



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.11.2007 Bulletin 2007/46

(51) Int Cl.:
B65D 1/24 (2006.01)

(21) Application number: **06076025.3**

(22) Date of filing: **09.05.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

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(54) **Reinforced plastic crate**

(57) A plastic crate (1) comprises a bottom part (4) from which side walls (2, 3) and substantially hollow support columns (6, 11, 12) extend. At least some of the support columns (6) are provided with reinforcing undulations (8) extending substantially along the height of the

columns. This allows relatively thin support columns to have a great structural strength. The support columns (6) may be located at or near a corner (7) of the crate and the undulations (8) may face the interior of the crate. The crate may further be provided with dividers (13) for creating bottle compartments.

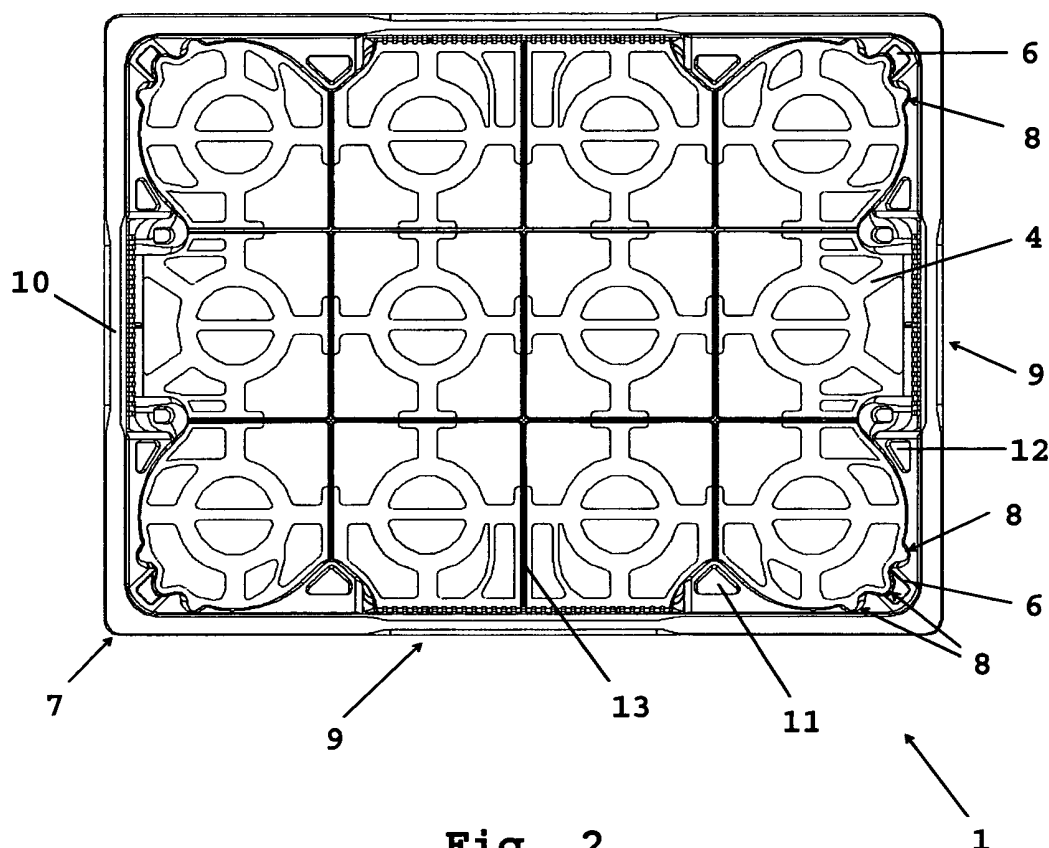


Fig. 2

Description

[0001] The present invention relates to a reinforced plastic crate suitable for storing and transporting bottles or similar objects. More in particular, the present invention relates to a plastic crate which comprises a bottom part and side walls. Support columns extend from the bottom part to support any further crates when the crate is used in a stack.

[0002] It is well known to stack empty or full plastic crates. The problem that arises when stacking full crates is that the weight of the stack will tend to deform the lower crates in the stack. A temporary deformation may harm the contents of the crate, while a permanent deformation may make the crate unsuitable for further use.

[0003] British Patent GB 1 096 183 discloses a plastic crate provided with support pillars. Each pillar has the cross-sectional shape of a quarter circle and is provided with a buckling section. One or more bracing members serve to resist the tendency of the pillars to buckle. The bracing members are constituted by ribs which extend horizontally over the exterior surfaces of the side walls. This structure has the disadvantage that the provision of a buckling section inevitably introduces a weak spot in the crate. The bracing members necessarily have to be strong to compensate for the weakness of the buckling sections. As a result, the ribs require relatively much plastic material and contribute significantly to both the cost and the weight of the crate.

[0004] European Patent EP 0 527 745 B1 suggests to solve the above-mentioned problem by providing vertical hollow columns spaced along the side walls and vertical ribs extending from the side walls near the corners of the crate. In the embodiment shown, the vertical hollow columns have a substantially triangular cross-section. Although such hollow columns are useful, they require a relatively large wall thickness, and therefore relatively much plastic material, to achieve sufficient strength. The vertical ribs further contribute to the amount of plastic required, and therefore to the cost and the weight of the crate.

[0005] It is an object of the present invention to overcome these and other problems of the Prior Art and to provide a reinforced crate which has sufficient resistance against deformation while requiring a minimum amount of material.

[0006] Accordingly, the present invention provides a plastic crate, comprising a bottom part from which side walls and substantially hollow support columns extend, characterised in that at least some of the support columns are provided with reinforcing undulations extending substantially along the height of the columns.

[0007] By providing the hollow support columns of the crate with undulations which extend along the height of these columns, the strength of the columns is significantly increased. As a result, the load bearing capacity of the crate is increased without increasing the thickness of the crate walls or of the column walls. Alternatively, a crate

having the same load bearing capacity but more interior space may be provided, as columns having the same strength may have smaller dimensions when provided with the undulations according to the present invention.

[0008] An added advantage of the present invention is that the undulations increase the corresponding mould surface, which results in faster cooling and reduced production cycle times.

[0009] The undulations or corrugations may have a sinusoidal, stepped (rectangular), triangular or any other suitable cross-sectional shape. The undulations preferably extend over the entire height of the columns, but may also extend over only part of their height. In the latter case, additional measures may be taken to reinforce those parts of the columns which are not provided with undulations, for example providing local reinforcing ribs.

[0010] The undulations of the present invention do not alter the basic cross-sectional shape of the columns. The column provided with one or more undulations essentially retains its basic cross-sectional shape, which may for example be circular, triangular, or rectangular, although the undulations of course deviate from this basic cross-sectional shape. In this respect, the undulations of the present invention are to be distinguished from corners and similar basic cross-sectional shape defining features that the hollow reinforcing columns may exhibit, and from securing formations for inserts and similar auxiliary features that are designed for other purposes than reinforcing the columns.

[0011] It is noted that in normal use of the crate the bottom part will extend substantially horizontally, while the support columns and any side walls will extend substantially vertically. Accordingly, the undulations will also extend substantially vertically. It will be understood that the support columns and/or the side walls may not extend exactly at right angles relative to the bottom part, and deviations from a right angle are possible.

[0012] In the crate of the present invention, the support columns are preferably located at or near a corner of the crate. Other locations are also possible, but it has been found that a support column located at a corner is the most effective. This is particularly true if two side walls join at a support column.

[0013] The reinforcing undulations may be located at any side of the columns, and may cover the whole perimeter of the columns. It is preferred, however, that the reinforcing undulations face the interior of the crate. This leaves the exterior of the crate unaffected.

[0014] Each reinforced support column may be provided with any suitable number of undulations, for example one to seven undulations. However, it is preferred that three undulations per reinforced column are provided. This number achieves a good reinforcement using undulations which have suitable dimensions.

[0015] The crate of the present invention advantageously has at least two side walls, preferably four side walls, for example two longer side walls and two shorter side walls. The side walls serve to contain and protect

any articles present in the crate. However, embodiments can be envisaged in which columns extend from the base part, the side walls being very low or even absent. In a preferred embodiment, however, the columns have almost or entirely the same height as the side walls.

[0016] It is preferred that the reinforced columns are integrated in the side walls. That is, the side walls constitute part of the walls of the column. By providing columns which are integral with the side walls, in particular if the side walls and the columns have approximately the same height, a strong crate structure is achieved. In addition, material is saved as the columns and the side walls will have some wall surfaces in common.

[0017] Advantageously, each side wall is provided with a handle section. However, in some embodiments handle sections are provided in the shorter side walls only. A central handle may be provided in addition to, or instead of, handle sections in the side walls.

[0018] The bottom part may be constituted by a closed surface but preferably comprises an open structure, for example a lattice structure or any other suitable structure. An open structure saves both material and weight and facilitates cleaning.

[0019] The crate according to the present invention is preferably suitable for storing and/or transporting bottles. To this end, the crate may be provided with divider elements to define bottle positions.

[0020] The present invention will further be explained below with reference to exemplary embodiments illustrated in the accompanying drawings, in which:

Fig. 1 schematically shows a partial cross-sectional view of a bottle crate according to the present invention.

Fig. 2 schematically shows a top view of the bottle crate according to the present invention.

Fig. 3 schematically shows a bottom view of the bottle crate according to the present invention.

[0021] The bottle crate 1 shown merely by way of non-limiting example in Figs. 1, 2 and 3 comprises side walls 2 and 3, and a bottom part 4. The side walls have a top rim 5. A reinforcing column 6 is located at a corner 7 of the crate. In accordance with the present invention, the column 6 is provided with undulations 8, which will later be discussed in more detail. A handle opening 9 in the (shorter) side wall 2 defines a handle section 10. In the embodiment shown, the side walls 2 and 3 are both hollow so as to provide a light-weight but strong structure, but hollow side walls are not essential and substantially solid side walls may be used instead.

[0022] Fig. 1 shows a 45° cross-sectional view of a corner section of a bottle crate according to the present invention. As can be seen in Fig. 1, a column 6 extends from the bottom part 4 almost until the upper rim 5. In the embodiment shown, the column 6 ends a few centimetres from the upper rim 5 so as to facilitate the stacking of the crate, but in other embodiments (not shown) the column

5 may extend up to or even beyond the rim 5.

[0023] The column 6 is located at the corner 7 where the side walls 2 and 3 meet. As shown in Figs. 2 and 3, the column 6 shares wall sections with the side walls 2 and 3, thus providing an integral hollow structure. In the embodiment shown, the undulations 8 extend over the full height of the column 6 so as to reinforce the column over its full height. In other embodiments, the undulations 8 may extend over only part of the height of the column 6.

[0024] As shown in the top view of Fig. 2, the column 6 has three undulations 8. The number of undulations may be varied and may depend, amongst other things, on the wall thickness and the type of plastic used. In addition, the dimensions of the column 6 may also depend on the dimensions of the bottles to be carried in the crate 1. Only a single undulation may be used, but other numbers, like two, four, five, six, seven or even more undulations are possible. Typically, the size of the undulations will decrease as their number increases. The undulations 8 are shown to be substantially sinusoidal ("S-shaped"), but other shapes are possible, for example triangular or rectangular ("stepped") shapes.

[0025] In the embodiment shown, additional columns 11 and 12 are provided which are not reinforced in accordance with the present invention. As can be seen, these additional columns 11 and 12 each extend next to a handle opening 9. Of course it is possible to provide these additional columns with reinforcing undulations according to the present invention, but this is not always necessary. The columns 6, 11 and 12 are all hollow, but this is not essential and solid columns may be used instead.

[0026] It is further shown in Fig. 2 that the bottom part 4 of the crate 1 consists of an open structure comprising a rectangular lattice and circular bottle support elements. This can be seen more clearly in the bottom view of Fig. 3. As shown in Fig. 2, the crate 1 is further provided with a bottle divider lattice 13 which additionally serves to reinforce the crate.

[0027] The crate 1 is preferably integrally formed and may be made of a suitable plastic material, such as HDPE (High Density PolyEthylene).

[0028] The present invention is based upon the insight that a column surface having vertically extending undulations greatly increases the strength of the column without increasing its weight to any significant extent. As a result, a crate having relatively thin walls can have a high load bearing capacity.

[0029] It is noted that any terms used in this document should not be construed so as to limit the scope of the present invention. In particular, the words "comprise(s)" and "comprising" are not meant to exclude any elements not specifically stated. Single elements may be substituted with multiple elements or with their equivalents.

[0030] It will be understood by those skilled in the art that the present invention is not limited to the embodiments illustrated above and that many modifications and additions may be made without departing from the scope

of the invention as defined in the appending claims.

Claims

1. A plastic crate (1), comprising a bottom part (4) from which side walls (2, 3) and substantially hollow support columns (6, 11, 12) extend, **characterised in that** at least some of the support columns (6) are provided with reinforcing undulations (8) extending substantially along the height of the columns.

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2. The crate according to claim 1, wherein the undulations (8) extend over only part of the height of the column (6).

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3. The crate according to any of the preceding claims, wherein the undulations (8) are substantially sinusoidal, triangular or rectangular.

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4. The crate according to any of the preceding claims, wherein the reinforced support columns (6) are located at or near a corner (7) of the crate.

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5. The crate according to any of the preceding claims, wherein the reinforcing undulations (8) face the interior of the crate.

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6. The crate according to any of the preceding claims, wherein each reinforced support column (6) is provided with one to seven undulations (8), preferably three undulations (8).

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7. The crate according to any of the preceding claims, which has at least two side walls, preferably four side walls (2, 3).

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8. The crate according to any of the preceding claims, wherein the reinforced columns (6) have substantially the same height as the side walls (2, 3).

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9. The crate according to any of the preceding claims, wherein the reinforced columns (6) are integrated in the side walls (2, 3).

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10. The crate according to any of the preceding claims which is suitable for storing and/or transporting bottles.

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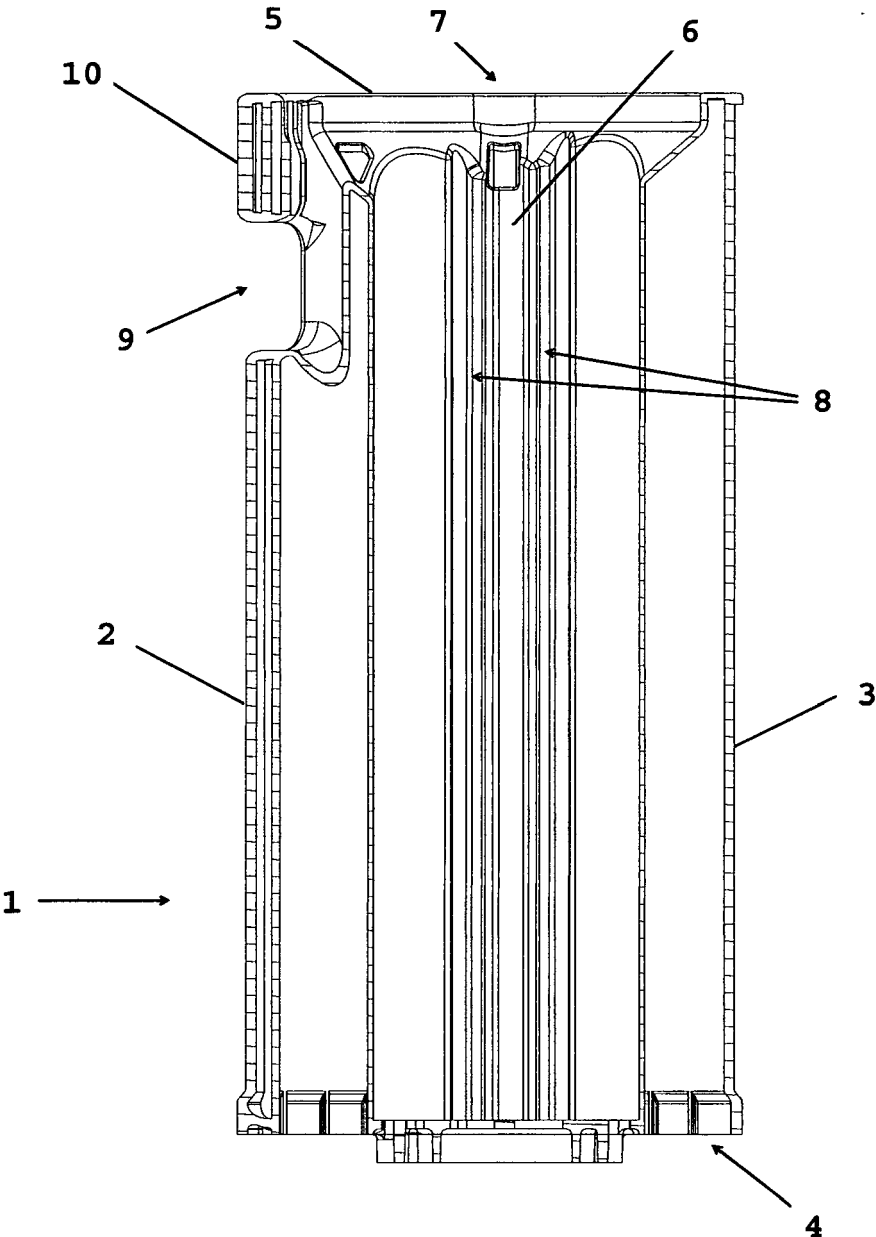


Fig. 1

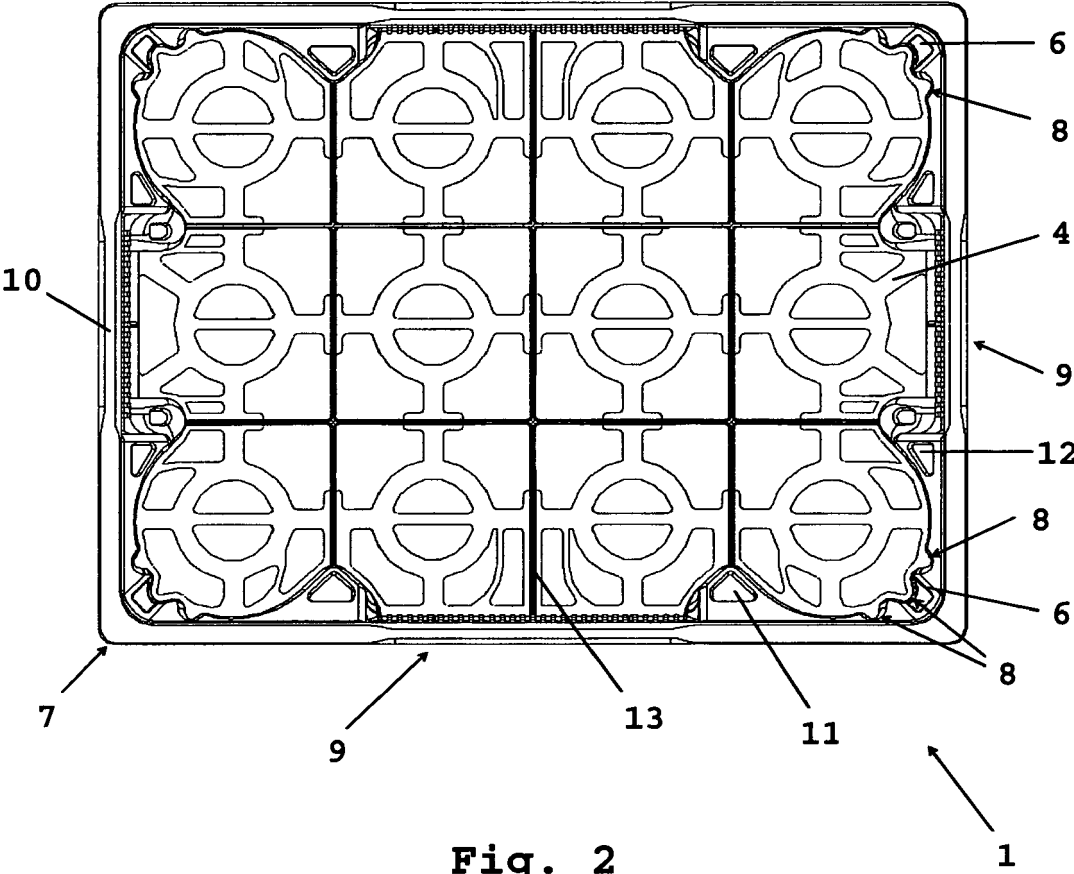


Fig. 2

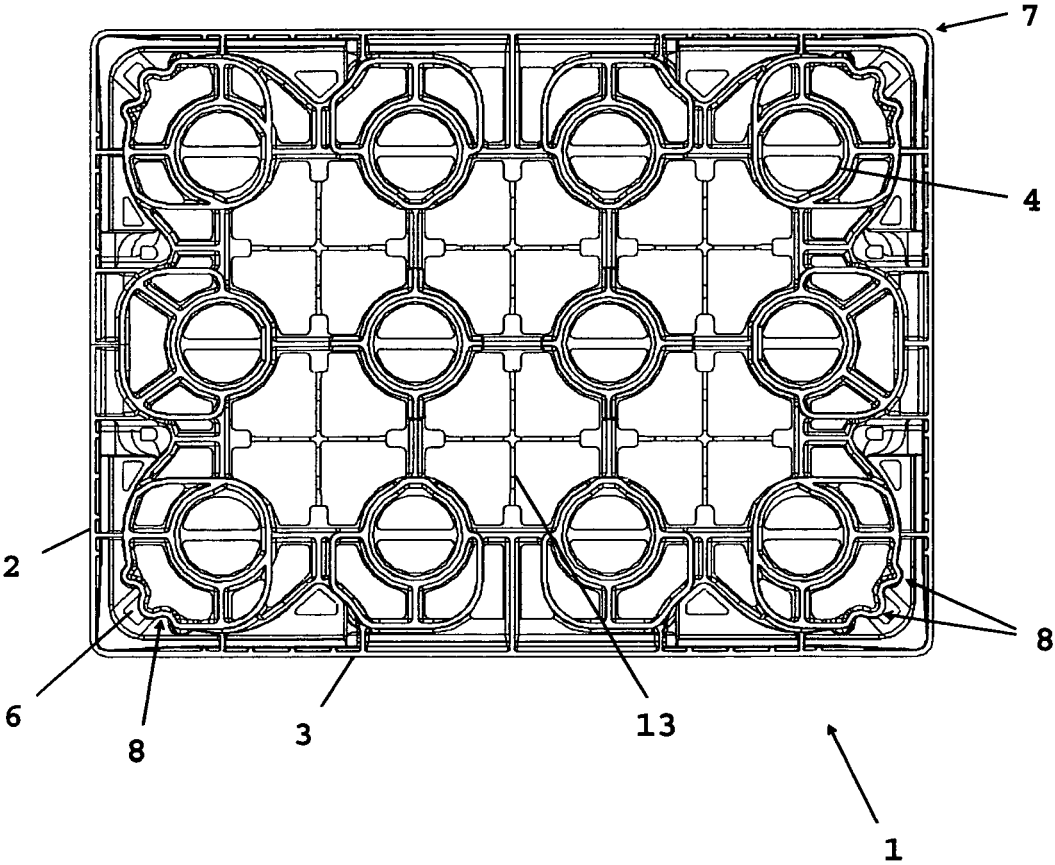


Fig. 3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 07 6025

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 6 401 960 B1 (HAMMETT ROY) 11 June 2002 (2002-06-11) * column 3, line 34 - column 5, line 4; figure 1 *	1,3-7,9, 10 8	INV. B65D1/24
Y	-----		
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC) B65D
Place of search Munich		Date of completion of the search 5 October 2006	Examiner Bevilacqua, Vincenzo
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03/82 (P04/C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 06 07 6025

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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05-10-2006

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- EP 0527745 B1 [0004]