tube. When ~~a~~ blood is drawn from a patient, lid member of the blood collection tube is pierced with a blood collection needle. Rubber is suitable to seal a through-hole formed by the blood collection needle.

However, rubber is deteriorated when exposed to a sodium hypochlorite solution. If the washing solution container is sealed with a rubber lid, therefore, the rubber may deteriorate upon long-term preservation, to disadvantageously permeate external CO_2 into the container. If CO_2 is permeated into the container, decomposition of sodium hypochlorite contained in the solution may be promoted to reduce a detergency of the washing solution.

Reference to any prior art or background information in this specification is not, and should not be taken as, an acknowledgment or any form of suggestion that this prior art or background information forms part of the common general knowledge in Australia or any other jurisdiction; or that this prior art or background information could reasonably be expected to be ascertained, understood and regarded as relevant by a person skilled in the art.

Problem to be solved by the present invention

The present invention has been proposed in order to solve the aforementioned problem. An object of the present invention is to provide a washing solution container for a blood analyzer automatically handleable by the blood analyzer and capable of preserving a chlorine-based washing solution over a long period while keeping a detergency.

Summary of the inventions

A first aspect of the present invention ~~is~~ provides a container storing a washing solution used for a blood analyzer, comprising: a container body, having a form of a blood collection tube, made of thermoplastic resin resistant against a chlorine-based washing solution and provided with an opening on an upper end; a chlorine-based washing solution stored in the container body; and a multilayer film bonded to the container body to seal the opening, wherein an identification code indicating that the container accommodates the washing solution is assigned to the container body, and the multilayer film includes: a seal layer heat-sealed to an upper end surface of the container body thereby sealing the opening; and a gas barrier layer arranged on the outer side of the seal layer.

In the present description, "a form of a blood collection tube" denotes a form of a cylinder, having a bottom portion and including an upper opening, corresponding to a form of a blood collection tube.

~~According to the present invention,~~ Also described herein, a lid of the washing solution container is prevented from deterioration resulting from the content (chlorine-based washing solution) upon preservation over a long period. Further, the gas barrier layer of the multilayer film prevents permeation of outside air. Thus, the washing solution container can preserve the chlorine-based washing solution over a long period while keeping a detergency. In addition, since the seal layer is heat-sealed to the container body,

washing solution is a sodium hypochlorite solution having an available chlorine concentration of at least 1 % and not more than 12 %.

In the aforementioned aspect, the pH of the sodium hypochlorite solution is at least 9.

In the aforementioned aspect, the quantity of the chlorine-based washing solution is identical to or larger than a quantity used for washing once the blood analyzer and less than a quantity used for washing twice the blood analyzer.

A second aspect of the present invention ~~is~~ provides a method for washing a flow system of a blood analyzer, the method comprising: loading a washing solution container storing a washing solution on a rack, the washing solution container comprising a container body having a form of a blood collection tube provided with an upper opening and a multilayer film bonded to the container body to seal the upper opening; transporting the rack toward the blood analyzer; obtaining an identification code assigned to the container body; piercing the multilayer film with a pipette provided with the blood analyzer; aspirating the washing solution in the container body by the pipette; and using the aspirated washing solution to wash the flow system of the blood analyzer, wherein the container body is made of thermoplastic resin resistant against a chlorine-based

washing solution; and the multilayer film includes: a seal layer heat-sealed to an upper end surface of the container body thereby sealing the upper opening; and a gas barrier layer arranged on the outer side of the seal layer.

In the aforementioned aspect, the aspiration is executed so that substantially all quantity of the washing solution in the container body is aspirated.

The aforementioned method further comprises removing the washing solution container from the rack, wherein the step of piercing the multilayer film is executed to the removed container.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view showing the appearance of a washing solution container according to an embodiment of the present invention;

Fig. 2 is a longitudinal sectional view for illustrating the structure of the washing solution container according to the embodiment shown in Fig. 1;

Fig. 3 is a schematic sectional view for illustrating the structure of a multilayer film of the washing solution container according to the embodiment of the present invention;

Fig. 4 is a perspective view showing an example of a blood analyzer to which the washing solution container

from the blood collection tubes T and analyzes the same. The blood collection tube T is made of transparent (translucent) glass or synthetic resin. The blood collection tube T has a form of a tubular container having a bottom portion, and has an opening upper end (not shown), as shown in Fig. 5. The blood collection tube T accommodates the whole blood specimen collected from a patient. The opening upper end is sealed with a lid member (rubber stopper) T1. A label T3 having a bar code T2, including a sample ID, printed thereon is attached to a side surface of the blood collection tube T. The blood collection tube T is transported to the measurement unit 30 or 40 by the transport unit 20 in a state loaded on the rack R. The washing solution container 1 according to this embodiment can be handled similarly to the blood collection tube T, and is loaded on the rack R to be supplied to the measurement unit 30 or 40. The rack R is formed to be capable of holding ten containers.

As shown in Fig. 6, the transport unit 20 is arranged in front of the measurement units 30 and 40 (along arrow Y2) aligned in the lateral direction (direction X). The transport unit 20 includes right and left tables 21 and 22 for stocking racks R and a rack transport portion 23 extending in the direction X to connect the right and left tables 21 and ~~23~~ 22 with each other for transporting the

preservation temperature was set to 45°C. Reaction rates were converted to those corresponding to 30°C (room temperature) on the basis of general reaction kinetics, that is, the reaction rate is generally doubled as temperature rises by 10°C. Fig. 10 shows the results of the test. As to Example 2, the preservation test was conducted over a longer period than that for Example 1, and two tests of Lots 1 and 2 were conducted.

As shown at (a) in Fig. 10, the washing solution ~~1~~ 4 according to Example 1 exhibited a pH value of 11.93 after a lapse of 3 months (converted as 30°C preservation) from the initial value of 12.17. And it was proved that the pH has been maintained around 12. Further, the available chlorine concentration of the washing solution ~~1~~ 4 according to Example 1 (initial concentration = 4.98%) shows 3.33 % after a lapse of 3 months (converted as 30°C preservation). As shown at (b) in Fig. 10, the pH value of the washing solution ~~1~~ 4 according to Example 2 remained substantially unchanged after a lapse of 2.8 months (converted as 30°C preservation) from the initial value in each Lot. And it was proved that the pH has been maintained around 12.

Further, the available chlorine concentration of the washing solution ~~1~~ 4 according to Example 2 (initial concentration = about 5% in each lot) shows about 3.2 % after a lapse of 2.8 months (converted as 30°C

preservation). After a lapse of 7 months (converted as 30°C preservation), the pH value was about 11 and the chlorine concentration was about 1.9 %.

As already described, when a sodium hypochlorite solution is employed as a detergent, the available chlorine concentration in use is preferably at least 1 %, and more preferably at least 1.5 % in order to reliably ensure a detergency. Both of the washing solutions ~~1—~~4 according to Examples 1 and 2 exhibited available chlorine concentrations of about 3.2 % to about 3.3 % after a lapse of about 3 months (converted as 30°C preservation).

Therefore, each of the washing solutions ~~1—~~4 according to Examples 1 and 2 has a sufficient preservation stability capable of ensuring sufficient detergency after a lapse of 3 months. In Example 2 subjected to longer-period preservation test, the available chlorine concentration was more than 1.5 % after a lapse of 7 months (converted as 30°C preservation), and high preservation stability over a long period was confirmed. In general, decomposition of a chlorine-based washing solution is promoted when the liquid property thereof approaches neutral. Both of the washing solutions ~~1—~~4 according to Examples 1 and 2 maintained the pH values around 12 after the lapse of about 3 months (converted as 30°C preservation). This means that the washing solutions ~~1—~~4 according to Examples 1

CLAIMS

1. A container storing a washing solution used for a blood analyzer, comprising:

a container body, having a form of a blood collection tube, made of thermoplastic resin resistant against a chlorine-based washing solution and provided with an opening on an upper end;

a chlorine-based washing solution stored in the container body; and

a multilayer film bonded to the container body to seal the opening, wherein

an identification code indicating that the container accommodates the washing solution is assigned to the container body, and

the multilayer film includes:

a seal layer heat-sealed to an upper end surface of the container body thereby sealing the opening; and

a gas barrier layer arranged on the outer side of the seal layer.

2. The container according to claim 1, wherein

the chlorine-based washing solution is a hypochlorite solution.

9. The container according to claim 1, wherein the seal layer is made of a same material as the container body.

10. The container according to claim 1, wherein the upper end of the container body is provided with a flange protruding circumferentially, and the multilayer film is bonded to the flange.

11. The container according to claim ~~12~~ 10, wherein the multilayer film has a circular shape and a diameter larger than the diameter of the flange portion.

12. The container according to claim 1, wherein the identification code is assigned in a form of a bar code.

13. The container according to claim 1, wherein the thickness of the seal layer is larger than the thickness of the gas barrier layer.

14. The container according to claim ~~15~~ 13, wherein the thickness of the seal layer is the largest in the layers constituting the multilayer film.

obtaining an identification code assigned to the container body;

piercing the multilayer film with a pipette provided with the blood analyzer;

aspirating the washing solution in the container body by the pipette; and

using the aspirated washing solution to wash the flow system of the blood analyzer,

wherein the container body is made of thermoplastic resin resistant against a chlorine-based washing solution; and

the multilayer film includes:

a seal layer heat-sealed to an upper end surface of the container body thereby sealing the upper opening; and

a gas barrier layer arranged on the outer side of the seal layer.

19. The method according to claim 18, wherein

the aspiration is executed so that substantially all quantity of the washing solution in the container body is aspirated.