United States Patent [19]

Drucker

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[54] **CENTRIFUGE ROTOR HEAD AND SAMPLE HOLDER ASSEMBLY**

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[52] **U.S. Cl.** **233/26**

[51] **Int. Cl.** **B04b 9/12**

[58] **Field of Search** ..... 233/1 R, 26, 27, 233/28

[56] **References Cited**

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[57] **ABSTRACT**

An improved centrifuge material carrier is provided which has general utility, but which is particularly useful for subjecting whole blood contained in flat plastic bags to a centrifuge action so as to separate the red cells from the plasma in the blood. The carrier to be described includes an oneast one cup of an oval cross-section which is removably supported on a centrifuge rotor in trunion rings, and which serve as a receptacle for the aforesaid flat plastic bags. The oval cross-section of the cup provides many advantages, including the fact that swirl during deceleration is prevented, which leads to a better separation of the red blood cells from the plasma, with no tendency for the constituents to recombine during the operations subsequent to the centrifuging operation.

1 Claim, 4 Drawing Figures

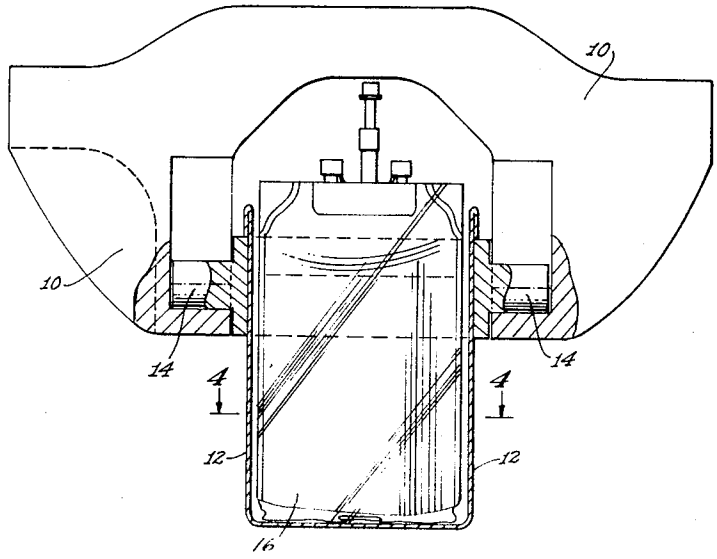


Fig. 1

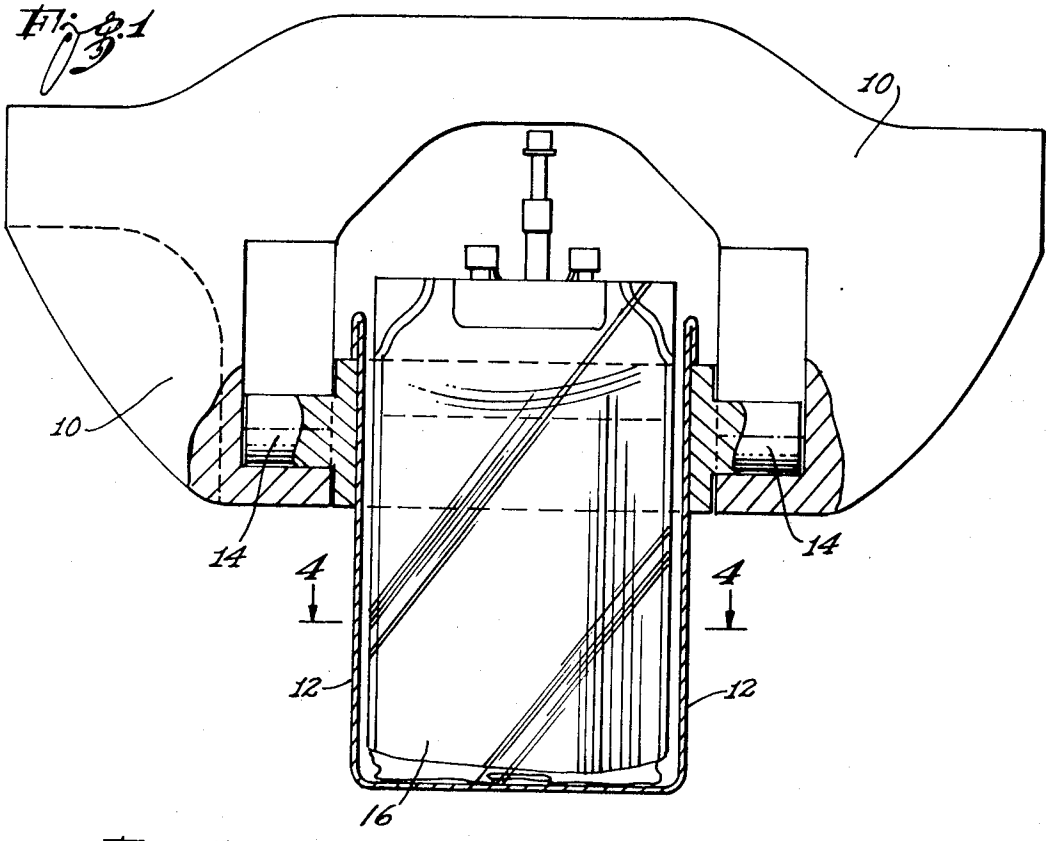


Fig. 2

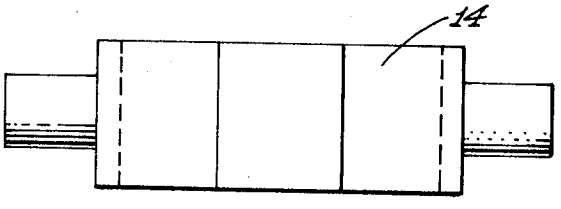


Fig. 3

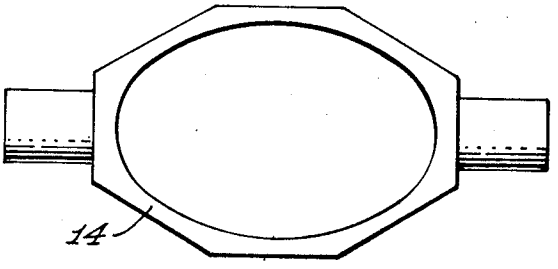
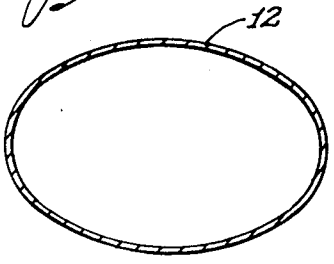


Fig. 4



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CENTRIFUGE ROTOR HEAD AND SAMPLE HOLDER ASSEMBLY

BACKGROUND OF THE INVENTION

In the preparation of serum for transfer to a patient or for a serum bank, for example, it is usual for the whole blood from a donor to be placed in a flat plastic bag. The plastic bag is then subjected to centrifugal action so that the red blood cells may be separated from the serum. The red blood cells are then returned to the donor.

In the past, the plastic bags were supported in essentially round receptacles in the centrifuge apparatus, and this gave rise to many problems and disadvantages when the prior art mechanisms were used.

In the apparatus of the present invention, the plastic bags are supported in oval cups, or receptacles, so that the bags are held in their more natural shape while they are being spun by the centrifuge apparatus. This oval support of the plastic bags also reduces their tendency to rupture during the high force spin time. Also, the oval receptacles permits easy removal of the bags after the spinning operation, with a minimum disturbance of the packed cells. When the flat bags are spun in round cups or carriers, as is the case in the prior art apparatus, for example, they have a tendency to fold, kink, double-over and generally to take the shape of a wet rag. This promotes disturbances insofar as the blood cells are concerned when the bags are removed from the prior art round cups.

The apparatus of the present invention with the provision of a cup having an oval cross-section provides a means for streamlining and allowing for higher rotor speeds and faster spin downs. For example, the cups of the present invention essentially lie flat with respect to the plane of spin, so that a minimum surface is presented to the air resistance, and also because the oval shape of the cup further reduces the wind friction.

The oval cup configuration in the apparatus of the present invention also permits more cups to be placed in a given rotor size. Moreover, the oval shape of the cups retards swirl in the fluid contained therein on deceleration. This permits better transfer of plasma to recipient, for example, when the aforesaid flat plastic bags are used for plasma phoresis. That is, there is less chance of red cells of the sample becoming remixed with the plasma, which would cause a rejection reaction by the recipient.

Although the invention will be described in conjunction with flat plastic bags which contain whole blood for the separation of the red blood cells from the serum, it will be apparent as the description proceeds that the apparatus of the invention has general application. For example, delicate serums and compounds may be spun in smaller or larger oval shaped cups or tubes to achieve the higher speed due to reduced windage, and also to reduce the tendency to swirl and disturb the precipitate.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary plan view, partly in section, of a rotating centrifuge rotor in which a cup of oval cross-section is supported in a trunion ring, in accordance with the invention;

FIG. 2 is a side elevation of the trunion ring of FIG. 1;

FIG. 3 is a plan view of the trunion ring; and

FIG. 4 is a cross-section of the cup of FIG. 1 taken along the line 4—4 of FIG. 1.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

The fragment of the rotor shown in FIG. 1 is designated **10**. The rotor is rotatable about a selected axis. A cup **12** is suspended from the rotor in a trunion ring **14**, and as the rotor rotates at a sufficiently high speed, the cup **12** assumes the illustrated horizontal position. A plastic bag **16** of the type normally used, for example, for obtaining blood from a donor, is placed in the cup **16**, and as the rotor **10** rotates, the blood in the bag is subjected to centrifugal forces which permit the red blood cells to be separated from the plasma.

The cup **12** has an oval cross-section as best shown in FIG. **4**, and for the reasons described above. The trunion ring **14** has a shape which is best shown in FIGS. **2** and **3**, and is pivotally received in the rotor **10**.

The cup **16** is supported in the trunion ring **14** by a lip formed at the top of the cup by bending back the upper extremity thereof, as best shown in FIG. **1**. This permits the cup to be removable from the ring, so that at the end of the centrifuge action, the cup **12** and bag **16** may be removed together from the apparatus, and the bag later removed from the cup under circumstances where there is less chance of disturbing the precipitate in the bag.

As mentioned above, due to the oval shape of the cup, the bag is supported in its more natural condition, and there is less tendency for the bag to rupture, or to assume unnatural shapes, either while in the cup or during its removal. Also, the support of the bag in a non-circular configuration in the cup **12** prevents swirl during deceleration of the apparatus.

It is apparent that although a particular embodiment of the invention has been shown and described, modifications may be made. It is intended in the following claims to cover all such modifications which fall within the scope of the invention.

What is claimed is:

1. In a centrifuge apparatus which includes a rotor member rotatable about a selected axis, the combination of:

a trunion ring pivotally mounted on said rotor having an inner edge circumscribing an oval-shaped area; and

a removable cup having an oval cross-section of constant dimensions throughout its length suspended in said trunion ring and extending through the area circumscribed thereby, said cup being mounted on said trunion with the long axis of the cup being normal to a radius extending from said selected axis presenting a minimum surface to air resistance as the centrifuge is rotated and being shaped to reduce wind friction, said cup serving to support a flat plastic bag containing a whole blood sample or the like for the separation of the red blood cells from the plasma therein, said oval-shaped cup substantially obviating any tendency for the bag to fold, kink, or double-over during the operation of the centrifuge, and said oval-shaped cup reducing swirl of said sample during deceleration to obviate any tendency for the constituents of the sample to recombine subsequent to the centrifuge operation.

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