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(71) Applicant: **FISONS LIMITED**
Fison House 9 Grosvenor Street
London(GB)

(72) Inventor: **Lovegrove, Brian Walter**
12 Linden Close
Crawley, Sussex(GB)

(74) Representative: **Dummett, Thomas Ian Peter et al,**
Fisons Limited Fison House Princes Street
Ipswich 1P1 1QH(GB)

(54) **Centrifuge assembly.**

A chamber (41) within which a rotor (1) is to be rotated is provided with a wall (5) encircling the rotor (1) when the rotor (1) is in position and generally coaxial with the axis of rotation of the rotor (1), whereby the wall (5) is pivotably mounted so that it can pivot about an axis (10) from an inoperative position permitting access to the rotor to an operative position encircling the rotor.

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Fig.1.

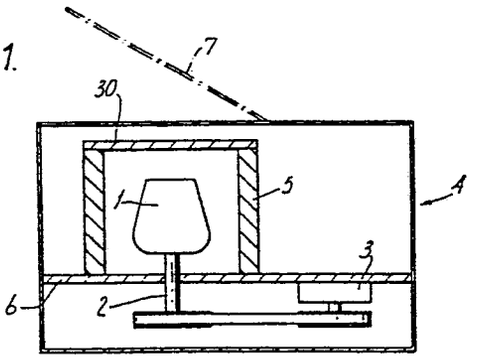
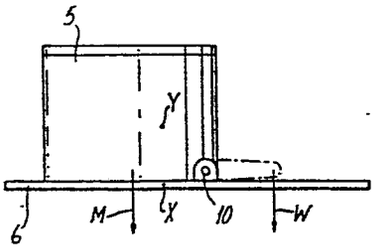


Fig.2.



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Centrifuge Assembly

The present invention relates to a centrifuge assembly.

With many forms of centrifuge, the rotor is removeably mounted on the drive shaft so that different rotors may be used in the one centrifuge. However, problems are encountered with changing the rotors since they are heavy. Female operators often find it difficult to raise and lower the rotors into the rotor chamber, notably with centrifuges which are mounted on a work surface as opposed to being free standing cabinet machines. Furthermore, the rotor must be housed within a guard ring to protect operators in case of rotor failure. This guard ring further hinders ready access to the rotor, but can not be dispensed with.

We have now devised a form of centrifuge assembly which reduces the above problems.

Accordingly, the present invention provides a centrifuge assembly comprising a chamber within which a rotor is to be rotated, the chamber being provided with a wall encircling the rotor when the rotor is in position and generally coaxial with the axis of rotation of the rotor, characterised in that the wall is pivotably mounted so that it can pivot about an axis from an inoperative position permitting access to the rotor to an operative position encircling the rotor.

For convenience, the invention will be described with reference to a preferred form thereof as shown in the accompanying drawings in which

Figure 1 is a diagrammatic vertical cross section of a centrifuge;

Figure 2 shows a detail of the centrifuge of Figure 1;

Figure 3 is a diagrammatic part skeltal view of a counter-balance mechanism for use in the centrifuge of Figure 1; and

Figure 4 is a detailed view of part of the mechanism of Figure 3.

The centrifuge comprises a conventional removeable rotor 1 mounted on a shaft 2 driven by a motor via a direct drive or by a suitable drive mechanism 3 as shown in Figure 1. The rotor rotates within a rotor chamber 4 having a base plate 6. This chamber is provided with a high tensile steel or other material annular guard-ring 5 surrounding the rotor. The guard-ring 5 is generally coaxial with the axis of rotation of the rotor and will usually be of circular form but could be polygonal, e.g. squared or hexagonal. The guard-ring 5 extends within chamber 4 for at least the height of rotor 2 and usually it is required that the guard-ring 5 project some way beyond either end of the rotor. Preferably, the top and bottom extremities of the guard-ring subtend an angle of at least 5^{o} to the axis of rotation at the top and bottom extremities of the rotor. The guard-ring 5 is of conventional design and dimensions. If desired, the top end of the guard-ring can be tapered inwardly to provide further protection against escape of fragment from the rotor.

In a conventional centrifuge, guard-ring 5 is fixedly mounted, e.g. by welding, to the base plate 6 of the chamber 4 and a sliding

or pivotting lid 7 (shown dotted in the open position in Figure 1) is provided for access to the rotor 2. However, access to the rotor is limited since the operator must view the rotor through the lid opening and over guard-ring 5. Also exchange of the rotor requires lifting of the rotor over guard-ring 5 through the lid opening.

In the centrifuge assembly of the invention the guard-ring 5, together with any external cladding to chamber 4, is mounted on a pivot so that the guard-ring can be pivotted out of the way to permit ready access to the rotor. Thus, guard-ring 5 can be formed in two segments which are pivotted about an axis substantially parallel to the axis of rotation of the rotor so that the two segments can be swung apart to permit access to the rotor. However, it is preferred that the whole of guard-ring 5 move as a unit about an axis substantially normal to the axis of rotation of the rotor so that it is tilted upwards from its operative position to permit access to the rotor. Preferably, as shown in Figure 2 the guard-ring 5 is mounted on an axle or pair of pins 10 at the periphery thereof so as to tilt the guard-ring upwards and away from the rotor. However, the axle or pins 10 could be located forward or aft of the periphery of the guard-ring 5 if desired. The precise location of the pivot point of the guard-ring will depend upon the design of the centrifuge and whether a counterbalance system, as described below, is used. Thus, if there is adequate room within the centrifuge housing, the guard-ring can be pivotted about an axis located substantially at its mid-point

to provide a tilting unit which requires little effort to tilt.

Where the pivot point is located at or near the periphery of the guard ring, considerable effort may be required to tilt the guard-ring which typically weights between 10 and 50 kgs. It is therefore preferred to provide the guard-ring with a counter-balancing mechanism which reduces the effort needed. In order that the guard-ring should tilt at a uniform angular rate, it is preferred that the counterbalancing force should vary substantially linearly with the angle of tilt of the guard-ring. In this way excessive angular acceleration of the guard-ring during tilting is reduced. The counterbalance mechanism could take the form of a weight W carried by the guard-ring 5 (as shown dotted in Figure 2) acting against the mass M of the guard-ring about the pivot point. Such a system however would require the use of very large weights if the assembly is to be compact. We therefore prefer to use energy storage means such as a spring or pneumatic piston to provide the counterbalancing forces. A particularly preferred counterbalancing mechanism is shown diagrammatically in Figure 3. This comprises a cylinder containing gas under pressure acting on a plunger journalled in the cylinder. Such devices are denoted herein as 'gas springs'. The gas spring 20, or preferably a pair of gas springs located one to each side of chamber 4, acts upon a line 21. Preferably each gas spring 20 acts on one end of a yoke piece 22 linking the free ends of the plungers 23 in the gas springs. Each line 21 is linked to yoke piece 22 and passes via a pulley 24

to a lever arm 25 mounted on the guard-ring 5. The precise dimensions of the arm 25 and its location will depend upon the weight of guard-ring 5 and the location of the pivot point. Gas springs 20 can be replaced by conventional coiled springs.

The springs 20 exert via lines 21 and arms 25 a leverage tending to tilt the guard-ring. To compensate for deviations from linearity in the force exerted by springs 20 we prefer to link lines 21 to arms 25 at a point on the upper surface of the arms as shown in Figure 4 and to run lines 21 over the surface of arms 25, preferably in a groove or channel. The surface of arm 25 (or the depth of the groove or channel) is given a cammed profile as shown in Figure 4 so that the effective length of lever arm 25 varies as guard-ring 5 is tilted and spring 20 is compressed or released.

The above form of counterbalance mechanism offers advantages over the conventional form of use of a gas spring where the spring would be mounted at x and y on Figure 2. With this type of mounting , there are severe limitations as to where the spring can be mounted and yet achieve adequate leverage about the pivot point. Also the spring obstructs the access to the rotor. The form of mechanism shown in Figure 3 can be readily accommodated within the centrifuge housing either horizontally as shown or vertically with minimal disruption to the centrifuge design and with little extra weight.

It will usually be preferred that the guard-ring 5 be provided with an upper closure 30 so as to form, when in the closed position

against base plate 6, a total enclosure within which rotor 2 is housed for rotation. If desired, closure 30 can be provided with a conventional lid to permit access to the rotor without tilting guard-ring 5. It is also preferred that any external cladding or housing around guard-ring 5 be mounted on guard-ring 5 so that it can be tilted as a unit with guard-ring 5. The guard-ring 5 is preferably provided with some form of locking mechanism whereby the ring can not be lifted when the rotor is moving. Thus, base plate 6 can carry one or more locking pins which are held in position in a corresponding socket in ring 5 or the cladding carried by it. The locking pins are withdrawn, for example by a solenoid, when the rotor comes to rest after a run.

Claims:

1. A centrifuge comprising a chamber (4) within which a rotor (1) is to be rotated, the chamber (4) being provided with a wall (5) encircling the rotor (1) when the rotor is in position and generally coaxial with the axis of rotation of the rotor (1), characterised in that the wall (5) is pivotably mounted so that it can pivot about an axis from an inoperative position permitting access to the rotor (1) to an operative position encircling the rotor.

2. A centrifuge as claimed in claim 1 characterised in that the wall (5) is pivotted as a whole about an axis (10) generally perpendicular to the axis of rotation of the rotor (1).

3. A centrifuge as claimed in claim 2 characterised in that a counterbalance mechanism (20, 21, 22, 23, 24 and 25) is provided to assist pivotting of the wall (5).

4. A centrifuge as claimed in claim 3 characterised in that the counterbalance mechanism comprises a gas filled cylinder and piston (20) acting via a linkage (21) upon a level arm (25) mounted on the wall (5).

5. A centrifuge as claimed in any one of the preceding claims characterised in that the wall (5) is provided with an integral member (30) closing the upper end of the rotor chamber (4).

6. A centrifuge as claimed in any one of the preceding claims characterised in that the wall (5) is provided with a locking means to prevent pivotting of the wall (5) whilst the rotor (1) is rotating.

Fig.1.

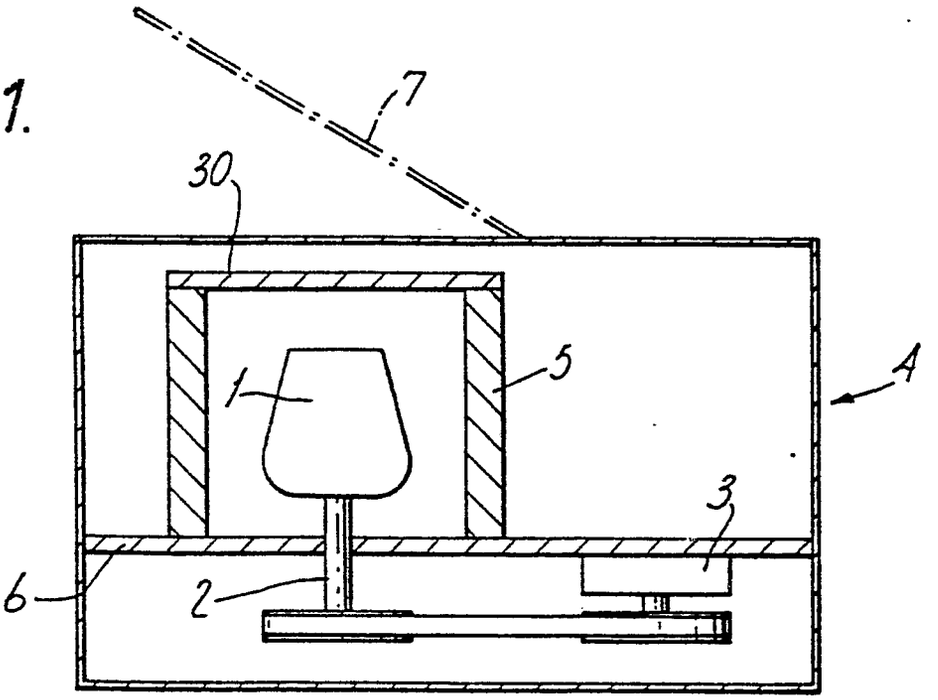


Fig.2.

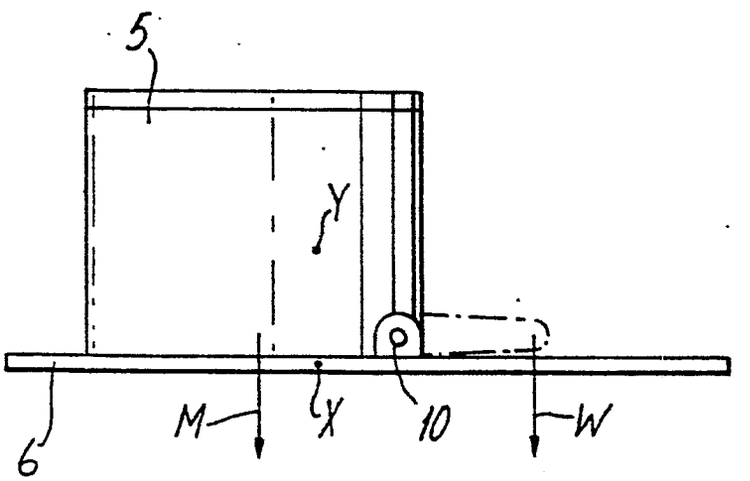


Fig. 3.

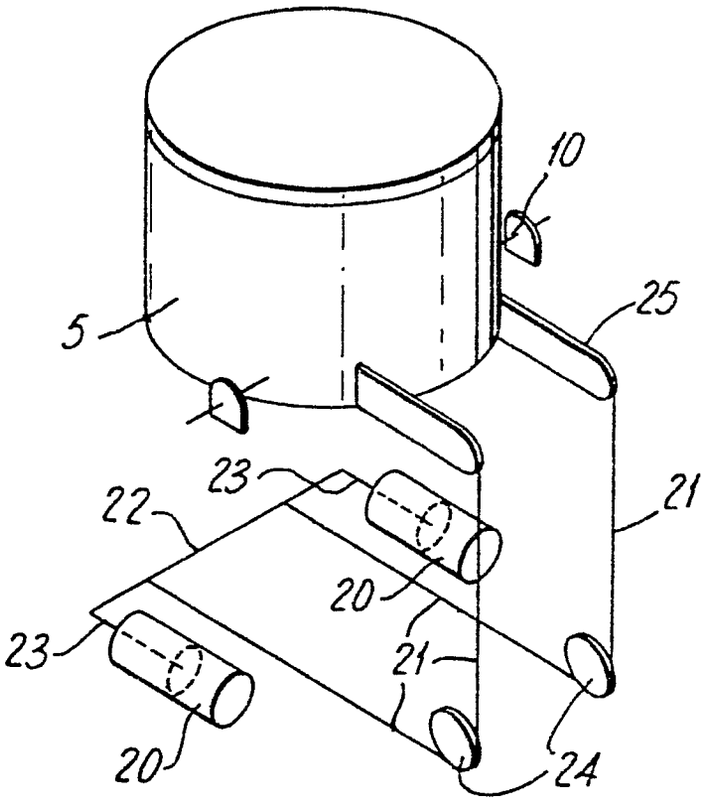
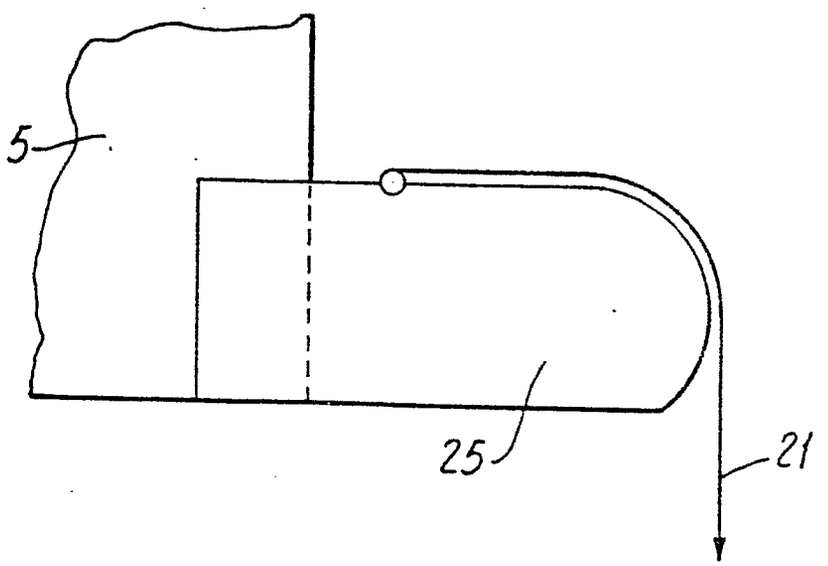


Fig. 4.



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EUROPEAN SEARCH REPORT

Application number
EP 80 30 0087

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	US - A - 3 240 425 (RAY) * Column 4, lines 45-63; column 6, lines 26-29 and 48-50 *	1,2,6
	US - A - 3 244 363 (HEIN) * Column 5, lines 12-27; figure 5 *	1,2,6
	DE - C - 599 226 (KRAUB) * Page 1, lines 65-68; page 2, lines 1-10 *	3,4
A	US - A - 3 347 453 (GOERGEN) * Column 5, lines 8-12 *	1

CLASSIFICATION OF THE APPLICATION (Int. Cl.)

B 04 B 7/02

TECHNICAL FIELDS SEARCHED (Int.Cl.³)

B 04 B
D 06 F

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24-04-1980	VERDONCK

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