

[54] **SERUM SKIMMER**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 161,696, July 12,
1971, abandoned.

[52] **U.S. Cl.**..... **210/94, 210/518, 210/DIG. 23**

[51] **Int. Cl.**..... **B01d 21/24**

[58] **Field of Search**..... 210/85, 94, 406,
210/516-518, DIG. 23, 359

[56] **References Cited**

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[57] **ABSTRACT**

An instrument is provided for skimming serum from the cellular material, such as the red blood cells, of a blood sample; the cells having been dispersed, for example, by centrifugal action, to the bottom of the tubular receptacle containing the sample. The instrument of the invention includes a resilient plug member which is inserted down into the receptacle, and which has an opening therein that permits the serum to pass through the plug member as it is moved down through the serum in the receptacle. The plug preferably has a filter across the opening which permits the serum, but not the cellular material, to pass through the opening as the plug is pushed down into the tubular receptacle. A hollow rigid rod extends upwardly from the plug, and the rod is removably attached to the plug to serve as a conduit for the serum flowing through the opening in the plug. The rod also serves as a handle to permit the plug to be pushed down into the serum in the tubular receptacle and subsequently to be pulled up towards the mouth of the receptacle. A label may be attached to the instrument which remains in the tubular receptacle for labeling purposes after the instrument has been removed. The label may be coded for machine reading.

3 Claims, 9 Drawing Figures

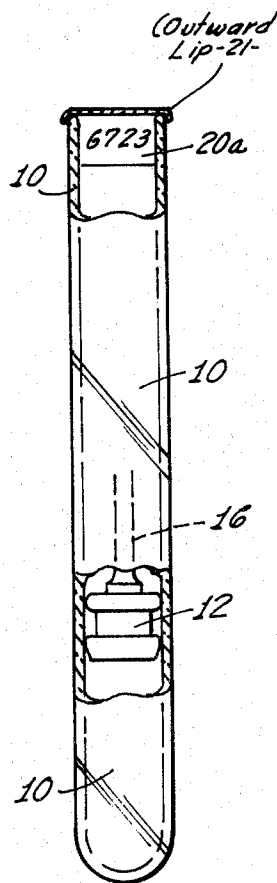


Fig. 1

Fig. 2

Fig. 3

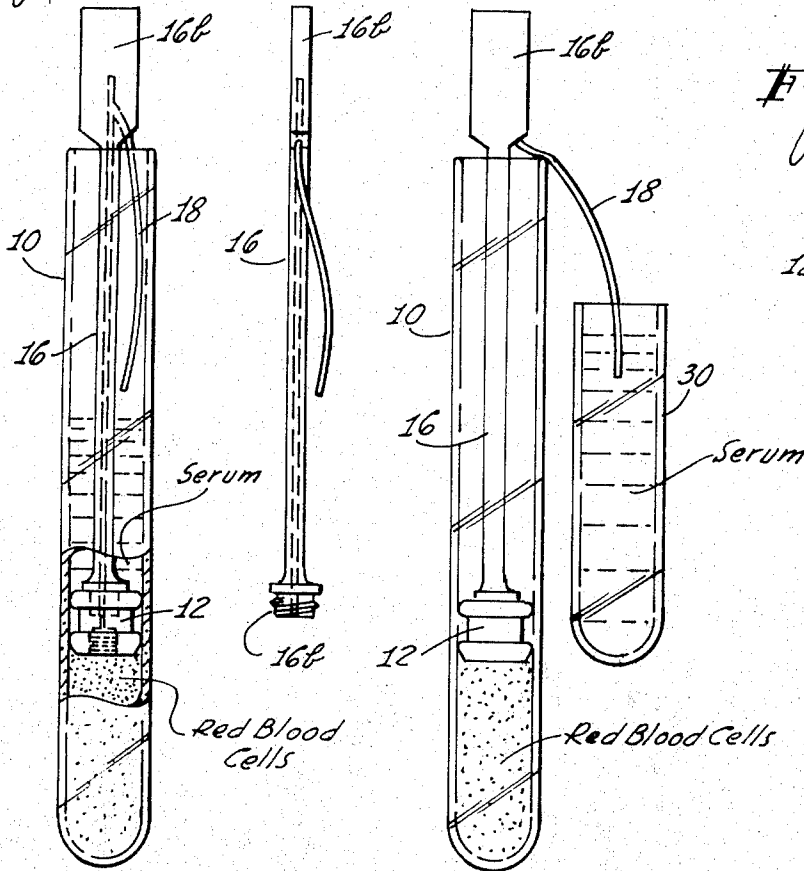


Fig. 4

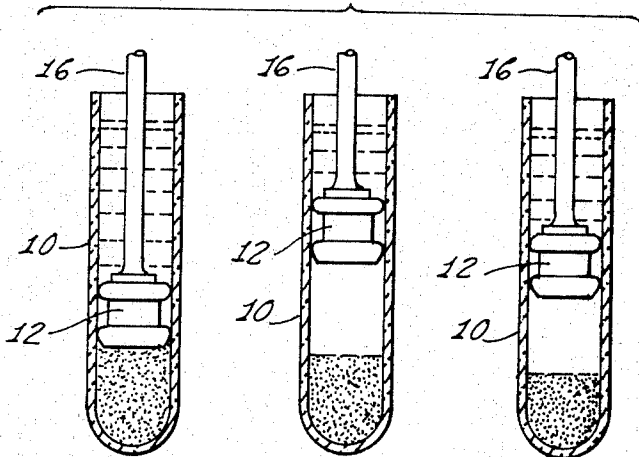
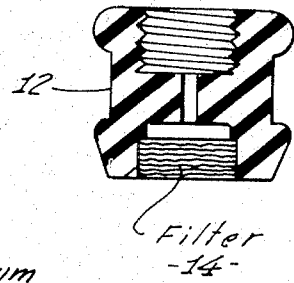


Fig. 5

Fig. 6

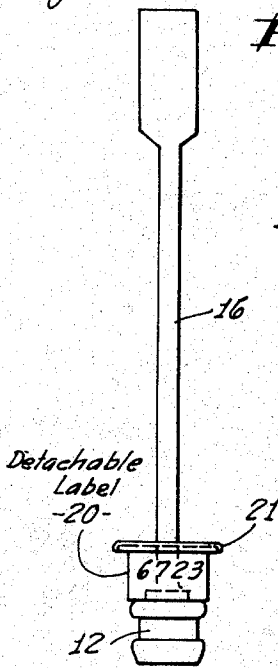


Fig. 7

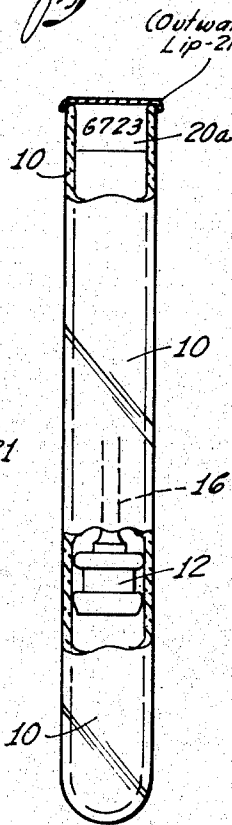


Fig. 8

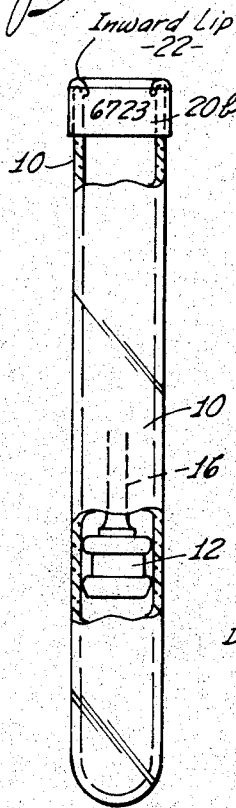
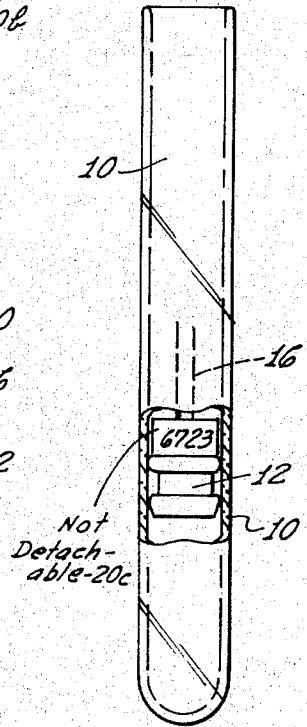


Fig. 9



SERUM SKIMMER

This application is a continuation-in-part of Copending Application Ser. No. 161,696, filed July 12, 1971, now abandoned.

BACKGROUND OF THE INVENTION

The examination of blood samples in a clinical laboratory usually requires the blood serum to be separated from the cellular material which is suspended in whole blood. For that reason, it is customary to place the whole blood samples in test tubes, or similar elongated receptacles, and to subject the samples to a centrifugal force to cause the cells to be dispersed to the bottom of the tubular receptacle. Then, it is usual in the prior art to provide a skimmer for separating the serum in the test tube from the cellular material.

For example, such an instrument is described in U. S. Pat. No. 3,355,098; Farr. The present invention is intended to be an improvement over the unit described in the aforesaid patent, in that it accomplishes the purpose of the Farr unit without the need for a separate plastic tube, as is required in the unit described in the Farr patent. It is usual to make such a tube out of butyrate, since butyrate is not susceptible to breakage, and is inexpensive. However, butyrate interferes with the serum in time and it also transpires moisture.

The instrument of the present invention is advantageous as compared with the unit described in the patent, since it does not require a separate tube, and since it is adapted to be fitted directly into the test tube in which the blood sample is contained. This feature not only provides for a less expensive instrument, as compared with the unit of the patent, but also one which does not require butyrate tubing, or the like, and which has other inherent improvements which will become evident as the present description proceeds.

Although the instrument of the invention is primarily concerned with the separation of serum or plasma from centrifuged clotted, or whole blood specimens, contained, for example, in a usual glass test tube; the device has general utility in the separation of any liquid from any particulate matter dispersed in the bottom of the receptacle containing the liquid and particulate matter.

The invention provides in general therefore, an instrument for separating a liquid from dispersed solids suspended therein. In particular, the invention provides an instrument for separating blood serum from cellular bodies which have been dispersed to the bottom of the receptacle containing the mixture.

In a second embodiment, a label is attached to the instrument which remains in the receptacle after the separation has been effectuated for labelling purposes.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevation of a test tube containing serum and cellular material, in which the cellular material has been dispersed to the bottom of the test tube, for example, by centrifuging; and showing an instrument representing one embodiment of the present invention inserted into the test tube;

FIG. 2 is a side view of one of the components of the instrument of the invention shown in FIG. 1;

FIG. 3 shows the instrument of the invention in a test tube, and used for a slightly different purposes from

that of FIG. 1, and in which the serum is actually transposed into a second receptacle;

FIG. 4 is a cross-section of a second component of the instrument of the invention;

FIG. 5 shows the manner in which the instrument of the invention may be used in a multiplicity of test tubes, so as to cause the serum in the test tubes to be established at a constant level, for automatic machinery, or the like;

FIG. 6 shows a second embodiment in which a plastic cap is attached to the instrument to serve as a label; and

FIGS. 7, 8 and 9 show different manners in which the label of FIG. 6 may be used to identify different serum samples.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

As shown in FIG. 1, a blood sample is contained in a tubular receptacle, such as a test tube 10, and has been subjected to a centrifuge action so that its red cells are dispersed to the bottom of the tube, and the serum appears as a clear liquid disposed over the red cells. The device of the invention in the embodiment of FIG. 1, includes a plug member 12 which is formed of rubber, or equivalent resilient material.

As shown in FIG. 4, for example, the plug member 12 has an opening extending through it, and a filter 14 is mounted at the mouth of the opening. The filter 14 serves to pass the serum, but to prevent the passage of the red cells, or other cellular material, through the plug 12. The filter 14 may be composed, for example, of polypropylene felt, which has openings of the order of 3 microns, and which is effective to impede the passage of the red blood cells which have a particle size of the order of 7 microns. However, other appropriate filters may be used, composed, for example, of nylon, stainless steel screen, Teflon, paper of the like.

The device of the invention in the illustrated embodiment also includes a hollow elongated rigid member 16 which may be composed, for example, of aluminum, or any other suitable material. The elongated member 16, as shown in FIG. 2, has an end portion 16a which is adapted to be threaded into the plug 12. The member 16 serves as a handle and as a conduit for the liquid passed through the filter 14 and through the opening in the plug 12. The liquid emerges from the elongated member 16 through a flexible tubular member 18 affixed to the upper end 16b of the rigid member.

The rigid elongated member 16 is also used as a handle to push the plug 12 down into the test tube 10, and to pull the plug up and out of the test tube. As the plug 12 is moved down into the test tube, the serum passes through the filter 14 in the plug and up through the hollow interior of the rod 16. The flexible tube 18 may be inserted into the mouth of the tube 10, so that as the plug 12 is pushed by the handle 16 down into the serum, the serum is passed through the tube 18 into the upper part of the test tube. Alternately, and as shown in FIG. 1, the tube 18 may be inserted into a second test tube 30, so that the serum may be transferred directly from the test tube 10 into the second test tube.

After the plug 12 has been pushed down to the position shown in FIG. 1 so that it is in the vicinity of the red cells, with the serum disposed above it, the handle 16 may be removed by unscrewing it from the plug 12. Then, the top of the test tube 10 may be plugged by an appropriate stopper, and the test tube may be sent

through the mail, or by any other means, to an appropriate receiving station. Alternatively, the test tube 10 may be placed in an automatic machine, so that the serum at the top of the plug 12 may be sampled for test purposes. In this respect, most present day automatic machines require the levels of the specimens to be essentially at the same height. This may be achieved by the device of the invention, and by setting the plugs 12 at different levels in different test tubes, such as designated A, B and C in FIG. 5, so that the actual level of the serum will be the same in each of the tubes.

In the embodiment of FIG. 6, a label 20 in the form, for example, of a plastic cup is mounted on the skimmer adjacent, for example, the upper end of the plug 12. The label may have identifying numbers formed on it; or coded indicia, for example, of the magnetic type, may be provided on the label, for machine reading of the sample.

The label 20 may be formed with an external peripheral lip 21, so that when the skimmer is inserted into the tubular receptacle 10, the lip engages the upper edge of the receptacle, and the label becomes detached, as designated 20a in FIG. 7. The label is now positioned inside the tubular receptacle 10, so that its surface is protected. However, its indications may be observed through the transparent tubular receptacle, and/or its magnetic code may be sensed by an appropriate machine sensor through the wall of the receptacle.

As an alternative, the label 20 may be provided with an inwardly extending lip. Such a lip 22, as shown in FIG. 8, may have a diameter slightly larger than the outer diameter of the tubular receptacle 10. The latter embodiment, as represented 20b, provides for the label to be supported externally of the tubular member 10. This may be desirable in some instances where the label may be susceptible to causing contamination of the serum within the receptacle.

The embodiments of FIGS. 7 and 8 are advantageous for machine reading, since the labels are automatically detached from the skimmer instrument when it is inserted into the tubular receptacle. When detached, the

labels are all supported at the same level on the receptacle for convenient machine reading. However, if desired, the labels may be permanently attached to the plug 12, as designated 20c in FIG. 9, to remain with the plug within the receptacle after the handle 16 has been removed.

The invention provides, therefore, a simple and inexpensive instrument that may be used to skim serum from a first cellular matter in the bloodstream, and which performs the operation efficiently and simply.

While particular embodiments of the invention have been shown and described, modifications may be made, and it is intended in the following claims to cover all such modifications which come within the spirit and scope of the invention.

What is claimed is:

1. An instrument for separating a liquid in an elongated tubular shaped receptacle, or the like, from solids dispersed to the bottom of the receptacle, including: a resilient plug member having an outer periphery configured to fit snugly with the inner surface of the receptacle and having an opening therein; a rigid tubular member affixed to said plug member and extending axially therefrom to provide a conduit for liquid passing through said opening in said plug member, and also to provide a handle for moving said plug member up and down within said receptacle, a detachable label member attached to said plug member, in which said label member includes a peripheral lip for engaging the end of the tubular shaped receptacle when the plug member is inserted down into the receptacle to cause the label member to be detached from said plug member and to be mounted at the upper end of said tubular shaped receptacle.

2. The instrument defined in claim 1, in which said label is mounted externally of said tubular shaped receptacle.

3. The instrument defined in claim 1, in which said label is mounted internally of said tubular shaped receptacle.

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