(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 0 954 381 B2**

(12) **NEW EUROPEAN PATENT SPECIFICATION**
After opposition procedure

(45) Date of publication and mention of the opposition decision:
21.01.2009 Bulletin 2009/04

(45) Mention of the grant of the patent:
21.09.2005 Bulletin 2005/38

(21) Application number: **98901823.9**

(22) Date of filing: **14.01.1998**

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

(86) International application number:
PCT/US1998/000796

(87) International publication number:
WO 1998/032539 (30.07.1998 Gazette 1998/30)

(54) APPARATUS FOR SPRAYING LIQUIDS, AND DISPOSABLE CONTAINERS AND LINERS SUITABLE FOR USE THEREWITH

VORRICHTUNG ZUM SPRÜHEN VON FLÜSSIGKEITEN UND EINWEGBEHÄLTER UND LINER DAFÜR

APPAREIL DE PULVERISATION DE LIQUIDES ET RECIPIENTS ET GARNITURES JETABLES UTILISABLES AVEC CELUI-CI

(84) Designated Contracting States:
DE ES FR GB IT

(30) Priority: **24.01.1997 GB 9701447**
18.06.1997 GB 9712784

(43) Date of publication of application:
10.11.1999 Bulletin 1999/45

(60) Divisional application:
03020831.8 / 1 415 719
04002190.9 / 1 435 265
05010707.7 / 1 579 922
05020408.0 / 1 611 960
08103274.0 / 1 961 488

(73) Proprietor: **3M COMPANY**
St. Paul,
Minnesota 55133-3427 (US)

(72) Inventors:
- **JOSEPH, Stephen, C., P.**
Warwickshire CV10 0XP (GB)
- **DOUGLAS, Malcolm, F.**
Swansea SA3 2DP (GB)
- **BUTLER, Alan, F.**
Warwickshire CV9 1HG (GB)
- **BASTOW, David, R.**
Staffordshire B77 3EU (GB)
- **SALHUS, Jerry, E.**
Bloomington, MN 55438 (US)
- **HARTFEL, Margaret, E.**
Minneapolis, MN 55413 (US)

(74) Representative: **Wightman, David Alexander**
Barker Brettell LLP
138 Hagley Road
Edgbaston
Birmingham
B16 9PW (GB)

(56) References cited:
EP-A- 0 678 334
US-A- 3 401 842
US-A- 4 951 875
US-A1- 4 151 929
FR-A1- 1 282 085
US-A- 3 432 104
US-A- 5 143 294

EP 0 954 381 B2

Description

[0001] The present invention relates to apparatus for spraying liquids (for example, spray guns) and, more especially, to the liquid containers or reservoirs of such apparatus.

[0002] FR 1 282 085 discloses the features of the preamble of claim 1.

[0003] In the field of spray guns, it has been proposed for various reasons that a disposable liner should be used in the reservoir of the gun (see US-A-3 211 324, 3 255 972, 4 151 929, 4 951 875 and 5 143 294, and EP-A-0 678 334). Guns for spraying liquids (e.g. paints, garden chemicals etc.) are generally well known and typically comprise a reservoir in which a liquid to be dispensed is contained, and a spray nozzle through which the liquid is dispensed, under pressure, under the control of a trigger mechanism. The liquid may be fed from the reservoir under gravity and/or it may be entrained in a stream of pressurized fluid, for example air or water, which is supplied to the gun from an external source.

[0004] When a user wishes to change the liquid in the reservoir of a spray gun, it is usually necessary to clean the gun very thoroughly to ensure that no traces of the old liquid remain in the gun to contaminate the new liquid. That applies particularly to paint spray guns because any traces of an old batch of paint remaining in a gun may affect the colour of a new batch of paint to the extent that the new batch of paint becomes useless. This can cause problems especially in vehicle body shops where the paint applied to a vehicle is often required to match existing paint work exactly. Alternatively, if paint residues have been allowed to dry within the gun, they may flake and contaminate the new batch of paint. The cleaning of spray guns is, however, a comparatively complex and time consuming operation. Moreover, in the case of paint spray guns, the cleaning operation involves the use of comparatively large amounts of solvents which, for environmental reasons, should be handled and disposed of with care. That, in turn, can add substantially to the cost of a painting operation. It has already been suggested (see, for example, EP-A-0 678 334 mentioned above) that the use of a disposable liner in the paint reservoir (i.e. the paint pot) of a spray gun can simplify the cleaning of the gun and reduce the amount of solvent required.

[0005] US-A-3 432 104 describes a spray gun having a cup assembly for containing paint to be sprayed and, within the cup assembly, a disposable liner that is preferably constructed from a flexible plastic film material. The liner is in the form of a bag, sealed at the bottom end and open at the upper end, and the sides of the liner are pleated to allow it to expand when filled with liquid.

[0006] The present invention is concerned with the provision of liquid spraying apparatus having an improved liner in the fluid reservoir for the liquid to be sprayed and, in particular, a liner in which liquid (for example, paint) can be accurately mixed as required. It is a further object of the invention to facilitate removal of the liner from the reservoir after use.

[0007] The present invention provides liquid spraying apparatus as defined in the accompanying claim 1. In an embodiment of the invention, the reservoir and the liner of the liquid spraying apparatus each comprise an open-ended container having a base and side walls, and a removable lid is located in the open end of the reservoir and secures the liner to the reservoir at that end. The liner may be thermo/vacuum formed from a thermoplastic material.

[0008] The term "thermo/vacuum-forming" as used herein means a process by which a sheet of material is heated to a softened condition and formed into a required shape, defined by a mould, while in that softened condition. It includes the case in which the application of a differential air pressure is used to assist in forming the material into the required shape and, in particular, includes the case in which a vacuum is produced on one side of the material to assist in forming it into the required shape (also known simply as "vacuum-forming").

[0009] The term "collapsible" as used herein with reference to the side walls of a liner for use in liquid spraying apparatus in accordance with the invention indicates that the side walls can be distorted so that, by the application of moderate pressure (e.g. hand pressure), the rim of the liner can be pushed towards the base of the liner, without the side walls being ruptured.

[0010] The term "paint" is used herein to include all forms of paint-like coating materials that can be applied to a surface using a spray gun, whether or not they are intended to colour the surface. The term includes, for example, primers, base coats, lacquers and similar materials.

[0011] By way of example only, embodiments of the invention will be described with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a prior art spray gun, shown partly-disassembled so that it can be filled with paint;

Fig. 2 shows the components of an alternative form of paint reservoir for the gun of Fig. 1, in an exploded condition;

Fig. 3 shows the paint reservoir of Fig. 2 in an assembled condition, with an adapter for connecting the reservoir to a spray gun;

Fig. 4 shows a longitudinal cross-section through the paint reservoir and the adapter of Fig. 3;

Fig. 5 shows the paint reservoir of Fig. 4 being attached to a spray gun;

Fig. 6 shows the paint reservoir of Fig. 4 in use on a spray gun;

Fig. 7 shows components of the paint reservoir of Fig. 4 being removed after use;

Fig. 8 is similar to Fig. 2 but shows a modified form of paint reservoir;

Fig. 9 shows a longitudinal cross-section through an alternative form of lid for the paint reservoirs of Figs.

2 to 4 and 8;

Fig. 10 is similar to Fig. 2 but shows another modified form of paint reservoir;

Fig. 11 shows part of a longitudinal cross-section through the paint reservoir of Fig. 10;

Fig. 12 is a perspective view of a liner for a paint reservoir of a spray gun;

Fig. 13 is a similar view but showing the liner in the process of being collapsed for disposal;

Fig. 14 (a) to (c) is a diagrammatic illustration of a method for producing a liner for the paint reservoirs of Figs. 2 to 4, and 10; and

Fig. 15 illustrates a modification of the method of Fig. 14.

[0012] Fig. 1 of the drawings illustrates a typical prior art paint spray gun 1 of the gravity-feed type. The gun 1 comprises a body 2, a handle 3 which extends downwards from the rear end of the body, and a spray nozzle 4 at the front end of the body. The gun is manually-operated by a trigger 5 which is pivotally-mounted on the sides of the gun. The paint reservoir, or paint pot, 6 which contains paint (or similar material) to be discharged by the gun, is located on the top of the body 2 and communicates with an internal passageway (not visible) for compressed air, which extends through the gun from a connector 7 at the lower end of the handle 3 to the nozzle 4. In use, the connector 7 is connected to a source of compressed air (not shown) so that, when the user pulls on the trigger 5, compressed air is delivered through the gun to the nozzle 4 and entrains and atomizes paint which is being delivered under gravity from the pot 6. The paint is then discharged through the nozzle 4 with the compressed air, as a spray.

[0013] The paint which is contained in the pot 6 is often mixed by hand (for which a separate receptacle, for example a jug, is required), and poured into the pot. To ensure that there are no unwanted particles in the paint, which would spoil the finish of the painted surface, the paint is usually poured into the pot 6 through a filter. Fig. 1 shows the cap 8 of the pot 6 removed for this purpose, and a conical filter 9 about to be positioned on the open end of the pot. The filter 9 is shown as being a known type of disposable conical filter, having solid sides and a filter mesh portion 10 at the pointed end of the cone. When the pot 6 has been filled with paint, the filter 9 is removed and discarded, and the cap 8 of the pot is replaced. If the filter 9 is a reusable filter then, like the gun, it should be cleaned thoroughly before it is used with a different liquid (e.g. a paint of a different colour or a liquid having a different chemical composition).

[0014] Fig. 2 illustrates the components of an alternative form of paint pot 11 which can be used on the gun 1 of Fig. 1 (or any similar gun) instead of the pot 6. The alternative form of paint pot 11 is shown assembled in Fig. 3 and (in cross-section) in Fig. 4.

[0015] The paint pot 11 comprises an open container 12, comparable in size to a conventional paint pot of a hand-held spray gun, having an air hole 12A in its base and provided with a disposable liner 13. The liner 13 corresponds in shape to (and is a close fit in) the interior of the container 12 and has a narrow rim 14 at the open end which sits on the top edge of the container. The container 12. also has a disposable lid 15 which is a push-fit in the open end of the liner 13. The lid 15 has a central aperture 16 (Fig. 4) from which extends a connector tube 17 provided, at its end, with outward extensions 18 forming one part of a bayonet connection. The aperture 16 is covered by a filter mesh 19 which may be a push fit into the aperture or may be an integral part of the lid 15. The lid 15 is held firmly in place on the container 12 by an annular collar 20 which screws onto the container, on top of the lid.

[0016] The paint pot 11 is attached to the spray gun 1 through the use of an adapter 21 shown, separated from the paint pot, in Fig. 3 and (in cross-section) in Fig. 4. The adapter 21 is a tubular component which, at one end 22, is formed internally with the other part of the bayonet connection for attachment to the connector tube 17 of the paint pot 11. At the other end 23, the adapter is shaped to match the standard attachment of the spray gun paint pot (typically a screw thread).

[0017] The liner 13 of the paint pot 11, as already mentioned, corresponds in shape to the interior of the container 12 and has a narrow rim 14 at the open end which sits on the top edge of the container. As described below, the liner is self-supporting but is also collapsible and, preferably, has a comparatively rigid base 13A and comparatively thin side walls 13B so that, when it collapses, it is in the longitudinal direction by virtue of the side walls collapsing rather than the base. In addition, the liner 13 has no pleats, corrugations, seams, joints or gussets, and also no groove at the internal junction of the side walls 13B with the base 13A. A liner of that type will be described in greater detail later with reference to Figs. 12 and 13. Also described below is a thermo-forming process by which such a liner can be produced.

[0018] The container 12 of the paint pot 11 is formed from a plastic material, for example polyethylene or polypropylene, and may be translucent (as shown in Fig. 2) or opaque, and of any suitable size. For use with a paint spray gun, containers having a capacity of 250, 500 or 800 ml could typically be used, although other sizes could be used if required. The lid 15 is also formed from a plastic material, for example, polyethylene or polypropylene, and may be formed by an injection moulding process. The lid may be translucent or opaque and may be coloured. The collar 20 may be a moulded plastic component, or it may be a machined metal (for example, aluminium) component. The adapter 21 may be a machined metal component and may, for example, be formed from aluminium and anodised.

[0019] To use the paint pot 11, the adapter 21 is attached (at the end 23) to the spray gun and is left in position. Then, with the paint pot 11 disassembled as shown in Fig. 2, the liner 13 is pushed inside the container

12. Paint is then put into the container, the lid 15 is pushed into place and the collar 20 is screwed down tightly to hold the lid in position. The top portion of the liner 13 is then trapped between the lid 15 and the container 12, and the liner rim 14 is trapped between the top edge of the container and the collar 20, as shown in Fig. 4. Advantageously, the lid 15 is formed with barbs (not visible) on its surface to engage and hold the top of the liner. The spray gun 1 is then inverted from its normal operating position so that the end of the connector tube 17 can be attached to the adapter 21 as illustrated in Fig. 5, after which the gun can be returned to its normal position (illustrated in Fig. 6) and is ready for use in the usual way: As paint is removed from within the liner 13, the sides of the liner collapse as a result of the decreased pressure within the liner. The base of the liner, being more rigid, retains its shape so that the liner tends to collapse in the longitudinal rather than the transverse direction thereby reducing the possibility of pockets of paint being trapped in the liner.

[0020] The user can choose to evacuate the air from within the liner 13 before operating the spray gun 1 although that is not essential. It does, however, increase the range of angles at which the gun will function satisfactorily since there is no risk of air entering the gun from the paint pot 11. To evacuate the air from within the liner 13, the trigger 5 of the gun should be actuated while the gun is still in the position shown in Fig. 5.

[0021] After use, when the gun is to be cleaned, the gun can be re-inverted and the trigger 5 can be actuated briefly to allow paint within the gun to drain back into the liner in the pot 11. The pot 11 is then removed from the gun by detaching the connector tube 17 from the adapter 21 (which remains on the gun). The collar 20 is removed from the container 12, and the lid 15 is then pulled out, bringing with it the collapsed liner 13, as shown in Fig. 7. The lid (including the filter 19) and liner are discarded, leaving the container 12 and collar 20 clean and ready for re-use with a fresh liner and lid. Only the gun itself needs to be cleaned, resulting in a substantial reduction in the amount of solvent used. The risk of unused paint spilling from the pot 11 is also substantially reduced because the liner 13 is removed and discarded with the lid 15 in place. Moreover, because the liner is discarded in a collapsed condition, the amount of space required for collection of used liners is minimized.

[0022] Because the liner 13, as described above, is an accurate fit inside the container 12 and has a smooth internal surface, it is possible to mix paint in the container 12 itself rather than in a separate receptacle. In that way, cleaning of a separate mixing receptacle can be eliminated to achieve a further reduction in the amount of solvent used. That possibility does not exist when using a gravity-feed gun with a conventional paint pot, as shown at 6 in Fig. 1, because the latter is open at both ends. The possibility of the liner 13 being punctured or damaged by the mixing implement is minimized, first because the liner fits inside the container 12 exactly and, second, because the self-supporting nature of the liner (described below) means that it is less likely to be dragged around inside the container during the mixing process. To facilitate the use of the container 12 as a mixing receptacle, the side walls of the container may be provided with markings 25 (Figs. 2 and 3) enabling the volume of the contents of the container to be determined. The general shape of the container 12 and, in particular, the fact that it is flat-bottomed and stable when in the orientation shown in Fig. 2 makes it particularly suitable for use as a mixing receptacle, as does the fact that it is translucent as already described. If, however, the container 12 is opaque, it could be formed with slots in the side walls, through which the liner 13 could be viewed to enable the user of the spray gun to assess the amount of paint in the pot 11 at any time.

[0023] When paint is mixed in the container 12, the inclusion of the filter mesh 19 in the container lid 15 prevents unwanted particles in the paint from entering the spray gun. The mesh 19 can be omitted, however, if the paint is textured, or if it is mixed in a separate receptacle and strained when it is transferred to the lined container 12 or if the presence of contaminants in the paint is unimportant.

[0024] Although the collar 20 of the paint pot 11 is described above as being a separate item, it could be combined with the lid 15, in which case it would also be disposable. As a further alternative, the lid 15 (with the connector tube 17 and the mesh 19) could be formed as an integral part of the liner 13, to which it could be connected by a hinge joint 26 as illustrated in Fig. 8. In that case, there is no need for the lid to fit inside the mouth of the liner to ensure that the lid and liner will be removed together from the container after use: however, that would still be necessary if the lid were required to remain in place in the liner after use. As yet another alternative, the collar 20 could be replaced by a band secured around the top of the pot 11 to hold the lid 15 and liner 13 in place. The band could be secured to the pot 11 and could, for example, be formed from rubber or be part of a metal clip arrangement of the type used to secure the tops of jars and bottles.

[0025] If a more positive engagement is required between the lid 15 of Figs. 2 to 4 and the liner 13, the lid could be a snap fit with the liner instead of a push-fit as shown. The liner could, for example, be formed with an internal circumferential rib positioned to engage in a corresponding groove on the adjacent surface of the lid.

[0026] As yet a further alternative, the push-in lid 15 could be replaced by a lid 27 having the form shown in Fig. 9. The lid 27 is also a push-fit inside the liner but is generally conical in shape and at its upper end 28, corresponds in shape to the end of the connector tube 17 of Figs. 2 to 4 so that it will engage in the same adapter 21. The lid 27 has an outwardly-extending rim 29 which will sit on top of the liner rim 14, and a shaped portion 29A which will engage the internal surface of the liner. The form of the shaped portion 29A allows the lid 27 to

be pushed into the mouth of the liner and also provides a recess 29B into which the edge of the liner can the contract so that the lid is securely located. The form of the shaped portion illustrated in Fig. 9 is not essential, however, and alternatives could be used including, for example, barbs as described above with reference to the lid 15 of Fig. 4. The lid 27 is held in place on the container by a screw-on collar, similar to the collar 20, which will sit on top of the rim 29 of the lid. The lid 27 may incorporate a filter similar to the filter 19 of Figs. 2 to 5. Alternatively, in each case, the filter may be generally cylindrical in shape so that it can be inserted into the tubular part of the lid from the end adjacent the bayonet connection. In that case, the internal shaping of the tubular part of the lid should ensure that the filter remains in position when the spray gun is in use.

[0027] The components of an alternative form of paint pot 30 are illustrated in Fig. 10.

The pot 30, like the pot 11 of Fig. 2, comprises a container 12 and a liner 13. In this case, however, the filter 19 of the pot 11 is formed as a separate item 31 having a diameter corresponding to that of the container 12 and including a circumferential sealing gasket 32. In addition, the lid 15 and collar 20 of the pot of Fig. 2 are replaced by a generally-conical lid 33 which is a screw-fit onto the container and which, at its upper end has a tubular extension 34 of similar shape to the connector tube 17 of Fig. 3 so that it will engage in the same adapter 21. The pot 30 is assembled by pushing the liner 13 inside the container 12 and then, after paint has been put into the container, placing the filter 31 on top of the container and securing it in position by screwing down the lid 33. The rim 14 of the liner 13 and the sealing gasket 32 of the filter 31 are then both trapped between the lid 33 and the container 12, as illustrated in Fig. 11, thereby preventing the leakage of paint from the pot 30 at this location when the pot has been secured to a spray gun and is inverted for use.

[0028] The adapter 21 could be dispensed with by forming the ends of the tubular parts 17, 34 of lids of the containers 11, 30 with screw threads so that they can engage directly in the standard paint pot attachment on the spray gun 1.

[0029] Although the above description refers to a paint spray gun, it should be understood that it applies also to other types of spray gun including, for example, guns of the type which are attached to water hoses (rather than air supply lines) for spraying substances such as garden chemicals. The description also applies to suction-feed guns, i.e. guns in which the liquid outlet from the reservoir is located at the top of the reservoir when the gun is in use and liquid is drawn from the reservoir through a supply tube by the action of the compressed air or other pressurized fluid flowing through the gun. In that case, the construction of the liner and/or the supply tube should be such that the liner can collapse without blocking the supply tube. For example, a short supply tube can be used provided all air is exhausted from the liner before the gun is used. Alternatively, a flexible supply tube could be used, which will collapse with the liner. As a further alternative, a modified liner which does not have a rigid base could be used, so that the liner collapses in a different manner from the liner 13 of Fig. 2. Since the reservoir of a suction-feed gun is not inverted during use, as in a gravity-feed gun, it is possible to omit the air hole in the reservoir, provided the connection between the reservoir and the gun permits air to enter the space between the reservoir and the liner.

[0030] Returning now to the paint pot 11 of Fig. 2, the liner 13 will now be described in greater detail, together with a method by which it can be produced. The liner, shown in isolation in Figs. 12 and 13, is preferably transparent and is thermoformed from a single piece of plastics material, preferably polyethylene or polypropylene. The shape of the liner is dictated by the internal shape of the container 12. The comparatively rigid base 13A is circular and the liner 13, like the inside of the container 12, is generally cylindrical but tapers inwards slightly from the mouth towards the base 13A. The rim portion 14, like the base, is also comparatively rigid but the side walls 13B are flexible and, as already described, can be made to collapse. Nevertheless, the liner 13 is capable of standing, unsupported, on the base 13A with the side walls 13B extended and upright as shown in Fig. 12. When the liner 13 collapses, the comparatively rigid base 13A retains its form but moves towards the rim portion 14 of the liner as a consequence of the collapse of the side walls 13B, as illustrated in Fig. 13. The side walls 13B collapse in a similar fashion to a plastic bag without being ruptured (e.g. by splitting, tearing or cracking).

[0031] In one form, the liner has a height of about 110 mm, a diameter at its base 13A of about 78 mm and a diameter at its mouth (excluding the rim portion 14) of about 86 mm. The base has a thickness of about 400 μm, the rim portion 14 has a thickness of about 900 μm, and the side walls 13B have a thickness of about 150 μm. In another form, the liner has the same height and the same diameters at its base and mouth but the base has a thickness of about 300 μm, the rim portion has a thickness of about 200 μm, and the side walls 13B have a thickness in the range of from 50 to 250 μm.

[0032] A method of producing a liner as shown in Fig. 12 will now be described with reference to Fig. 14 (a)-(c).

[0033] A sheet 60 of low density polyethylene (LDPE), approximately 250 x 225 mm and 0.5 mm thick, was clamped at its periphery in the moulding frame 61 of a vacuum-forming machine. The LDPE material is commercially available from, for example, Plastech Extrusions Ltd. of Widnes, Cheshire, England and the vacuum-forming machine used was the model "FLB 725" from C.R.Clarke and Company Limited of Ammanford, Carmarthenshire, Wales. It will be appreciated, however, that any suitable plastics material could be used and that the method could be carried out using any suitable thermo/vacuum-forming machine.

[0034] After the sheet 60 had been placed in position,

the bank of heaters 62 of the vacuum-forming machine was moved into position above the sheet (as shown in Fig. 14(a)), and the sheet was heated to a soft, pliable, state suitable for vacuum-forming. The fact that the sheet had reached the appropriate temperature could be seen by the change in its appearance from milky to transparent.

[0035] The bank of heaters 62 was then removed and the mould platen 63 was moved upwards from below the sheet 60, bringing the mould 64 into contact with the sheet to deform the latter in an upwards direction. At this time, the vacuum pump of the machine was switched on to remove air from beneath the sheet 60. The upward movement of the mould platen 63 was continued until the platen reached the top of its stroke, where it seals against the frame 61 holding the sheet 60 (Fig. 14(b)). The mould 64 had a shape corresponding to the internal shape of the container 12 of the spray gun paint pot 11.

[0036] Operation of the vacuum pump was continued with the mould platen sealed against the frame 61 and the pressure difference created between the upper and lower sides of the sheet 60 caused the latter (which was already in contact with the top of the mould 64) to move down into contact with the sides of the mould (Fig. 14 (c)). The mould platen 63 was then moved away from the cooled sheet 60 leaving a moulded portion 65 having the desired shape of the liner 13 and without any pleats, corrugations, seams, joints or gussets, or any groove at the internal junction of the side walls 13B with the base 13A. Following removal from the frame 61, the sheet 60 was trimmed around the mouth of the moulded portion 65 to form the rim 14 of the liner 13. The width of the rim 14 is determined by the location at which the sheet 60 is trimmed at this stage, and can be adjusted as required.

[0037] The above-described process was found to yield a moulded portion 65 (and hence a liner 13) in which that part of the plastics sheet 60 that had been in contact with the sides of the mould 64 during the forming process was substantially thinner than the part that had been in contact with the top of the mould. The process differs from a conventional vacuum-forming process which would aim to eliminate, as far as possible, any differences in thickness in the moulded portion 65 and, to that end, would include the additional step of applying air pressure to the underneath of the heated sheet 60, after step (a) of Fig. 14, to cause the sheet to adopt a dome shape before the mould platen 63 seals against the frame 61: the thickness of the sheet would then be comparatively even when it moves into contact with the mould 64 in step (c) of Fig. 14. Generally in the process illustrated in Fig. 14, for a given size of sheet 60, the size of the mould 64 has been found to affect the thickness of the sides of the resulting liner 13 more than the base. In other words, if the size of the mould 64 is increased, the thickness of the base of the resulting liner 13 will be about the same but the sides of the liner will be much thinner. On the other hand, if the size of the mould is decreased, it may be found that a point is reached at which longitudinal creases appear in the sides of the liner 13.

[0038] If a further reduction is required in the thickness of the sheet 60 where it contacts the sides of the mould 64 in step (c) of Fig. 14, the sheet 60 can be located between two thin metal plates 66 (Fig. 15) when it is clamped in the frame 61 of the forming machine, each metal plate 66 having a hole 67 in the location of the mould 64 and larger in size than the largest cross-section of the mould. The plates 66 are also clamped in the frame 61 and the process of Fig. 14 is then repeated. The effect of the plates 66 is that only the central portion of the sheet 60 is exposed directly to the heaters 62 and is drawn over the mould 64 when the latter has been moved upwards (in this case, through the holes 67 in the plates 66). In that way, less of the sheet 60 is used in the formation of the moulded portion 65 and the resulting liner 13 will have a slightly thinner base 13A and rim 14 and substantially thinner side walls 13B. It is also possible to obtain a comparable result by using only the upper plate 66 shown in Fig. 15.

[0039] As a modification of the process illustrated in Fig. 15, the plastics sheet 60 can be in the form of a circular disc of material which is clamped at its periphery between the two plates 66. Depending on the size of the disc, the clamped periphery may then form the rim 14 of the liner 13 and there may be no excess material to be trimmed away.

[0040] It has been found that a liner 13 produced by a process as described with reference to Figs. 14 and 15 will collapse as described with reference to Fig. 13 when used in the spray gun reservoir 11 of Fig. 2. The liner 13 can also be collapsed by hand by pushing the base 13A of the liner towards the rim 14. It has been found that the liner is typically capable of standing unsupported on its base 13A and this feature may be of use for storage purposes. The liner has no pleats, corrugations, seams, joints or gussets, and no groove at the internal junction of the side walls 13B with the base 13A: consequently, there are no internal locations in which material within the liner can become trapped. The base 13A of the liner will, of course, occupy some space at the base of the container 12 of the spray gun reservoir 11 and the markings on the wall of the container 12 need to be positioned to take account of that fact.

[0041] Generally, in an article of the type shown in Fig. 12, the base 13A is typically at least 25 μm thick, more typically at least 100 μm thick. The side walls 13B are thin in comparison to the base 13A, to the extent that they can be collapsed as described to facilitate disposal of the liner: typically, the thickness of the side walls 13B is less than half the thickness of the base 13A and may be less than one fifth the thickness of the base. Depending on the materials used, and the intended use of the liner, the side walls 13A will usually be less than 250 μm thick.

[0042] For certain uses of an article of the type shown in Fig. 12, the rim portion 14 may not be essential and can be omitted. If no rim 14 is required the sheet 60 of

Fig. 14(c) would, of course, be trimmed immediately adjacent the mouth of the moulded portion 65. It has been found that the self-supporting nature of the liner can be retained even if the rim portion 14 is omitted.

[0043] It should also be noted that the base 13A of a liner of the type shown in Fig. 12 need not be circular but could have another shape, for example rectangular or triangular; dictated by the shape of the reservoir in which the liner is required to fit. In some cases, the base need not be rigid.

[0044] It will be appreciated that the process illustrated in Figs. 14 and 15 requires the mould 64 to have a slightly tapered shape with the largest cross-section being at the lower end (as seen in Figs. 14 and 15) to allow the sheet 60 to be removed when the forming operation is complete: that, in turn, requires that the reservoir of the liquid spraying apparatus should be similarly tapered mternally. The liner may be formed from any suitable thermoplastic material capable of forming a thin film which is impervious to the materials it is intended to contain. In some cases, it may be desirable to use a material which is in the form of a laminate. For most applications, however, polyolefins such as polyethylene or polypropylene are preferred since these a relatively cheap, are readily thermo-formable, and are inert to most aqueous and organic fluids.

Claims

1. Apparatus for spraying liquids, comprising:

a fluid reservoir (12),
a removable collapsible liner (13) located within the reservoir, said liner (13) having a base (13A) and side walls (13B), and
a spray nozzle (4) for dispensing fluid from within the liner (13),

wherein the liner (13) collapses as fluid is withdrawn therefrom during operation of the spraying apparatus;
wherein
the liner (13) has a shape that corresponds to the interior of the reservoir (12) such that it is a close fit within the latter and such that the liner (13) has in its non-collapsed state no pleats, corrugations, seams, joints or gussets, and also no groove at the Internal junction of the side walls (13B) with the base (13A), **characterized in that** the liner (13) is self-supporting.

2. Apparatus as claimed in claim 1, including removable lid (15) which is located in an opening in the reservoir (12) and which secures the liner (13) to the reservoir (12) at the periphery of the opening.

3. Apparatus as claimed in claim 1, in which the reservoir (12) and the liner (13) each comprise an open-ended container having a base and side walls, and in which a removable lid (15) is located at the open end of the reservoir (12) and secures the liner (13) to the reservoir (12) at that end.

4. Apparatus as claimed in claim 2 or claim 3, in which the liner (13) is removable from the reservoir (12) together with the lid (15).

5. Apparatus as claimed in any one of claims 2 to 4, further comprising a removable filter (19) positioned to filter liquid passing from within the liner (13) to the spray nozzle (4).

6. Apparatus as claimed in claim 5, In which the filter (19) is located in the reservoir (12) and is removable from the reservoir (12) together with the lid (15).

7. Apparatus as claimed in any one of claims 2 to 6, in which the liner (13) has a comparatively rigid base (13A), side walls (13B) that are thin in comparison to the base (13A) and are collapsible and a flat outwardly-extending rim portion (14) that is shaped to sit on the edge of the opening In the reservoir (12).

8. Apparatus as claimed in claim 7, in which the rim portion (14) is also comparatively rigid.

9. Apparatus as claimed in claim 7 or claim 8, in which the rim portion (14) is substantially thicker than the side walls (13B) of the liner (13).

10. Apparatus as claimed in any one of claims 7 to 9, in which the liner (13) is capable of standing, unsupported, on the base (13A) with the side walls (13B) extended and upright.

11. Apparatus as claimed in any one of claims 7 to 10, in which the liner (13) has a circular base (13A) and is generally cylindrical in shape.

12. Apparatus as claimed in any one of the preceding claims, in which the liner (13) is thermo/vacuum-formed from a thermoplastic material.

13. Apparatus as claimed in any one of the preceding claims, in which the reservoir (12) Is formed from a plastic material.

14. Apparatus as claimed in any one of the preceding claims, the apparatus being in the form of a gravity-fed spray gun (1) and the reservoir being provided with an air vent (12A).

Patentansprüche

1. Vorrichtung zum Sprühen von Flüssigkeiten, die Folgendes aufweist:

   ein Fluidreservoir (12),
   einen abnehmbaren, zusammenlegbaren Liner (13),
   der sich im Reservoir befindet und eine Basis (13A) und Seitenwände (13B) aufweist, und
   eine Sprühdüse (4) zur Abgabe von Fluid aus dem Liner (13),
   wobei sich der Liner (13) beim Abziehen von Fluid daraus während des Betriebs der Sprühvorrichtung zusammenlegt;
   wobei der Liner (13) eine Form aufweist, die dem Inneren des Reservoirs (12) entspricht, derart, dass sie genau in Letzteres hineinpasst, und dass der Liner (13) in seinem nicht zusammengelegten Zustand keine Falten, Wellungen, Nähte, Verbindungsstellen oder Seitenfalten und auch keine Nut an der inneren Verbindungsstelle der Seitenwände (13B) mit der Basis (13A) aufweist,

   dadurch gekennzeichnet, dass der Liner (13) selbsttragend ist.

2. Vorrichtung nach Anspruch 1, die einen abnehmbaren Deckel (15) aufweist, der sich in einer Öffnung im Reservoir (12) befindet und den Liner (13) am Umfang der Öffnung am Reservoir (12) befestigt.

3. Vorrichtung nach Anspruch 1, wobei das Reservoir (12) und der Liner (13) jeweils einen ein offenes Ende aufweisenden Behälter mit einer Basis und Seitenwänden aufweisen, und wobei ein abnehmbarer Deckel (15) am offenen Ende des Reservoirs (12) angeordnet ist und den Liner (13) an dem Ende am Reservoir (12) befestigt.

4. Vorrichtung nach Anspruch 2 oder 3, wobei der Liner (13) zusammen mit dem Deckel (15) aus dem Reservoir (12) entfernt werden kann.

5. Vorrichtung nach einem der Ansprüche 2 bis 4, die weiterhin einen entfernbaren Filter (19) aufweist, der zum Filtern von aus dem Liner (13) zur Sprühdüse (4) strömender Flüssigkeit angeordnet ist.

6. Vorrichtung nach Anspruch 5, wobei der Filter (19) im Reservoir (12) angeordnet ist und zusammen mit dem Deckel (15) aus dem Reservoir (12) entfernt werden kann.

7. Vorrichtung nach einem der Ansprüche 2 bis 6, wobei der Liner (13) eine vergleichsweise starre Basis (13A), Seitenwände (13B), die im Vergleich mit der Basis (13A) dünn sowie zusammenlegbar sind und einen flachen, sich nach außen erstreckenden Randteil (14) aufweist, der so geformt ist, dass er auf dem Rand der Öffnung im Reservoir (12) sitzt.

8. Vorrichtung nach Anspruch 7, wobei der Randteil (14) auch vergleichsweise starr ist.

9. Vorrichtung nach Anspruch 7 oder 8, wobei der Randteil (14) wesentlich dicker ist als die Seitenwände (13B) des Liners (13).

10. Vorrichtung nach einem der Ansprüche 7 bis 9, wobei der Liner (13) ungestützt auf der Basis (13A) stehen kann, wobei die Seitenwände (13B) ausgebreitet und aufrecht sind.

11. Vorrichtung nach einem der Ansprüche 7 bis 10, wobei der Liner (13) eine kreisförmige Basis (13A) aufweist und allgemein zylindrisch geformt ist.

12. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei der Liner (13) durch Thermo-/Vakuumformen aus einem thermoplastischen Material hergestellt ist.

13. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei das Reservoir (12) aus einem Kunststoffmaterial hergestellt ist.

14. Vorrichtung nach einem der vorhergehenden Ansprüche, die in Form einer Schwerkraftzuführungs-Sprühpistole (1) vorliegt, wobei das Reservoir mit einem Lüftungskanal (12A) versehen ist.

Revendications

1. Appareil de pulvérisation de liquides, comprenant:

   un réservoir de fluide (12),
   une garniture pliante amovible (13) située à l'intérieur du réservoir, ladite garniture (13) comprenant une base (13A) et des parois latérales (13B), et
   une buse de pulvérisation (4) pour distribuer un fluide à partir de l'intérieur de la garniture (13),
   dans lequel la garniture (13) se plie lorsque le fluide est aspiré hors de celle-ci pendant le fonctionnement de l'appareil de pulvérisation,
   dans lequel la forme de la garniture (13) correspond à l'intérieur du réservoir (12), de telle sorte qu'elle s'adapte étroitement à l'intérieur de ce dernier, et que dans son état non plié, la garniture (13) ne comporte aucun pli, joint ou gousset, ni aucune ondulation ou couture, et ne présente en outre aucune rainure à la jonction interne des parois latérales (13B) avec la base (13A), **ca-**

ractérisé en ce que la garniture (13) est autoportante.

2. Appareil selon la revendication 1, comprenant un couvercle amovible (15) qui est disposé dans une ouverture dans le réservoir (12) et qui attache la garniture (13) au réservoir (12) à la périphérie de l'ouverture.

3. Appareil selon la revendication 1, dans lequel le réservoir (12) et la garniture (13) comprennent chacun un récipient à extrémité ouverte présentant une base et des parois latérales, et dans lequel un couvercle amovible (15) est placé à l'extrémité ouverte du réservoir (12) et fixe la garniture (13) au réservoir (12) à cette extrémité.

4. Appareil selon la revendication 2 ou la revendication 3, dans lequel la garniture (13) peut être extraite du réservoir (12) de concert avec le couvercle (15).

5. Appareil selon l'une quelconque des revendications 2 à 4, comprenant en outre un filtre amovible (19) positionné de manière à filtrer le liquide passant depuis l'intérieur de la garniture (13) vers la buse de pulvérisation (4).

6. Appareil selon la revendication 5, dans lequel le filtre (19) est disposé dans le réservoir (12) et peut être extrait du réservoir (12) de concert avec le couvercle (15).

7. Appareil selon l'une quelconque des revendications 2 à 6, dans lequel la garniture (13) comprend une base relativement rigide (13A), des parois latérales (13B) minces comparativement à la base (13A) et pliables, et une partie de rebord plat s'étendant vers l'extérieur (14) configurée de manière à se placer sur le bord de l'ouverture prévue dans le réservoir (12).

8. Appareil selon la revendication 7, dans lequel la partie de rebord (14) est également relativement rigide.

9. Appareil selon la revendication 7 ou la revendication 8, dans lequel la partie de rebord (14) est sensiblement plus épaisse que les parois latérales (13B) de la garniture (13).

10. Appareil selon l'une quelconque des revendications 7 à 9, dans lequel la garniture (13) est capable de se tenir droite sans être supportée, sur la base (13A) avec les parois latérales (13B) étendues et dressées.

11. Appareil selon l'une quelconque des revendications 7 à 10, dans lequel la garniture (13) présente une base circulaire (13A) et est de forme essentiellement cylindrique.

12. Appareil selon l'une quelconque des revendications précédentes, dans lequel la garniture (13) est formée thermiquement sous vide à partir d'une matière thermoplastique.

13. Appareil selon l'une quelconque des revendications précédentes, dans lequel le réservoir (12) est formé à partir d'une matière plastique.

14. Appareil selon l'une quelconque des revendications précédentes, l'appareil se présentant sous la forme d'un pistolet de pulvérisation, alimenté par gravité (1), le réservoir étant pourvu d'un trou d'évent (12A).

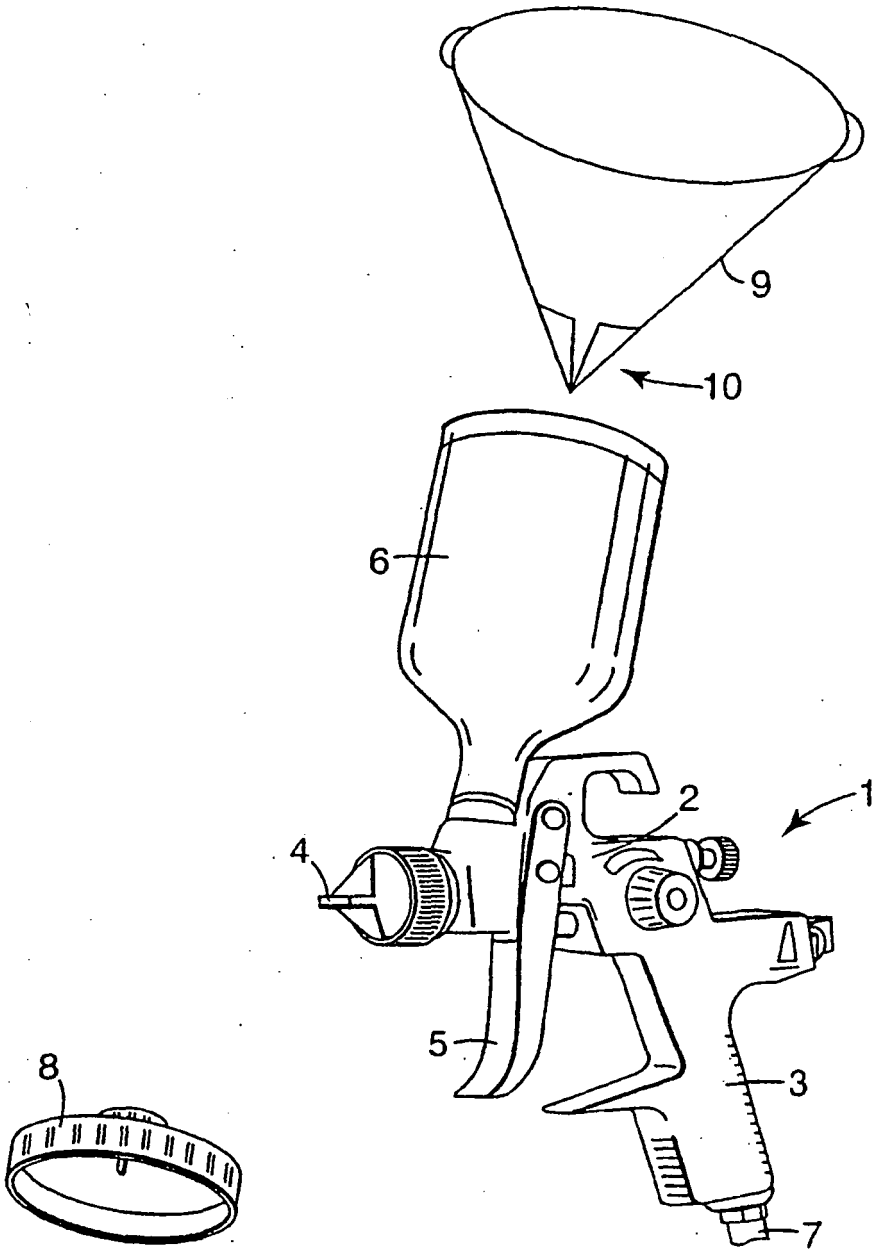

Fig. 1
PRIOR ART

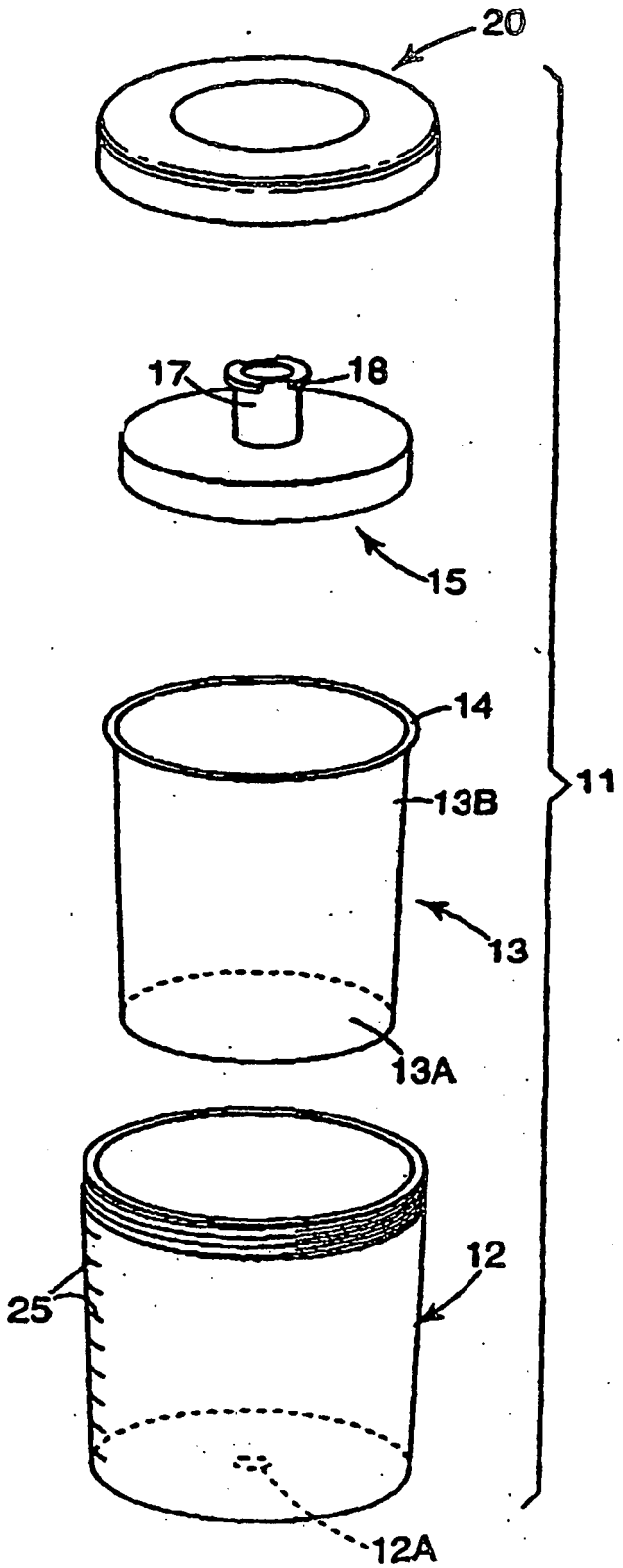

Fig. 2

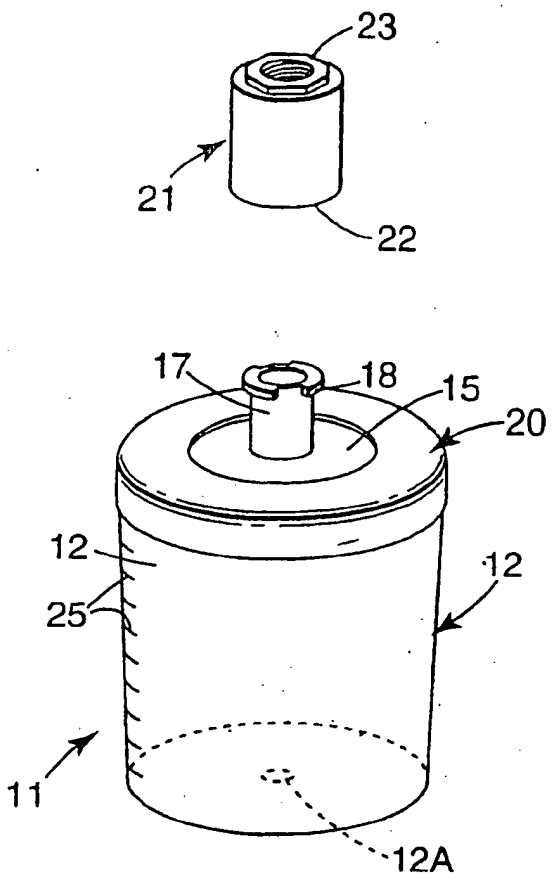
23
21
22
17
18
15
20
12
12
25
11
12A

Fig. 3

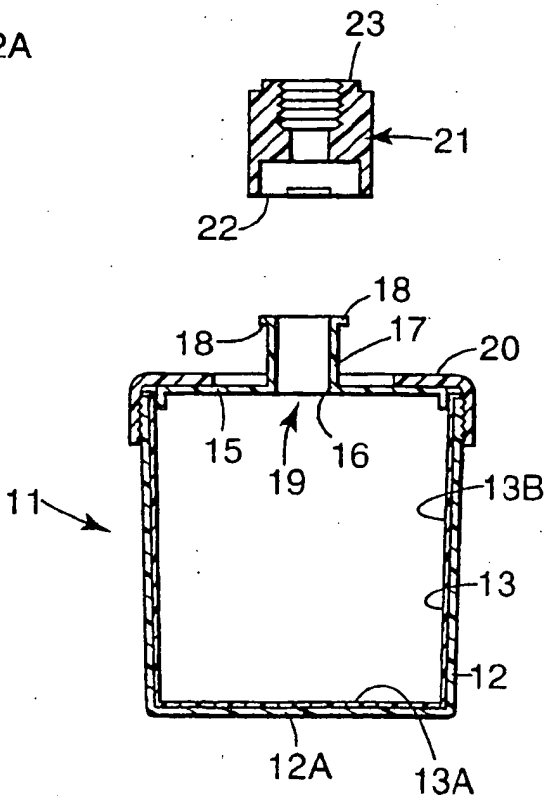
23
21
22
18
18
17
20
15
19
16
11
13B
13
12
12A
13A

Fig. 4

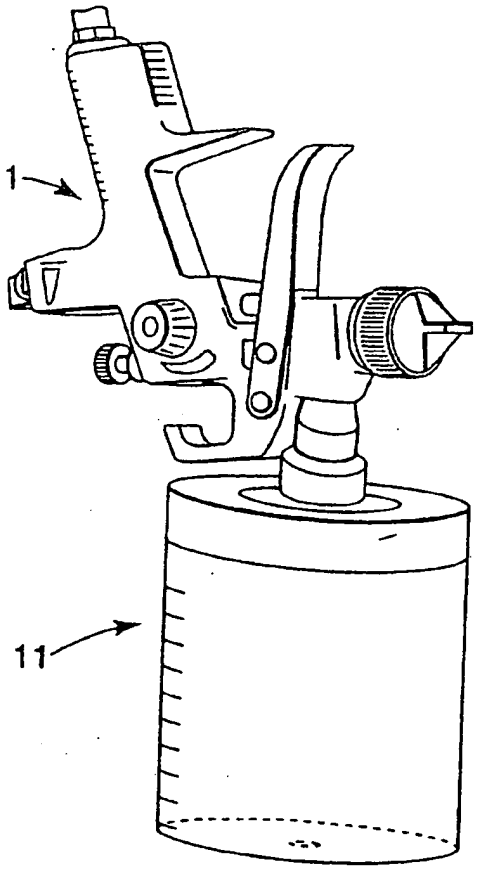

Fig. 5

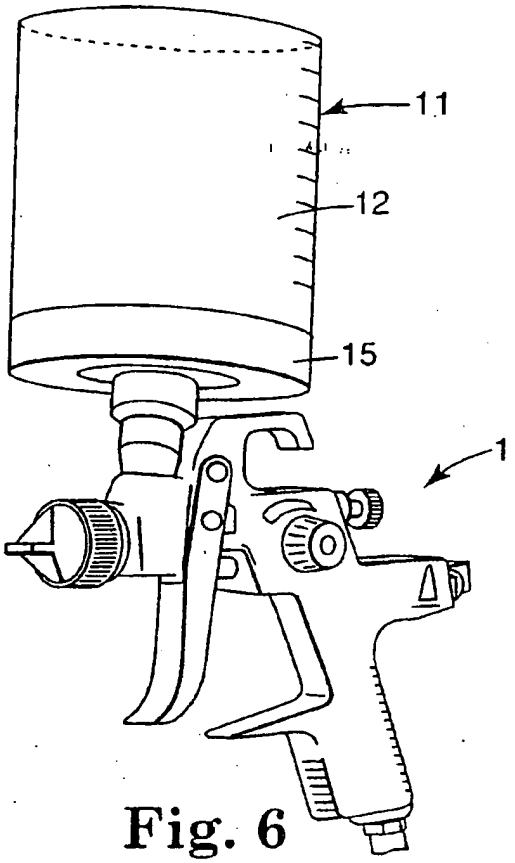

Fig. 6

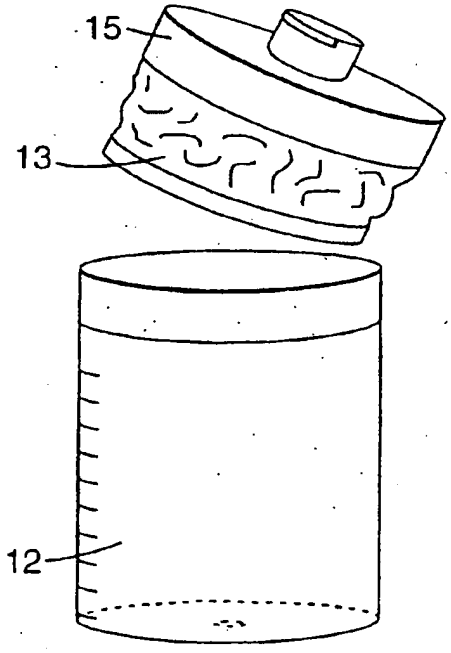

Fig. 7

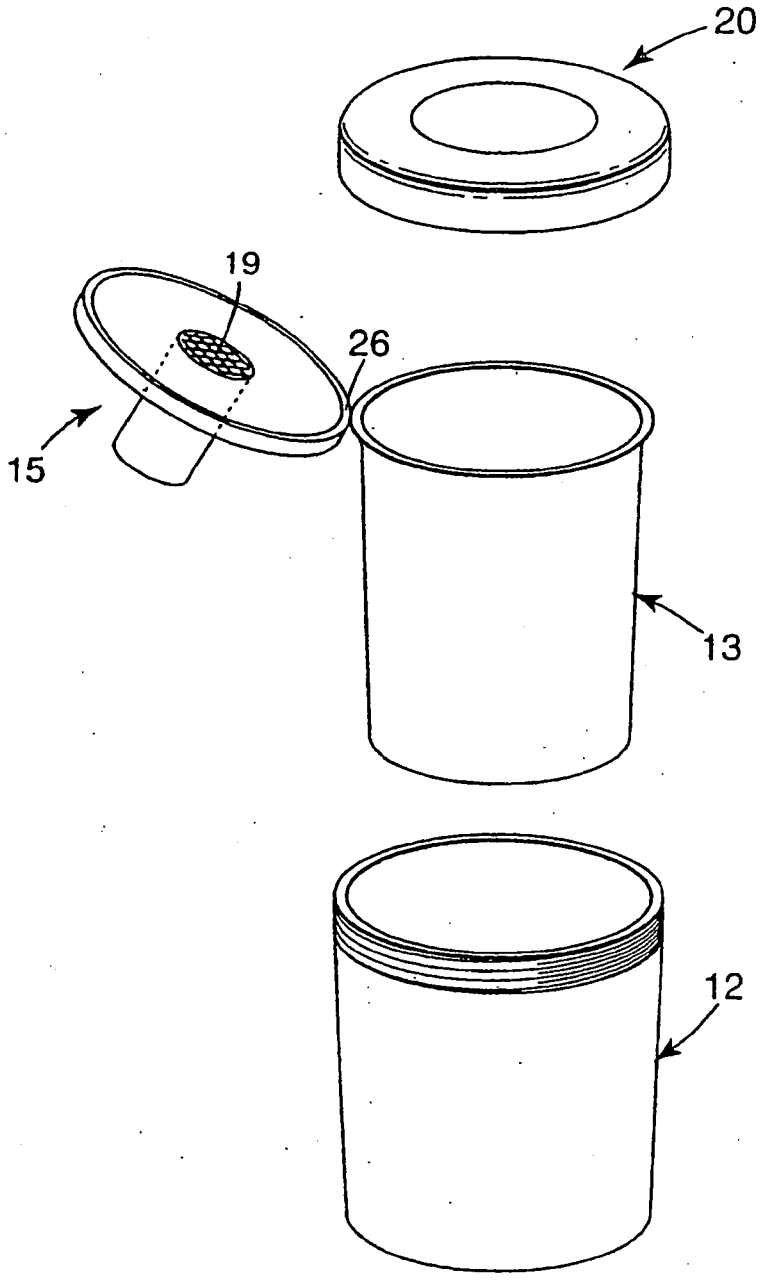

Fig. 8

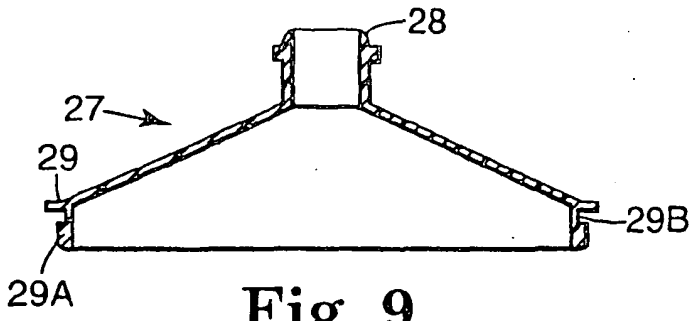

Fig. 9

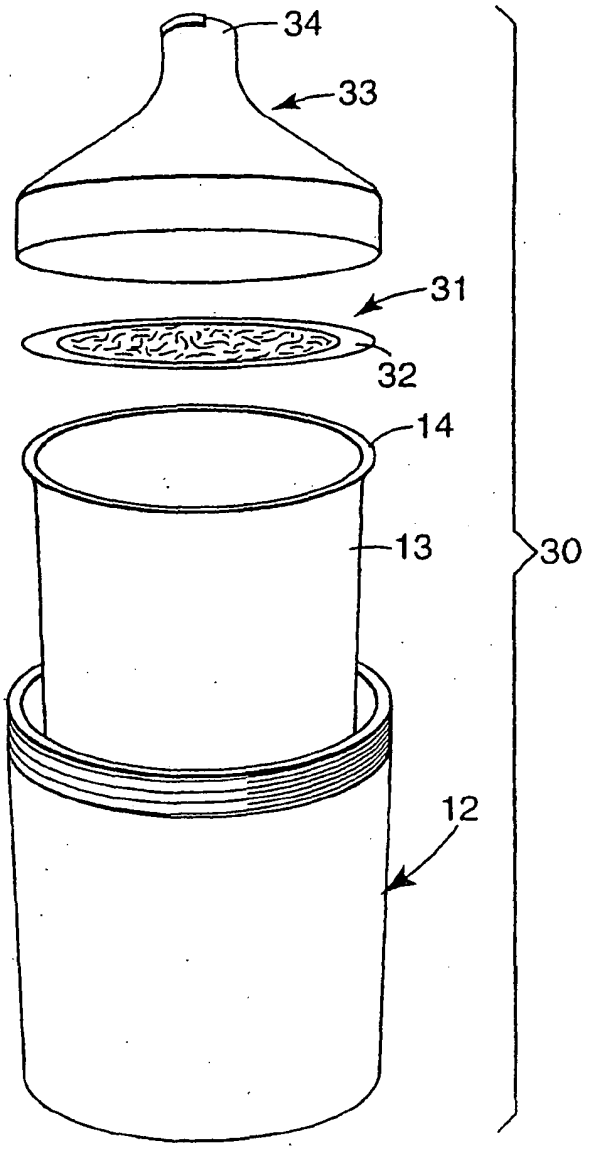

Fig. 10

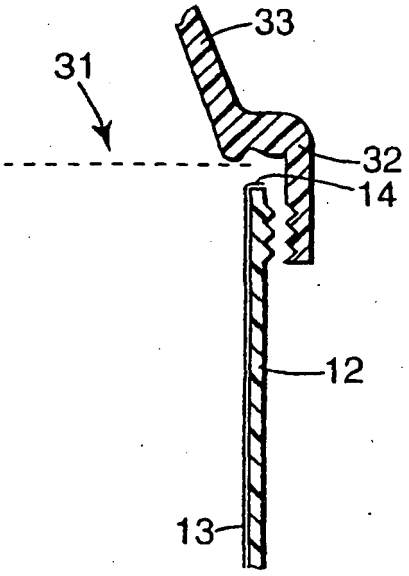

Fig. 11

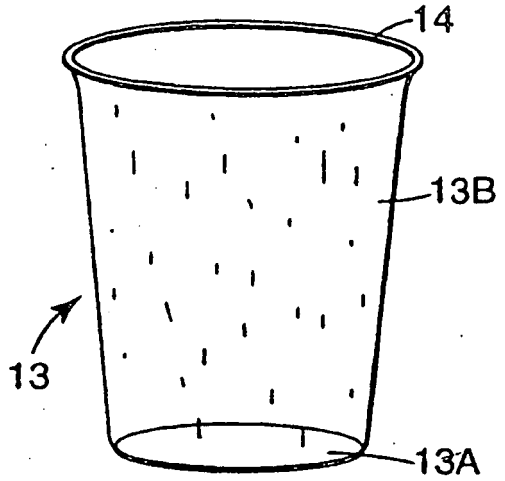

Fig. 12

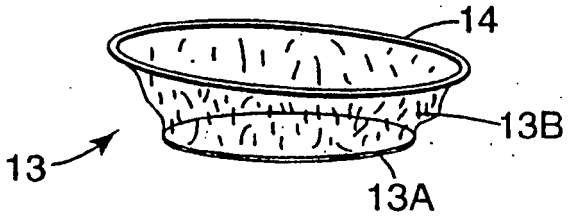

Fig. 13

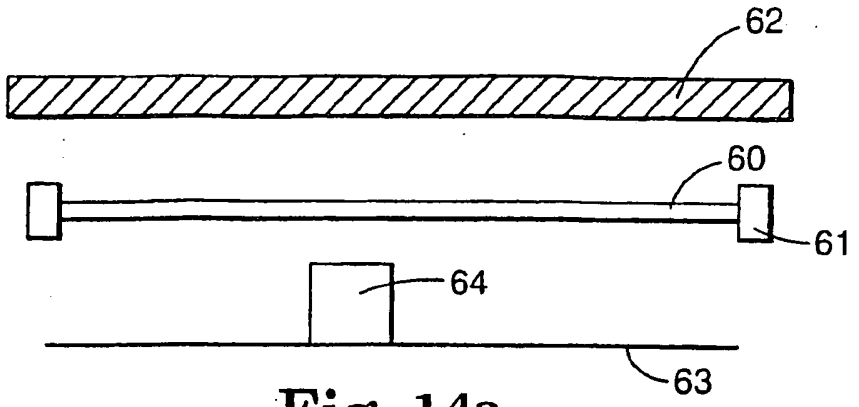

Fig. 14a

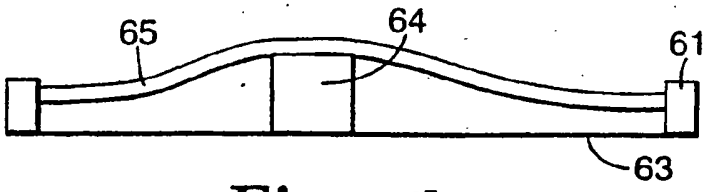

Fig. 14b

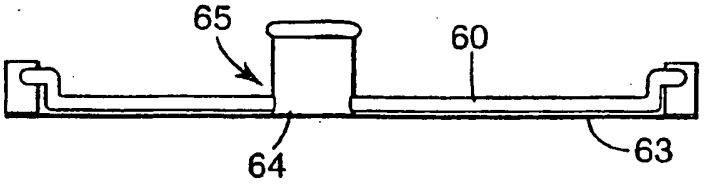

Fig. 14c

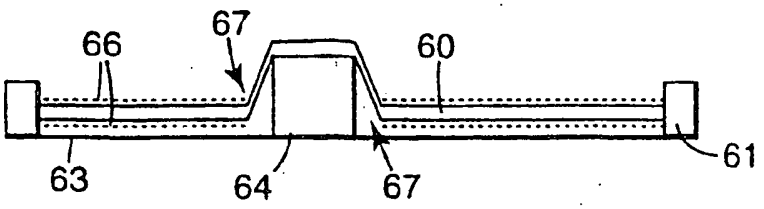

Fig. 15

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- FR 1282085 **[0002]**
- US 3211324 A **[0003]**
- US 3255972 A **[0003]**
- US 4151929 A **[0003]**
- US 4951875 A **[0003]**
- US 5143294 A **[0003]**
- EP 0678334 A **[0003] [0004]**
- US 3432104 A **[0005]**