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TEMPERATURE INDICATOR FOR BLOOD STORAGE CONTAINER

Filed April 15, 1957

FIG. 1.

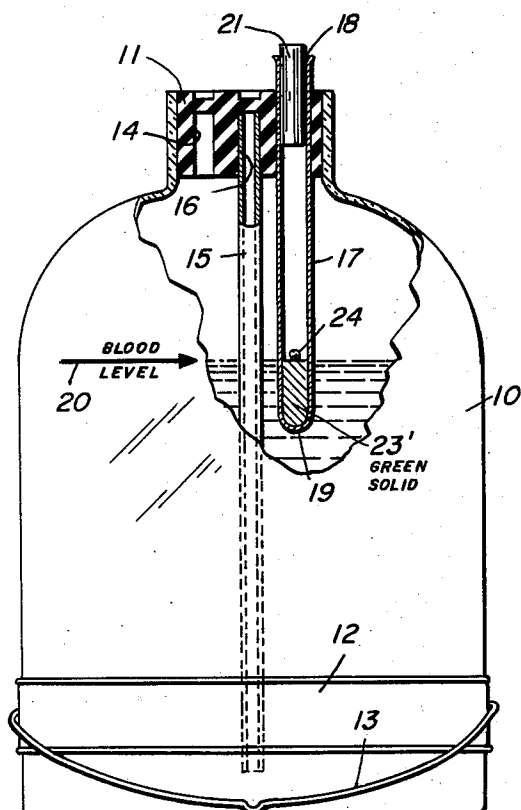


FIG. 2.



FIG. 3.

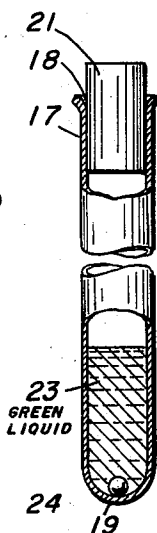


FIG. 4.

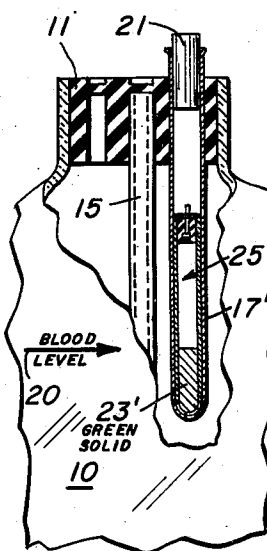


FIG. 5.

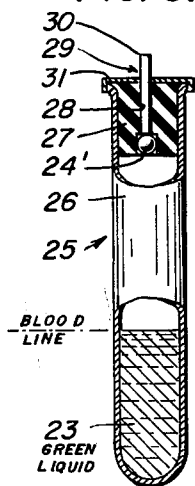


FIG. 6.

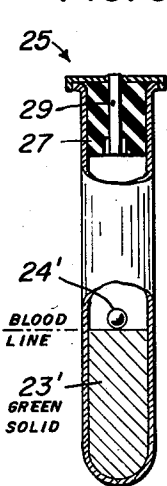
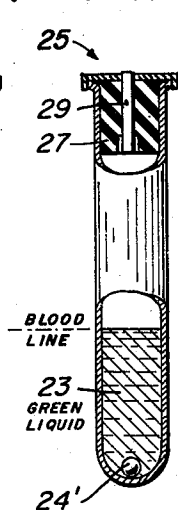


FIG. 7.



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TEMPERATURE INDICATOR FOR BLOOD STORAGE CONTAINER

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7 Claims. (Cl. 128—272)

This invention relates to an indicator or telltale device for use in association with a container for the storage for subsequent use of human blood or other physiological liquids.

In the handling of supplies of human blood after the blood has been taken from donors, it is customary to collect and store the blood in special bottles for refrigeration until the blood is to be used. Whole blood must be stored under refrigeration at temperatures below 50° F. and preferably between 39° and 43° F. It has been established that whole blood must not be used if it has been frozen, and regardless of the temperature must not be used if stored for more than 21 days. Our invention consists generally in providing a visible indicator or telltale device in association with or inside the blood storage bottle which by change of appearance will indicate whether or not the particular bottle of blood has ever, since the initial refrigeration, reached a temperature above 50° F., such as during its transportation from the refrigerator to the point of use at a hospital operating room or the like.

One object of the invention is to provide a telltale or indicator device for use in or in association with a blood storage bottle which by change of appearance above the blood level indicates whether or not the particular batch of blood has reached a temperature which makes it unsafe for use. Another object is to provide a telltale device for a blood storage bottle which will indicate whether or not the contents of the bottle have at any time reached the high temperature at which it becomes unsatisfactory for use, or if it has, after having once reached a dangerous temperature, subsequently been re-chilled to an ostensibly safe refrigeration temperature.

These and other objects are attained by our invention which will be understood from the following description, reference being made to the accompanying drawings in which:

Fig. 1 is a side elevational view partly in section showing the essential details of a commonly used form of blood storage bottle including our indicator device installed in the stopper for the bottle;

Fig. 2 is a side elevational view showing an indicator pellet for use with the device of Fig. 1;

Fig. 3 is a side elevational view of the indicator device of Figs. 1 and 2 after the pellet has dropped out of sight;

Fig. 4 is a side elevational view partly in section of an alternative form of our invention, including a blood storage bottle having an enclosing tube adjustably set in the stopper, which tube is adapted to receive a separate indicator;

Fig. 5 is an enlarged side elevational view partly in section of the separate indicator following our invention as shown in Fig. 4;

Fig. 6 is a side elevational view partly in section showing the indicator tube with the liquid solidified by cooling, and with an indicator pellet resting on the solidified liquid; and

Fig. 7 is another view of the indicator device shown in Fig. 5, after the liquid has melted.

Referring to the drawings, particularly Fig. 1, a con-

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ventional blood storage bottle consists of a glass bottle 10 having an inserted stopper 11, preferably of rubber or the like, and also having near the bottom of the bottle a metal band 12 and a bail 13 hingedly attached thereto by which the bottle and contents may be hung in an inverted position, for example during the removal of the contents in a blood transfusion operation. The stopper 11 is provided on the inside of the bottle with a tubular opening 14 which does not go entirely through the stopper, and which permits the puncturing penetration by a hypodermic needle, or other instrument, for withdrawal of the blood. The stopper 11 is also provided with a long glass tube 15 which is mounted in a hole 16 which also does not extend entirely through to the outer face of the stopper but is puncturable by means of a hypodermic needle or the like in order to allow air to enter the container when blood is being withdrawn from the inverted bottle through the opening 14. The bottle stopper 11 is further provided with a glass tube 17 having an open end 18 extending above the outer face of the stopper 11, the lower end 19 of the glass tube 17 being closed and preferably extending below the blood level line 20 which is marked on the upper side wall of the glass bottle 10. The open end 18 of the tube 17 may be provided with a removable stopper 21. The elevation of the tube 17 is adjustable in and out of the stopper so that if desired the indicator liquid is not visible, but the pellet position of the indicator is visible.

In one form of our invention, which includes a blood storage bottle fitted with a tube 17 as described, a quantity of a liquid 23 is placed in the bottom of said tube, which, after chilling (along with the blood contained in the bottle) to a solidifying temperature below 50° F. and preferably to 39° to 43° F. The liquid 23 is selected to melt a few degrees above the selected critical temperature for the blood of about 50° F.

The preferred composition of the liquid 23 is 2-undecanone (Eastman's P2209) which has a melting range of 52° to 55° F. Other solidifiable compositions having melting temperature ranges slightly above 50° F., and which may be used in blood storage indicators of this invention are iso-amyl stearate having a melting range of 50° to 59° F.; ethyl myristate having a melting range of 50° to 54° F.; p-bromophenetole having a melting range of 50° to 54° F.; and n-undecyl alcohol having a melting range of 59° to 63° F. These liquids may be contrastingly colored with suitable dyes to make the liquids more readily visible, as for example by "Kreugers" oil emerald green conc.

A small pellet 24, of glass or the like, as shown in Fig. 2, is a necessary part of our invention, it being contemplated that when the liquid 23 in the tube 17 has been solidified, the stopper 21 is temporarily withdrawn and a pellet 24, of glass or other solid material which has a higher specific gravity than the solid 23', is put into the tube 17 and rests upon the solidified liquid 23'. When the blood in the bottle 10 warms up to a temperature above about 50° F., the material 23' in the tube 17 melts and the glass pellet 24 sinks to the bottom. This indicates that the blood has been too long above the critical temperature and therefore should not be used. This stage is shown in Fig. 3.

In another form of our invention shown in Fig. 4, the bottle 10, as above described, including the tube 17', is used, but the indicator or telltale is a separate tubular unit 25, which is inserted within the glass tube 17' for use in indicating temperatures in the blood stored in the bottle. This preferred separable telltale device is shown in Figs. 5 to 7.

Referring particularly to Fig. 5, the telltale 25 consists of a glass tube 26 of small enough diameter to be inserted in the enclosing glass tube 17' permanently

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mounted in the stopper 11 of the bottle 10. Within the glass tube 26 is placed a quantity of solidifying liquid 23, as previously described for the form of the invention shown in Figs. 1 to 3. The tube 26 is provided with a stopper 27 which is provided with a hole 28 in which is slidably fitted a rod-like plunger 29 whose outer end 30 extends above the stopper 27, and whose lower end makes contact with a pellet 24 which is frictionally removably held in the lower end of the hole 28. The pellet may also be removably held on the face of the stopper by an adhesive material. The pellet 24 may be pushed out by pressing the outer end 30 of the plunger 29. A sealing coating 31 may be applied over the stopper 27 and the adjacent end of the tube 26.

For use as an indicator for the blood in the bottle, the separable telltale unit 25 is inserted in the enclosing tube 17, and is then refrigerated with the blood contained in the bottle, and the liquid 23 is solidified. When this condition has been attained, the plunger 29 is pressed in to release the pellet 24, which drops and rests upon the solidified surface of the solidified material 23. When the blood in the bottle has warmed up to a temperature above 50° F., the solidified material 23 liquifies, and the pellet 24 drops to the bottom of the tube 26, and is no longer visible above the top surface of the liquid 23 or above the level of the blood in the bottle if the telltale unit has been positioned so that only the pellet is visible above the blood line. If the bottle and contents should be re-chilled, the pellet would not then be located on top of the solidified material 23, and the indication would be that the blood should not be used.

As an alternative manner of using the telltale shown in Fig. 5, the telltale device may be separately chilled to solidify the material 23, after which the pellet 24 may be released by the plunger 29 so that the pellet rests on the solidified material 23. In this chilled condition, the telltale 25 may then be placed in the enclosing tube 17 of the bottle after the bottle and blood have been refrigerated to a temperature below the solidification temperature of the liquid 23. If the blood in the bottle subsequently becomes warm enough to melt the material 23, the pellet 24 will drop to the bottom of the tube 26 and no longer be visible. The separate unit 25 shown in Fig. 5 may itself be adjustably positioned in the stopper 11, or the unit may merely be attached to or associated with the bottle on the outside thereof.

The advantages of our invention will be apparent from

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the above description. Means have been provided for indicating whether or not the blood in the bottle has been above the critical high temperature above which it should not be used for transfusions. The telltale device of this invention will also show that a bottle of blood has once (since the initial chilling) been too warm, even though subsequently cooled to the usual refrigeration temperature.

We claim:

1. A telltale device for use with a whole blood storage container comprising an elongated transparent tube having a closed inner end; a solidifiable liquid having a melting point a few degrees above 50° F. corresponding to the critical warming temperature range for human blood for use in transfusions, said liquid only partly filling said tube; a stopper in the open end of said tube, said stopper having a movable plunger movable longitudinally in a hole therethrough and being held frictionally in said stopper, and a pellet having a higher specific gravity than said solidifiable liquid, said pellet being initially held on the inner face of said stopper in a position to be released by movement of said plunger, said pellet being released to rest on the surface of said solidifiable liquid after said liquid has been solidified by cooling below 50° F.

2. The telltale device defined in claim 1 in which the solidifiable liquid is 2-undecanone.

3. The telltale device defined in claim 1 in which the solidifiable liquid is iso-amyl stearate.

4. The telltale device defined in claim 1 in which the solidifiable liquid is ethyl myristate.

5. The telltale device defined in claim 1 in which the solidifiable liquid is p-bromophenetole.

6. The telltale device defined in claim 1 in which the solidifiable liquid is n-undecyl alcohol.

7. The combination of the telltale device defined in claim 1, and a sealed stoppered blood storage bottle, a transparent enclosing tube for said telltale device being adjustably inserted through the stopper of said bottle, the plunger in the stopper of said telltale device being operable from the open end of said enclosing tube from outside said bottle.

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