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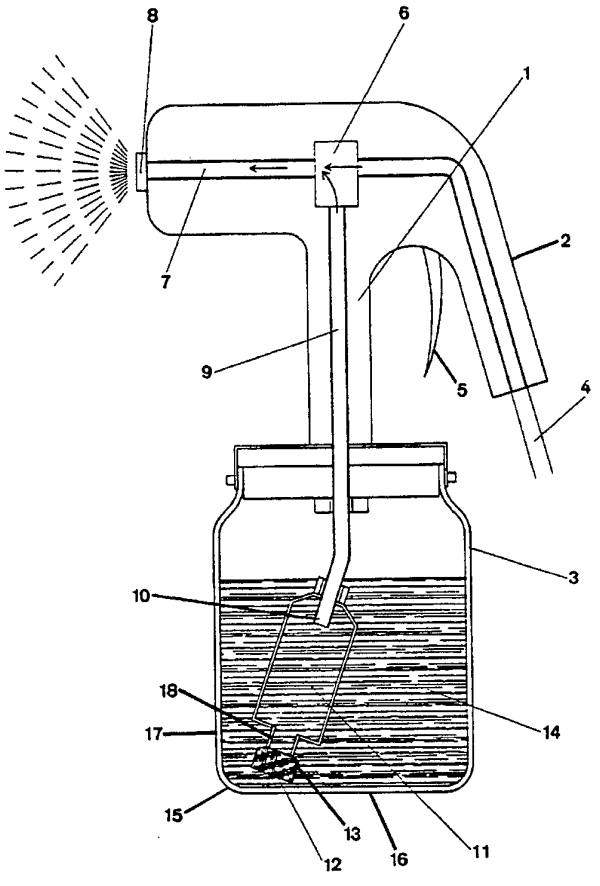
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(54) Title: LIQUID SPRAYING DEVICE DRIVEN BY COMPRESSED AIR

(57) Abstract

A compressed-air-operated liquid spraying device comprises a liquid container (3), a conduit (9) emerging into the liquid container through one end thereof and adapted to convey the liquid from the container to a nozzle (8) through influence by compressed air. Said conduit emerges through said one end (10) thereof into a smaller liquid container (11) enclosed in said liquid container (3), having an opening (13) through which the conduit communicates with the larger, proper liquid container (3) and being arranged to function as a buffer by being, as the conduit, arranged to be filled with liquid through said opening and by that supply the quantity of liquid contained therein for spraying when the liquid spraying device is inclined away from a normal position in which the larger liquid container is located substantially under the nozzle.



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Liquid spraying device driven by compressed air

FIELD OF THE INVENTION AND PRIOR ART

The present invention relates to a compressed-air-operated liquid spraying device according to the preamble of the appended claim 1.

As examples of such devices the spray guns used for lacquering cars and car details or parts may be mentioned, wherein the liquid container accordingly contains paint, and this field of use will be discussed hereinafter so as to illustrate the invention, although numerous other fields of use would be possible. All types of compressed-air-operated liquid spraying devices are comprised, such as those sucking the liquid through ejector action, those having liquid containers connected to compressed air, those having liquid containers containing compressed air (such as paint spray bottles) and the like.

When such spraying of liquids, in particular paint, with air as driving medium or propellant takes place, there is a need of being able to incline or put the liquid spraying device oblique away from a normal position, in which the liquid container is substantially under the nozzle and the bottom thereof is directed downwardly, with a maintained function.

When paint spraying for example cars it is necessary for obtaining a good result that the paint container of such a paint spray gun is located close to said normal position. Would the paint spray gun and by that the paint container be inclined too much the paint sprayed would be replaced by primarily air, since the end of said suction conduit in the paint container will not be located in the paint, which results in a deficient quality of the paint or lacquer surface. This means in its turn that lacquering of details or parts which when they are mounted on a car or another object require too much inclination of the paint spray gun, for example inner fenders

of a car, gets very laborious, with a frequent turning of the device, so that it is often chosen to release the part, which is then mounted separately in such a position that paint spraying may take place in a conventional way with the liquid spraying device in said normal position. This procedure is very time consuming compared with lacquering "in situ".

Thus, the devices already known of the type defined in the introduction have the disadvantage that the spraying device may not be inclined too much when for example paint is sprayed without an incorrect paint and air mixture with a lower quality of the surface layer painted as a result.

SUMMARY OF THE INVENTION

The object of the present invention is to provide a device of the type defined in the introduction, which finds a remedy to the inconveniences mentioned above of such devices already known.

This object is obtained in accordance with the invention by providing a device according to the appended claim 1.

Thanks to the presence of a smaller liquid container enclosed in the liquid container, into which said conduit emerges and which has an opening through which the conduit communicates with the larger liquid container, it is possible to keep the liquid spraying device inclined away from said normal position during a limited period of time, for instance keep it upside down, i.e. with the container above the nozzle and in spite of that avoid an incorrect mixing of air into the liquid and by that obtain an excellent surface layer. The driving or operation through compressed air, for example by ejector action, which arises in conventional liquid spraying devices results in filling the conduit with liquid, so that the liquid located in the conduit will upon turning such a liquid spraying device for example upside down, be able to first be sprayed out before the mixing of air into the liquid will be too great. However, this volume is very small, so

that in practise no such spraying may be carried out. In the device according to the invention said driving or operation through compressed air will on the other end accomplish filling of also the inner, smaller liquid container, which may be called an auxiliary liquid container, and this will continuously be filled with liquid, so that this constitutes a buffer, when the liquid spray gun is inclined away from said normal position and by that so much liquid that corresponds to the total volume of the inner liquid container and the conduit may be sprayed in such an inclined position without any additional mixing of air thereinto. For example an inner fender of a car may by that be lacquered in a state mounted on the car without lowering the quality of the surface layer obtained.

According to a preferred embodiment of the invention the inner, smaller liquid container is replaceably arranged in the larger liquid container for enabling changes to inner liquid containers having different volumes for adaption to different conditions of use, so that for example this volume may be increased should the liquid spraying device during a longer period of time be used for spraying objects requiring a considerable inclination of the liquid spray gun away from said normal position.

Further advantages as well as advantageous characteristics of the invention will appear from the description following and the other dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

With reference to the appended drawings, below follows a description of a liquid spraying device according to a preferred embodiment of the invention cited as an example and such a device according to the prior art.

In the drawings:

Fig.1 is a sectioned view of the device according to the invention in the normal position,

Fig. 2 is a sectioned view enlarged with respect to Fig. 1 and of a part containing the liquid containers of the device according to Fig. 1 turned upside down with respect to the position in Fig. 1, and

Fig. 3 shows a view corresponding to Fig. 2 of a part of a conventional prior art device turned upside down.

The liquid spray gun 1 shown i Fig. 1 is intended to be hand-operated and has for this sake a handle 2. It has also a liquid container 3, which is intended to receive the liquid, for example paint, to be sprayed by the device. A conduit 4 for supply of compressed air schematically indicated is connected to the handle and extends inside the handle to a valve 6 controllable through operation of a rocking lever 5 by the hand gripping around the handle 2. The conduit 4 continues on the other side of the valve 6 through a conduit portion 7 to a nozzle 8. One end of a suction conduit 9 does also emerge into the valve 6, which is an ejector valve, said suction conduit being led into the liquid container 3 and the other end 10 of which emerges into a smaller liquid container 11 enclosed inside the liquid container 3. This smaller liquid container 11 communicates through an opening 13 here covered by a filter 12 with the outer, larger liquid container 3. The filter 12 is arranged to remove possible undesired particles contained in the liquid container 3 from the liquid before it is sprayed out through the nozzle 8.

The opening 13 is in the normal position shown in Fig. 1 directed substantially downwardly, which means that it will be directed upwardly when the device is turned upside down, and it is located in the region of a lower angle or a corner 15 of the liquid container 3, which is formed by a transition between a bottom 16 and a wall 17 of this container. The portion 18 of the inner container 11 located closest to said opening 13 is provided with a cross-section reduced

with respect to container portions following thereupon, so that said opening may be arranged in the angle of the bottom region of the liquid container 3, which would not be possible with an inner container 11 inclined in a way shown in Fig. 1 should the cross-section thereof not be reduced in the opening region. Suction of liquid is in this way possible also when the liquid container 3 is almost empty.

The inner liquid container 11 is advantageously arranged removable from the end 10 of the suction conduit 9, so that it after opening the liquid container 3 may be removed and changed for an inner liquid container having a different volume for adaption of this volume to different fields of use of the liquid spraying device.

The function of the liquid spraying device according to the invention is as follows: When the ejector valve 6 is opened through the rocking lever 5 compressed air will flow therethrough and through ejector action draw liquid through the suction conduit 9, so that an air and liquid mixture so produced advances in the conduit portion 7 to the nozzle 8, through which it is finely divided sprayed onto the surface to be covered by the liquid, for instance a car detail to be lacquered. When there is so much liquid in the liquid container 3 as illustrated in Fig. 1 the smaller liquid container 11 will naturally always be filled, but also in cases of considerably less liquid in the liquid container 3, i.e. when a part of the inner liquid container 11 is in the normal position shown in Fig. 1 located above the liquid level in the liquid container 3, the inner liquid container 11 and the suction conduit 9 will continuously be filled thanks to the ejector action produced by leading compressed air through the valve 6. Thus, when the ejector valve 6 is closed through release of the rocking lever 5 the suction conduit 9 and the inner liquid container 11 will always be filled with liquid as long as the liquid container 3 has not run out of liquid. As a consequence thereof, inclination of the liquid irrespectively of the location of the opening 13, i.e. even if this gets located in a space (see the air room 19 in Fig. 2) in the liquid container 3 which is not filled by liquid, means that these will be filled with liquid which may be sprayed out through the nozzle 8 with the

desired air and liquid mixture and by that spraying result. This is illustrated in Fig. 2, where the liquid spraying device has been turned upside down. In such a position the spraying may thus be continued by means of the liquid spraying device until the inner container 11 is emptied on liquid. Such a great volume for spraying liquid when the container is inclined is in this way provided that such work may be carried out in a comfortable way.

It is illustrated in Fig. 3 what is happening when the conventional device of this type is turned upside down. It is necessary that the suction conduit 9' is inclined close to the bottom 16' of the container in order to make it possible for the liquid spraying device to reach the major part of the liquid contained in the liquid container 3' in the normal position. As a consequence of this, the suction conduit 9' will in the position shown in Fig. 3 open into an air room 19', so that the suction conduit 9' will immediately be filled by air when spraying through the nozzle. The end of the suction conduit 9' could in such an already known device be arranged more far away from the bottom 16' of the container so as to enable a certain degree of spraying when the device is turned upside down, but this would mean that great amounts of liquid would remain in the container 3' and couldn't be sprayed out in the normal position. The present invention enables contrary thereto spraying of liquid in the normal position according to Fig. 1 of the liquid spraying device until nearly the "last drop" as well as spraying in the upside down position or in a position with the device inclined in another degree from the normal position.

The invention is of course not in any way restricted to the preferred embodiment described above, but several possibilities to modifications thereof would be apparent to a man skilled in the art in this field without departing from the basic idea of the invention.

As already mentioned in the introduction the invention is not in any way restricted to devices having compressed-air-operation by ejector action according to the embodiment described above, but it

is well applicable to other types of compressed-air-operated liquid spraying devices.

It is also stated that "air" in the claims has to be very broadly interpreted and comprises also other gas mixtures than that in conventional air and also pure gases.

Furthermore, "in which the larger liquid container is located substantially under the nozzle" means that the liquid container in said normal position is located below the nozzle, but it has not necessarily to be located directly below the nozzle.

It is not necessary that the opening of the liquid container is provided with a filter, although this is advantageous through the purifying effect obtained thereby.

As an example of an other modification possibility all types of other shapes of the inner liquid container than that shown in the figures may be mentioned.

Claims

1. Compressed-air-operated liquid spraying device comprising a liquid container (3), a conduit (9) emerging into the liquid container through one end thereof and adapted to convey the liquid from the container to a nozzle (8) through influence by compressed air, *characterised* in that the conduit emerges through said one end (10) thereof into a smaller liquid container (11) enclosed in said liquid container (3), having an opening (13) through which the conduit communicates with the larger proper liquid container (3) and being arranged to function as a buffer by being, as the conduit, arranged to be filled with liquid through said opening and by that supply the quantity of liquid contained therein for spraying when the liquid spraying device is inclined away from a normal position in which the larger liquid container is located substantially under the nozzle.

2. Liquid spraying device according to claim 1, *characterised* in that said opening (13) is located close to that part of said larger liquid container (3) which forms a bottom (16) when the device is in said normal position and has the liquid container last mentioned substantially under the nozzle (8).

3. A liquid spraying device according to claim 2, *characterised* in that in said normal position said opening is located in the region of the lower angle (15) of the outer, larger container (3), said angle being formed by the transition between a bottom (16) and a wall (17) of this container.

4. A liquid spraying device according to any of claims 1-3, *characterised* in that the portion (18) of the inner, smaller container (11) located closest to said opening (13) has a cross-section being reduced with respect to container portions adjacent thereto.

5. A liquid spraying device according to any of the preceding claims, *characterised* in that the volume of the inner, smaller liquid

container (11) is at least several times smaller than that of the outer, proper liquid container (3).

6. A liquid spraying device according to any of the preceding claims, *characterised* in that it comprises a filter (12) covering said opening (13) and arranged to purify the liquid from the larger liquid container (3) entering the smaller liquid container (11).

7. A liquid spraying device according to any of the preceding claims, *characterised* in that it is formed by a hand-operated liquid spray gun (1) having a handle (2).

8. A liquid spraying device according to any of the preceding claims, *characterised* in that it is adapted to be used for spraying liquid substantially uniformly on surfaces.

9. A liquid spraying device according to claim 8, *characterised* in that it is adapted to be used for paint spraying surfaces.

10. A liquid spraying device according to any of the preceding claims, *characterised* in that the inner, smaller liquid container (11) is replaceably arranged in the larger liquid container (3) for enabling changes to inner liquid containers having different volumes for adaption to different conditions of use.

11. A liquid spraying device according to any of the preceding claims, *characterised* in that said conduit (9) is a suction conduit arranged for suction of the liquid to the nozzle (8) through an ejector action produced by the fact that this conduit emerges into a supply conduit (4) for compressed air connected to the nozzle.

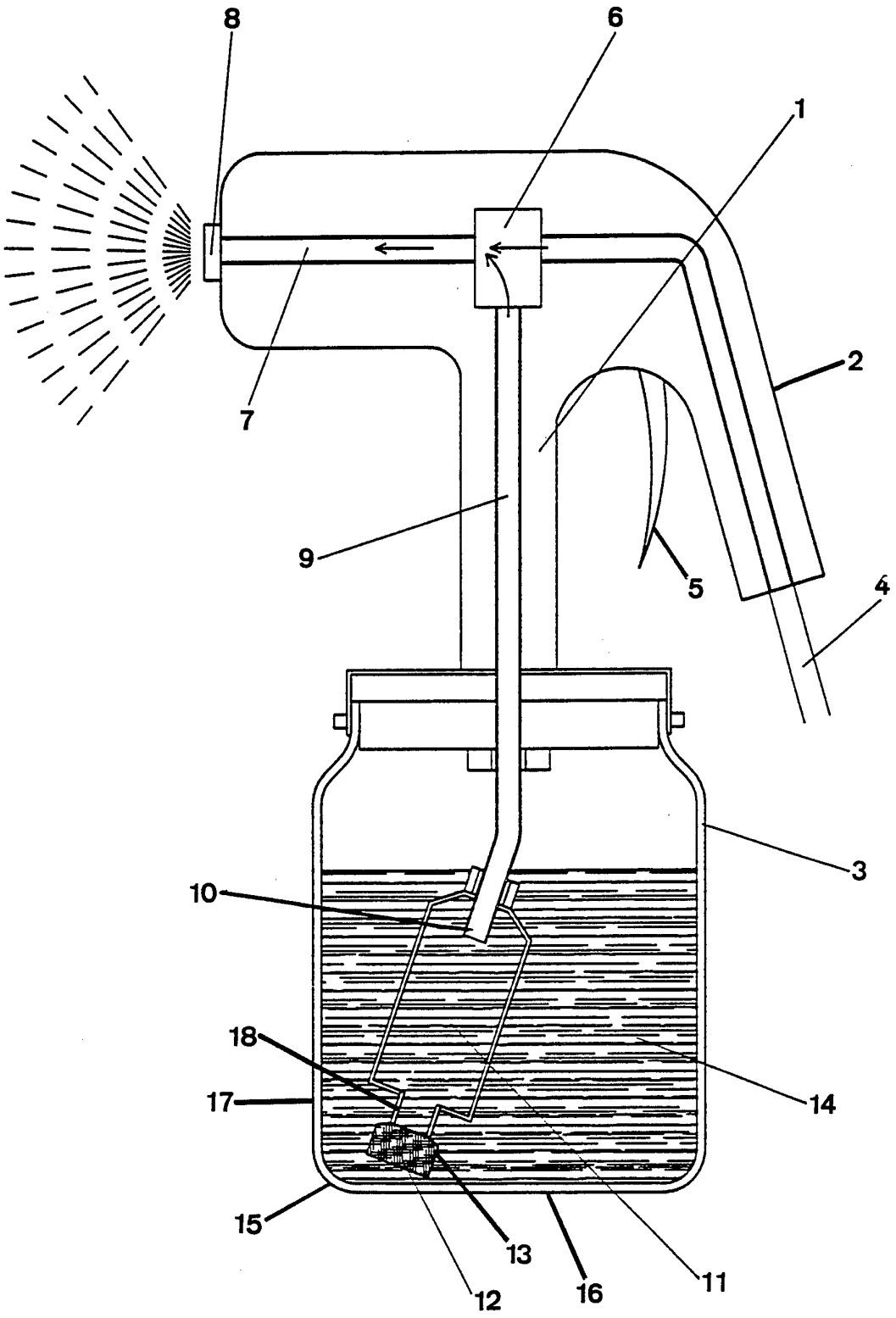


Fig 1

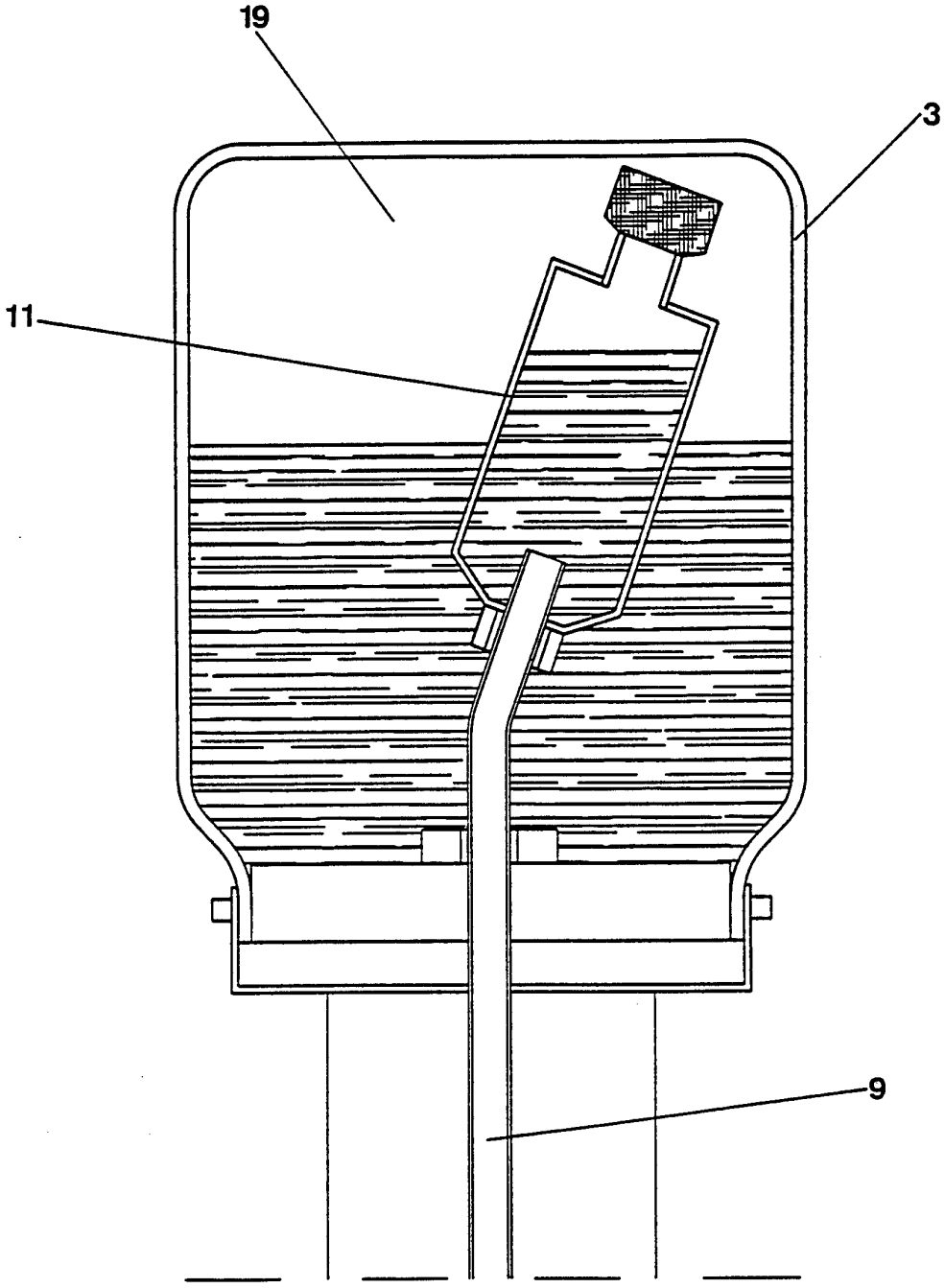


Fig 2

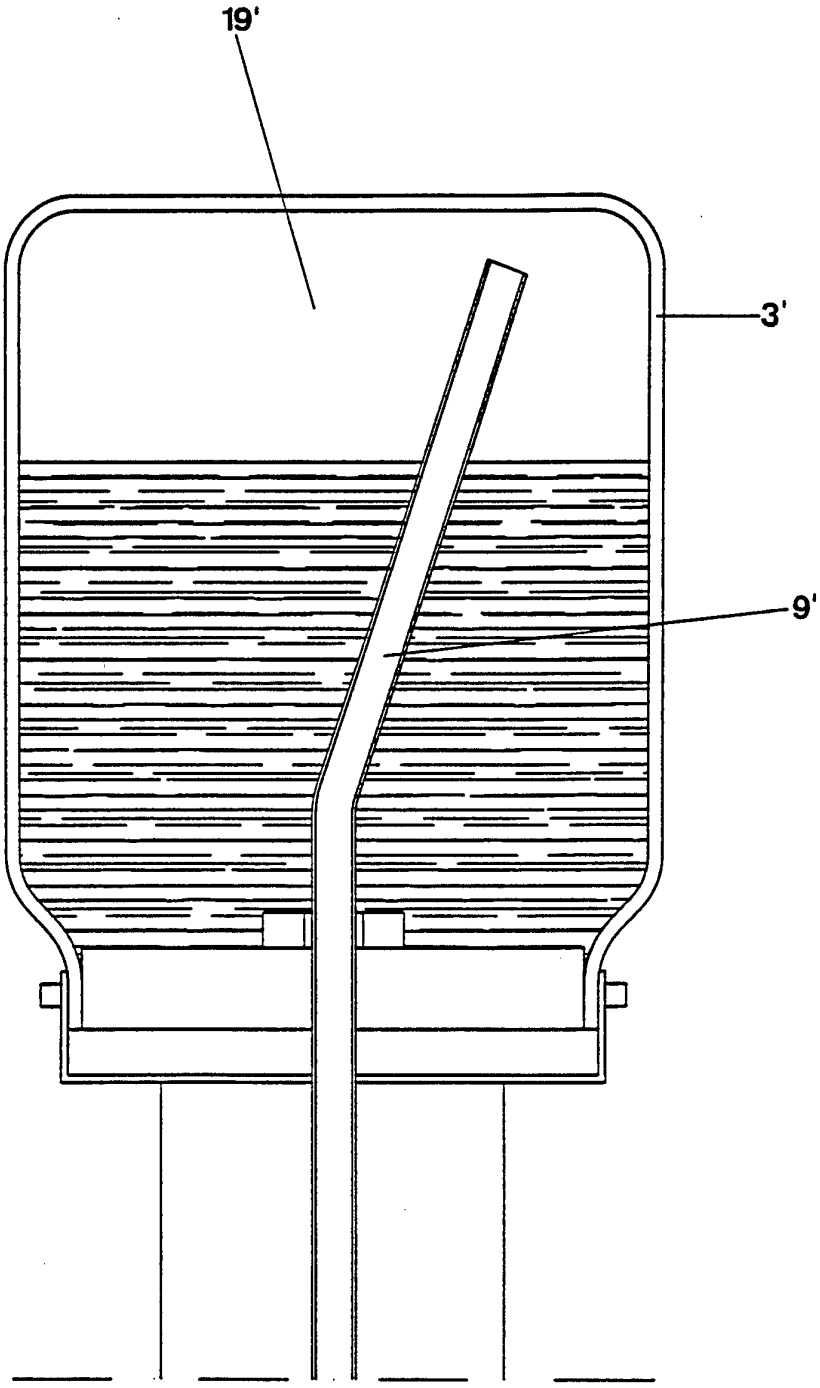


Fig 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 94/00843

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B05B 7/30
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B05B, B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP, A2, 0285040 (KAJ CHEMIETECHNIK GMBH & CO KG), 5 October 1988 (05.10.88), figure 1, abstract --	1
A	EP, A2, 0418032 (MINNESOTA MINING AND MANUFACTURING COMPANY), 20 March 1991 (20.03.91), figure 1, abstract --	1
A	EP, A1, 0211695 (ETHERTON, COLIN EDMUND), 25 February 1987 (25.02.87), figures 1,4 -- --------	1

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A2- 0285040	05/10/88	DE-U- 8704859	14/05/87
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