, by way of example only, with reference to the accompanying schematic drawing, in which:

Figure 1 is a schematic view of a plastics-walled container according to the invention, for containing a carbonated beverage, such as lemonade; and,

Figure 2 is a detailed enlarged view of the wall structure of the container shown in Figure 1.

Referring now to the drawing, a plastics-walled container according to the invention is designated generally by reference 10, and is intended to contain a carbonated beverage, such as lemonade or a carbonated cola. The container 10 has a strengthened separate moulded base 11, into which cylindrical container having a wall 12 can be seated, and which has a filling (and discharge) aperture 13 closable by a screw cap 14.

However, it should be understood that a plastics-walled container is one example only of a plastics walled product to which the invention may be applied. In its simplest form, the invention may be applied to a moulded sheet of plastics material, which is subsequently intended to be incorporated in, assembled with or otherwise fabricated to form an enclosure, and in which there is a requirement to prevent, or at least minimise the diffusion of gas from external atmosphere to the interior of the enclosure or vice versa.

The wall 12 of the container is moulded from plastics material i.e. by injection moulding from suitable plastics

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pellets, or blow-moulded. With existing plastics-walled containers, although the plastics material is substantially impervious to migration of liquid through the wall of the container, over a period of time the gaseous content of the liquid 15 stored in the container tends to diffuse through the wall of the container, and therefore even for an unused container with the cap 14 securely screwed down, a purchaser may find that the resulting liquid poured from the container may be "flat", if it has been stored on a shelf for too long a time.

The present invention seeks to solve this problem of gas diffusion through a plastics wall e.g. of a container, by providing an additive which can be moulded with the plastics material so as to distributed throughout the moulded wall, and so as to act as a barrier to passage of pressurised gas through the wall from the internal face to the outer face thereof.

Figure 2 is a detail enlarged view through the wall of the container 12, and having an inner face 16 which contains the liquid 15, and an outer face 17.

Flakes of gas-impermeable material e.g. glass flakes are added to the raw material constituents of the moulded plastics material, and during the moulding process, the flakes become distributed throughout the wall of the container, in order to resist migration of gas through the wall. Glass flakes are shown by reference 18 in Figure 2, and evidently as any gas liberated from the beverage 15 which attempts to migrate from the inner wall surface 16 to the outer wall surface 17 will have to diffuse between adjacent long chain molecules of the plastics material, but in so doing will meet resistance by the barriers to such flow passage of the gas by the random distribution of the glass flakes 18 throughout the wall of the container. The glass flakes therefore have the effect of considerably lengthening any possible flow path of gas attempting to migrate from the

inner wall surface 16 to the outer wall surface 17, and therefore over a given period of time, the proportion of gas which may escape through the plastics wall having glass flakes distributed throughout it will be very much smaller than the proportion of gas which can pass from the inner wall surface 16 to the outer wall surface 17 of a purely plastics moulded wall.

Therefore, by relatively simple means, the commercially acceptable storage life of a container of a carbonated beverage can be considerably improved, while the container still has all of the advantages of usage of a plastics material i.e. lightweight, easy handling, and non-brittleness.

Typical glass flakes added to the plastics material constituents may be 300 microns diameter and 2 microns thick. However, glass flakes of other shapes and sizes may be utilised in the invention, and coming in the range up to 300 microns or more in diameter, and thickness of 0.6 to 2 or more microns.

It has been found that incorporation of glass flakes into the plastics material in a proportion of about 2% by weight gives enhanced resistance to gaseous permeation through the wall of the container. However, greater (or lesser) proportions of glass flake can be incorporated into the plastics material constituents if required, and still give beneficial results i.e. at least inhibit gas permeation through the wall of the container.

Desirably, the glass flakes are treated with a silane bonding agent to improve adhesion of the glass flakes in the moulded wall structure.

The invention may also be applied to plastics sheeting for use in packaging e.g. incorporate glass or other flakes into thermoplastic sheeting.

Claims:

1. A plastics-walled product (10) which is moulded from plastics material which includes discrete flakes (18) of impermeable material distributed throughout the wall in order to resist migration of gas through the wall.
2. A product according to claim 1, and moulded from polyethylene, polyester or acetal.
3. A product according to claim 1 or 2, and formed by injection moulding, or by blow moulding.
4. A product according to anyone of claims 1 to 3, and comprising an enclosure.
5. A product according to anyone of claims 1 to 3, and taking the form of a plastics-walled container for a gasified liquid.
6. A product according to anyone of the preceding claims, in which the flakes are glass flakes.
7. A product according to claim 6, in which the glass flakes have a thickness in the range 0.6 to 2 microns, and diameter of up to 300 microns.
8. A product according to claim 6 or 7, in which the glass flakes are incorporated into the plastics material in a percentage by weight of at least 2%.
9. A product according to anyone of the preceding claims, and comprising a plastics walled container for a carbonated beverage, comprising a cylindrical enclosure (12) having a separate moulded base (11) and a closable outlet (13).
10. A sheet moulded of plastics material and including discrete flakes (18) of impermeable material distributed throughout the moulded material.
11. A sheet according to claim 10 in which the flakes (18) are glass flakes.

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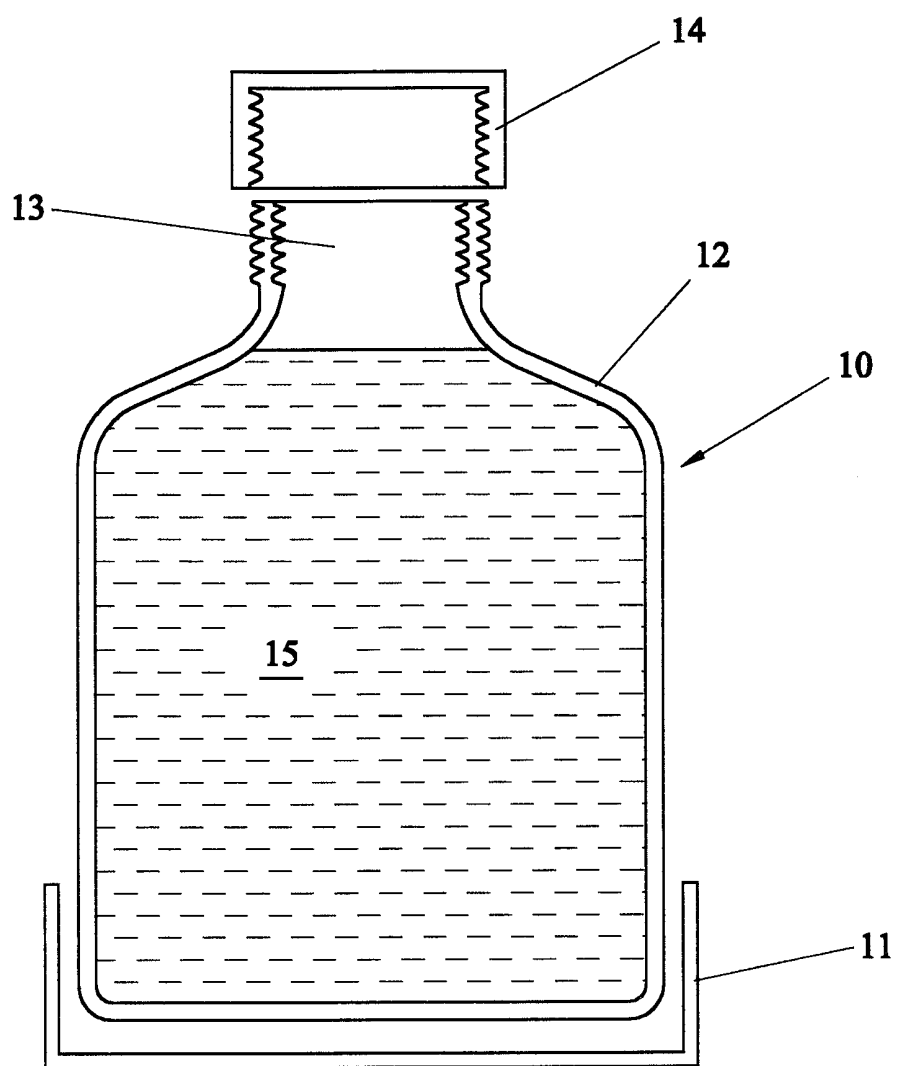


FIG. 1

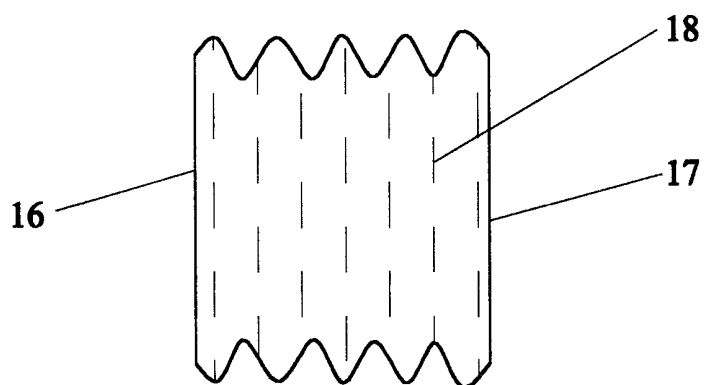


FIG. 2

# INTERNATIONAL SEARCH REPORT

In ternational Application No

PCT/GB 00/00733

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B65D1/28

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B65D

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                      | Relevant to claim No. |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| X          | EP 0 331 072 A (KURARAY CO)<br>6 September 1989 (1989-09-06)<br>examples 1-12<br>claims 1-9<br>---                                                                                                                      | 1-11                  |
| X          | DATABASE WPI<br>Section Ch, Week 199310<br>Derwent Publications Ltd., London, GB;<br>Class A23, AN 1993-080966<br>XP002139063<br>& JP 05 026395 A (POLYPLASTICS KK),<br>2 February 1993 (1993-02-02)<br>abstract<br>--- | 1-6, 10,<br>11        |
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☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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|-------------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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