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(54) Dispensing devices

(57) The invention comprises dispensing devices for active liquids to evenly disperse these liquids in an aqueous environment or into the air, which devices comprise a container for holding the liquid to be dispersed, wherein the container is at least partially made of a porous material and comprises an air inlet opening. The dispensing devices are particularly suitable for delivering cleaning liquids and perfume to the flush water of a toilet bowl, in which case the air inlet opening is constructed in such a way that no water can enter the container during use.

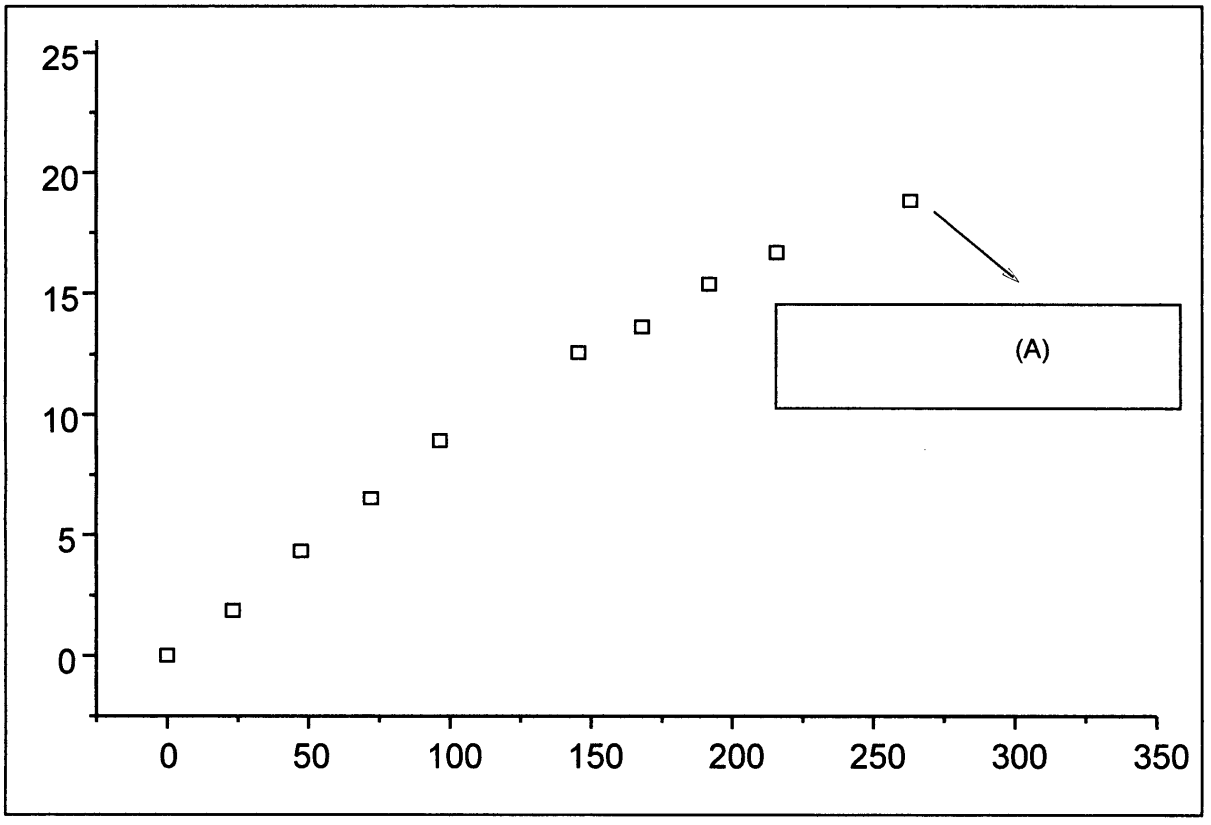

Fig. 6

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Description

[0001] The invention relates to dispensing devices for liquids, in order to evenly distribute these liquids in the air and/or in an aqueous environment. Particularly, the invention relates to dispensing devices suitable for dispensing liquid cleaning agents and perfume to the flush water in a toilet bowl or for distributing perfume in the air.

Background and prior art

[0002] Many different dispensing devices are known in the art for dispending liquid cleaning agents to the flush water of a toilet bowl and there is a large amount of patent literature describing such devices. Usually, dispensing devices are attached to the inside of e toilet bowl, close to the rim, with a clamp fixed over the rim of the toilet bowl. When flushing the toilet the flush water flows past the device and thus takes up a quantity of cleaning agent. Usual dispensing devices comprise a closed and replaceable container for the cleaning liquid which is placed in the dispensing device. These devices comprise a variety of provisions to on the one hand prevent leakage, and on the other hand provide an as even as possible delivery of the cleaning liquid to the flush water. Such devices are of a complicated construction and therefore expensive. Examples of such devices are described e.g. in WO 99/66139, WO 99/66140, WO 01/02653 and DE-A-10020090.

[0003] Less complicated devices are described in DE-G 8415681.3 (Henkel). It discloses containers for liquids comprising a discharge opening for dispensing the liquid to the flush water. This opening is closed off with a capillary active material, such as a sponge, or a porous plate or foil. The cleaning liquid penetrates through the capillary active closing material and is flushed off the outside by the flush water when flushing the toilet.

[0004] Similar devices are disclosed in WO 2006/000917 (Quest International Services). These devices comprise of a liquids container that is completely or largely made of a porous plastic. They are attached under the rim of the toilet bowl with a clamp or similar attachment means. The liquid in the container has a viscosity such that it gradually seeps through the pores of the plastic by capillary forces and is delivered into the current of flush water.

[0005] Devices such as described in WO 2006/000917 may also be shaped such that they are suitable as air fresheners or devices for perfuming rooms. To that end the container is filled with a perfume. This evaporates from the pores of the container and is continuously replenished from the inside.

[0006] Devices such as described above have the disadvantage that the amount of liquid delivered to the flush water may vary. On the one hand, flush water may penetrate the container and thereby affect the viscosity of the liquid. Without intending to provide a conclusive explanation, it may be theorized that the loss of liquid from the container causes a lower than atmospheric pressure in the container and thereby leads to sucking in water that, due to its low viscosity, can penetrate the container relatively easily. On the other hand, the low pressure in the container may lead to a gradual decline in the delivery of liquid.

[0007] Containers as described in WO 2006/000917 have a relatively large porous surface area, because, according to the drawings, they are made entirely, or almost entirely, from porous material. On the one hand this promotes the delivery of liquid, but on the other hand also the possibilities for water ingress. Moreover, porous material is relatively expensive compared to the usual hard packaging materials such as plastic of which containers for toilet cleaner liquids are usually made.

Summary of the invention

[0008] The present invention presents a solution to the problems outlined above by providing an air inlet opening in the container for the liquid. This prevents the occurrence of any pressure difference between the inside and the outside of the container. When intended for use in an aqueous environment this opening can be constructed in such a way that no water can enter the container. The absence of any pressure difference between the inside and the outside of the container provides a steady delivery of liquid, however, without any loss of liquid due to leakage.

[0009] Thus, the invention provides dispensing devices for active liquids to evenly disperse these liquids in an aqueous environment or into the air, which devices comprise a container for holding the liquid to be dispersed, characterized in that the container is at least partially made of a porous material and comprises an air inlet opening.

Detailed description of the invention

[0010] The container may be made entirely or largely out of porous material, as is also described in WO2006/000917. However, due to the specific characteristics of the container according to the invention this is not necessary to obtain a satisfactory and steady delivery of the active liquid.

[0011] Porous wall materials are generally more expensive than the conventional wall materials used for liquids containers, such as glass, metal (particularly aluminium) or non-porous plastics. Moreover, for a container which is entirely or largely made of porous material it is more complicated to package it in such a way that no liquid seeps out before use.

[0012] The speed of delivery of the active liquid is determined, apart from the physical properties of the liquid, also by the ratio between the porous and the non-porous surface area of the container wall. Nevertheless, for the reasons mentioned above, it is advantageous to construct only part of the wall or walls of the container from

porous material, because the presence of the air inlet opening guarantees sufficient delivery of liquid. Generally, it is sufficient to have a maximum of 50%, or even only 40% or less, of the total wall surface area made of porous material. For the application purposes for which these devices are particularly suitable it is generally sufficient if only 30% or less of the total wall surface area is made of porous material.

[0013] The porous material may have a uniform pore size, or a nonuniform pore size in which the variation may be within narrow or wide limits. The choice of the (average) pore size in combination with the viscosity of the active liquid and the surface area of the porous wall determines the rate of delivery of the liquid. In general, a pore size of at least 1μm is preferred.

[0014] Suitable porous wall materials are known in the art and comprise e.g. porous glass or ceramic material and particularly porous plastics such as polypropylene and polyethylene.

[0015] The size of the air inlet opening is not critical. It may be provided in the porous and/or in the non-porous part of the container wall. The opening is constructed in such a way that under conditions of use the active liquid cannot flow through. It is recommended to choose the position of the opening in the container such that under conditions of use the active liquid does not come into contact with it. For that reason, an opening in the upper part of the container is very suitable. The opening may be provides with a removable cap, covering foil, or similar cover, in order to close it during transport and storage.

[0016] In case the devices according to the invention are used to deliver active liquid to an aqueous environment, e.g. flush water in a toilet bowl, the opening will be constructed in such a way as to prevent water from entering the container during use. This can be effected e.g. by providing the opening is a position in the container wall, or by constructing the container and the opening, so that the opening is protected against the force of the stream of flush water and/or such that the water easily drops of the wall of the container. Thus, the opening may be protected with a covering rim or cap that breaks the force of the water stream. It is also possible to provide an opening in the top of the container with a cap that can be put in two positions: closed to prevent leakage of the liquid before use, and open, whereby influx of air is guaranteed, but the cap nevertheless prevents the influx of flush water. For the person skilled in the art it will be apparent that many ways and means may be utilized to prevent the influx of water through the air inlet opening.

[0017] It is generally advisable to keep the air inlet opening small, preferably not more than 10mm^2 total surface area.

[0018] When the opening is very small, e.g. 2mm diameter or less, it may be sufficient to make the surface wall in the immediate vicinity of the opening from a strongly water-repellent material or to treat it with such a material, thereby preventing water from sticking to the wall or entering the container after the flush.

[0019] Before use the opening as well as the porous wall is preferably closed off with a removable cap, foil, sheet or similar.

[0020] The containers may be made in a large variety of shapes and sizes, such as square, oblong, round, flat, annular, spherical, decorative end fantasy shapes. More or less tubular, e.g. cylindrical shapes are particularly suitable to be attached under the rim of a toilet bowl. The non-porous part of the wall may be translucent or transparent, so as to provide an easy check on whether the active liquid has been consumed. A coloured liquid also gives a colour to the porous part of the wall as long as there is still liquid in the container.

[0021] The container may be provide with a mouth that can be closed with a suitable cap or similar closure means such as screw cap or a click cap. The closure is applied after the container has been filled with liquid, either to close the container permanently or leaving the possibility to open it again later to refill the container with liquid.

[0022] The container may be provided with a means to vary the porous surface that is exposed to air or water. Thus, a tubular container may be provided with a ring that can be turned or slid to cover a greater or smaller part of the porous part of the wall. In a different embodiment a slide or a rotating ring may be used which acts as a diaphragm.

[0023] For the purposes of this invention the term "active liquid" is used to denote a liquid which has an intended action in the environment in which it is dispersed. In case of liquids intended for dispersion in the air such liquids may provide an agreeable odour or combat disagreeable odours, more particularly perfumes, or they may have an insecticide or insect-repellent activity.

[0024] The devices according to the invention are particularly suitable for dispersing active liquids in an aqueous environment, more particularly the flush water of a toilet. Active liquids suitable for such purposes comprise a wide range of components known in the art for these purposes, such as cleaning agents (detergents, bleaching agents, disinfection agents and the like) and perfumes.

[0025] The active liquids have a relatively high viscosity, to have them seeping through the porous material with the desired velocity. The desired viscosity is therefore also dependent on the pore size of the porous material. Generally, with the usual porous wall materials a viscosity of at least 200mPas is desirable (determined with a Haake RS1™ viscometer with 60/1° geometry at 1sec^{-1} and 20°C). The desired viscosity of the liquid may be obtained by adding usual thickening agents.

[0026] When the active liquids to be dispersed contain components which are mutually incompatible, it is of course possible to put them in separate devices according to the invention. However, it is in many cases more attractive to divide a container according to the invention in separate compartments, e.g. with partitions, and to fill these compartments with the separate non-compatible components. These compartments may be provide each

with separate porous walls of which the pore sizes may chosen according to the properties of the separate components. The compartments may also be constructed such that they all face a common porous wall. Although some interaction may take place within the porous wall where the components meet, generally this does not or hardly influence the proper operation of the devices according to the invention.

[0027] Depending on the field of application of the devices according to the invention, they may comprise other elements apart from the liquids container. Thus, devices intended for dispersing perfume in the air may comprise a means to put the device down or to hang it on the wall. Devices intended to disperse toilet cleaning agents will generally comprise a hook, clamp or similar means to attach it under the rim of a toilet bowl. All these means are constructed in such a way that the liquid remains in contact with the porous wall surface until it is consumed.

[0028] The invention also comprises dispensing devices as described above of which the container is filled with active liquid having a viscosity of at least 200mPas, determined as described above.

Examples

[0029] The invention is exemplified with the embodiments of the devices of the invention illustrated in Figures 1-5:

Fig. 1 shows a simple embodiment consisting of a cylindrical container having an air inlet opening (1) at the top and of which one side wall consists of a porous plate (2) which is attached to the remainder of the cylinder with a screw- or click-ring (not illustrated) or similar attachment means. The level of the liquid in the cylinder is indicated by (3).

In Fig. 2 the container has a tubular connection between the air inlet opening and the cylindrical container. This tube is covered at the upper end with a cap that can be place in two possible positions: a closed position before use and an open position in use. In the open position air can enter the container, but the influx of flush water is prevented by the cap. The tube with the cap is indicated by (1) and the porous plate by (2). Fig. 2a shows the tubular connection and the cap in detail, with the inlet opening indicated by (3). It can be seen that the cap is maintained in any of the two positions with cams engaging with recesses in the wall of the tube: they are indicated by (4) for the open, and (5) for the closed position. Figures 2A and 2B give detailed views of the porous plate (2) and different ways in which it can be attached to the container with a ring (8) and be covered before use with a liquid-tight but removable covering foil or plate (7). The wall of the container is indicated by (6). The construction as shown in Figures 2B and 2C is also suitable for a container as shown in Fig. 1.

Fig. 3 shows a cylindrical container intended for the delivery of two incompatible liquids (A: side view, B: front view). The container is longitudinally divided into two compartments I and II by a partition (9). Both compartments share the porous plate (2) which is provided with air inlet openings (1) for both compartments.

An alternative container for non-compatible liquids is depicted in Fig. 4 where the partition is positioned across and which is provided with two porous plates (2), one for each compartment. Each porous plate is provided with an air inlet opening (1).

Figures 5A and 5B show two embodiments of the closure of the container according to Fig. 4 with a porous plate (2) that is attached to the cylindrical container with a closure ring (8). Between the porous plate and the front rim of the closure ring an intermediate ring (10) is positioned as shown in Fig. 5C (side view). The air inlet opening (1) in the porous plate is positioned behind the front rim of the closure ring in such a way that the intermediate ring secures sufficient air access between the closure ring and the porous plate to the air inlet opening. The front rim of the closure ring is constructed such that the air inlet opening is protected against the current of flush water. A closure according to Fig. 5, especially 5B, is very suitable for a container according to Fig. 3, whereby two instead of one air inlet opening are positioned behind the front rim of the closure ring.

Dispensing example

[0030] A container with a volume of 19.5ml was provided with a porous wall with a surface area of 9.5cm^2 made of porous polyethylene of 2mm thickness and a pore size of 20-50μm, manufactured by Porex Technologies GmbH of Singwitz, Germany. The container was filled with toilet cleaning liquid marketed by Sara Lee and called "Flush fresh selection Green Fields"™. The air inlet opening, which was protected against water influx, had a diameter of 1mm. The container was attached under the rim of toilet bowl that was in normal use. The decrease of the amount of cleaning liquid was monitored in time by regular weighing. Liquid consumption is shown in the graph of Fig.6 in which the weight loss in grams is indicated on the vertical axis against time in hours on the horizontal axis. At point A in the graph the liquid in the container was completely consumed.

Claims

1. Dispensing device for active liquids to evenly disperse these liquids in an aqueous environment or

into the air, which devices comprise a container for holding the liquid to be dispersed, **characterized in that** the container is at least partially made of a porous material and comprises an air inlet opening.

2. Dispensing devices according to claim 1 **characterized in that** the container wall consist for 50% or less of porous material.

3. Dispensing devices according to claims 1 or 2 **characterized in that** the porous material is a porous plastic.

4. Dispensing devices according to claims 1-3 **characterized in that** the air inlet opening is constructed in such a way that during use in an aqueous environment no water enters the container.

5. Dispensing devices according to claim 4 **characterized in that** they comprise a provision to attach the container under the rim of a toilet bowl.

6. Dispensing devices according to claims 1-5 **characterized in that** the container is filled with an active liquid having a viscosity of at least 200mPas.

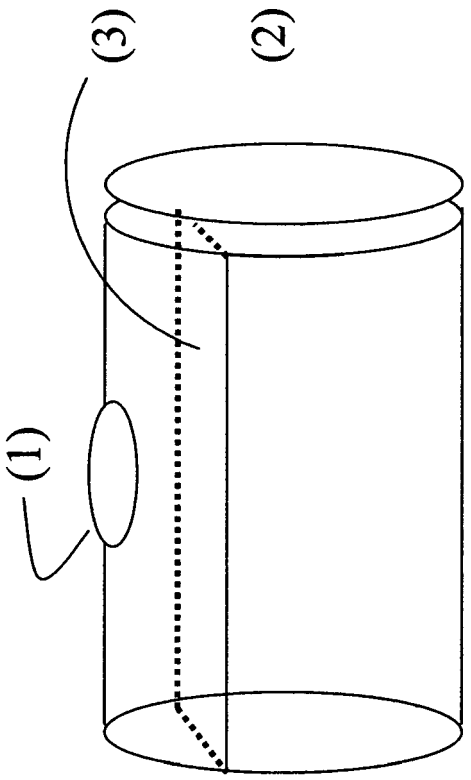

Fig 1

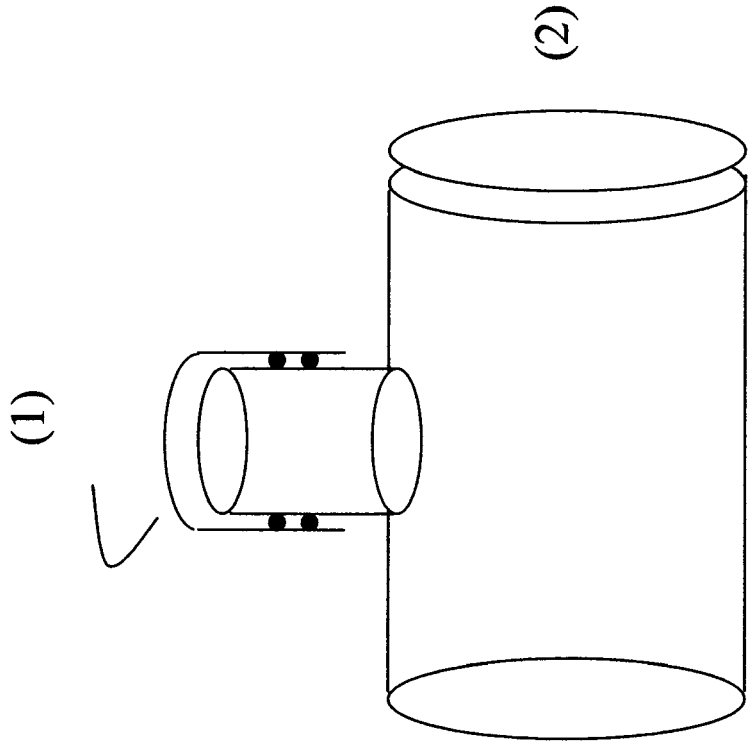

Fig 2

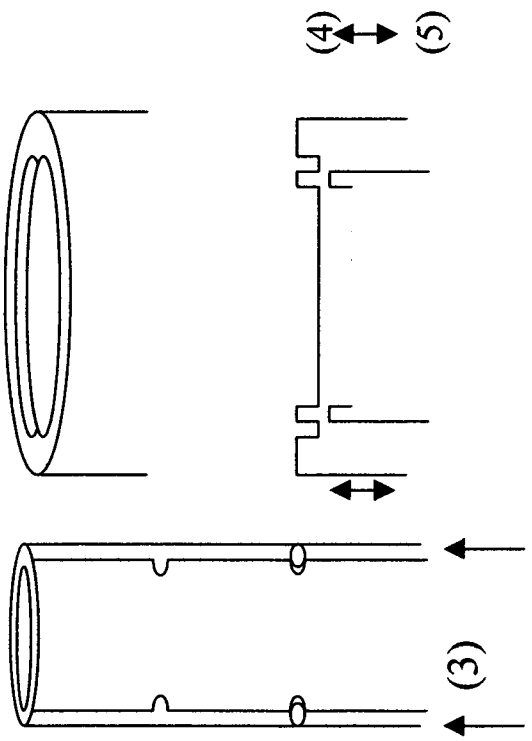

Fig 2A

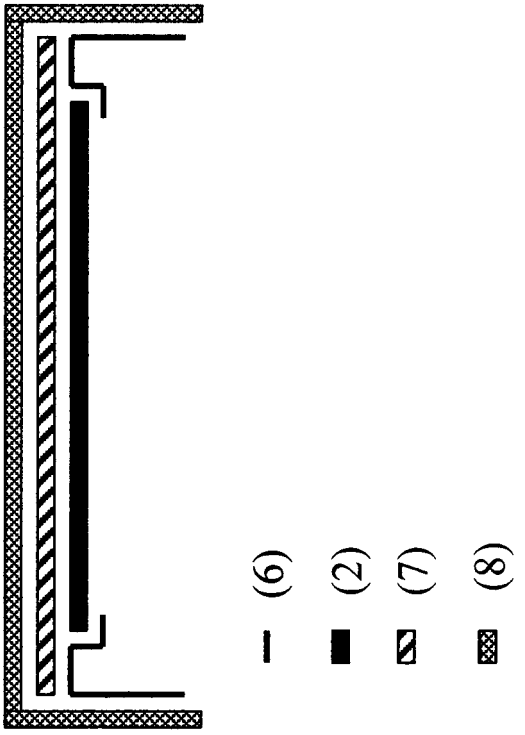

Fig 2B

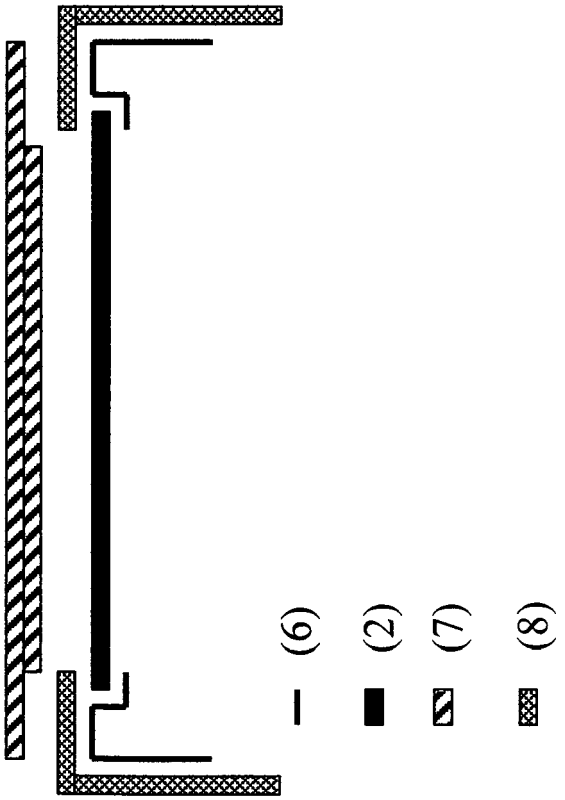

Fig 2C

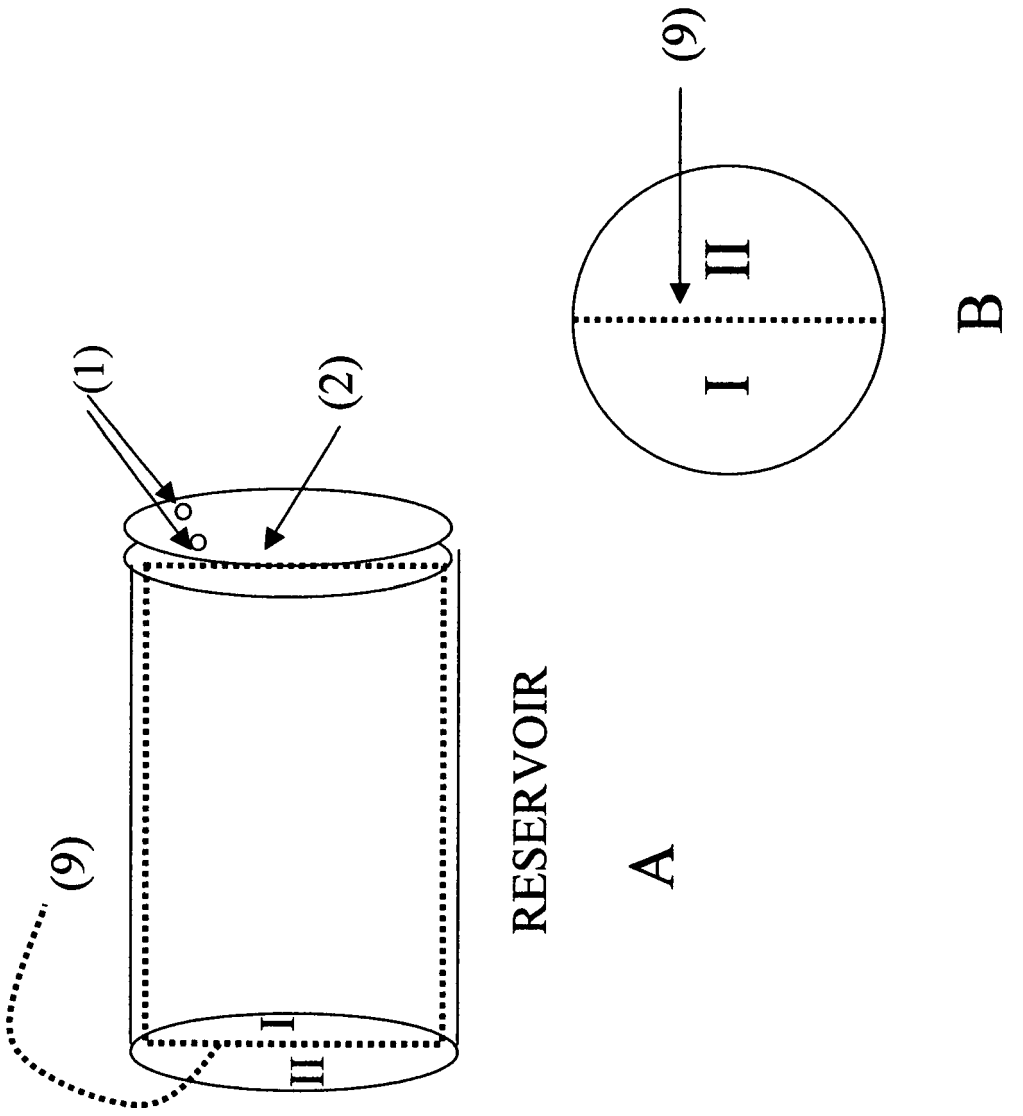

Fig. 3

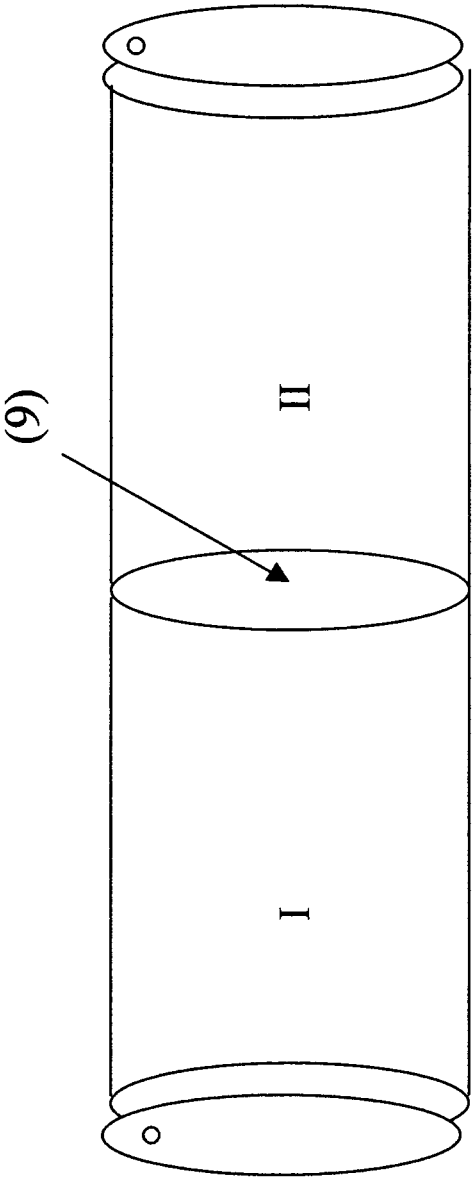

Fig 4

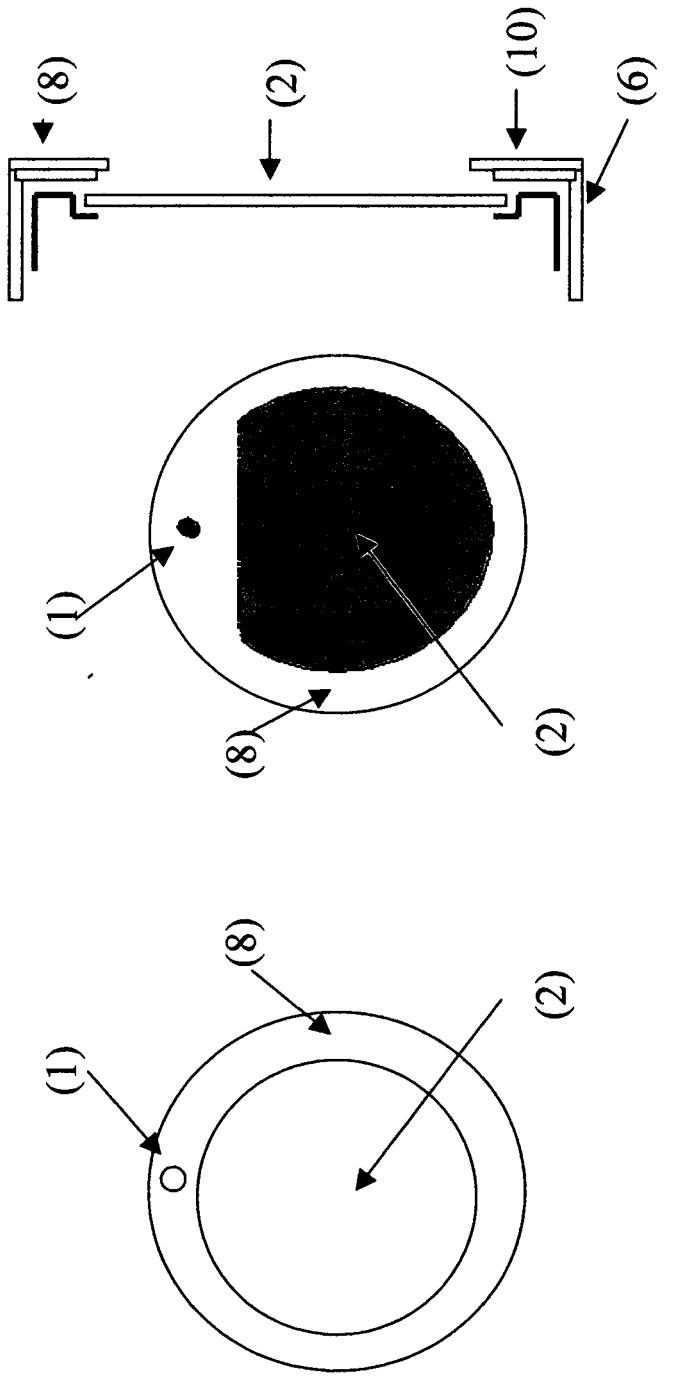

Fig 5

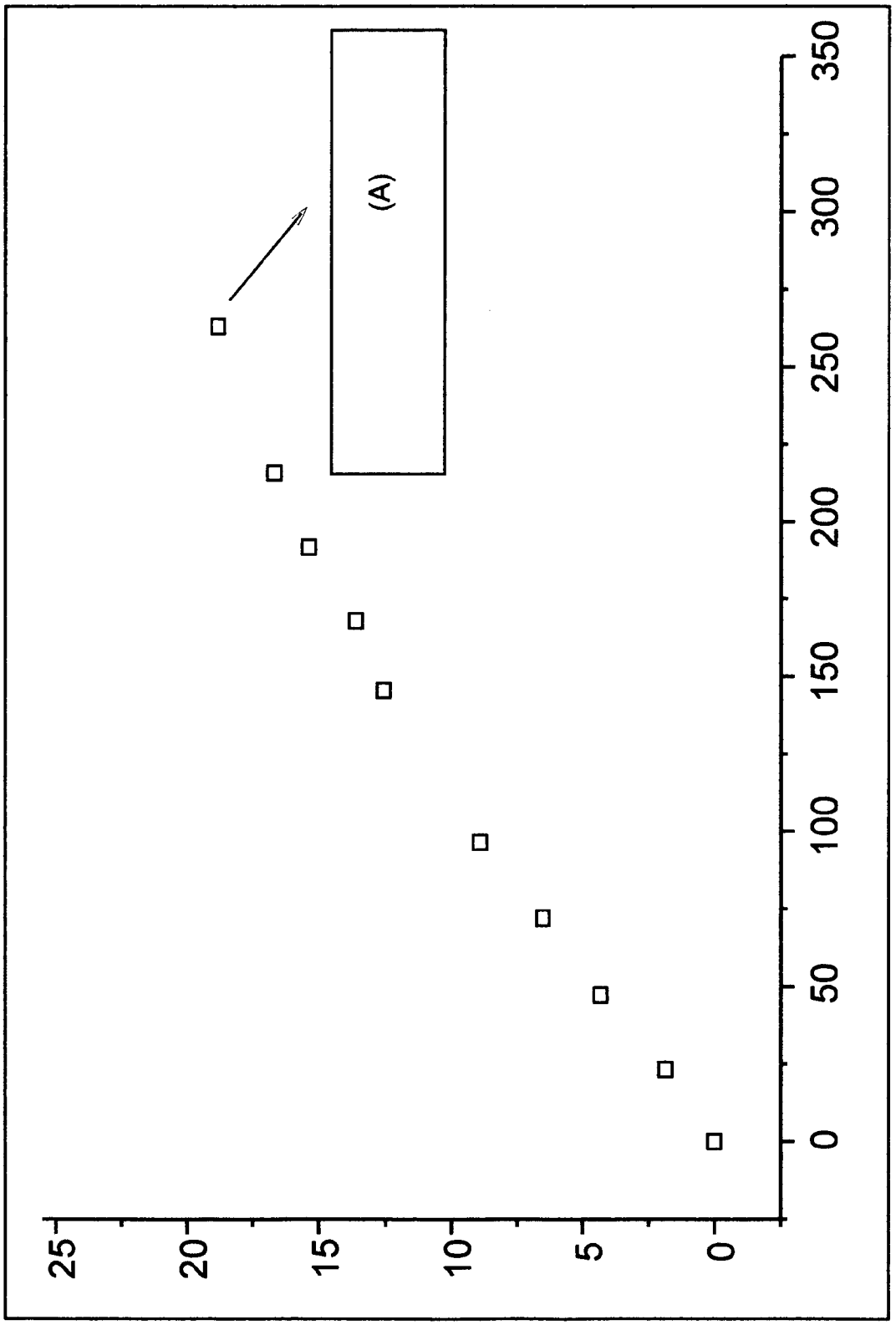

Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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