

[54] **CONTINUOUS FLOW CENTRIFUGE
HEAD CONSTRUCTION**

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233/47 A, 21, 22; 285/134, 190; 210/78, 335

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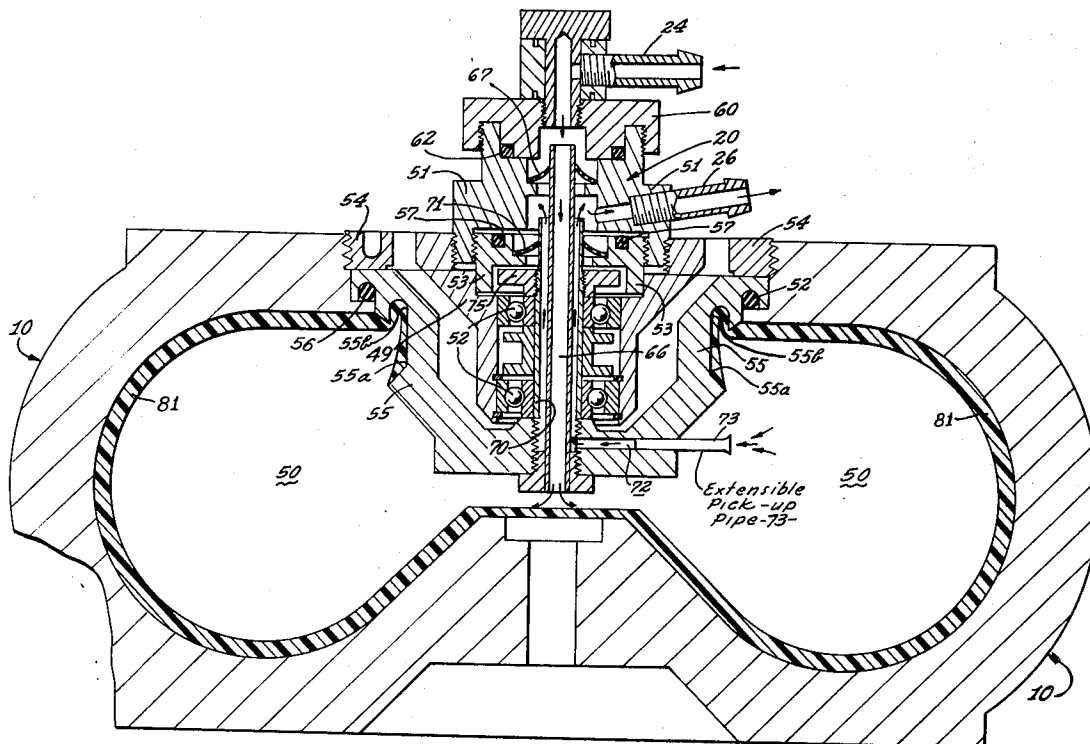
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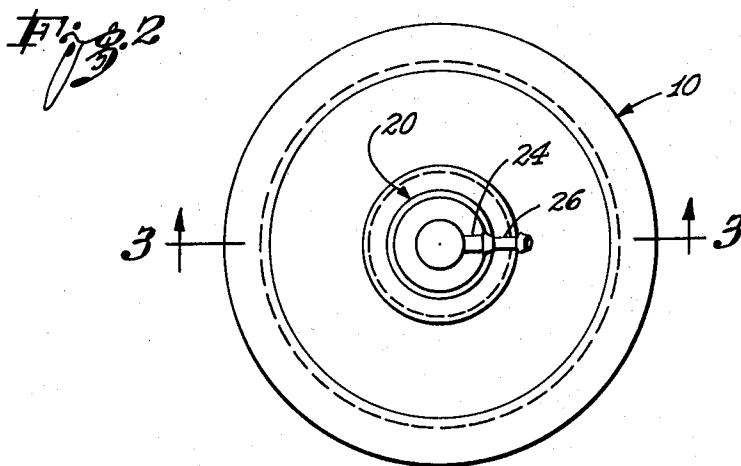
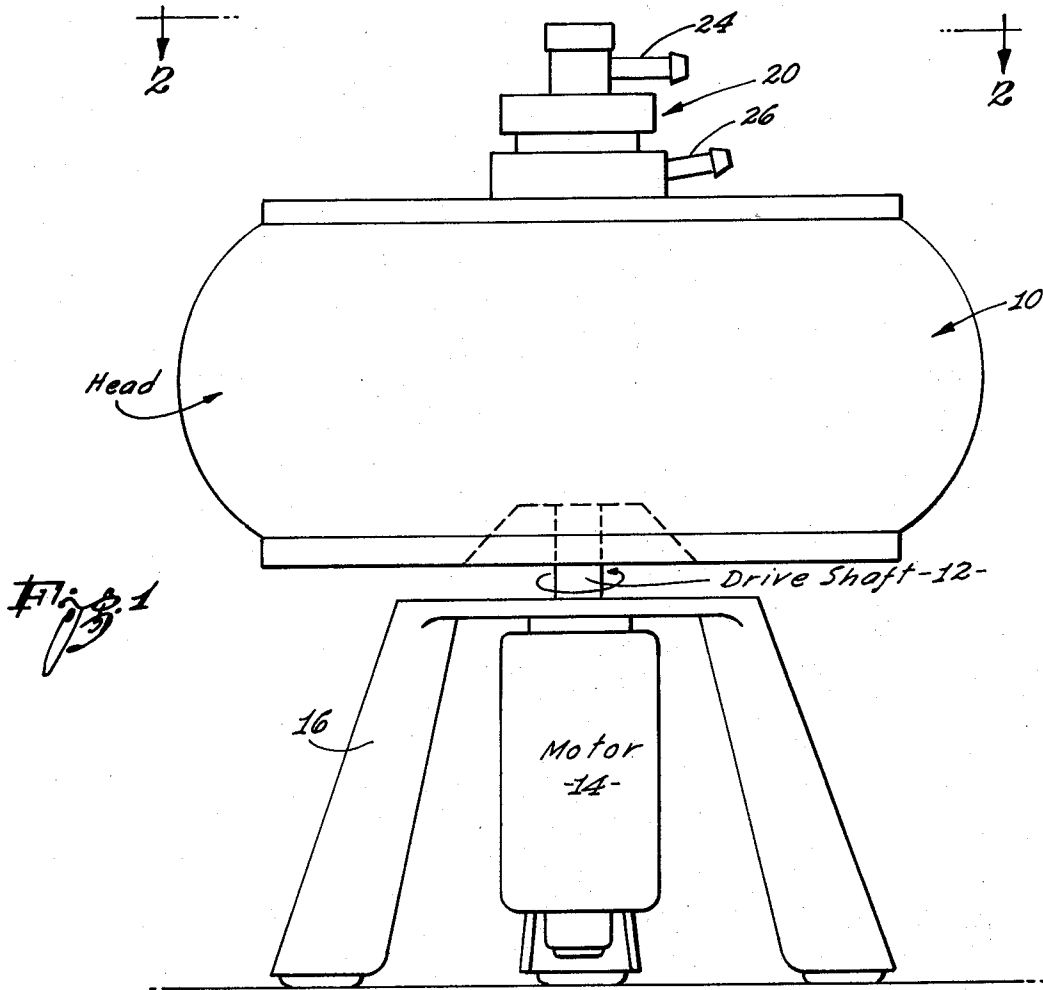
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[57] **ABSTRACT**

An improved centrifuge head is provided which is constructed to permit continuous flow of a liquid through the head, whereby sediment and other constituents of the liquid may be removed by the centrifugal forces within the head as the liquid passes therethrough.

3 Claims, 3 Drawing Figures





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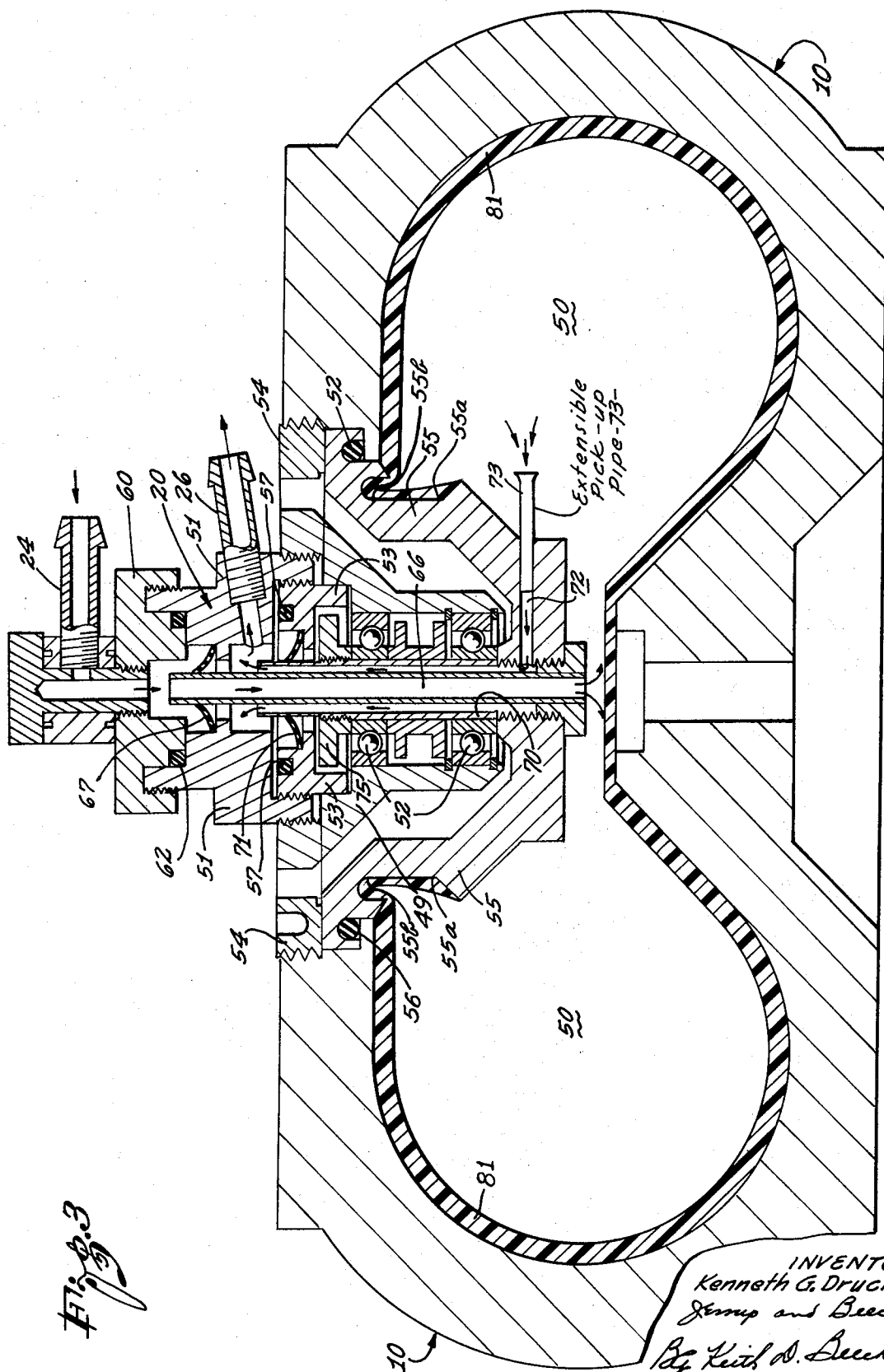


Fig. 3

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CONTINUOUS FLOW CENTRIFUGE HEAD CONSTRUCTION

BACKGROUND OF THE INVENTION

It is usual in most prior art centrifuges to support a plurality of test tubes, or other receptacles, for example, on a rotating head. This permits the various constituents of the liquid samples contained in the test tubes to be separated out by centrifugal forces. Such prior art centrifuges are well suited, for example, for separating out the various constituents of a multiplicity of different liquid samples. For example, when such prior art centrifuges are used for medical purposes, the various receptacles may contain different whole blood samples, and the centrifuge action may be used to separate out the red blood cells of each sample so as to determine anaemic conditions.

However, it is often desirable to remove sediment, or other constituents, from a stream of liquid on a continuous basis, and to provide a continuous stream of the liquid which is free from such constituents. This is achieved by means of the apparatus of the present invention, by passing the liquid through the centrifuge head to be described. The centrifuge head, as will be described in detail herein, is constructed, so that the liquid stream may readily be passed through the head and be subjected to the centrifugal forces within the head on a continuous basis.

The head of the present invention is constructed in a simple and economical manner to include a rotatable housing which defines an inner toroidal-shaped chamber, and a central section which is rotatably mounted on the housing so that it may be held stationary as the housing rotates. An inlet conduit for the fluid stream extends through the central section and into the center of the inner chamber. As the liquid enters the inner chamber, it is subjected to a rotating action, so that the heavier particles of the constituents to be removed are forced out towards the peripheral wall of the chamber. An outlet conduit is provided having an entrance displaced by a predetermined amount from the center of the chamber, and the outlet conduit discharges the fluid from the chamber, but free of the heavier constituents thereof which are forced to the peripheral wall of the chamber and away from the entrance of the latter conduit. A plastic bag may be suspended in the chamber to receive the fluid and to serve as a receptacle for the sediment, so as to obviate the need to clean the inside walls of the chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of a centrifuge assembly which incorporates a head constructed in accordance with the concepts of the present invention;

FIG. 2 is a top plan view of the head of FIG. 1, taken essentially along the lines 2—2 of FIGURE 1; and

FIG. 3 is a side section of the head, taken along the lines 3—3 of FIG. 2.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

As shown in FIG. 1, for example, the head of the present invention may include a housing 10 having a generally cylindrical shape. The housing 10 is mounted, for example, on the drive shaft 12 of an electric motor 14; the drive shaft and motor being supported on a suitable stand or base 16. When the motor 14 is electrically energized, the drive shaft 12 is caused to rotate, and the head 10 is caused to rotate about the axis of rotation of the drive shaft.

The assembly also includes a central hub section 20 which is rotatably mounted in the head 10, so that the section 20 may be held stationary as the head rotates. An inlet conduit 24 extends into the hub section 20 and through the hub section into the interior of the head 10, as best shown in FIG. 3. An outlet conduit 26 also extends through the hub section 20 and like the inlet conduit 24, is coupled to the chamber within the housing.

In the operation of the centrifuge apparatus of FIG. 1, a stream of liquid is introduced into the centrifuge through the inlet conduit 24, and is subject to centrifugal action within the head 10. A continuous stream of the liquid is discharged from the centrifuge through the conduit 26, the discharge stream being free of the heavier constituents of the inlet stream, which constituents are separated out within the head 10.

As best shown in FIG. 3, for example, the head 10 defines an inner chamber 50 which has a generally toroidal configuration, and which is symmetrical about the axis of rotation of the head. The hub 20 includes a first upper bracket 51 which is threaded to lower brackets 49 and 53, and which is sealed thereto by an O-ring 57. The brackets 51 and 53 are coaxial with the axis of rotation of the head 10. The resulting assembly, which constitutes the hub 20, is rotatably mounted in the head 10 by bearings 52.

A plug 54 is threaded into the head 10 to hold a central dish-shaped bracket 55 in position in the head 10. The bracket 55 is sealed to the head 10 by means, for example, of an O-ring 56, and it supports the bearings 52. The inlet conduit 24 extends into the hub 20 through a cap 60 which is threaded to the hub, and which is sealed by means of an O-ring 62. The inlet conduit 24 is coupled through the cap 60 to a further conduit 66, the conduit 66 extending along the axis of rotation of the head and terminating within the chamber 50 at the center of the chamber. The conduit 66 is sealed by a lip seal 67. The outlet conduit 26 is coupled to a further conduit formed by a tubular member 70 which extends through the hub 20 in coaxial relationship with the conduit 66. The conduit 70 is sealed by a lip seal 71. The aforesaid conduit is coupled to a radial passage 72 having an entrance displaced from the center of the chamber 50, as shown. An extensible pick-up pipe 73 may be slidably mounted in the passage 72 in telescopic relationship therewith. The pipe 73 may be extended to any desired length so that selected constituents may be excluded from the discharge stream in the basis of weight. A slinger 75 may be mounted on the conduit 70.

As the head 10 rotates the conduits 24 and 26, and the associated hub components, are held stationary in the bearings 52. The liquid introduced through the conduit 24 passes through the hub and through the conduit 66 to the center of the chamber 50. The liquid is then subjected to centrifugal forces within the chamber as it rotates with the chamber, and its heavier constituents move outwardly towards the wall of the chamber. The lighter constituents, however, enter the pick-up pipe 73, and pass through the passageway 72 and up the conduit 74 to be discharged through the conduit 26.

In the manner described above, a continuous stream of liquid may be maintained into and out of the rotating head 10, with the stream being continuously subjected to a centrifuge separation action. A plastic bag is suspended around a neck 55a on the central bracket 55 so that the ends of the inlet conduit 66 and the pick-up pipe substantially fills the chamber 50. The bag rotates with the chamber and serves as a liner for the chamber and as a receptacle for the sediment removed from the sample. The bag may be supported by cords around its neck and around the neck 55a of the bracket, or by an O-ring in the upper annular groove 55b.

The lip seals 67 and 71 have been formed to provide an adequate seal for the mechanism and to be more effective than the usual prior art face seals. The O-rings 57 and 62 are also effective since their associated hub components are stationary and there are no centrifugal forces on these seals.

It will be appreciated that although a particular embodiment of the invention has been shown and described, modifications may be made. The following claims are intended to cover the modifications which come within the spirit and scope of the invention.

What is claimed is:

1. A centrifuge head, or the like, which permits a continuous flow of liquid through the centrifuge head and which permits the liquid to be exposed to centrifugal forces as it passes through the centrifuge head so as to separate certain con-

stituents out of the liquid, said centrifuge head including: a housing defining an internal chamber mounted for rotation about a particular axis; a fixed hub section mounted on said housing in coaxial relationship therewith with respect to said particular axis and including a first bracket extending into said chamber and held stationary as the housing rotates about said particular axis; a central dish-shaped bracket rotatably supported on said first bracket within said chamber in axial alignment with said hub section for rotation with said housing about said hub section, a bag supported on said dish-shaped bracket, said dish-shaped bracket having a peripheral shoulder within said chamber coaxial with said particular axis and receiving the neck of the bag to support the bag in the chamber; inlet means including a first conduit extending along said particular axis and through said hub section and through said dish-shaped bracket into said chamber so as to introduce liquid into the center of the chamber; outlet means including a

second conduit extending along said particular axis through said dish-shaped bracket and through said hub section coaxially with said first conduit and having an entrance within said chamber displaced radially from the center of said chamber by a predetermined amount; and an extensible pick-up pipe extending horizontally in said chamber and slidably mounted in said second conduit in telescoping relationship therewith and protruding from the entrance thereof.

2. The centrifuge head defined in claim 1, in which said housing has a configuration such that said chamber is generally toroidal in shape and is symmetrical about said particular axis.

3. The centrifuge head defined in claim 1, in which said hub section is formed of a plurality of separate brackets threaded to one another and in coaxial relationship with said particular axis.

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