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(54) **Container with lid**

(57) There is provided a container with lid capable of preventing evaporation of a liquid, which is stored in the container, even if the liquid is continuously pipetted from the container. The container 10 with lid has a tubular container body 12 having a bottom 12b at the lower end thereof and having an opening 12a at the upper end thereof, a first lid portion 14 for opening and closing the opening 12a of the container body 12, a second lid portion 16 for opening and closing an opening 14a which is formed in the first lid portion 14, a first connecting portion

18 which connects the first lid portion 14 with the container body 12, and a second connecting portion 20 which connects the second lid portion 16 with the first lid portion 14, wherein the container body 12, the first and second lid portions 14, 16, and the first and second connecting portions 18, 20 are integral-molded. A first sealing member 22 is mounted on the first lid portion 14, and a second sealing member 24 is mounted on the second lid portion 16.

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## Description

### BACKGROUND OF THE INVENTION

#### Field of the Invention

[0001] The present invention generally relates to a container with lid. More specifically, the invention relates to a container (or a vessel) having a lid for holding the interior thereof in a sealed state.

#### Description of the Prior Art

[0002] Conventionally, a large number of containers called microcentrifuge tubes having a volume of 1.5 ml have been used as specimen sampling containers, sample assaying containers and so forth in various fields of biochemistry, such as genetic engineering, cell culture and pharmacological evaluation.

[0003] If such a microcentrifuge tube is used as a sample assaying container, a sample is often solved in a volatile solvent, such as methanol, when the sample is assayed. However, when a conventional microcentrifuge tube having no structure for holding the interior thereof in a sealed state is used for assaying a small amount of liquid sample, there are some cases where the liquid sample evaporates during operation, so that the concentration of the sample varies or the amount of the sample is insufficient by evaporation.

[0004] As containers for preventing such evaporation of samples, there are proposed various sealed containers (sealed microcentrifuge tubes) with lid capable of holding the interior thereof in a sealed state (see, e.g. Japanese Patent Publication No. 4-31945 and Japanese Patent Laid-Open No. 10-323176).

[0005] However, if such a conventional container with lid proposed in Japanese Patent Publication No. 4-31945 or Japanese Patent Laid-Open No. 10-323176 is used for assaying a sample, the interior of the container can not be held in a sealed state since a lid is open when the sample is assayed. In addition, if such a conventional container with lid is used for temporarily storing a reagent therein, a small amount of reagent is continuously pipetted into each of wells of a microplate or the like from the container while the lid of the container is open, so that there is the possibility that the reagent evaporates if the reagent is volatile.

### SUMMARY OF THE INVENTION

[0006] It is therefore an object of the present invention to eliminate the aforementioned problems and to provide a container with lid capable of preventing evaporation of a liquid, which is stored in the container, even if the liquid is continuously pipetted from the container.

[0007] In order to accomplish the aforementioned object, a container with lid according to the present invention comprises: a tubular container body having a bottom at

one end thereof and having an opening at the other end thereof; a first lid portion capable of opening and closing the opening of the container body; a second lid portion capable of opening and closing an opening which is formed in the first lid portion; a first connecting portion which connects the first lid portion with the container body; and a second connecting portion which connects the second lid portion with the first lid portion, wherein the container body, the first and second lid portions, and the first and second connecting portions are integral-molded.

[0008] In this container with lid, a first sealing member is preferably mounted on the first lid portion for sealing a gap between a peripheral portion of the first lid portion and the opening of the container body when the opening of the container body is closed by the first lid portion. In this case, the first sealing member preferably has a closing portion capable of opening and closing a central portion of the opening of the first lid portion, and the closing portion preferably has a cut.

[0009] In the above-described container with lid, a second sealing member is preferably mounted on the second lid portion for sealing a gap between the second lid portion and the opening of the first lid portion when the opening of the first lid portion is closed by the second lid portion. In addition, the first connecting portion is preferably folded when the opening of the container body is closed by the first lid portion, and the second connecting portion is preferably folded when the opening of the first lid portion is closed by the second lid portion. Moreover, the first and second lid portions, and the first and second connecting portions are preferably made of a resin material, and the first and second sealing members are preferably made of a material which is softer than the resin material.

[0010] According to the present invention, it is possible to prevent evaporation of a liquid, which is stored in the container, even if the liquid is continuously pipetted from the container.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The present invention will be understood more fully from the detailed description given herebelow and from the accompanying drawings of the preferred embodiments of the invention. However, the drawings are not intended to imply limitation of the invention to a specific embodiment, but are for explanation and understanding only.

[0012] In the drawings:

FIG. 1 is a perspective view of the preferred embodiment of a container with lid according to the present invention;

FIG. 2 is a plan view of the container with lid of FIG. 1; FIG. 3 is a side view of the container with lid of FIG. 1; FIG. 4 is a sectional view taken along line IV-IV of FIG. 2;

FIG. 5 is an enlarged sectional view showing a first lid portion of the container with lid of FIG. 1;  
 FIG. 6 is an enlarged sectional view showing a second lid portion of the container with lid of FIG. 1;  
 FIG. 7 is an enlarged plan view of a first sealing member of the container with lid of FIG. 1;  
 FIG. 8 is a side view of the first sealing member of FIG. 7;  
 FIG. 9 is a sectional view taken along line IX-IX of FIG. 7;  
 FIG. 10 is a sectional view showing a state that the first lid portion of the container with lid of FIG. 1 is open while the second lid portion thereof is closed;  
 FIG. 11 is a sectional view showing a state that the first and second lid portions of the container with lid of FIG. 1 are closed; and  
 FIG. 12 is a sectional view showing a state that the second lid portion of the container with lid of FIG. 1 while the first lid portion thereof is closed.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0013]** Referring now to the accompanying drawings, the preferred embodiment of a container with lid according to the present invention will be described below in detail.

**[0014]** As shown in FIGS. 1 through 4, a container 10 with lid in this preferred embodiment comprises: a tubular container body 12 having a bottom at the lower end thereof and an opening 12a at the upper end thereof; a first lid portion 14 for opening and closing the opening 12a of the container body 12; a second lid portion 16 for opening and closing an opening 14a which is formed in the first lid portion 14; a first connecting portion 18 which connects the container body 12 with the first lid portion 14; and a second connecting portion 20 which connects the first lid portion 14 with the second lid portion 16. The container body 12, first lid portion 14, second lid portion 16, first connecting portion 18 and second connecting portion 20 are made of a flexible resin material, such as polypropylene, having excellent chemical resistance and heat resistance, and are integral-molded by injection molding or the like. The container 10 with lid in this preferred embodiment further comprises a first sealing member 22 mounted on the first lid portion 14, and a second sealing member 24 mounted on the second lid portion 16.

**[0015]** The container body 12 comprises: a substantially cylindrical large-diameter portion 12c having a substantially circular opening 12a at the upper end thereof; a substantially cylindrical small-diameter portion 12d, the diameter of which is smaller than that of the large-diameter portion 12c; and a tapered portion 12e having a substantially circular bottom portion 12b at the lower end thereof. The small-diameter portion 12d extends downwards from the bottom of the large-diameter portion 12c, and the tapered portion 12e extends downwards from the bottom of the small-diameter portion 12d, so that a

liquid storing chamber 12f having a volume of about 0.5 to 1.5 ml is formed in the container body 12.

**[0016]** The first lid portion 14 comprises a substantially cylindrical member which has a substantially cylindrical opening 14a. As shown in FIGS. 1 through 5, the first lid portion 14 has a groove portion 14b, which is formed in the top face thereof (the upper surface in FIG. 5) and which extends in circumferential directions so that a cylindrical portion 22b (see FIG. 9) of the first sealing member 22 (which will be described later) is fitted into the groove portion 14b, and a groove portion 14c which is formed in the side face thereof and which extends in circumferential directions so that an engaging portion 22c (see FIG. 9) of the first sealing member 22 (which will be described later) is fitted into the groove portion 14c. Furthermore, the outside diameter of a portion of the first lid portion 14 (a cylindrical portion shown by 14d in FIG. 5), which is inserted into the opening 12a of the container body 12 when the container body 12 is closed by the first lid portion 14, is slightly smaller than the inside diameter of the opening 12a of the container body 12. Thus, as shown in FIGS. 11 and 12, when the container body 12 is closed by the first lid member 14, the cylindrical portion 14d of the first lid member 14 is housed in the opening 12a of the container body 12, and the first sealing member 22 mounted on the first lid member 14 is compressed to seal the peripheral portion of the opening 12a of the container body 12.

**[0017]** As shown in FIGS. 1 through 4 and 6, the second lid member 16 comprises: a substantially guitar-shaped flat plate portion 16a having a protruding portion 16b which extends from the side face of a substantially circular plate portion in substantially parallel thereto; and a cylindrical portion 16c which extends downwards from the bottom face of the substantially circular plate portion of the flat plate portion 16a in substantially perpendicular thereto and which has a substantially circular opening 16d at the lower end thereof. The side face of the cylindrical portion 16c has a groove portion 16e which extends in circumferential directions and into which a substantially cylindrical second sealing member 24 of a softer material, such as a rubber, e.g. silicon rubber, than the resin material is fitted. Furthermore, the outside diameter of the cylindrical portion 16c of the second lid portion 16 is slightly smaller than the inside diameter of the opening 14a of the first lid member 14. Thus, when the opening 14a of the first lid portion 14 is closed by the second lid portion 16 as shown in FIGS. 10 and 11, the cylindrical portion 16c of the second lid portion 16 is housed in the opening 14a of the first lid portion 14, and the second sealing member 24 fitted into the groove portion 16e of the second lid portion 16 is compressed to seal the opening 14a of the first lid member 14.

**[0018]** As shown in FIGS. 1 through 4, the first connecting portion 18 comprises a strip-like portion which substantially linearly extends from a portion near the upper end of the side face of the large-diameter portion 12c of the container body 12 to a portion near the lower end

(the lower end in FIGS. 3 and 4) of the side face of the first lid portion 14 to connect the container body 12 with the first lid portion 14. The central portion of the first connecting portion 18, except for both end portions thereof, is thin to such an extent that it can be folded as shown in FIGS. 11 and 12. Thus, the opening 12a of the container body 12 can be closed by the first lid portion 14 as shown by arrow B in FIG. 4.

**[0019]** As shown in FIGS. 1 through 4, the second connecting portion 20 comprises a strip-like portion substantially linearly extending from a portion near the lower end (the lower end in FIGS. 3 and 4) of the side face of the first lid portion 14, which is the opposite side face to the first connecting portion 18 in radial directions, to the side face of the flat plate portion 16a of the second lid portion 16, which is the opposite side face to the protruding portion 16b. The central portion of the second connecting portion 20, except for both end portions thereof, is thin to such an extent that it can be folded as shown in FIGS. 10 and 11. Thus, the opening 14a of the first lid portion 14 can be closed by the second lid portion 16 as shown by arrow A in FIG. 4.

**[0020]** The first sealing member 22 is made of a softer material, such as a rubber, e.g. silicon rubber, than the resin material. As shown in FIGS. 7 through 9, the first sealing member 22 comprises a cylindrical portion 22b having a substantially circular opening 22a, an engaging portion 22c protruding and extending from the cylindrical portion 22b, and a closing portion for opening and closing the opening 22a of the cylindrical portion 22b. The engaging portion 22c protrudes outwards in radial directions from the upper end of the side face of the cylindrical portion 22b. The engaging portion 22c extends so as to have a substantially U-shaped cross section to form a gap 22e between the tip thereof and the cylindrical portion 22b, and extends over the entire periphery of the cylindrical portion 22b in circumferential directions thereof. The cylindrical portion 22b of the first sealing member 22 is fitted into the groove portion 14b which is formed in the top face of the first lid portion 14 (the upper surface in FIG. 5), and the tip portion of the engaging portion 22c is fitted into the groove portion 14c which is formed in the side face of the first lid portion 14. Thus, the first lid member 14 is clamped and held between the cylindrical portion 22b and the engaging portion 22c, so that the first sealing member 22 is fixed to the first lid member 14. The closing portion 22d comprises a substantially plate-like portion which is slightly inclined upwards as a distance from the center thereof decreases. The closing portion 22d has a cross-shaped cut 22f which is made therein so as to cross at the center thereof as shown in FIG. 7, so that a pipette chip or like can be inserted into the container body 12 through the cut 22f to pipette a liquid from the container body 12 even if the opening 12a of the container body 12 is closed by the first lid portion 14 as shown in FIG. 12.

**[0021]** Referring to FIGS. 10 through 12, an example of a method for using the container 10 with lid in this preferred embodiment will be described below.

**[0022]** First, as shown in FIG. 10, the first lid portion 14 of the container 10 with lid is open while the second lid portion 16 thereof is closed. In this state, a liquid, such as a reagent, is put in the container body 12. Then, as shown in FIG. 11, the first lid portion 14 is closed. In this state, the opening 12a of the container body 12 is air-tightly closed by the first sealing member 22 which is mounted on the first lid portion 14, and the opening 14a of the first lid portion 14 is air-tightly closed by the second sealing member 24 which is mounted on the second lid portion 16, so that the interior of the container body 12 can be held in a sealed state. If a liquid, such as a reagent, is thus put in the container body 12 in a state that the opening 14a of the first lid portion 14 is closed by the second lid portion 16, the interior of the container body 12 can be held in a sealed state by closing the first lid portion 14 without causing the operator's hand to contact the opening 14a of the first lid portion 14 and the closing portion 22d of the first sealing member 22, so that it is possible to prevent contamination of the liquid in the container body 12.

**[0023]** Then, as shown in FIG. 12, the second lid portion 16 of the container 10 with lid is open while the first lid portion 14 thereof is closed. In this state, a pipette or the like can be inserted into the container body 12 through the cross-shaped cut 22f to pipette the liquid from the container body 12 while the interior of the container body 12 is substantially held in a sealed state without substantially opening the interior of the container body 12, since the cross-shaped cut 22f is made in the closing portion 22d of the first sealing member 22 although the peripheral portion of the opening 12a of the container body 12 is sealed by the first sealing member 22 which is mounted on the first lid portion 14. Therefore, even if a liquid, such as a volatile reagent, is held in the container body 12, it is possible to hold gastightness in the container body 12 to prevent evaporation in the container body 12. In addition, the opening and closing directions of the first lid portion 14 are opposite to those of the second lid portion 16, and the second lid portion 16 has the protruding portion 16b, so that it is possible to simply open and close the first lid portion 14 and second lid portion 16 by the operator's one hand.

**[0024]** While the large-diameter portion 12c of the container body 12, the first lid portion 14 and the second lid portion 14 in the container 10 with lid have been substantially linearly arranged in the above-described preferred embodiment, it is not always required to substantially linearly arrange them if they are integral-molded.

**[0025]** While the first sealing member 22 has been mounted on the first lid portion 14 of the container 10 with lid in the above-described preferred embodiment, it is not required to provide the first sealing member 22 if the first lid portion 14 has a shape corresponding to the first sealing member 22 mounted thereon while a soft material is used as the material of the container body 12 and so forth to be integral-molded. Alternatively, it is not required to provide the first sealing member 22 if a closing portion

corresponding to the closing portion 22d of the first sealing member 22 is formed so as to be integrated with the first lid portion 14 and if the outside diameter of a portion (the cylindrical portion 14d) of the first lid portion 14 to be inserted into the opening 12a of the container body 12 is increased so that the cylindrical portion 14d of the first lid portion 14 can be fitted into the opening 12a of the container body 12 to seal the peripheral portion of the opening 12a of the container body 12 when the opening 12a of the container body 12 is closed by the first lid portion 14, while a soft material is used as the material of the container body 12 and so forth to be integral-molded. Also in such constructions, it is possible to prevent evaporation of a liquid, such as a reagent, in the container body 12 when the liquid is pipetted by means of a pipette chip.

**[0026]** Similarly, while the second sealing member 24 has been mounted on the second lid portion 16 of the container 10 with lid in the above-described preferred embodiment, it is not required to provide the second sealing member 24 if the cylindrical portion 16c of the second lid portion 16 has a shape corresponding to the second sealing member 24 mounted thereon while a soft material is used as the material of the container body 12 and so forth to be integral-molded. Alternatively, it is not required to provide the second sealing member 24 if the outside diameter of the cylindrical portion 16c of the second lid portion 16 is increased so that the cylindrical portion 16c of the second lid portion 16 can be fitted into the opening 14a of the first lid portion 14 to seal the opening 14a of the first lid portion 14 when the opening 14a of the first lid portion 14 is closed by the second lid portion 16, while a soft material is used as the material of the container body 12 and so forth to be integral-molded.

**[0027]** A container with lid according to the present invention can be utilized as a microcentrifuge tube in various fields of biochemistry, such as genetic engineering, cell culture and pharmacological evaluation, and can be utilized as one of various containers, such as sampling containers, assaying containers, reaction containers and centrifuge containers.

## Claims

### 1. A container with lid comprising:

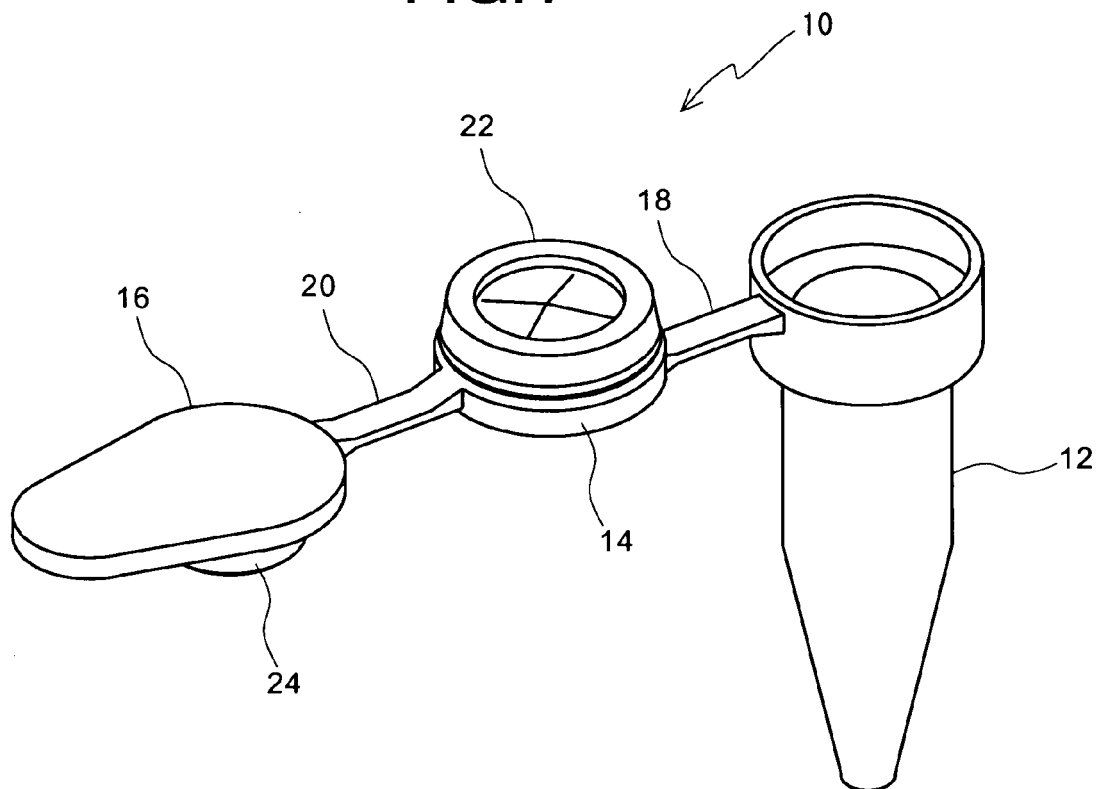
a tubular container body having a bottom at one end thereof and having an opening at the other end thereof;  
a first lid portion capable of opening and closing the opening of the container body;  
a second lid portion capable of opening and closing an opening which is formed in the first lid portion;  
a first connecting portion which connects the first lid portion with the container body; and  
a second connecting portion which connects the

second lid portion with the first lid portion,

wherein the container body, the first and second lid portions, and the first and second connecting portions are integral-molded.

2. A container with lid as set forth in claim 1, which further comprises a first sealing member, mounted on said first lid portion, for sealing a gap between a peripheral portion of said first lid portion and the opening of said container body when the opening of said container body is closed by said first lid portion.
3. A container with lid as set forth in claim 2, wherein said first sealing member has a closing portion capable of opening and closing a central portion of the opening of said first lid portion.
4. A container with lid as set forth in claim 3, wherein said closing portion has a cut.
5. A container with lid as set forth in claim 1, which further comprises a second sealing member, mounted on said second lid portion, for sealing a gap between said second lid portion and the opening of said first lid portion when the opening of said first lid portion is closed by said second lid portion.
6. A container with lid as set forth in claim 1, wherein said first connecting portion is folded when the opening of said container body is closed by said first lid portion, and said second connecting portion is folded when the opening of said first lid portion is closed by said second lid portion.
7. A container with lid as set forth in claim 1, wherein said container body, said first and second lid portions, and said first and second connecting portions are made of a resin material, and said first and second sealing members are made of a material which is softer than said resin material.

**FIG.1**



**FIG.2**

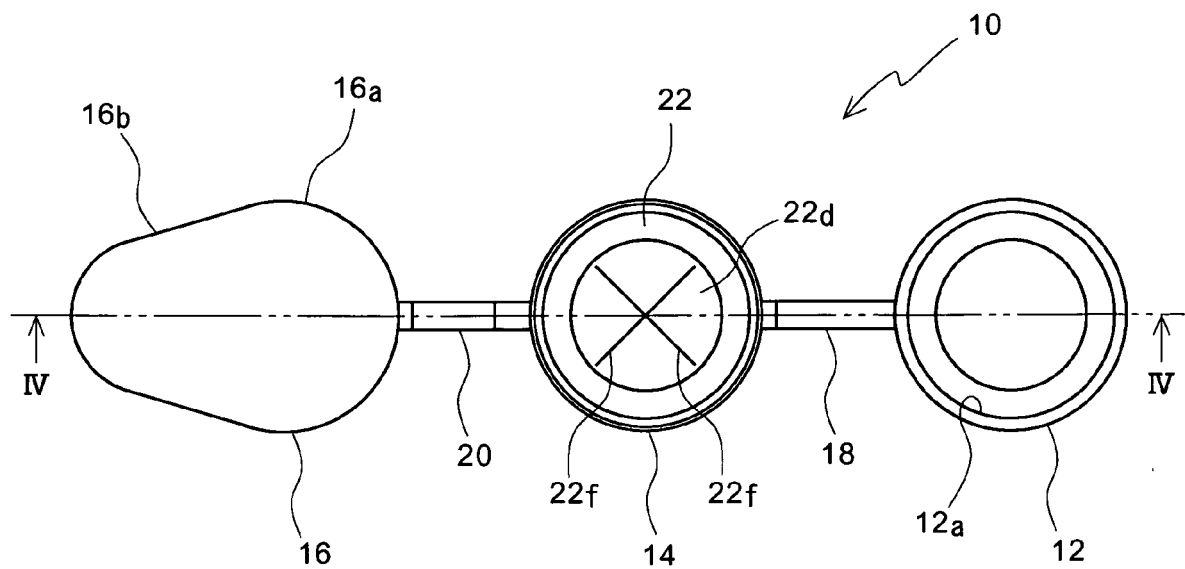


FIG.3

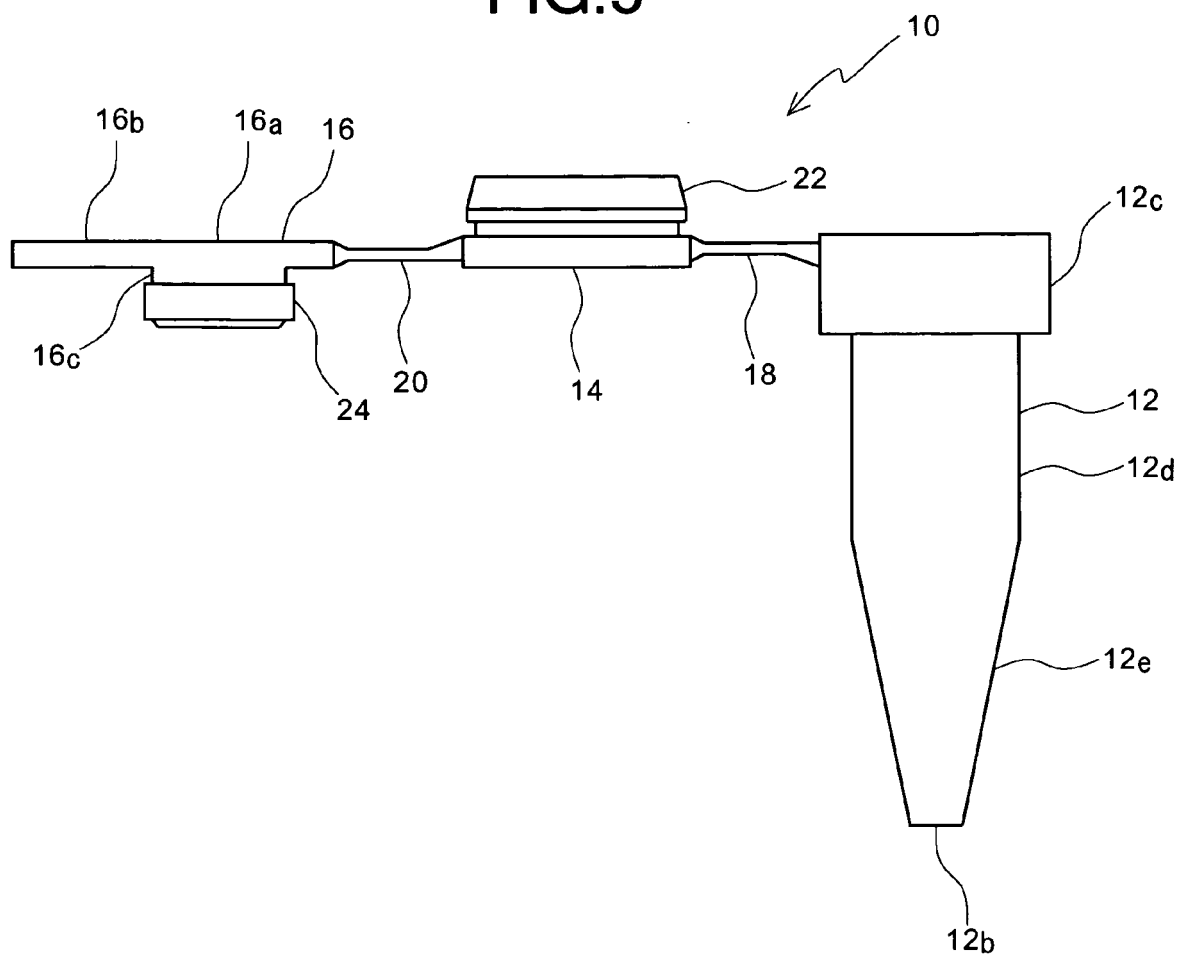


FIG.4

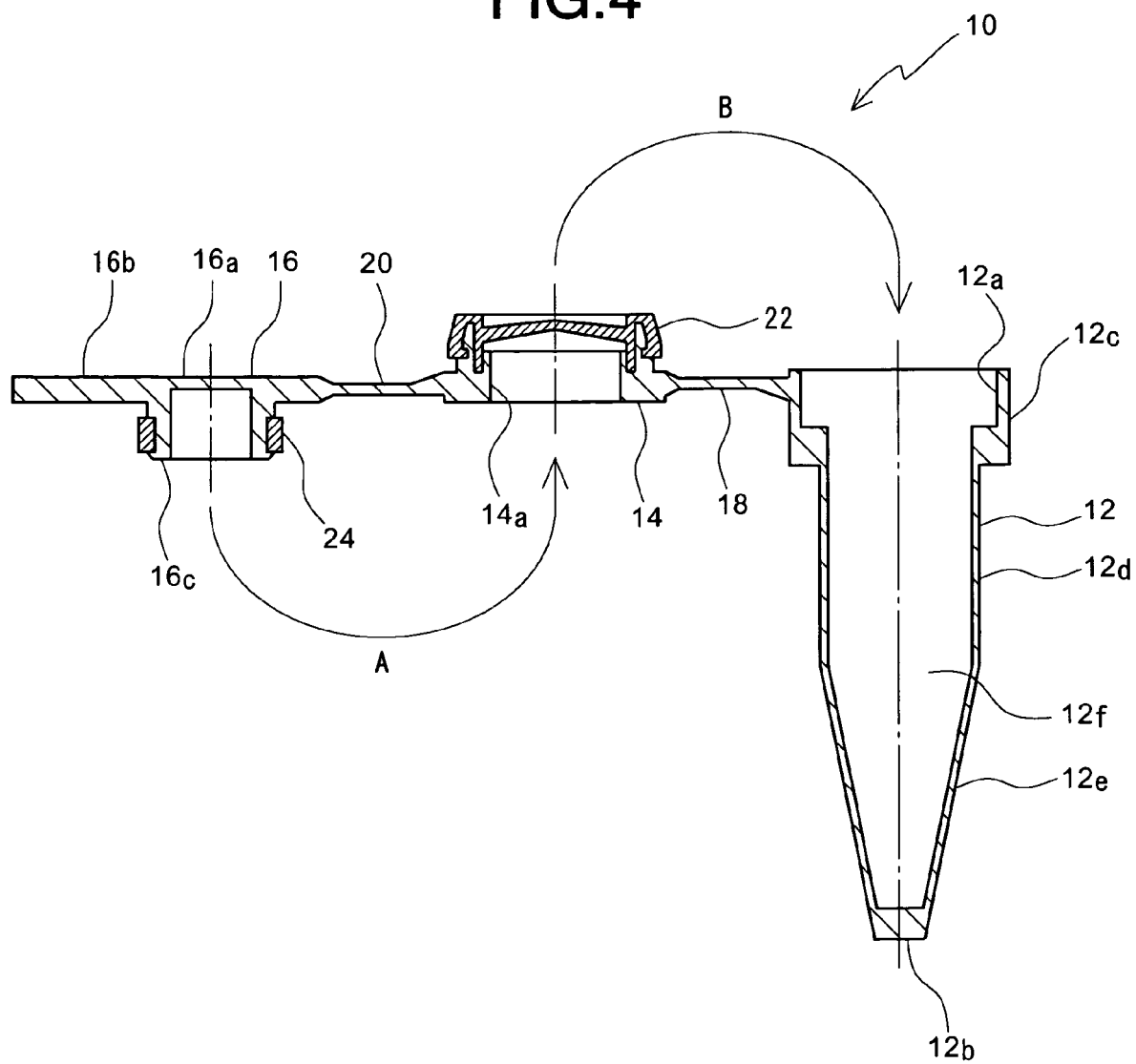




FIG.5

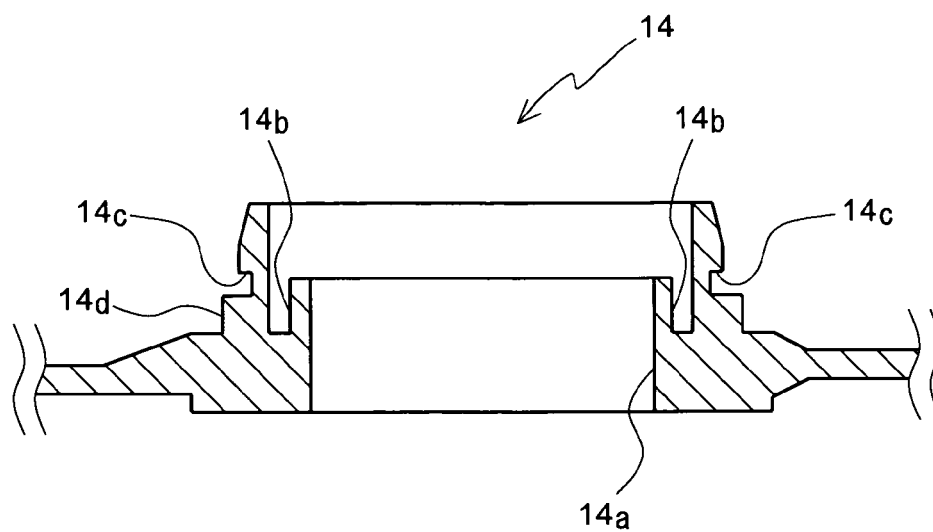


FIG.6

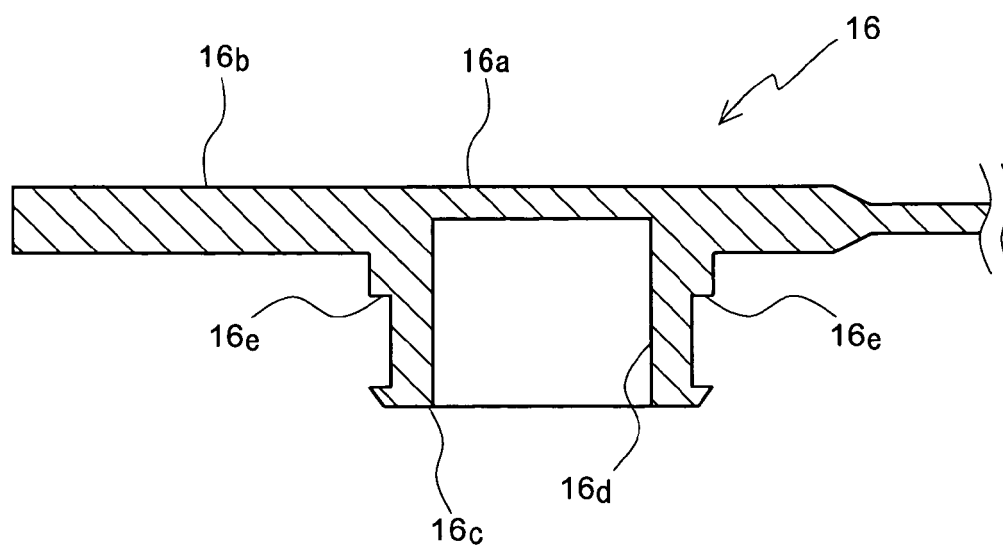


FIG.7

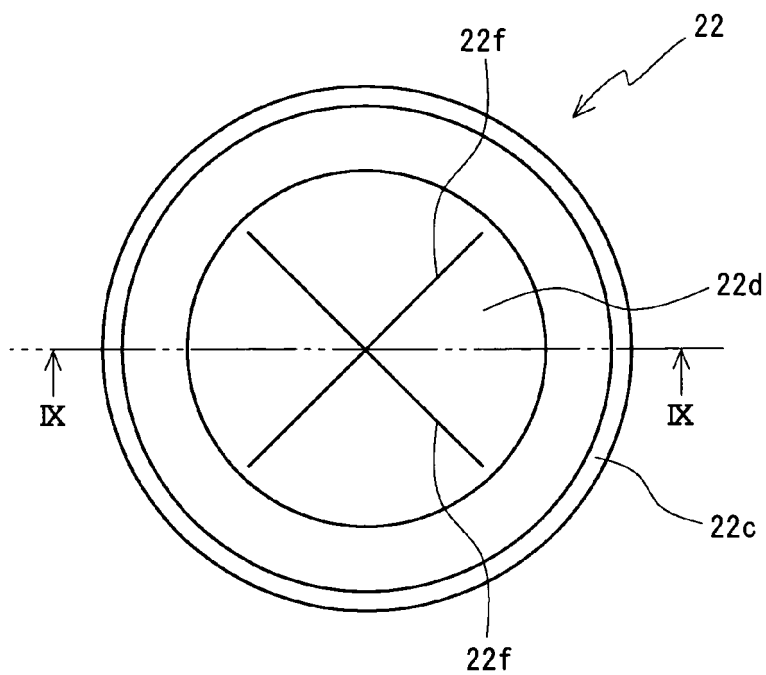


FIG.8

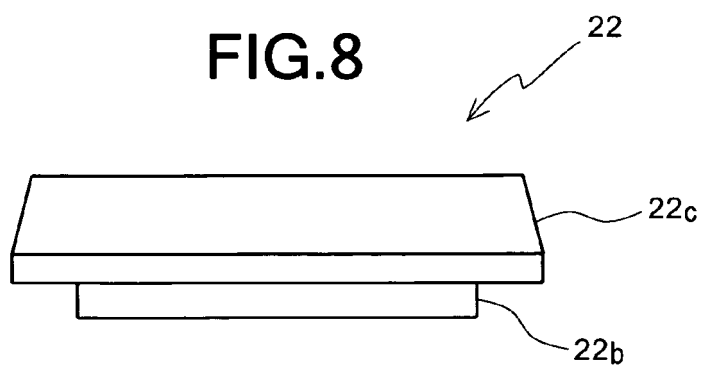


FIG.9

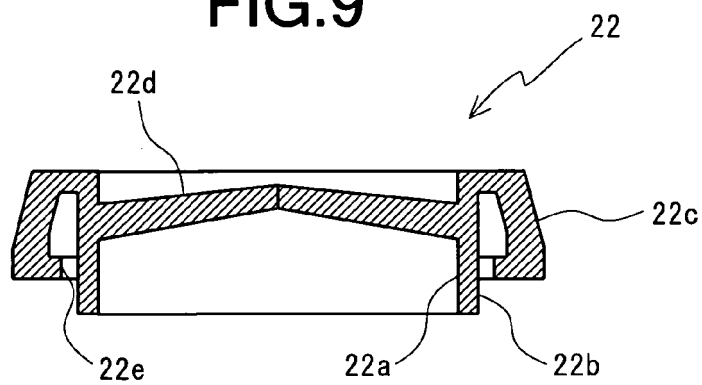


FIG.10

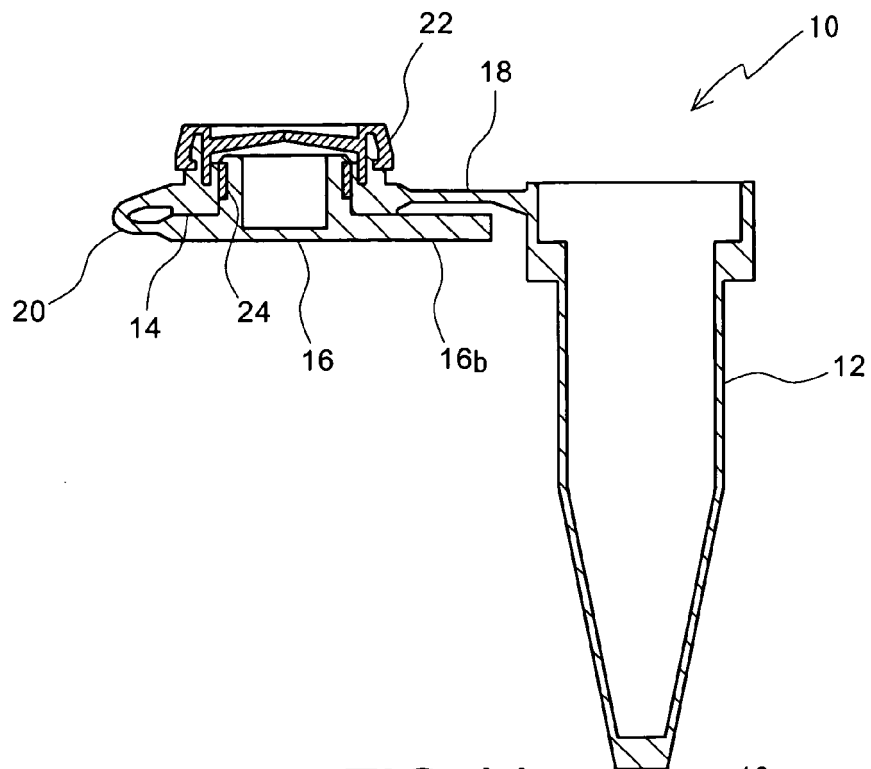


FIG.11

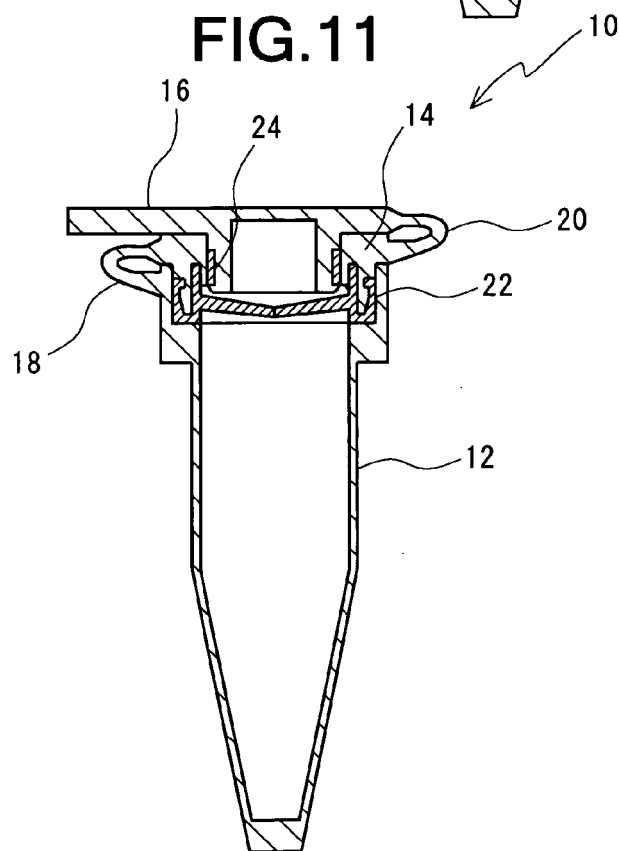
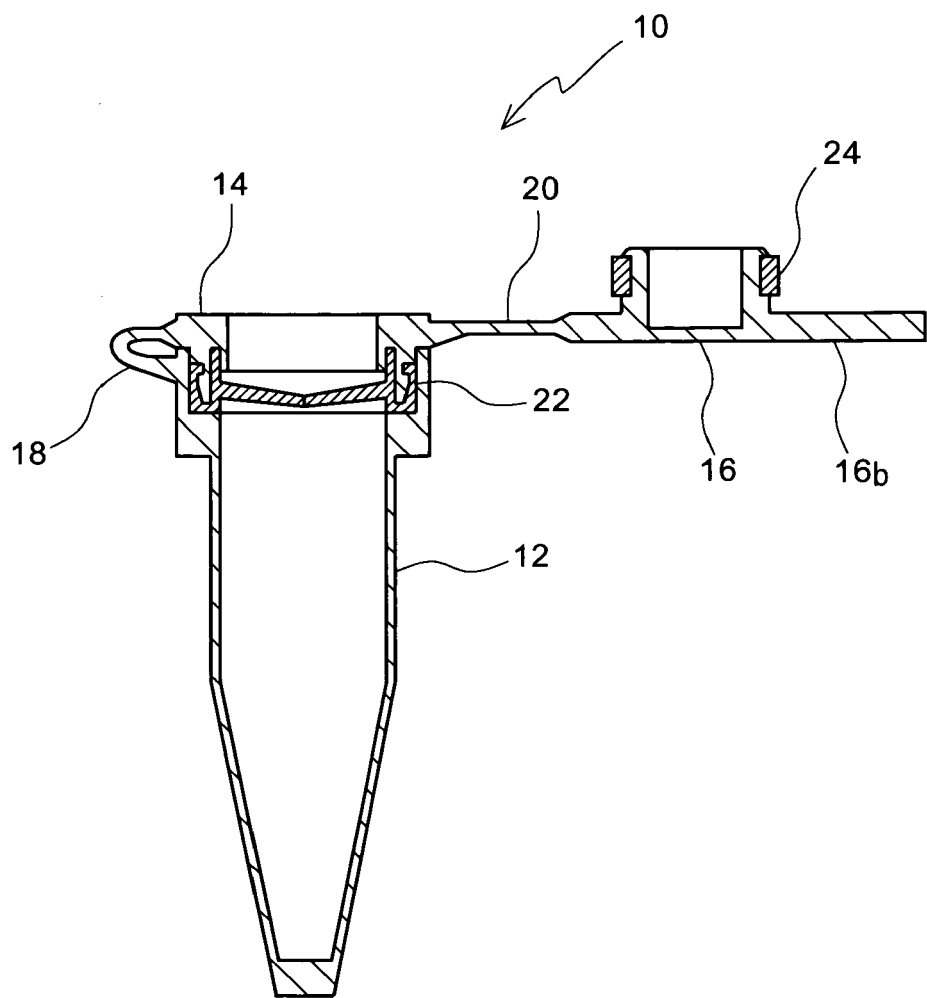


FIG.12





European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number  
EP 07 02 2241

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                   |                                                      |                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Citation of document with indication, where appropriate, of relevant passages                                                                     | Relevant to claim                                    | CLASSIFICATION OF THE APPLICATION (IPC)         |
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| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                   |                                                      |                                                 |
| Place of search<br>Berlin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                   | Date of completion of the search<br>12 February 2008 | Examiner<br>Cubas Alcaraz, Jose                 |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                                                                                                   |                                                      |                                                 |

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EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 07 02 2241

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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12-02-2008

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**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.*

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