

[54] **CENTRIFUGAL SEPARATING APPARATUS**

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[58] Field of Search **233/19 R, 19 A, 1 R, 20 R,
233/20 A, 47 R**

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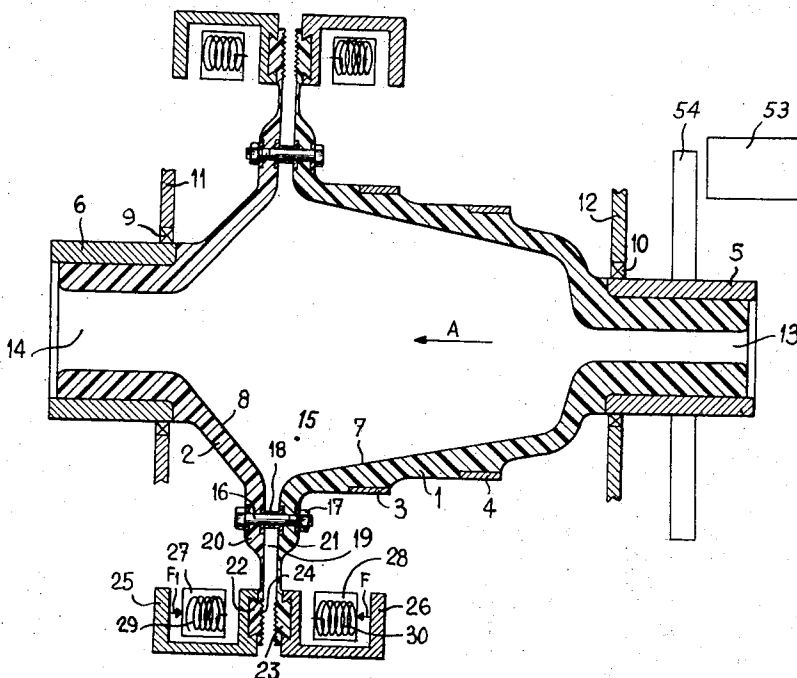
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[57] **ABSTRACT**

Centrifugal separating apparatus comprises a rotatable drum formed from at least two axially-spaced parts. The adjacent portions of adjacent parts have frusto-conical walls which co-operate to define a chamber which receives a component separated in the drum. The adjacent edges of the parts comprise lips of a deformable material which bound an outlet opening from the chamber. The lips are associated with means for selectively closing the opening, for example by moving the lips together.

12 Claims, 6 Drawing Figures



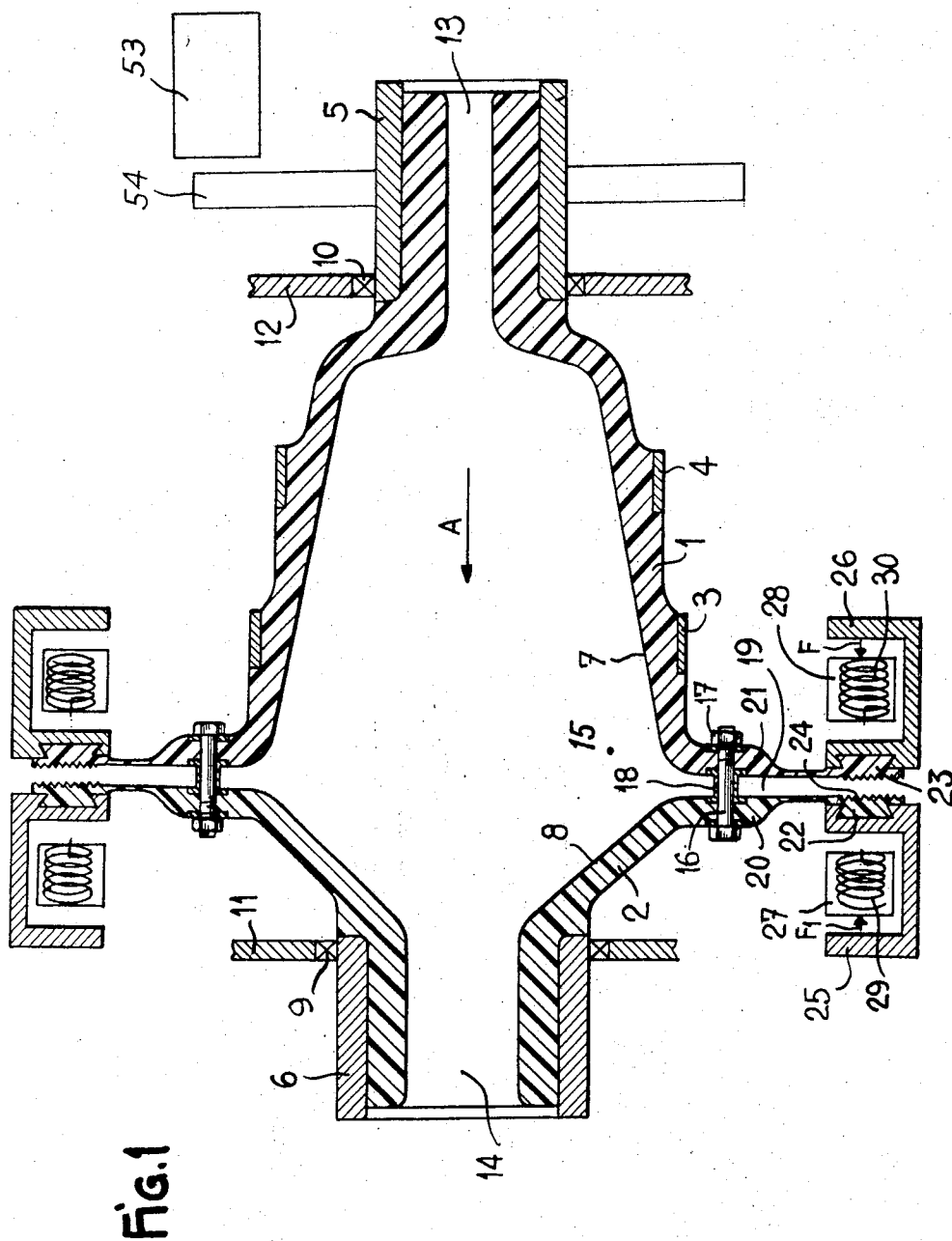


FIG. 2

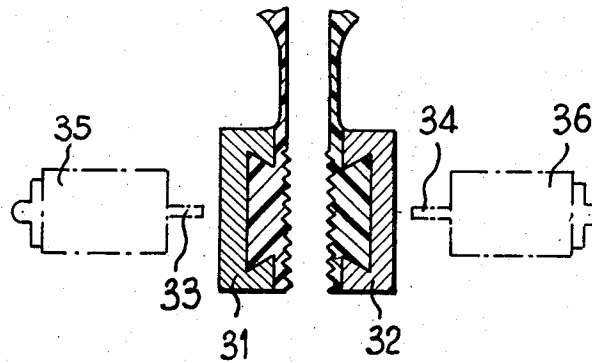


FIG. 3

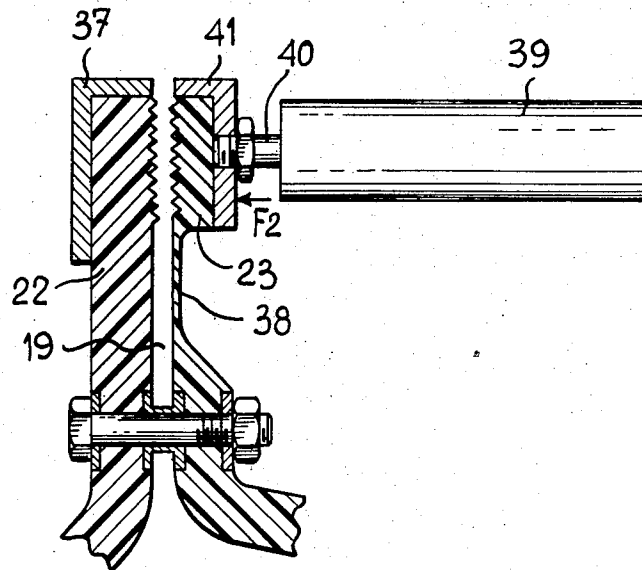


FIG. 4

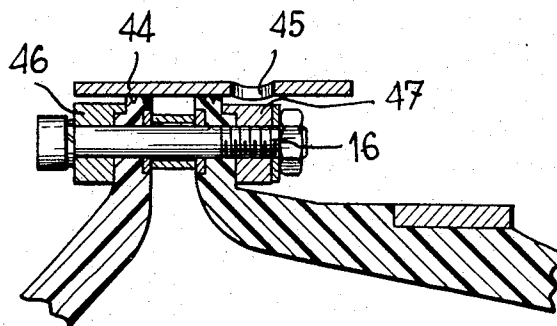
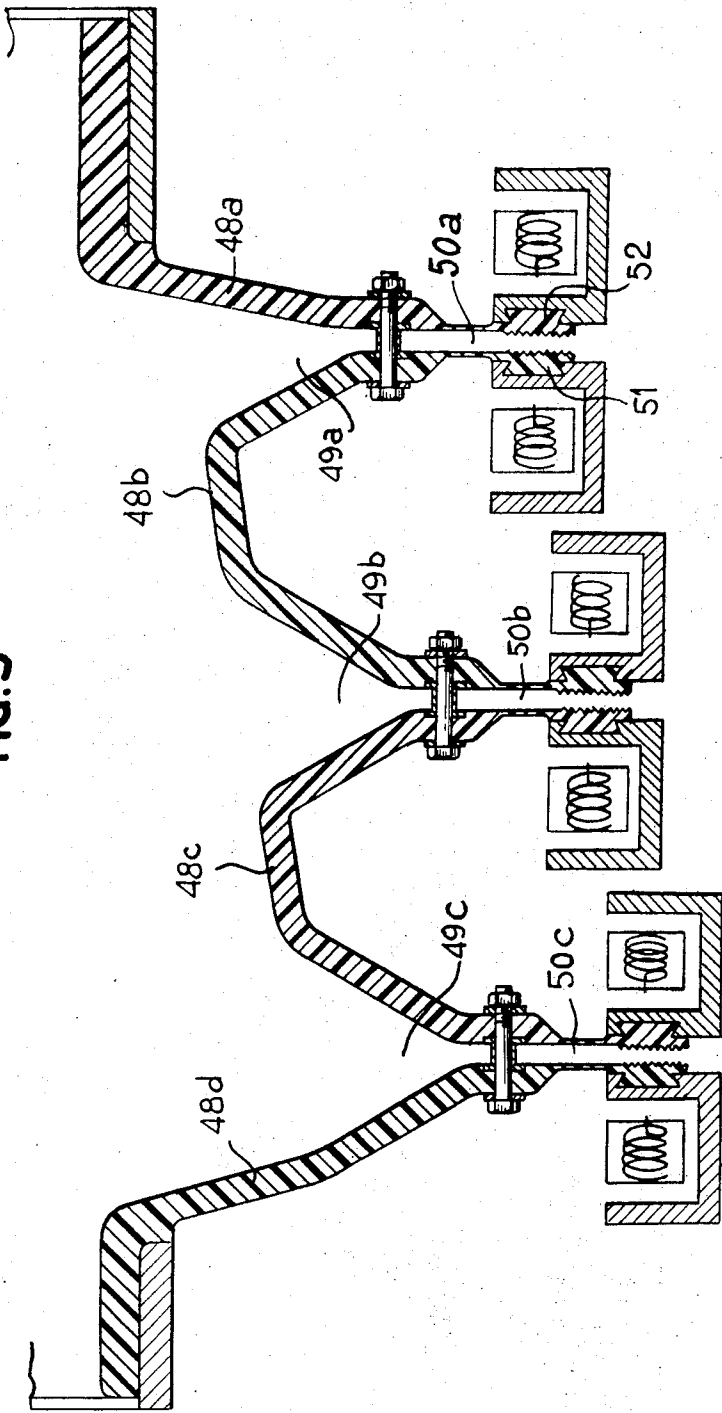


Fig. 5



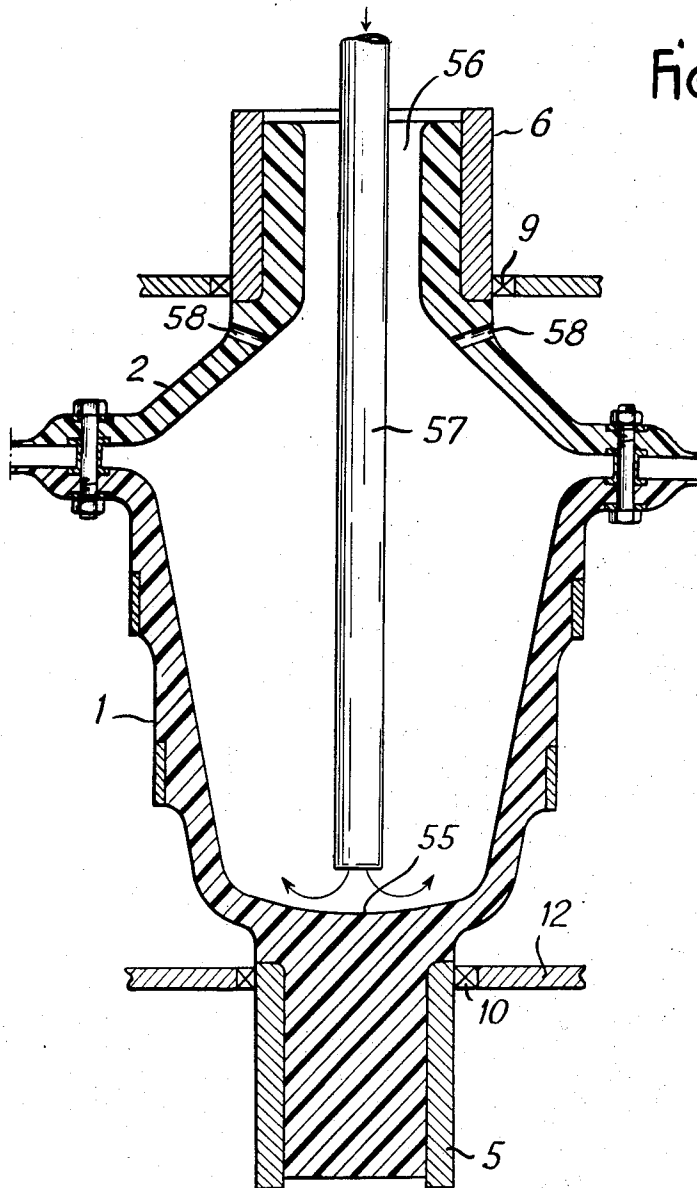


FIG. 6

CENTRIFUGAL SEPARATING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to centrifugal separating apparatus.

2. Description of the Prior Art

There has been proposed centrifugal separating apparatus for separating, for example, a liquid and a solid, or two different liquids, comprising a drum consisting of at least two parts having frusto-conical walls defining chambers for one of the separated components. In order to discharge this component from the chamber, one of the parts of the drum is axially displaceable so as to provide a circular outlet opening from the drum.

In this previously proposed apparatus, the parts of the centrifuging drum are made of a rigid material and the mechanism for displacing the parts of the drum is very complicated.

SUMMARY OF THE INVENTION

According to the present invention, there is provided in centrifugal separating apparatus, a rotatable drum, said drum comprising at least two parts, said parts having frusto-conical walls which co-operate to define a chamber to receive a component separated in the drum, the adjacent edges of the parts being spaced to define a circular outlet opening from the chamber, the said edges comprising two lips of a deformable material, and means co-operating with the lips to bring the lips selectively into an open or a closed position.

According to the present invention, there is also provided in centrifugal separating apparatus, a rotatable drum, said drum comprising at least two axially-spaced annular parts, the adjacent portions of the adjacent parts of the drum being shaped to define a chamber in the peripheral portion of the drum, and the adjacent parts being axially spaced to define an outlet from the chamber, and a lip on each said part, the lips lying on opposite sides of the opening and being formed from a deformable material, and means associated with the lips to selectively block the opening.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying diagrammatic drawings, in which:

FIG. 1 is a longitudinal section of centrifugal separating apparatus in accordance with the invention;

FIGS. 2 to 4 are fragmentary sections, to enlarged scales, showing the different arrangements for closing an outlet opening of a drum of the apparatus of FIG. 1;

FIG. 5 is a fragmentary longitudinal section of a modified form of drum; and

FIG. 6 is a longitudinal section of another form of centrifugal separating apparatus in accordance with the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The centrifugal separating apparatus shown in FIG. 1 has a drum comprising two parts 1 and 2 made of a relatively deformable material. One of the parts, 1, is reinforced externally by bands 3 and 4, preferably metal bands, and the two parts 1 and 2 have at their end

portions metal rings 5 and 6 rotatably mounted in support members 11 and 12 by means of ball bearings 9 and 10.

The material to be treated (for example a liquid) is introduced through an inlet 13 into the drum and is subjected therein to the action of centrifugal force which causes separation into an outer layer of a relatively heavy component, and an inner layer of a relatively lighter component.

The inner layer is withdrawn from the drum in the direction of the arrow A, through an outlet 14 whereas the outer layer consisting for example of a sediment or a different liquid accumulates in a peripheral chamber 15 defined by frusto-conical walls 7 and 8 of the parts 1 and 2 of the drum.

The parts 1 and 2 are joined together by a plurality of screws 16 provided with nuts 17 and distributed around the periphery of the parts: spacers 18 are interposed between the parts 1 and 2 so as to define a circular outlet opening 19 for the passage of the component accumulating in the chamber 15. The opposing edges 20 and 21 of the parts 1 and 2 have extensions in the form of deformable annular lips 22 and 23 which consist of the same material as the parts 1 and 2 and which are moulded integrally with those parts. The lips 22 and 23 are provided with grooves 24 and can lie in a spaced configuration (as shown in FIG. 1) or in a configuration in which they are in contact so as to block or close the circular opening 19.

The lips 22 and 23 are fast with annular members 25 and 26 respectively, the members 25 and 26 consisting of soft iron and constituting armatures capable of being attracted by cores 27 and 28 of annular coils 29 and 30 when the coils are energised by the passage of an electric current. When the members 25 and 26 are attracted by the cores of the coils 29 and 30 as indicated by the arrows F and F₁, the lips 22 and 23 come into contact and cause the circular opening 19 to be closed.

In the arrangement shown in FIG. 2, the lips 22 and 23 are located in rigid housings 31 and 32, preferably of metal, and rods 33 and 34 of electromagnets 35 and 36 are adapted to urge the housings 31 and 32 towards each other when the electromagnets are connected to a source of electric current, whereby to close the opening 19.

In the arrangement shown in FIG. 3, one of the lips, 22, is fixed and located in a rigid housing 37 whereas the other lip, 23, is provided with a deformable portion 38 which enables the lip 23 to be displaced by means of a hydraulic or pneumatic cylinder 39 of which the actuating rod 40 is rigid with a housing 41 fixed to the periphery of the lip 23. The cylinder 39 acting in the direction of the arrow F₂ causes the lip 23 to contact the lip 22 so as to close the circular opening 19. The relative movement of the lips 22 and 23 can alternatively be effected by entirely mechanical means, for example by cams.

In the arrangement shown in FIG. 4, the lips are deformable and are fixed in position, the outer edges of the lips contacting a slidable annular member 44 having apertures 45 adapted to permit discharge through the circular opening when the apertures 45 are aligned with the opening.

In order to provide rigidity for the structure, housings 46 and 47 are mounted on screws 16 on each side of the lips.

In the embodiment shown in FIG. 5, the drum comprises a plurality of parts 48a, 48b, 48c and 48d of which the walls define a plurality of peripheral chambers 49a, 49b and 49c having corresponding outlet openings 50a, 50b and 50c. The outlet openings are bounded by deformable annular lips 51 and 52 associated with one of the means described above.

In the embodiments particularly described the drum is made of a plastics material, and the lips are formed integrally therewith; the drum can, however, be made of metal to which lips made of deformable material are attached.

The drum is preferably driven by a linear motor 53 (FIG. 1) which co-operates with a metal disc 54 rigid with the ring 5 provided at the end of the part 1. Alternatively, the drum can be driven by a conventional motor through a suitable transmission.

In the embodiment shown in FIG. 6, the drum is rotatable about a vertical axis and is closed at its bottom 55. The material to be treated is introduced through an upper inlet 56 by means of a vertical duct 57 which leads to the bottom part of the drum. After a centrifugal separating action has been effected one of the components of the material (this component itself being a liquid) is evacuated through orifices 58 provided in the periphery of the upper part 2 of the drum.

What is claimed is:

1. In centrifugal separating apparatus a rotatable drum, said drum comprising
 - at least two parts, said parts having frusto-conical walls which cooperate to define a chamber to receive a component separated in the drum, the adjacent edges of the parts being spaced from each other to define a circular outlet opening from the chamber therebetween, the said edges comprising two lips of a deformable material about the said opening, and means cooperating with the lips to bring the lips selectively together or apart to open or close said opening.
2. Apparatus as claimed in claim 1, wherein the said parts of the drum are formed of a plastics material, and the lips are integral with the respective parts.
3. Apparatus as claimed in claim 2, further comprising bands, said bands reinforcing the said parts of the drum.
4. Apparatus as claimed in claim 1, wherein the means for bringing the lips into an open or closed position comprises
 - a soft-iron member fast with each lip, and annular coil means arranged between each said soft-iron member and its associated lip, each said annular coil means including
 - a core, energisation of the coil means being operative to cause attraction of the soft iron members towards the cores whereby the lips are moved together to close the opening.
5. Apparatus as claimed in claim 1, wherein the said

means for bringing the lips into an open or closed position comprises

- a plurality of electromagnets arranged around the drum, said electromagnets including
- actuator rods, the actuator rods contacting the lips upon energisation of the electromagnets whereby to move the lips together to close the opening.

6. Apparatus as claimed in claim 1, wherein one of the lips is fixed, and the means for bringing the lips into an open or closed position comprises

- fluid-operated means for moving the other lip.

7. Apparatus as claimed in claim 1, wherein one of the lips is fixed and the means for bringing the lips into an open or closed position comprises

- electromagnetic means for moving the other lip.

8. Apparatus as claimed in claim 1, wherein the drum comprises more than two said parts which co-operate to form a plurality of said chambers and associated openings.

9. Apparatus as claimed in claim 1, further comprising linear motor means operative to drive the drum.

10. In centrifugal separating apparatus

a rotatable drum, said drum comprising

- at least two axially-spaced annular parts, the adjacent portions of the adjacent parts of the drum being shaped to define a chamber in the peripheral portion of the drum, and the adjacent parts being axially spaced to define an outlet from the chamber, and

- a lip on each said part, the lips lying on opposite sides of the opening and being formed from a deformable material, and

means associated with the lips to selectively block the opening.

11. Apparatus as claimed in claim 10, wherein the said means associated with the lips comprises

- an annular member surrounding the lips, said member having outlet apertures and being slidable to move the apertures selectively into, and out of, communication with the opening.

12. A centrifuge comprising a housing divided into two parts which combine to enclose a frusto-conically shaped chamber, means for adding to the chamber a material to be separated by centrifugal force, an annular flange about an end of each of said parts, the flange of one part being disposed in spaced face-to-face relation with the flange of the other part, means for securing the flanges together in said spaced face-to-face relationship, a deformable member carried by each of the flanges and disposed with respect to each other to define an outlet through which one of the components of the material separated by the centrifuge is discharged, said deformable members being adapted to be alternately pressed into contact with each other to close the said outlet and released to open the outlet, and means for pressing the deformable members together to close the outlet.

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