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(72) Inventor: **SUZUKI, Issei**  
**Yamato-shi Kanagawa 242 (JP)**

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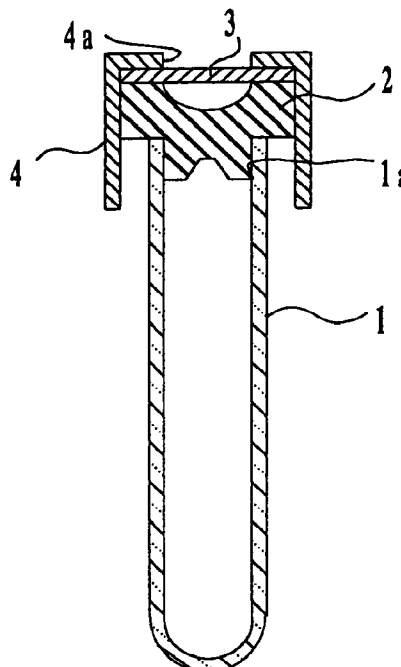
(74) Representative: **Mannucci, Gianfranco, Dott.-Ing.**  
**et al**  
**Ufficio Tecnico Ing. A. Mannucci**  
**Via della Scala 4**  
**50123 Firenze (IT)**

(71) Applicant: **SUZUKI, Issei**  
**Yamato-shi Kanagawa 242 (JP)**

(54) **CONTAMINATION-PROOF VACUUM BLOOD-SAMPLING TUBE**

(57) The vacuum blood collecting tube or container with contamination prevention means according to the present invention comprises an absorbing member of a liquid-absorbable and elastomeric material which is provided at least in the opening region of a tube or container body, through which region the blood collecting needle penetrates, so that any leaking or scattering of blood after collection can be avoided.

**FIG. 2**



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## Description

### TECHNICAL FIELD OF THE INVENTION

This invention relates to a vacuum blood collecting tube or container intended to be used in assembly with a vacuum blood collecting needle in which an amount of blood corresponding to a predetermined negative pressure of the interior can be collected.

### BACKGROUND ART OF THE INVENTION

Conventionally, as shown in FIG. 1, such kind of vacuum blood collecting tube or container comprises a vacuum blood collecting body A of test tube type which is made of a transparent plastic material and a rubber plug body B hermetically mounted on one end opening of the vacuum blood collecting body A. The interior of the blood collecting tube or container is retained in a negative pressure state at a pre-set level corresponding to the blood amount intended to collect.

When collecting blood by using such a vacuum tube or container, one end or tip of a vacuum blood collecting needle mounted to a holder is penetrated into the vein of the subject, and the other end of the needle is penetrated into the rubber plug body B mounted to one end opening of the vacuum blood collecting tube or container body A so as to communicate the needle with the interior of the tube or container whereby it is capable of collecting the blood of the amount corresponding the predetermined negative pressure within the vacuum blood collecting tube body A. Thus, after the collection of the blood, the vacuum blood collecting needle is withdrawn from the vacuum blood collecting tube or container, said tube or container with the collected blood is passed to test or examination.

In such a conventional vacuum blood collecting tube or container it is afraid that when taking the tube or container off the vacuum blood collecting needle after the blood collection from the subject, the vacuum blood collecting needle and the rubber-made plug body of the vacuum blood collecting tube or container may be caused with flashback or the blood may adhere to the fingers or the like of the doctor or nurse who manipulates the blood collecting device thereby leaving a dried blood. In such blood collection, blood is collected often for a plurality of the tubes or containers and thus there is a risk that each time the tube is withdrawn from the vacuum blood collecting needle the fingers of the doctor or nurse may get contact with the collected blood. This may cause a secondary infection in the blood collecting or examining operation.

### DISCLOSURE OF THE INVENTION

To prevent the infection accident caused by the contact with the blood in such blood collecting or examining operation or by the dried blood residue adhered to the external surface of the plug body of said vacuum blood

collecting tube, it is an object of the present invention to provide a vacuum blood collecting tube or container with contamination prevention means, in which it is possible to prevent any dropping or scattering of the blood to the outside when the vacuum blood collecting needle is separated from the vacuum blood collecting tube or container at the blood collection or examination whereby a sanitary environment is always kept.

According to the present invention, the above object is achieved by the provision of a member which absorbs the blood adhered to the vacuum blood collecting needle when the needle is withdrawn from or inserted into the blood collecting tube or container, and which is intended to prevent any dropping or scattering of the blood to the outside when the vacuum blood collecting needle is separated from the vacuum blood collecting tube or container.

Therefore, the vacuum blood collecting tube or container with contamination prevention means according to the invention comprises a vacuum blood collecting tube or container body whose one end is opening and whose interior is retained in a determined negative pressure state, a plug body made of an elastomeric member hermetically fitted with the opening of said vacuum blood collecting tube or container body, and an absorbing member which is positioned at the opening region through which at least the blood collecting needle penetrates and which is constituted by an elastomeric material having an absorbing property to liquid.

Preferably, the absorbing member can be constituted by any optional one material of a chemical fiber, a cotton fiber, paper and a synthetic resin which absorb liquid or by-a composite material of the two or more of said materials.

In one embodiment of the invention, the absorbing member is sheet-like and secured to the external surface of the plug body. In that instance, the absorbing member in the sheet form may also be formed as an external surface layer of the plug body by coating means.

According to another embodiment of the invention, the absorbing member is mass-like and secured to the external surface of the plug body. Alternatively, the mass-like absorbing member may be fixed being fitted into the plug body.

According to a further embodiment of the invention, the vacuum blood collecting tube or container with contamination prevention means is provided, in addition to the above structure, with a cap which is mounted to the outside of the opening of said vacuum blood collecting tube body thereby to prevent said outside portion of the tube body from contamination.

Moreover, the absorbing member may be structured in one body with the plug body and/or the cap.

According to still another embodiment of the invention, the blood collecting tube or container with contamination prevention means comprises a vacuum blood collecting tube or container body whose one end is opening and whose interior is retained in a predeter-

mined negative pressure state, a sealing member which is hermetically mounted to the flange of the opening of said tube body, a plug member which is secured to the region of said sealing member, through which region at least the blood collecting needle penetrates, and an absorbing member which is fixed onto the plug member and composed of an elastomeric material having absorbability to liquid.

In the present vacuum blood collecting tube or container thus structured, the absorbing member assembled with the plug body absorbs the blood staying at the tip of the needle when the vacuum blood collecting tube or container is separated from the vacuum blood collecting needle at blood collection thereby preventing the blood from dropping or scattering to the outside. Thus, it is capable of avoiding beforehand a risk that the blood collector touches the blood in error or part of the blood adheres to the external surface of the vacuum blood collecting tube so as to be left in the dried state, and it is possible always to retain a sanitary environment so that the blood collection or examination can be carried out safely and easily.

#### BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a schematic sectional view showing one example of a conventional vacuum blood collecting tube or container;

FIG. 2 is a schematic sectional view showing one embodiment of the vacuum blood collecting tube or container of the invention;

FIG. 3 is a schematic sectional view showing modified embodiment of the blood collecting tube or container of the invention;

FIG. 4 is a schematic sectional view showing another embodiment of the blood collecting tube or container of the invention;

FIG. 5 is a schematic sectional view showing a further embodiment of the vacuum blood collecting tube or container of the invention;

FIG. 6 is a schematic sectional view showing the essential part of still another embodiment of the vacuum blood collecting tube or container of the invention;

FIG. 7 is a schematic sectional view showing the essential part of a modified embodiment of the tube or container of FIG. 6;

FIG. 8 is an enlarged schematic sectional view showing a structural example of the absorbing member; and

FIG. 9 is a schematic sectional view showing a modification of the tube or container of FIG. 2.

#### PREFERRED EMBODIMENTS OF THE INVENTION

The invention will now be described more in detail, based on the embodiments, with reference to FIGS. 2 to 9 of the accompanying drawings.

FIG. 2 illustrates the vacuum blood collecting tube

or container according to one embodiment of the present invention. The illustrated vacuum blood collecting tube or container includes a vacuum blood collecting tube or container body 1 whose one end is opening and whose interior is retained in a predetermined negative pressure state. The body 1 is made of a suitable transparent plastic material, and the opening 1a at one end of the tube is hermetically fitted with a plug body 2 which is composed of rubber or an elastomeric polymer such as neoprene, isoprene or chloroprene. The external surface of the plug body 2 is formed in a recessed form, to which is secured a sheet-like absorbing member 3 made of an elastomeric material having absorbability to liquid. The sheet-like absorbing member 3 can be secured to the recessed external surface of the plug body 2 by means of adhesion, melting or welding, and the thickness of the absorbing member 3 is selected to allow the blood to be sufficiently absorbed from the tip of the needle. The absorbing member 3 may be made of one optional material of a chemical fiber, a cotton fiber, a non-woven cloth, paper, and a synthetic resin in which liquid is absorbable or of a composite material of two or more of said materials. Preferably, a porous material of ethylene tetrafluoride resin called water-repellent synthetic resin, or a high molecular porous material is usually employed.

Further, the vacuum blood collecting tube or container is provided with a cap 4 covering the opening 1a at one end of the tube body 1, the plug body 2 and the absorbing member 3 to prevent contamination of the opening exterior portion of the tube 1. The cap 4 is provided in its center with an opening 4a.

In order that the sheet-like absorbing member 3 having a predetermined thickness is adhered, melt connected or welded onto the plug body 2, a medicament for said purpose can be applied to either the absorbing member 3 or the upper surface of the plug body 2 thereby to construct the blood collecting tube or container body 1 and the absorbing member 3 in one body, and thus the vacuum blood collecting tubes or containers can be manufactured at low cost so as to be economical.

In using the illustrated vacuum blood collecting tube or container thus constructed, since the interior of the tube is in a negative pressure state the blood is sucked owing to the negative pressure by penetrating a blood collecting needle (not shown) into the center of the plug body 2 at blood collection, so that it is possible to collect the blood in the amount corresponding to the negative pressure level. Then, when the needle is withdrawn, a flashback of the blood takes place in the upper surface i.e. external surface of the rubber plug body 2 but the blood is absorbed by the absorbing member 3 to certainly prevent the blood from scattering or leaking.

FIG. 3 illustrates a modified embodiment of the present invention. In the embodiment of FIG. 2 the cap 4 has an opening 4a at its center portion, but in the case of this modified embodiment the outside of the central portion 5a of a cap 5 is formed to have a recessed pro-

file, the cap 5 preventing contamination of the opening outside portion of the vacuum blood collecting tube or container body. The other structures are substantially the same as in FIG. 2.

FIG. 4 illustrates another embodiment of the present invention, and the portions thereof corresponding to those of the embodiment of FIG. 2 are shown with the identical reference numerals. In the embodiment of FIG. 4, a sheet-like absorbing member 6 is constituted in two layers which are stuck together by melting or adhering, and the two layers may be constituted by one and identical material or different materials.

FIG. 5 illustrates still another embodiment of the invention, in which an absorbing member 7 is formed integrally with a cap 8, being incorporated with the cap, while the cap is secured to the flange portion of the external surface of the plug body 2.

FIG. 6 illustrates still further embodiment of the invention. A sealing member 9 of, for instance, a laminate material is hermetically mounted to the flange portion 1b at one end of the vacuum blood collecting tube or container 1, a plug member 10 which can be made of rubber or an elastomeric polymer is secured at least to the region beneath the sealing member 9, through which region the blood collecting needle penetrates, and an absorbing member 11 composed of an elastomeric material where liquid is absorbable is fixed above the plug member 10.

FIG. 7 shows a modified example of the embodiment illustrated in FIG. 6. In this instance, as shown in the drawing, the plug member 10 and the absorbing member 11 are provided while holding the sealing member 9.

Though the absorbing member is formed sheet-like in each of the embodiments as illustrated in the drawings, it can be structured in a massive or block form. Similarly to the embodiments as illustrated in the drawings, even in that case the absorbing member is secured to the external surface of the plug body or formed integrally with the plug body. Otherwise, as shown in FIG. 8, a massive absorbing member 12 is incorporated into the plug body 2. Even in that case, the massive absorbing member 12 can be composed of any one material of a chemical fiber, a cotton fiber, paper and synthetic resin which absorb liquid, or of a composite material of two or more of said materials. Further, in that case and in the case of paper, the paper is applied or impregnated with a starch component such as corn starch, and preferably it is arranged in a suitable form and then dried.

Alternatively, it is possible that the massive absorbing member is formed as a core and its circumference is enclosed by an elastomeric member like rubber so as to form a plug body.

Still alternatively, it is possible that the massive or block absorbing member is structured in one body with the cap, and it is directly fixed, together with the cap, to the plug body or the flange portion of the opening 1a at one end of the vacuum blood collecting tube or con-

tainer body by means of adhesion, melt connecting or screwing.

Further, in the present invention it is also possible to hold a sheet-like or mass-like absorbing member between the plug body and the cap to allow them to be structured in one body.

Furthermore, as shown in FIG. 9 in the present invention the material constituting the absorbing member is applied to the outer surface of the plug body 2 by means of a proper film-forming technique such as application or coating thereby forming the absorbing member as an absorbing member layer 13. Moreover, in the case of the device as shown in FIG. 3 as a modified embodiment in that instance, it is capable of forming the absorbing member layer in the inner surface of the cap 5.

## INDUSTRIAL APPLICABILITY

As described above in detail, according to the present invention, a liquid-absorbable, elastomeric, absorbing member is provided at least in the opening region of the tube or container body, through which region the blood collecting needle penetrates. Thus, after drawing the needle, the blood discharged to the outside because of flashback is absorbed by the absorbing member, and it does not adhere to other parts for drying or scatter. Therefore, the vacuum blood collecting tube or container of the present invention can be used safe without a risk of touching the blood, and as a result it is possible to prevent in advance the risk of a secondary infection such as of hepatitis virus and AIDS virus.

## Claims

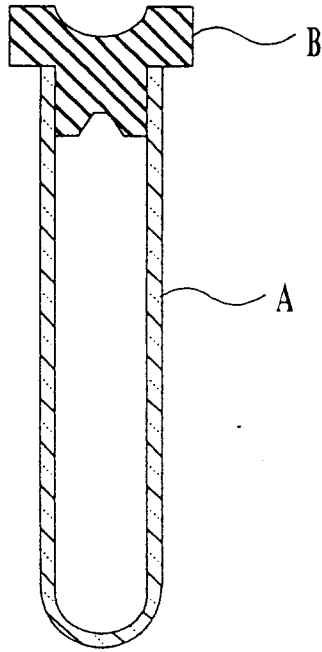
1. A vacuum blood collecting tube or container with contamination prevention means comprising:
  - a vacuum blood collecting tube or container body whose one end is opening and whose interior is retained in a negative pressure state; a plug body composed of an elastomeric material, said body being hermetically fitted with the opening of said tube or container body; and an absorbing member which is positioned at least in the opening region through which a blood collecting needle penetrates and which is composed of an elastomeric material having an absorbing property to liquid.
2. A vacuum blood collecting tube or container as claimed in claim 1, wherein said absorbing member is composed of any one material of liquid-absorbable chemical fiber, cotton fiber, paper and synthetic resin materials or of a composite material of two or more thereof.
3. A vacuum blood collecting tube or container as

claimed in claim 1, wherein said absorbing member is in a sheet form and secured onto the external surface of said plug body.

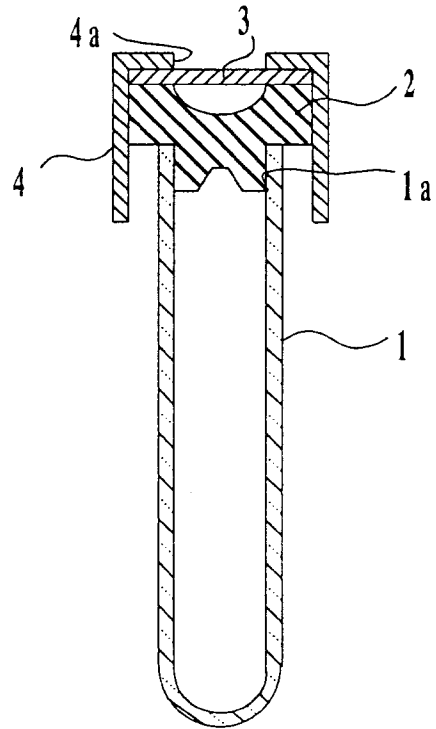
composed of an elastomeric material having absorbability to liquid.

4. A vacuum blood collecting tube or container as claimed in claim 3, wherein said sheet-like absorbing member is formed as an external surface layer of said plug body. 5
  
5. A vacuum blood collecting tube or container as claimed in claim 1, wherein the absorbing member is in a mass or block form and secured to the external surface of said plug body. 10
  
6. A vacuum blood collecting tube or container as claimed in claim 1, wherein said absorbing member is in a mass or block form and secured to said plug body in fitting thereinto. 15
  
7. A vacuum blood collecting tube or container as claimed in claim 1, wherein said absorbing member is structured in one body with said plug body. 20
  
8. A vacuum blood collecting tube or container with contamination prevention means comprising: 25
  - a vacuum blood collecting tube or container body whose one end is opening and whose interior is retained in a predetermined negative pressure state; 30
  - a plug body which is hermetically fitted with the opening of said tube or container body and which is composed of an elastomeric material;
  - an absorbing member which is positioned at least in the opening region through which a blood collecting needle penetrates and which is composed of an elastomeric material that absorbs liquid; and 35
  - a cap which is mounted to the outside of the opening of said blood collecting tube or container body so as to prevent contamination of the outside of the opening of said tube or container body. 40
  
9. A vacuum blood collecting tube or container as claimed in claim 7, wherein the absorbing member is constituted integrally with said cap. 45
  
10. A vacuum blood collecting tube or container with contamination prevention means comprising a vacuum blood collecting tube or container body whose one end is opening and whose interior is retained in a predetermined negative pressure state; a sealing member which is hermetically mounted to the flange of the opening of said tube body, a plug member which is secured to the region of said sealing member, through which region at least the blood collecting needle penetrates, and an absorbing member which is fixed onto the plug member and 50
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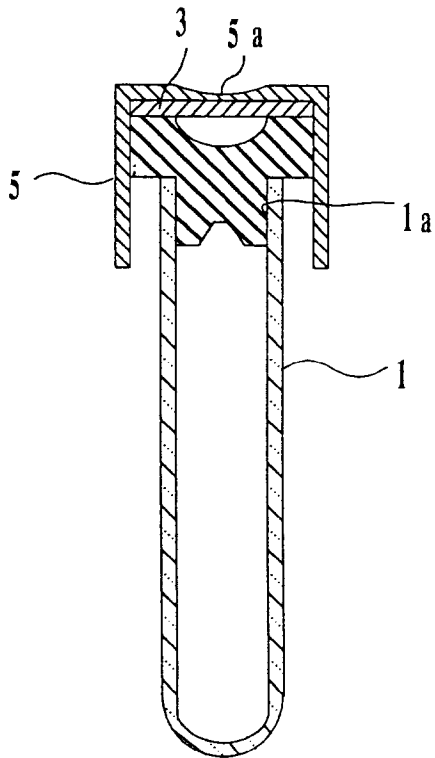
**FIG. 1**



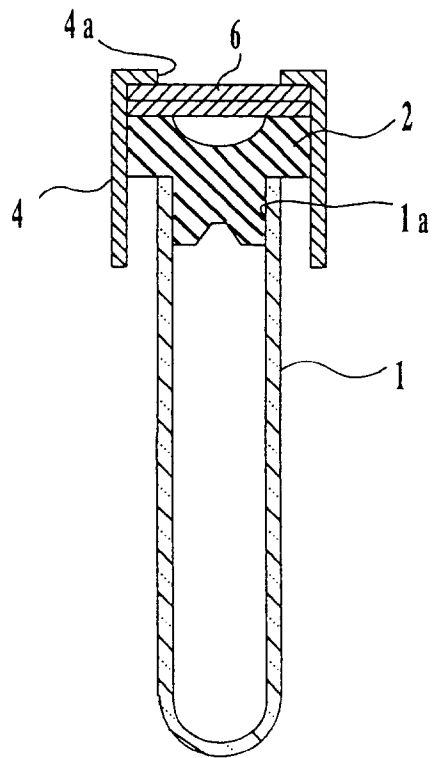
**FIG. 2**



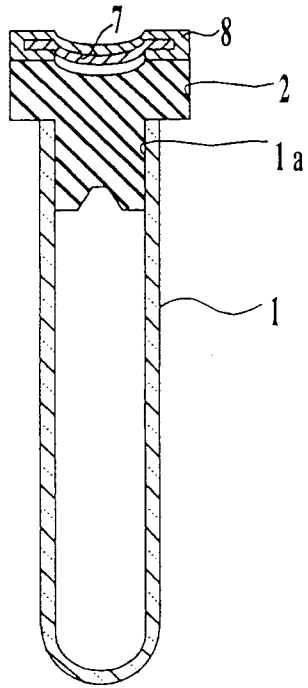
**FIG. 3**



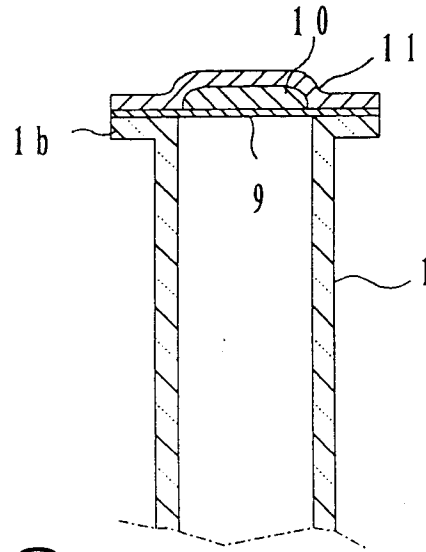
**FIG. 4**



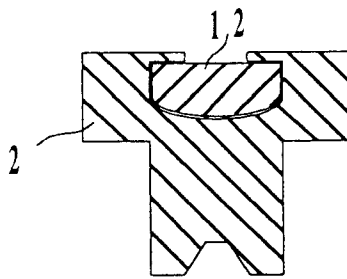
**FIG. 5**



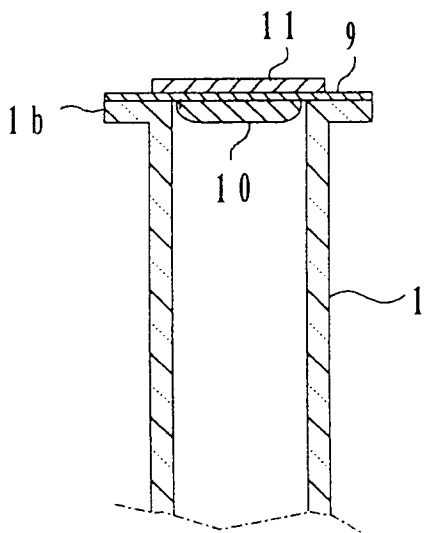
**FIG. 6**



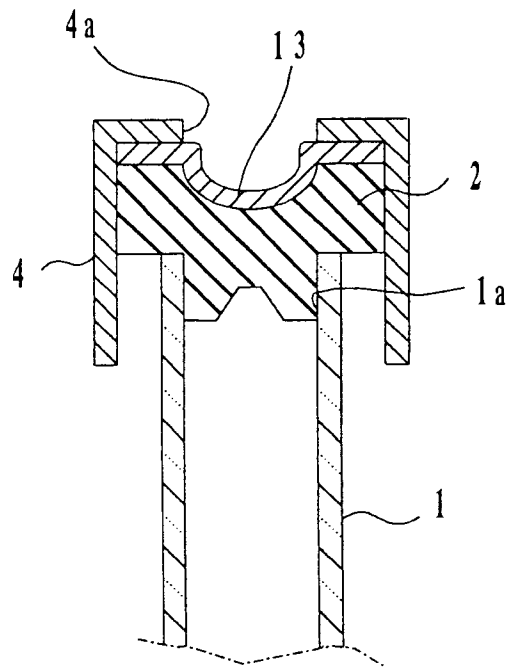
**FIG. 8**



**FIG. 7**



**FIG. 9**



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP96/00629

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> Int. Cl <sup>6</sup> A61B5/14, 300 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) Int. Cl <sup>6</sup> A61B5/14, 300 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1926 - 1996 Kokai Jitsuyo Shinan Koho 1971 - 1996 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP, 1-38502, B2 (Terumo Corp.), August 15, 1989 (15. 08. 89), Claim, Figs. 1 to 3 & EP, 199356, A2 & US, 4682703, A	1, 2, 5-7, 10 8
Y	JP, 64-49543, A (Shinsozai Sogo Kenkyusho K.K.), February 27, 1989 (27. 02. 89), Claim, Fig. 1 (Family: none)	8
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed		"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
Date of the actual completion of the international search June 3, 1996 (03. 06. 96)	Date of mailing of the international search report June 18, 1996 (18. 06. 96)	
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer  Telephone No.	

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