

July 23, 1968

M. GALASSO ET AL
CENTRIFUGAL APPARATUS

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2 Sheets-Sheet 1

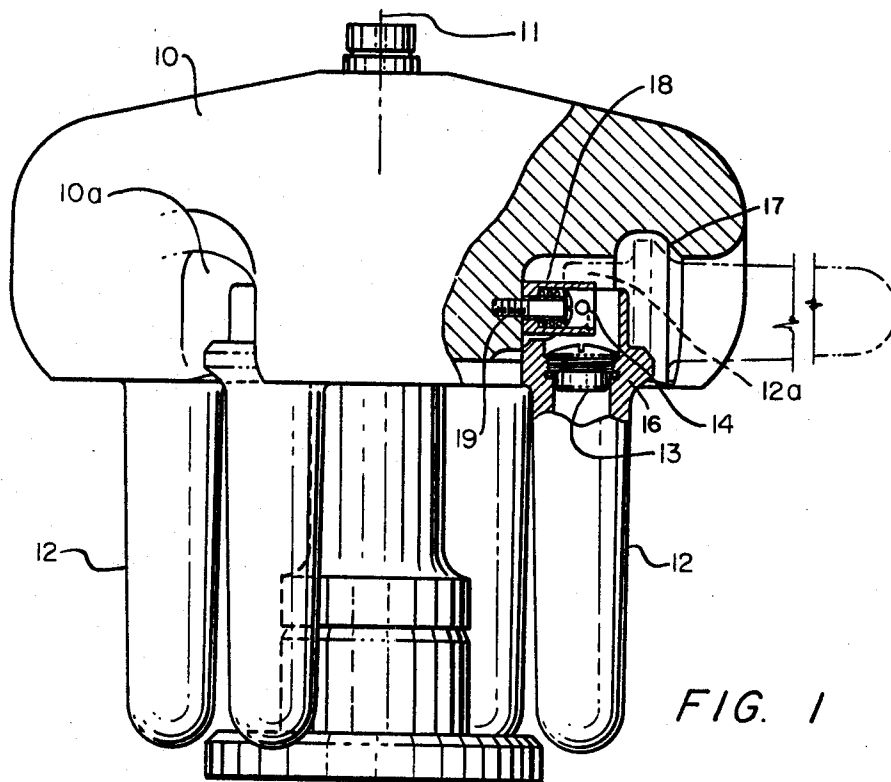


FIG. 1

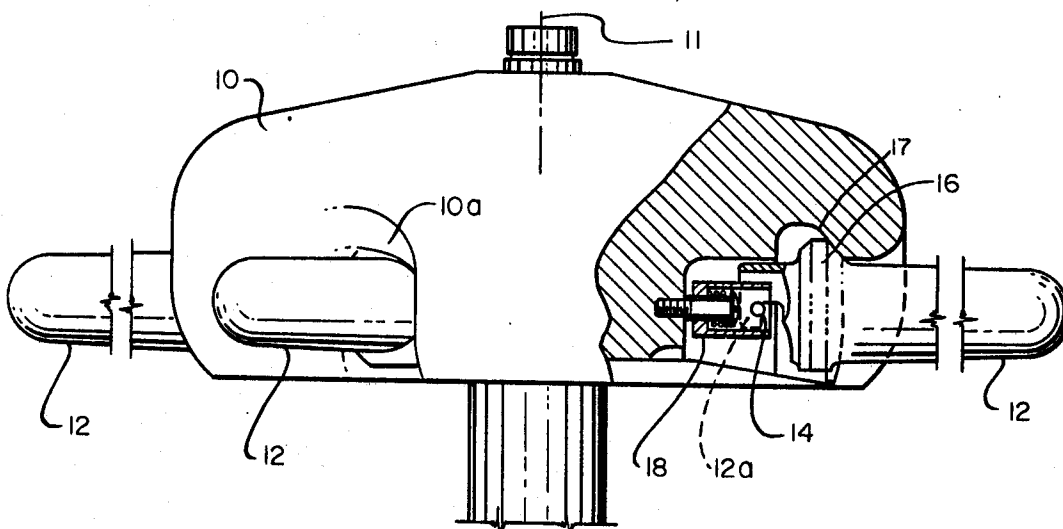


FIG. 2

INVENTORS
MAURICE GALASSO
GORDON A. DAVIDSON
BY

Lehr and Swain
ATTORNEYS

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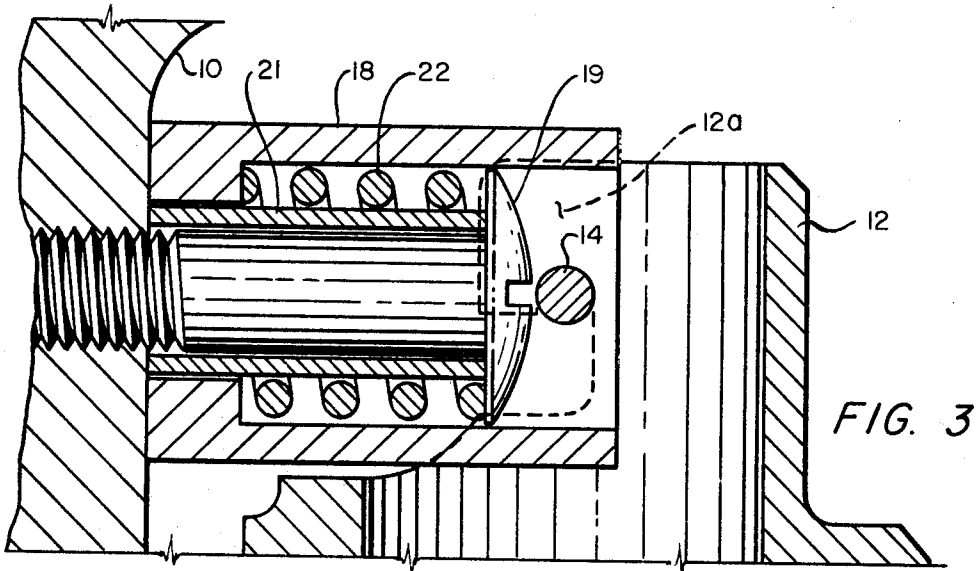
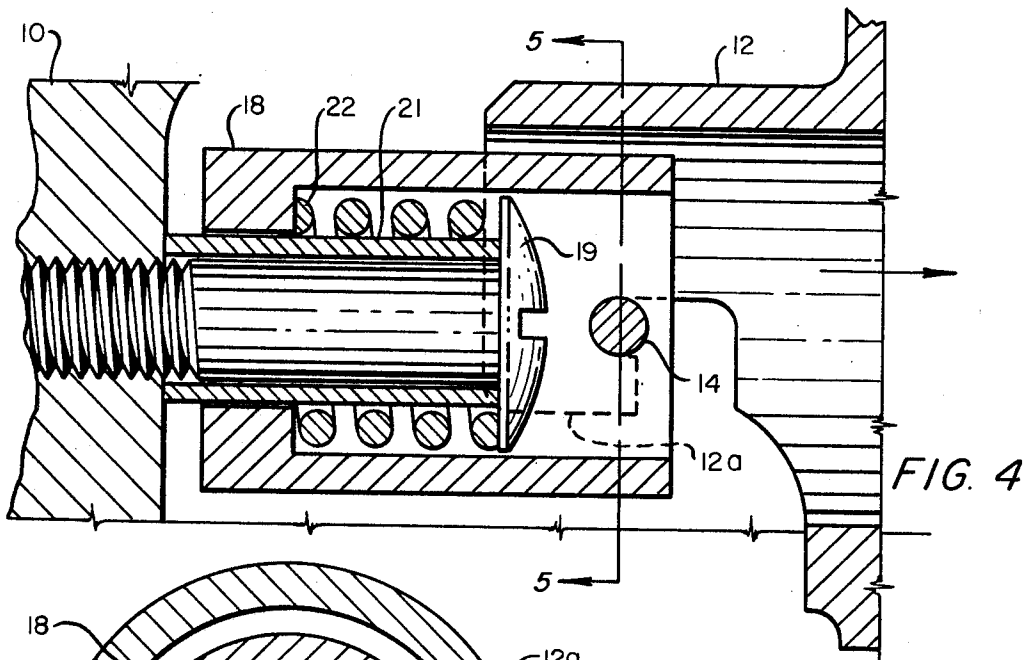
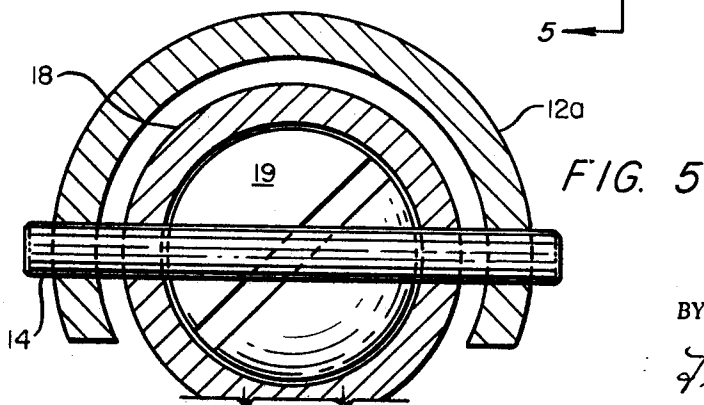
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GORDON A. DAVIDSON
BY

Lehr and Swain
ATTORNEYS

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CENTRIFUGE APPARATUS

Maurice Galasso, Los Gatos, and Gordon A. Davidson, Palo Alto, Calif., assignors to Beckman Instruments, Inc., a corporation of California

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8 Claims. (Cl. 233—26)

ABSTRACT OF THE DISCLOSURE

A centrifuge including a swinging bucket rotor in which each bucket is supported by an independent bucket hanging assembly disposed within a recess in the rotor. Each hanging assembly is spring biased in a radial direction toward the axis of rotation and includes a separate pin member carried by the assembly from which a bucket containing the sample to be subjected to centrifugation is suspended.

This invention relates generally to a centrifuge apparatus and more particularly to ultra-centrifuges which utilize high rotative speeds.

Swinging bucket type centrifuges include metal buckets which are supported from a rotor by suitable supporting means and which contain the liquid to be centrifuged. While the rotor is at rest, the bucket is generally hanging vertically downward from an appropriate bucket-hanger member and during centrifuging the buckets swing up to a horizontal plane. They are restrained from outward radial movement under the high centrifugal forces by portions of the rotor which supports the buckets.

In one type of centrifuge assembly the buckets are supported by pins which flex to allow the bucket under the forces applied to seat against the adjacent rotor portions. However, this had serious disadvantages such as requiring a large amount of space in the pins to extend into the rotor and also causes problems of alignment.

It is a general object of the present invention to provide a centrifuge apparatus in which the rotor will accommodate a relatively large number of buckets.

It is another object of the present invention to provide a centrifuge apparatus which includes an improved bucket-hanger member.

It is yet another object of the invention to provide a centrifuge apparatus which includes bucket-hanger members having a relatively small mass.

These and other objects of the invention will become more clearly apparent from the following description when taken in conjunction with the accompanying drawings.

Referring to the drawings:

FIGURE 1 is an elevational view, partly in section, of a centrifuge apparatus in accordance with the invention;

FIGURE 2 is an elevational view similar to FIGURE 1, showing the centrifuge in operation;

FIGURE 3 is an enlarged fragmentary sectional view of a portion of FIGURE 1;

FIGURE 4 is an enlarged fragmentary sectional view of a portion of FIGURE 2; and

FIGURE 5 is a sectional view taken along the line 5—5 of FIGURE 4.

The centrifuge apparatus illustrated in FIGURE 1 includes a centrifuge rotor 10 which is driven by an electric motor through suitable gearing (not shown) about a vertical axis 11. FIGURE 1 shows the rotor at rest. Hanging from the rotor are a plurality of metal buckets 12 which have caps 13 to retain the liquid to be centrifuged. Buckets 12 include a hanger extension 12a (best shown in FIGURE 2) which is hooked over pin members 14. Cut-out portions 10a of the rotor allow buckets 12 to be rotated

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into a horizontal plane as shown by the dashed outline in FIGURE 1, and as illustrated in FIGURE 2 during rotation of the rotor. At this time shoulder extensions 16 of the rotor are adapted to mate with seating portions 17 of the buckets 12 to limit outward radial movement of the buckets.

In accordance with the invention, pins 14 are included as part of and received in cross-drilled holes in cylindrical bucket-hanger members 18. Bucket-hanger members 18 are slidably mounted on rotor 10 by means of mounting screws 19 which are screwed into rotor 10. Their extension from the rotor is controlled by spacers 21 and spring 22 (FIGURES 3, 4). Member 18 is slidable in a radial direction with reference to vertical axis 11.

Resilient biasing means are provided for biasing bucket-hanger members 18 toward vertical axis 11 and include helical springs 22 which are wrapped around spacers 21 and screws 19. Each spring is retained at two points, one of which being the head of screw 19 and the other point the hanger member 18 itself. The action of the spring seats the end of the bucket members 18 against a mating surface on the rotor 10. The two surfaces are cylindrical and the seating uniquely positions the member to horizontally dispose pin 14.

In operation, buckets 12 are filled with liquid, capped and hung on the various pin members 14. It is not necessary that rotor be loaded to full capacity but the arrangement of buckets must be balanced. Initial rotation of rotor 10 moves buckets 12 to a horizontal plane and the centrifugal force provided by the rotating buckets begins to cancel the biasing force of springs 22 to move the bucket into engagement with shoulder portions 16 of the rotor. After sufficient centrifuging, the rotor is slowed down and the reverse of the above operation takes place.

With the improved centrifuge apparatus, a large number of buckets may be hung on a single rotor since the bucket-hanger members require relatively small space and this space is entirely within the bucket receiving cavity. Moreover, each bucket-hanger is mounted to the rotor by a single screw as opposed to more complicated pin arrangements.

We claim:

1. In a centrifuge system including a rotatable member having an axis of rotation adapted to carry a plurality of swinging buckets the improvement comprising: a bucket hanging member for each bucket connected to the rotatable member, said hanging member being movable in a radial direction with respect to the axis of rotation, each bucket hanging member including a pin member carried solely by the hanging member and from which a bucket is adapted to be pivotally suspended.

2. A centrifuge system as defined in claim 1 including in addition means to bias said hanging member in a radial direction toward the axis of rotation of said rotatable member.

3. A centrifuge system as defined in claim 2 wherein the rotatable member includes at least one recess having a seating portion and the bucket associated with the recess includes a shoulder extension adapted to intimately mate with the seating portion of the recess to limit the outward radial movement of the bucket during rotation of the rotatable member to thereby substantially relieve said hanging member from excessive stress.

4. A centrifuge apparatus according to claim 2 in which the bias means is a helical spring having an axis parallel to the path of movement of said bucket-hanger member.

5. A centrifuge system as defined in claim 2 wherein said bucket hanging member is connected to the rotatable member by mounting means extending in a radial direction into the rotatable member.

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6. A centrifuge system as defined in claim 5 wherein said mounting means comprises a single screw means.

7. A centrifuge system as defined in claim 5 wherein said hanging member includes at least two oppositely disposed side walls and an end wall, said pin member being connected between the side walls and the mounting means passing through the end wall.

8. A centrifuge system as defined in claim 7 wherein said bias means is resilient and retained between one end of said mounting means and the end wall of said hanging member.

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HENRY T. KLINKSIEK, *Primary Examiner.*