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⑤④ **Liquid preserving vessel for use in liquid sample analyzers.**

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⑤⑥ References cited:
EP-A-0 069 642
DE-A-2 719 113
DE-A-2 926 439
FR-A-2 521 956
US-A-3 368 560
US-A-4 116 336
US-A-4 387 126

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Description

The present invention relates to a vessel as stated in the precharacterizing portion of the single claim for preserving liquids for keeping standard solutions hermetically sealed against environmental influences and used for calibrating a calcium electrode and a pH electrode of liquid sample analyzers such as a blood analyzer.

Usually, in a vessel for preserving liquids as marked with a in Fig. 1, a mouth portion thereof is directly connected with an analyzer b so as to feed said analyzer b with the appointed quantity of a calibrating solution contained therein at a time when said analyzer b is calibrated. However, the conventional vessels for preserving liquids have the disadvantage that they are generally inflexible polyethylene tanks or glass bottles, and therefore, an internal air layer is expanded with the consumption of the liquid, whereby the chemical composition of the calibrating solution is changed due to the absorption of CO₂ contained in the air and also the concentration varies due to evaporation.

That is to say, in general, the calibrating solutions containing buffering agents such as BES (N,N-bis(2-hydroxymethyl)-2-aminoethane sulfonic acid) (pK = 6.9 at 37°C) and TES (N-tris-(hydroxymethyl)methyl-2-aminoethane sulfonic acid) pK = 7.22 at 37°C) having a pK value near the desired calibrating pH are used in such analyzers for determining calcium ions and pH at the same time, but, these buffering agents show a great affinity to calcium ions, whereby the difference is apt to be produced between the concentration of calcium weighted when the calibrating solution is prepared and the concentration of calcium ions in the prepared calibrating solution so that its preparation is difficult. In addition, in cases where such calibrating solutions are put in the above described conventional polyethylene tanks and glass bottles, as above described, an air layer is expanding with the consumption of calibrating solution and the calcium ions are bonded to CO₂ contained in the air to form a sediment of calcium carbonate or evaporation takes place, and as a result, the calibrating solution is changed in composition and concentration, such that the correct calibration can not be achieved.

From US—A—4 116 336 a vessel is known for preserving liquids for use in analyzers for liquid samples formed of a closed bag member consisting of two membrane members having very small permeability for air and water vapor and great flexibility, said membrane members are formed of a four-layer laminated membrane, respectively, consisting of an outermost polyester layer (a), an aluminum layer (b), a nylon layer (c) and an innermost plastic foil (d).

With respect to this vessel it is possible to control the intrusion of air thereinto from the outside as far as possible when the volume of the internal liquid is reduced (that is to say the calibrating solution contained in the vessel is

consumed) and to prevent water vapor from evaporating and intruding. The internal liquid may be withdrawn from the vessel by piercing the flexible wall of the container with a syringe needle. However, since the walls of the vessel are very thin, they cannot surely hold fast the needle in its position.

Furthermore, from US—A—3 368 560 a plastic container is known having a mouth portion sealed with a rubber plug for forming an outlet fitting. However, this outlet fitting has a very complicated structure and comprises an inner portion and an outer portion arranged coaxially to each other, a plug between said two portions, an integral flange at the outer end of the outer portion and a cap portion integrally connected to said integral flange via an annular web. The cap portion is provided with a finger tab suitably embossed with finger gripping ribs. In the operation of the cap portion, the finger tap is grasped between the thumb and forefinger and pulled whereupon a line of severance occurs in the area of the integral web.

On the other hand, as may be seen from Fig. 1 of US—A—3 368 560, the outlet fitting is provided on a side wall of said plastic container and diagonally arranged with respect to a hanger tab equipped with an eyelet or opening for suspension of the container on a standard. However, in this case a solution cannot be smoothly and surely taken out from the inside of said plastic container because of improper folding conditions of said container if a diagonally arrangement of the outlet fitting and the hanger tab is used.

From EP—A—0 069 642 a packing foil is known having an aluminum layer manufactured by vacuum deposition, whereas US—A—4 387 126 suggests the use of low density polyethylene for the innermost layer of a container.

It is an object of the present invention to provide a vessel for preserving liquids for use in analyzers for liquid samples from which a solution can be smoothly and surely taken out and which has a very simple and effective construction of the outlet fitting.

The solution of this object is characterized in that

- the bag member is provided with a mouth member made of hard plastic materials and fixedly adhered to the lower end portion thereof,
- the mouth member is sealed up tightly with a rubber plug,
- a cap provided with a small hole at the center thereof is screwed in said mouth member,
- a hanging hole is provided in the upper joined portion of said two membrane members,
- the aluminum layer is a vacuum deposited layer, and
- the innermost plastic foil is made from low density polyethylene.

An example of the invention is described in the following with reference to the drawings wherein Fig. 1 is a sketch for illustrating the problems of the prior art;

Fig. 2 to 5 illustrate a preferred embodiment of

a vessel for preserving liquids for use in analyzers for liquid samples, in which

Fig. 2 is a partially sectioned front view showing the vessel;

Fig. 3 is a sectional view taken along the line III—III of Fig. 2;

Fig. 4 is an enlarged sectional view showing the principal members of the vessel; and

Fig. 5 is a diagram illustrating an example of the application of the vessel in which a part (vessel) is solidly illustrated.

The preferred embodiment of the vessel according to the present invention will be described below with reference to Figs. 2 to 5.

As shown in Figs. 2, 3 a vessel for preserving liquids is formed of a hermetically closed bag member 4 consisting of two pieces of membrane member 2, (2) provided with a mouth member 1 made of hard plastic materials, which is sealed up tightly with a rubber plug 3, fixedly adhered to the lower end portion thereof and connected with each other all over the circumference thereof. 5 designates a hanging hole provided in the upper joined portion of said two pieces of membrane members 2, (2).

A four-layer laminated membrane consisting of the outermost polyester layer a, a vacuum deposited aluminium layer b, a nylon layer 3 (15 μ m) and a low-density polyethylene layer d (100 μ m), the thickness of said layer a and said layer b reaching 12 μ m in all, as shown in Fig. 4, is used as said membrane member 2. Said membrane member 2 is made of materials having high flexibility and having superior sealing and cut off properties for air, water vapour and light at the same time.

In addition, a cap 6, which is provided with a small hole 6a for letting pass a syringe there-through at the center thereof, can be screwed in said mouth member 1.

The solution, which contains TRIS, that is to say tris(hydroxymethyl)aminomethane, as a buffering agent, is enclosed in a vessel for preserving liquids as a standard calibrating solution for calibrating of analyzers, in which for example calcium ions and pH are determined at the same time, so that said solution may be filled in said vessel in such a manner that residual air is not contained in said solution at all. The calibrating solution, which hardly shows an affinity to calcium ions, can be prepared by using TRIS as a buffering agent instead of those cases where BES and TES are used as buffering agents.

Said vessel, in which the calibrating solution is enclosed in the above described manner, is connected with an analyzer 7 to calibrate said analyzer 7, as shown in Fig. 5. Referring to Fig. 5, 8 designate pipes for introducing a liquid to be tested, 9 designating a pipe for introducing the calibrating solution, 10 designating a switch valve, 11 designating a drawing pump, 12 designating a flow-through type ion electrode as a measuring member, and 13 designating a drain pipe. Said vessel for preserving liquids is fixed by inserting said hanging hole 5 over a hook 14

or the like and is connected with said pipe 9 for introducing the calibrating solution of said analyzer 7 by inserting a syringe 16 provided with a connecting tube 15 into said rubber plug 3 of said mouth member 1. If said switch valve 10 is switched over to the calibration side under such a condition, the calibrating solution is transferred to said ion electrode 12 in a determined quantity at every time by means of said drawing pump 11 to carry out the calibration. Then, said membrane members are gradually contracted with a gradual reduction of the volume of the calibrating solution contained in said vessel due to the high flexibility of the membrane material, whereby air cannot penetrate into said vessel from the outside.

Furthermore, since there is no solution passing through a passage 17 between said drawing pump 11 and said ion electrode 12 if the calibrating solution is completely consumed, a sensor 18 for detecting the complete consumption of said calibrating solution is provided and the exchange-alarm for the calibrating solution is given on the basis of the detection result to stop said drawing pump 11 automatically. Thus, the provision of an apparatus and a scale for detecting the liquid level at the vessel side is not required, and such a disadvantage adhering to the prior art that the pump 11 is operated under the condition that no liquid is flowing and air is transferred to said ion electrode 12 and it must be dried can effectively be prevented.

Further, since the bag member 4 made of greatly flexible materials contracts with the reduction of the quantity of liquid contained in said vessel even though liquid contained in the vessel is consumed, the pressure inside the vessel is not reduced so much. In addition, since the bag member 4 is made of materials having remarkably small permeability to air and water vapour, the intrusion of air from the outside as well as the evaporation and penetration of water vapour can be satisfactorily prevented, and therefore, the composition and concentration of the liquid contained in the vessel can be held constant for a long time. Therefore, a vessel according to the present invention can be very effectively used for a highly accurate determination of liquid quantities, for calibration purposes and the like.

Claim

A vessel for preserving liquids for use in analyzers for liquid samples formed of a closed bag member (4) consisting of two membrane members (2) having very small permeability for air and water vapor and great flexibility, said membrane members (2) are formed of a four-layer laminated membrane, respectively, consisting of an outermost polyester layer (a), an aluminum layer (b), a nylon layer (c) and an innermost plastic foil (d), characterized in that

— the bag member (4) is provided with a mouth member (1) made of hard plastic material

and fixedly adhered to the lower end portion thereof,

— the mouth member (1) is sealed up tightly with a rubber plug (3),

— a cap (6) provided with a small hole (6a) at the center thereof, is screwed in said mouth member (1),

— a hanging hole (5) is provided in the upper joined portion of said two membrane members (2),

— the aluminum layer (6) is a vacuum deposited layer, and

— the innermost plastic foil (d) is made from low density polyethylene.

Patentanspruch

Behälter zum Aufbewahren von Flüssigkeiten zur Verwendung in einem Flüssigkeitsproben-Analysator, bestehend aus einer durch zwei Membranen (2) gebildeten geschlossenen Tasche (4), die für Luft und Wasserdampf eine sehr geringe Durchlässigkeit sowie eine hohe Flexibilität aufweist, und bei der die Membranen jeweils aus einem Vierschichtaufbau mit einer äußeren Polyesterschicht (a), einer Aluminiumschicht (b), einer Nylonschicht (c) und einer inneren Kunststoffolie (d) bestehen, dadurch gekennzeichnet, daß

— die Tasche (4) ein an ihrem unteren Ende angeschlossenes Mundstück (1) aus einem harten Kunststoffmaterial aufweist,

— das Mundstück (1) mittels eines Gummistopfens (3) dicht versiegelt ist,

— eine Kappe (6) auf das Mundstück (1) aufgeschraubt ist, die in ihrem Zentrum ein kleines Loch (6a) aufweist,

— im oberen Verbindungsbereich beider Membranen (2) ein Loch (5) zum Aufhängen vorhanden ist,

— die innere Kunststoffolie (d) aus einem Polyäthylen mit niedriger Dichte besteht.

Revendication

Récipient pour conserver des liquides destinés à l'utilisation dans des analyseurs pour échantillons liquides, constitué d'un élément de pochette fermée (4) formé de deux éléments de membrane (2) ayant une très faible perméabilité vis à vis de l'air et de la vapeur d'eau, et une grande souplesse, lesdits éléments de membrane (2) étant constitués chacun d'une membrane stratifiée à quatre couches, consistant en une couche polyester extérieure (a), une couche d'aluminium (b), une couche de nylon (c) et une feuille de plastique intérieure (d), caractérisé en ce que

— l'élément de pochette (4) est muni d'un élément d'ouverture (1) en matière plastique dure et adhérent d'une manière fixe à la partie d'extrémité inférieure de ce dernier,

— l'élément d'ouverture (1) est fermé de manière étanche avec un bouchon de caoutchouc (3),

— un capuchon (6), muni en son centre d'un petit trou (6a), est vissé dans ledit élément d'ouverture (1),

— un trou de suspension (5) est prévu dans la partie supérieure raccordée desdits deux éléments de membrane (2),

— la couche d'aluminium (6) est une couche déposée sous vide, et

— la feuille de plastique intérieure (d) est en polyéthylène basse densité.

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Fig.1

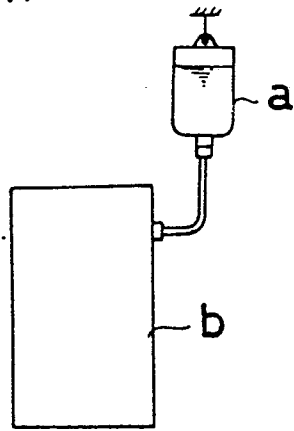


Fig.2

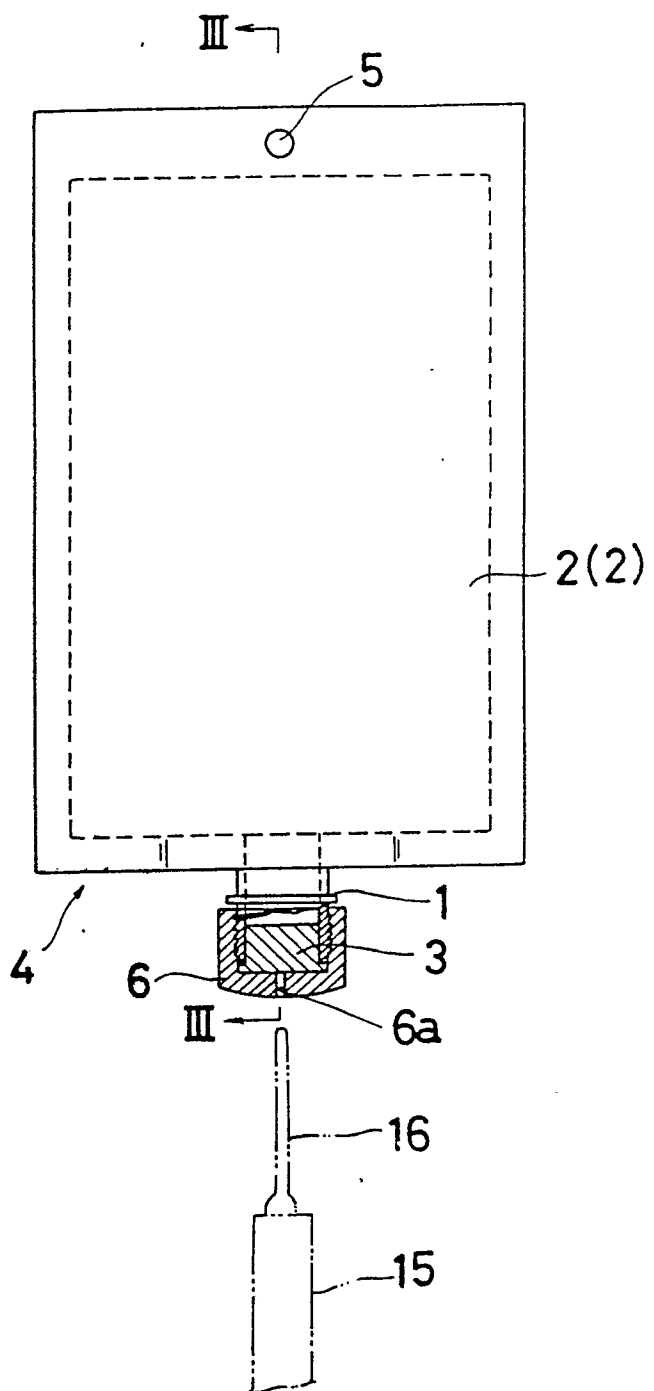


Fig. 3

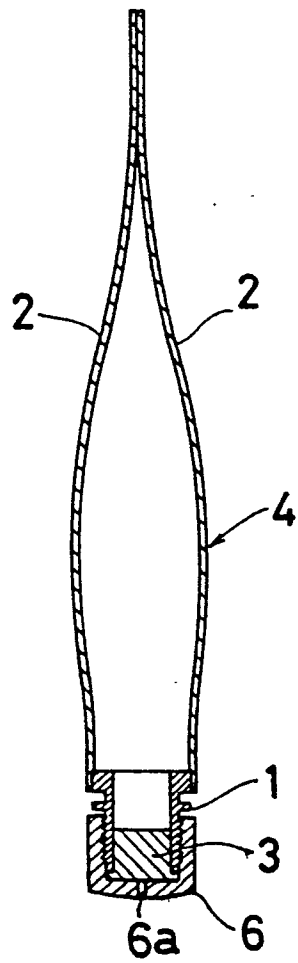


Fig.4

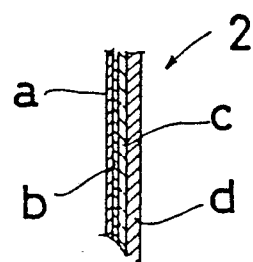


Fig. 5

