



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**10.01.2007 Bulletin 2007/02**

(51) Int Cl.:  
**B05B 7/24 (2006.01)**

(21) Application number: **05076539.5**

(22) Date of filing: **05.07.2005**

(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**

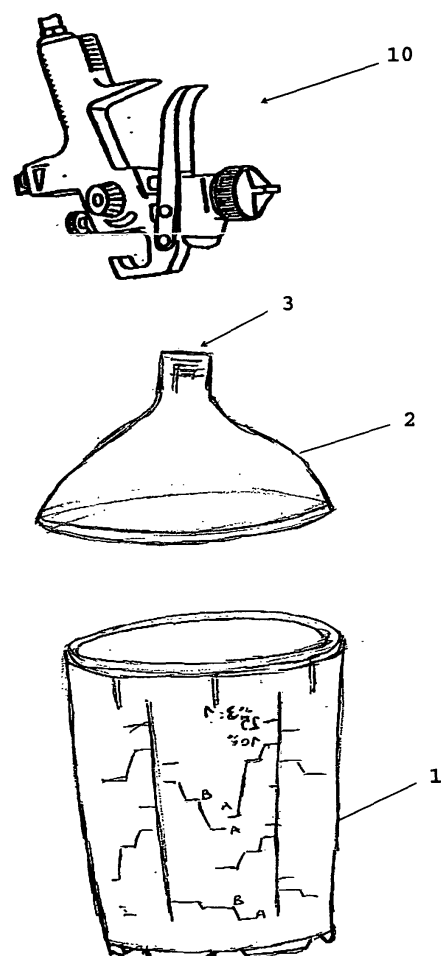
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(54) **Spray gun reservoir comprising a liquid tight vent**

(57) A liquid reservoir assembly for a spray gun (10) comprises a top part (1) and a base part (2), wherein the base part has an opening (3) for passing the liquid to the spray gun. The top part (1), which may be used as a mixing cup, has closed top and wall surfaces without any air vent openings. The base part and the top part provide a liquid-tight seal but not an air-tight seal so as to allow air to be drawn in through the crevice between the sealing parts. The absence of air vent openings allows the liquid reservoir to be handled without spilling liquid.



**Fig. 1**

## Description

**[0001]** The present invention relates to a spray gun reservoir. More in particular, the present invention relates to a liquid reservoir for mounting on a spray gun, a spray gun assembly provided with a liquid reservoir, and a method of providing such an assembly.

**[0002]** Spray guns having reservoirs for containing the liquid to be sprayed are well known. Such reservoirs are typically mounted on top of the spray gun using a hollow coupling element through which the liquid can flow. The position on top of the spray gun ensures that gravity assists the flow of the liquid.

**[0003]** The liquid, such as paint or herbicide, is typically first mixed in a blending cup or other suitable container before being poured into the spray gun reservoir. The reservoir is closed by a lid and is then mounted on the spray gun. During use, the amount of liquid in the reservoir steadily decreases, causing a lowered air pressure (vacuum) in the reservoir which would hinder the flow of liquid. To prevent this, the known reservoir is provided with a vent opening or air hole which allows air to be drawn from the outside.

**[0004]** After the spraying is finished, the spray gun and the reservoir have to be cleansed. To avoid cleansing the reservoir, it has been proposed to use a disposable liner in the reservoir. The liner, which contains the liquid, prevents the liquid coming into contact with the reservoir.

**[0005]** An example of a liquid reservoir for use with a spray gun is disclosed in International Patent Application WO 98/32539 (3M). This known liquid reservoir is provided with an air hole to draw in air when the amount of liquid in the reservoir is reduced. The reservoir must be held upright because of this air hole which is, in use, located in the top surface of the reservoir. The known reservoir is further provided with a disposable liner which involves an additional part and makes the spray gun assembly more expensive. In addition, the use of a liner, which has to be inserted into and removed from the reservoir, can be cumbersome.

**[0006]** International Patent Application WO 2005/018815 (Camilleri) discloses a disposable spray gun reservoir which is used without a liner. To prevent spilling liquid when the spray gun is handled, this known reservoir is provided with a closable vent valve consisting of a valve duct and a removable valve plug. The added parts increase the cost of the disposable reservoir, while the removable plug is easily lost.

**[0007]** It is therefore an object of the present invention to overcome these and other problems of the Prior Art and to provide a spray gun assembly which may be held in various positions without spilling liquid.

**[0008]** It is another object of the present invention to provide an inexpensive spray gun assembly having fewer parts.

**[0009]** It is a further object of the present invention to provide an inexpensive spray gun reservoir.

**[0010]** It is a still further object of the present invention

to provide a method of using a spray gun assembly which is both simple and economical.

**[0011]** Accordingly, the present invention provides a liquid reservoir assembly for a spray gun, the assembly comprising a top part and a base part, wherein the base part has an opening for passing the liquid to the spray gun, characterised in that the top part has closed top and wall surfaces, and in that the base part and the top part provide a liquid-tight seal but not an air-tight seal.

**[0012]** By providing a top part having closed surfaces, without an air hole, the reservoir assembly can be held in any position, including upside-down, without spilling fluid. It will be understood that the base part will have no openings other than the one (or ones) for passing the liquid to the spray gun.

**[0013]** By providing a liquid-tight seal but not an air-tight seal between the base part and the top part, air can be drawn through the slit between the mating elements of the top part and the base part. Surprisingly, it was found that the minute air leakage between the parts of the reservoir of the present invention provided sufficient air, while the lower pressure in the reservoir ensured that no liquid leaked out.

**[0014]** Accordingly, in the reservoir of the present invention air is supplied to the interior through "leakage" between the reservoir parts and no vent opening is necessary. As a result, the reservoir assembly (with or without the spray gun attached) may be held in any position without spilling liquid. In addition, the absence of a vent opening or vent mechanism lowers the cost of the reservoir.

**[0015]** It has further been found that parts providing a liquid-tight seal but not an air-tight seal can easily be produced. At least part of the invention resides in the insight that a conventional fluid container and its lid may be used as a spray gun reservoir, provided an opening is made in the lid for the passage of the liquid to the spray gun, and provided a liquid-tight (that is, liquid blocking) seal but not an air-tight (that is, hermetic) seal is obtained between the container and the lid. The laws of physics then ensure a sufficient supply of air through the seal.

**[0016]** In a preferred embodiment, one of the parts (preferably the base part) may be provided with a substantially U-shaped groove while the other part (preferably the top part) is provided with a substantially U-shaped rim which fits into the groove. Such sealing arrangements are well known in the art. No additional components are necessary, provided the substantially U-shaped elements provide a good and close fit. It will be understood that the top part may be provided with the substantially U-shaped groove while the base part is provided with the substantially U-shaped rim.

**[0017]** In alternative embodiments, the parts may be provided with mating screw threads which allow a minute passage of air.

**[0018]** The top part of the liquid reservoir of the present invention is preferably constituted by a container while the base part is constituted by a lid for the container. That

is, the top part has a circumferentially closed wall surface extending in a longitudinal direction from an end surface, thus defining an interior of the container. This allows the top part to be used as a mixing (blending) cup for mixing paint or other substances prior to spraying. The reservoir is then closed off by placing the base part (that is, the lid) on the top part (that is, the container), and is turned upside down for mounting on the spray gun. However, it is also possible for the base part to form a container, as disclosed in WO 98/32539 mentioned above. The container preferably has a substantially circular cross-section, although other cross-sections are also possible, for example substantially rectangular (e.g. square), oval, hexagonal or octagonal. The top part is preferably wider at its opening than at its closed end, although this is not essential.

**[0019]** It is preferred that the base part is funnel-shaped. This assists the flow of the liquid, in particular when the reservoir is almost empty. In alternative embodiments, however, the base part may be substantially planar.

**[0020]** The liquid reservoir assembly of the present invention may further comprise a filter. Such a filter, which may serve to remove particles from the liquid and which may be constituted by a mesh mounted in a holder, is preferably arranged in the base part. However, the filter may also be arranged in the top part. The filter is preferably removably mounted in one of said parts.

**[0021]** The liquid reservoir assembly of the present invention may be made of a plastic material, preferably a substantially transparent plastic material. Suitable plastic materials are polypropylene, polyethylene and polyamide, although other materials may also be used. It is preferred that the material has a certain resilience.

**[0022]** The liquid reservoir assembly of the present invention may further comprise a coupling member for coupling the reservoir and the spray gun. The coupling member may be made of metal or plastic, and may be provided with a suitable screw thread, a snap fit arrangement, or other coupling means.

**[0023]** The present invention also provides a spray gun assembly comprising a spray gun and a liquid reservoir assembly as defined above, and a base part for use in the liquid reservoir assembly as defined above. The present invention further provides a kit-of-parts for forming a liquid reservoir assembly or a spray gun assembly as defined above.

**[0024]** The present invention additionally provides a method of using a spray gun, the method comprising the steps of:

- mounting a container lid on a spray gun,
- pouring a liquid to be sprayed into a container, and
- closing the container using the lid so as to form a closed reservoir on which the spray gun is mounted,

characterised in that the container has closed top and wall surfaces, and in that the lid and the container provide

a liquid-tight seal but not an air-tight seal.

**[0025]** The order of the first and second steps is not essential and may be reversed. It will be understood that a suitable opening is made in the container lid for passing liquid to the spray gun, and that suitable coupling means may be provided for coupling the lid and the spray gun.

**[0026]** The present invention will further be explained below with reference to exemplary embodiments illustrated in the accompanying drawings, in which:

Fig. 1 schematically shows, in perspective, a spray gun assembly according to the present invention.

Fig. 2 schematically shows, in a cross-sectional view, an embodiment of a spray gun reservoir assembly according to the present invention.

Fig. 3 schematically shows, in a cross-sectional view, a preferred embodiment of a base part according to the present invention.

Fig. 4 schematically shows, in a cross-sectional view, an edge section of the base part of Fig. 2 in more detail.

**[0027]** The spray gun assembly shown merely by way of non-limiting example in Fig. 1 comprises a spray gun 10 and a reservoir assembly consisting of a top part 1 and a base part 2. It is noted that in Fig. 1 the spray gun assembly is shown in the position in which it is assembled, whereas in use the position of the spray gun, the base part and the top part would be reversed. Accordingly, the base part 2 (which is shown above the top part 1) is in use located below the top part 1, forming the base of the reservoir assembly. Similarly, the top part 1 is in use located above the base part 2.

**[0028]** The spray gun 10 may be a conventional, commercially available spray gun. The reservoir assembly, however, is novel and has advantageous properties which will be later explained with reference to Fig. 2.

**[0029]** In the embodiment shown, the top part 1 of the reservoir assembly is constituted by a container, such as a mixing (blending) cup. The container of Fig. 1 has a substantially circular cross-section, but the invention is not limited to this particular cross-section or shape. Markings may be present on the container to measure of quantities of liquids to be mixed and/or sprayed. The container 1 of Fig. 1 has no air vent opening and its wall surfaces are closed, the only opening of the container being the access opening at one end, which opening is to be closed off by the base part or lid 2. As the container has no opening in its other end or side wall(s), it can be used as a mixing cup. A Prior Art reservoir provided with a vent opening is not suitable for use as mixing cup.

**[0030]** The base part 2 shown in Fig. 1 has a funnel-shape to facilitate the flow of liquid from the reservoir assembly to the spray gun through the opening 3. However, other shapes are also possible, as will later be explained with reference to Fig. 2. The base part 2, which serves as a lid for the container (top part) 1, may have suitable coupling means for coupling with the spray gun,

such as a screw thread. Additional coupling means, which may involve a connecting tube, may be mounted on the base part 2 but are not essential. Those skilled in the Art will be capable of selecting or designing coupling members suitable for a particular spray gun.

**[0031]** It can be seen that this embodiment is particularly advantageous in that the top part (container) 1 can be used as a mixing cup. The spray gun (which may previously be connected to a source of compressed gas, for example compressed air) is mounted on the base part (lid) 2. Then the container 1 is then closed off by the base part (lid) 2, forming a closed reservoir assembly. The resulting spray gun assembly is then ready for use.

**[0032]** It is noted that the reservoir assembly of Fig. 1 does not include a liner, and that the container 1 is preferably disposable. In this way, a minimum number of parts is required while the cleansing of the spray gun assembly is made easy.

**[0033]** An embodiment of both the top part (container) 1 and the base part (lid) 2 is shown in more detail in Fig. 2. The container 1 is shown to have a substantially U-shaped edge 5 which fits into the corresponding U-shaped rim 4 of the lid 2. These matching elements 4 and 5 form a seal when brought together. The rim is supported by support elements 6 which may be located along the perimeter of the container at a spacing of, for example, 60 degrees. The support elements 6 and the edge 5 are preferably integral with the container 1.

**[0034]** In the embodiment of Fig. 2 the lid 2 is substantially planar, in contrast to the lid (base member) 2 of Figs. 1 and 3. In Fig. 2, the lid 2 may be a normal container lid in which a hole 3 is made for use in a spray gun assembly.

**[0035]** As mentioned above, the container (top part) 1 has no vent opening, which allows the container to be used as a mixing cup or storage container. Prior Art spray gun reservoirs have a vent opening as it is believed that such an opening is indispensable. Air has to be drawn into the reservoir to compensate for the outflow of liquid. However, the present inventor has found that a vent opening may be omitted as air may be drawn in through the seal constituted by the lid rim 4 and the container edge 5. The seal provided by the matching sealing elements (the rim 4 and the edge 5 in the embodiment shown) is therefore not air-tight. However, it has been found that this seal is water-tight (in general: liquid-tight), in particular as in use the pressure in the container 1 will be lower than the outside pressure. Accordingly, air is drawn in but liquid does not leak out.

**[0036]** The container edge 5 and the lid rim 4 are both shown to be inversely U-shaped in Fig. 2. As shown in more detail in Fig. 4, the (inversely) U-shaped rim 4 of the lid (base part) 2 may advantageously be provided with an inner transverse ledge 8 which improves the "snap" action of the seal. This ledge 8 can also be used in the embodiment of Fig. 3.

**[0037]** It will be understood that the positions of the container edge 5 and the lid rim 4 could be reversed,

leading to a (positive) U-shape in Fig. 2, and that other seal could be provided instead which would also draw air but be liquid-tight. For example, a suitable sealing arrangement could comprise gel or foam, in particular gel or foam capable of passing small quantities of air.

**[0038]** An alternative embodiment of the base part or lid 2 is illustrated in Fig. 3, where Fig. 3a shows the base part 2 in (partial) cross-section while Fig. 3b shows the base part 2 in top view.

**[0039]** The base part 2 of Fig. 3 is substantially funnel-shaped, the funnel ending at the central liquid opening 3. An outer surface near the opening 3 may be provided with a screw thread for mounting the base part 2 on a spray gun (10 in Fig. 1) but is in the embodiment shown provided with a bayonet coupling arrangement 7. Other coupling arrangements are also possible, for example "snap-fit" arrangements in which the coupling parts are clamped.

**[0040]** Between the rims 4 a filter 9 is accommodated. Such a filter serves to remove particles from the liquid and thus prevent any blockage of the spray gun. Although the filter 9 is shown to be located at the end of the base part remote from the opening 3, this is not essential and other positions are also possible, for example approximately half-way between the opening 3 and the remote end, or near the opening 3. Suitable notches may be provided in the inner surface of the base part 2 for accommodating the filter 9, preferably using a "snap-fit" mounting.

**[0041]** The base part 2 may be provided with integral support elements 6' which serve to strengthen the part and to distribute any forces exerted on the part.

**[0042]** Both the base part or lid 2 and the top part or container 1 may be made of plastic, preferably transparent plastic. Suitable plastics are thermoplasts, in particular polyethylene, although other materials may also be used. It is preferred that both the container and the lid are made of a bio-degradable plastic material. The container 1 and the lid 2 can be very inexpensive and may both be disposable, thus saving cleansing costs.

**[0043]** The liquid to be sprayed may be any liquid, including but not limited to paint (both paint based on water and paint based on other solvents), water, detergent and herbicide.

**[0044]** The present invention is based upon the insight that a liquid reservoir for use with a spray gun does not require an air vent opening if the seal between the parts of the reservoir is not perfect. The present invention benefits from the insight that in use, the lowered pressure in the liquid reservoir draws air in while preventing the liquid flowing out.

**[0045]** 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.

**[0046]** 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.

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### Claims

1. A liquid reservoir assembly for a spray gun, the assembly comprising a top part (1) and a base part (2), wherein the base part has an opening (3) for passing the liquid to the spray gun (10), **characterised in that** the top part (1) has closed top and wall surfaces, and **in that** the base part and the top part provide a liquid-tight seal but not an air-tight seal. 10  
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2. The liquid reservoir assembly according to claim 1, wherein one of the parts (2) is provided with a substantially U-shaped groove (4) while the other part (1) is provided with a substantially U-shaped rim (5) which fits into the groove. 20
3. The liquid reservoir assembly according to claim 1 or 2, wherein the parts (1, 2) are provided with mating screw threads. 25
4. The liquid reservoir assembly according to claim 1, 2 or 3, wherein the top part (1) of the reservoir of the present invention is constituted by a container while the base part (2) is constituted by a lid. 30
5. The liquid reservoir assembly according to any of the preceding claims, wherein the base part (2) is funnel-shaped. 35
6. The liquid reservoir assembly according to any of the preceding claims, made of a plastic material, preferably a substantially transparent plastic material. 40
7. The liquid reservoir assembly according to any of the preceding claims, further comprising a filter element (9). 45
8. A base part (2) for use in the liquid reservoir assembly according to any of the preceding claims. 50
9. A spray gun assembly, comprising a spray gun (10) and a liquid reservoir assembly according to any of claims 1-7. 55
10. A kit-of-parts for forming an assembly according to any of claims 1-7.
11. A method of using a spray gun, the method comprising the steps of:

- mounting a container lid (2) on a spray gun (10),

- pouring a liquid to be sprayed into a container (1), and
- closing the container using the lid so as to form a closed reservoir on which the spray gun is mounted,

**characterised in that** the container (1) has closed top and wall surfaces, and **in that** the lid (2) and the container (1) provide a liquid-tight seal but not an air-tight seal.

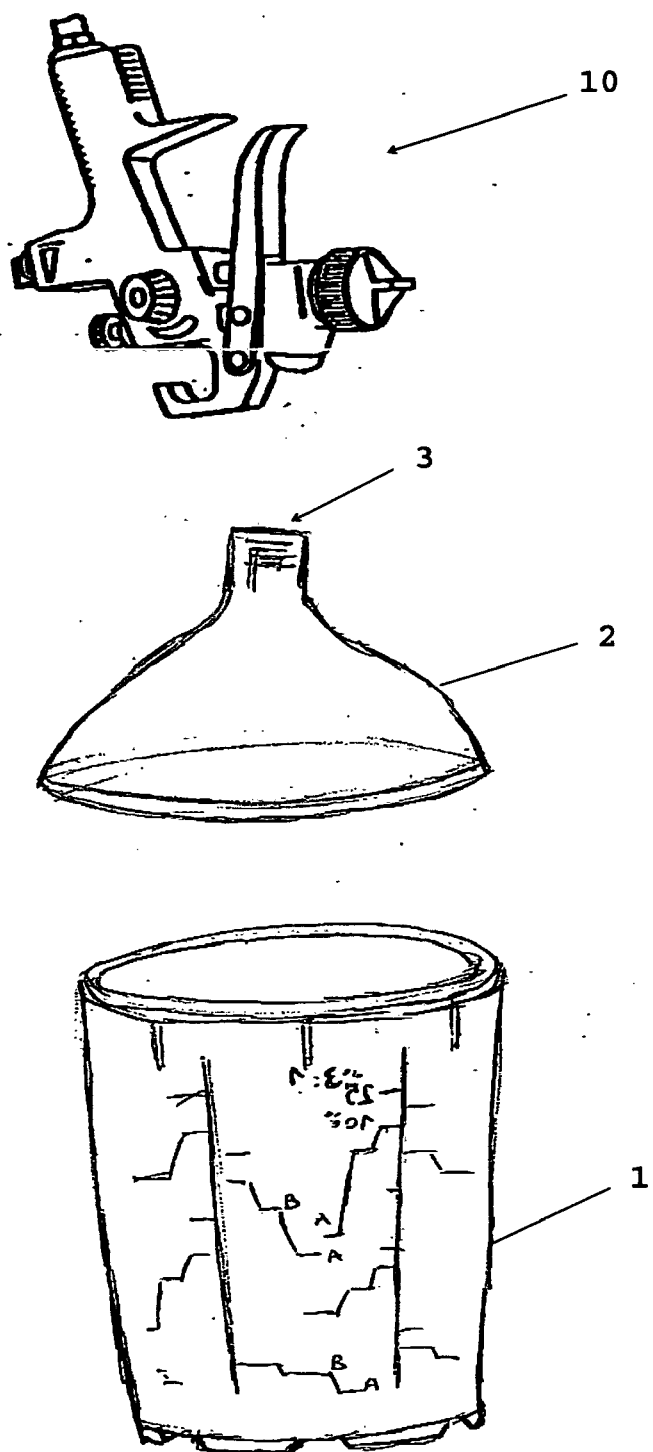


Fig. 1

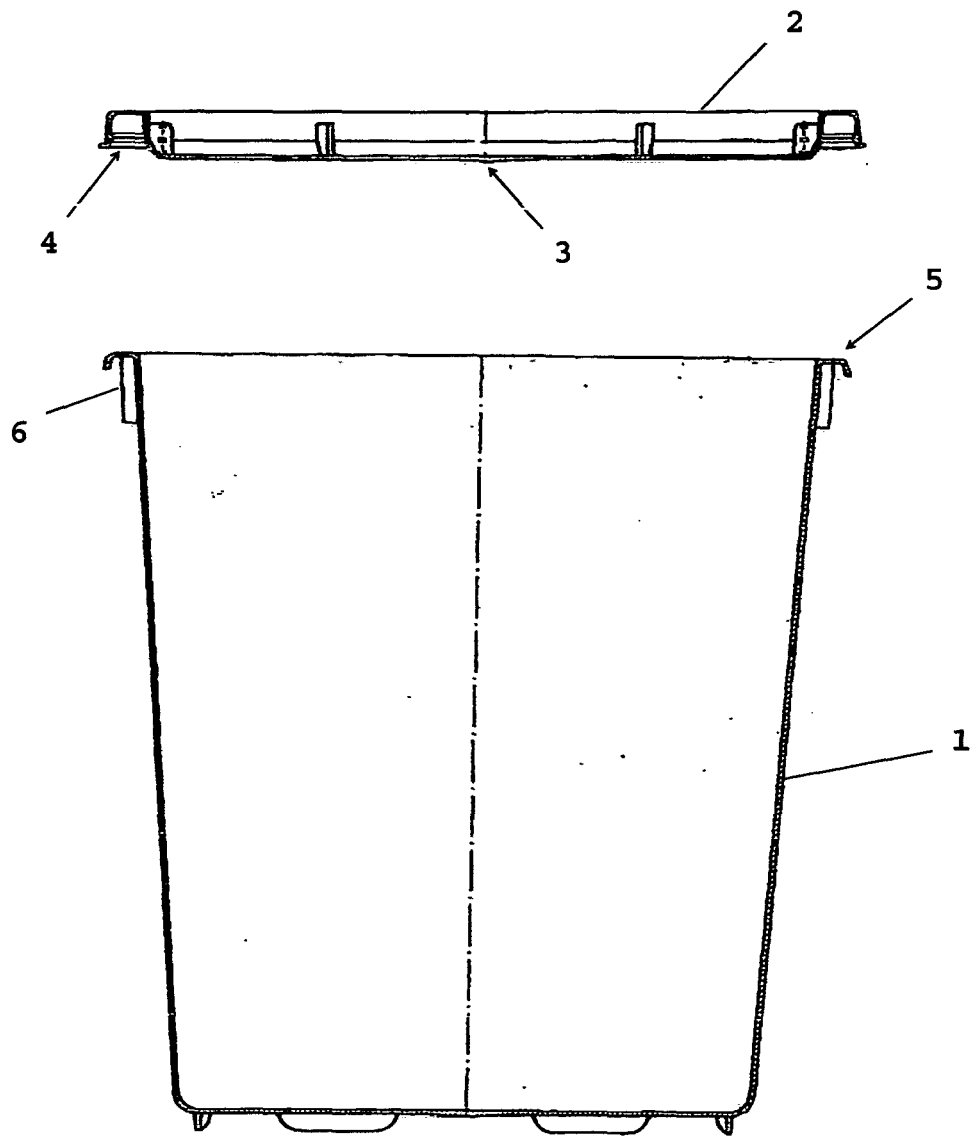
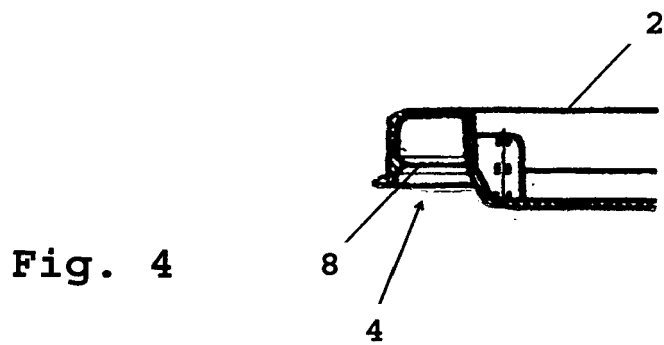
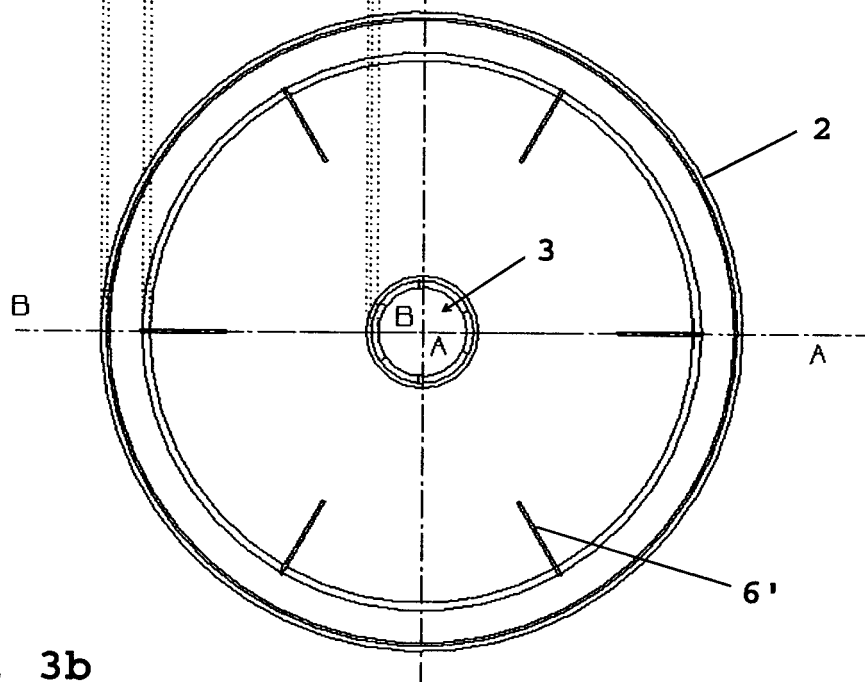
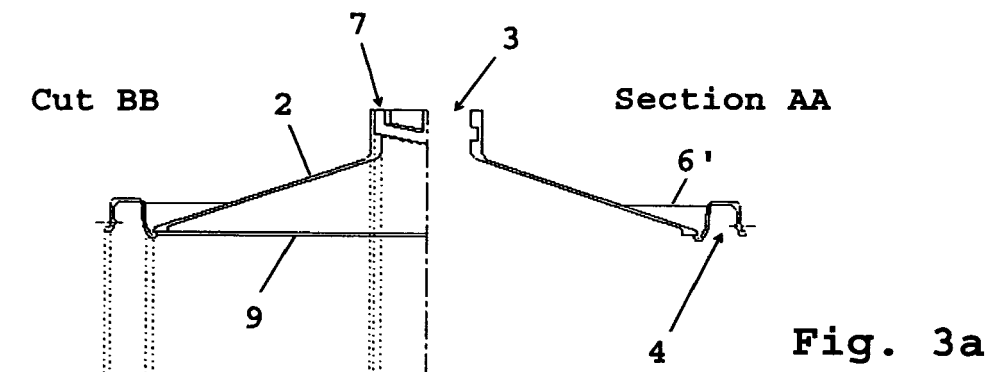


Fig. 2







European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 05 07 6539

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                       |                                  |                                         |
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| Munich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                       | 17 November 2005                 | Innecken, A                             |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                                                                                       |                                  |                                         |

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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