

April 20, 1965

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3,179,334

CENTRIFUGE DISCHARGE MEANS

Filed Sept. 15, 1961

Fig. 1

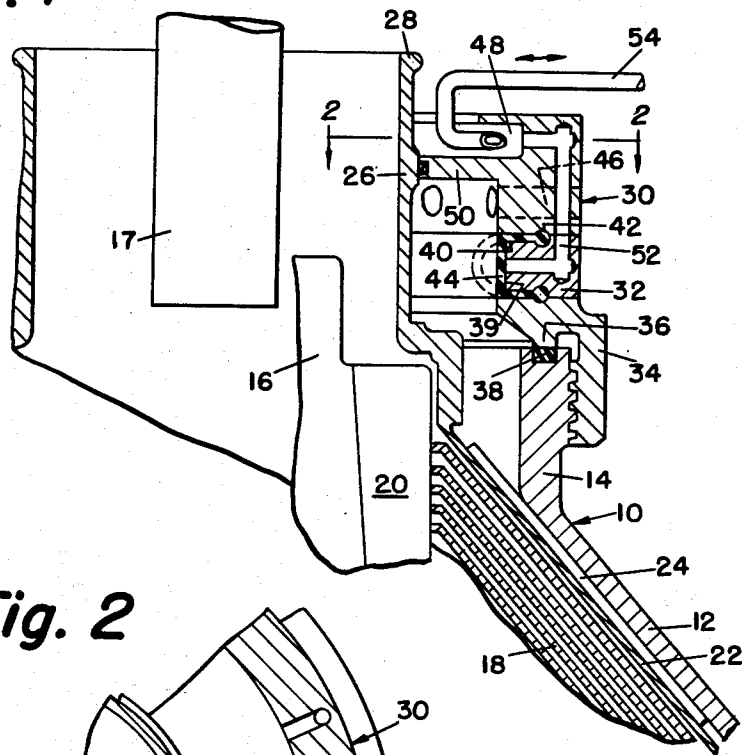


Fig. 2

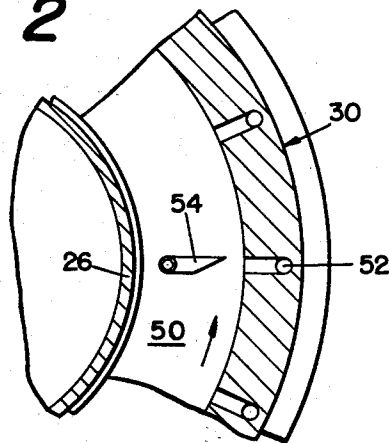


Fig. 3

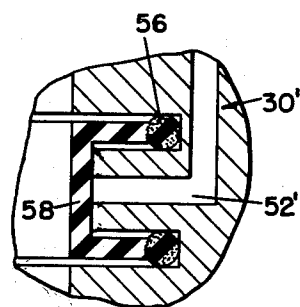
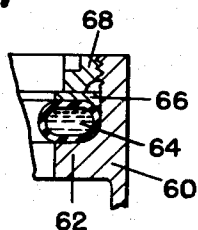


Fig. 4



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3,179,334

CENTRIFUGE DISCHARGE MEANS

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Filed Sept. 15, 1961, Ser. No. 138,305

5 Claims. (Cl. 233-20)

This invention relates to an apparatus for separating a feed mixture into its various components or "phases" according to their specific gravity. More specifically this invention relates to a centrifuge bowl having means to adjust the discharge level of one of the "phases." Still more specifically this invention relates to a centrifuge bowl having a weir which may be altered to adjust its inner diameter without disassembling the machine.

In the centrifuging art, the importance of adjusting the size of an effluent weir is well known. Such adjustment may enable the operator, for instance, to control the position of the interface between liquids or "phases" of different specific gravities within the bowl to establish the interface at the feed zone or immediately outside of the disc stack, etc., in order to attain the desired efficiency. Similarly, by adjusting the size of an effluent discharge weir, the operator can, in a clarifier bowl, for instance, control to some degree the residence time of the liquid in the bowl so that the desired length of the exposure of the liquid to the centrifugal field may be achieved.

In the prior art, the effluent discharge weir has often comprised a ring dam held in position about the discharge mouth by a threaded ring. For adjustment, the machine has been shut down, the threaded ring and the ring dam removed, and the ring dam replaced by a dam of the desired size.

The primary drawback in this prior art procedure has been time consumed in shutting down the machine, disassembling it, reassembling it, and once more getting it up to speed. It should be noted that it may take 10 to 15 minutes for some bowls to obtain operating speed from rest.

It is, therefore, an object of my invention, especially in its preferred form, to provide a means whereby the size of an effluent discharge weir may be easily adjusted without stoppage or disassembly of the machine, consequently saving much time, effort and frustration on the part of the operator.

It is a further object of my invention to provide an adjustable discharge weir especially adapted for automatic continuous adjustment while the centrifuge is in operation.

This invention embodies other novel features, details of construction and arrangement of parts which are herein after set forth in the specification and claims and illustrated in the accompanying drawing wherein:

FIGURE 1 is a fragmentary sectional view of a centrifugal separator embodying the invention;

FIGURE 2 is a sectional view taken on the line 2-2 of FIGURE 1;

FIGURE 3 is a fragmentary sectional view showing an alternate form of mounting of the resilient weir embodying my invention; and

FIGURE 4 is a fragmentary sectional view of an apparatus embodying a modified form of the invention.

Briefly, in a centrifuge bowl having an axial outlet for one of the effluents, the invention comprises weir means in the outlet for controlling the level of the effluent as it is discharged, and means associated with said bowl for moving the inner edge of the weir inwardly or outwardly from the axis of the bowl.

Referring more specifically to the drawings, a fragment of a separator bowl is shown in FIGURE 1 and generally designated 10. The bowl includes the conven-

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tional top 12 having an upward extension 14 exteriorly threaded. The bowl contains a conventionally mounted center tube 16 which is surrounded by a disc stack 18 comprising a plurality of individual frusto-conical disc elements. As shown in FIGURE 1, radial wings 20 extend out from the center tube to position the disc stack 18 and provide a substantially annular passage for light effluent.

The disc stack 18 is surmounted by a dividing cone 22 having radial partitions 24 which engage the underside of the top 12 and space the dividing cone down therefrom to permit upward passage of heavy effluent. The partitions 24 also serve to decelerate the inwardly flowing liquid. The dividing cone is formed with an upward longitudinal extension 26 comprising a light discharge effluent tube having a discharge edge 28.

Referring now to the area of FIGURE 1 illustrating a portion of the apparatus which embodies the invention, the discharge collar is generally designated 30. It preferably comprises an annular body portion 32 formed with an offset downwardly extending retaining ring 34 which is internally threaded and threadedly engages the upward extension 14 of the bowl top. Spaced inward from the retaining ring 34 the discharge collar is formed with an annularly downward rib 36. The rib 36 engages with an O-ring 38 in an annular groove in the top of upward extension 14 to seal the assembly.

The discharge collar 30 is shown in FIGURE 1 to preferably comprise three stacked annular segments held together by means not shown. The intermediate of these segments is undercut as at 39 with respect to its neighbors at its inner face. Similarly, its end faces for a distance inward from its outer face are undercut as at 40. Annular rounded grooves of similar radius are cut in the mating faces of the three segments of the discharge collar as at 42.

In assembly, an adjustable discharge weir 44 is secured between the segments of the discharge collar. The weir 44 comprises a continuous band of flexible resilient plastic or the like having along its opposite edges thickened ribs. The ribs are received into the grooves 42 in the abutting surfaces of the segments to securely hold the weir. As shown, the band comprising the weir normally conforms to the shape of the intermediate of the discharge collar segments.

Spaced about the upper segment of the discharge collar above the weir are a plurality of radially extending discharge ports 46 through which the heavy effluent passing over the weir 44 discharges from the bowl into a suitable collector (not shown).

The upper segment of the discharge collar 30 adjacent its upper end is formed with an inwardly facing annular trough or pocket 48 having walls which extend toward the axis of the bowl. The lower wall of the trough 48 comprises a flange 50 which extends inward to meet the longitudinal extension 26 in sealed engagement and comprises the top wall of the heavy discharge passage. It prevents downward passage of liquid from the trough 48 when the machine is at rest.

As shown in FIGURES 1 and 2 a plurality of passages 52 are provided between the outer wall of the trough 48 and the peripheral surface of the intermediate segment of the discharge collar.

A skimmer tube 54 comprises a J-shaped hollow element which may have its short leg bevelled off is adjustably mounted by means not shown so that its short leg may extend to the desired depth of the trough 48.

It may be seen that in operation the distance to which the discharge weir 44 projects inward toward the axis may be varied to control the level of discharge. For this purpose, control liquid is presented into the trough 48 and communicates through the passages 52 to the weir.

Seeking its own level, the control liquid will create pressure in the weir to cause it to bulge inwardly. Thus the weir may be regarded as an inward portion of an expandible fluid chamber in the form shown. By introducing more control liquid to the trough 48 or by skimming 5 some off using tube 54 in a well known manner, projection of weir 44 may be adjusted correspondingly inward or outward.

It will be understood that the material of the weir 44 may be selected from any of the flexible resilient plastics. 10 An especially suitable one, which is resistant to chemical attack, has been found in Viton, a Du Pont-trademarked synthetic rubber.

Similarly, the mode of securing the edges of the band comprising the weir 44 may be altered. As an example 15 it is contemplated that the thickened ribs 56 (FIG. 3) along the margins of the band 58 may be weighted, for instance, by lead particles disposed therein during molding and held outwardly by centrifugal force in annular grooves on opposite sides of the outlet of passage 52' 20 in the discharge collar 30'.

An alternate structure embodying a form of the invention is shown in FIGURE 4. In this form a discharge collar 60 is formed adjacent its upper end with an inwardly extending flange 62. Against the upper surface 25 of the flange rides the discharge weir 64 which comprises an annular tubular element formed of a flexible resilient plastic and containing a deformable relatively non-compressible fluid. A washer 66 rides on top of 30 the weir. Above the washer the discharge collar is threaded internally and receives an externally threaded ring 68 which may be adjusted by a spanner or other means to urge the washer 66 downward.

Thus, after the machine has been shut down, the radius of the inner edge of the weir 66 may be adjusted by 35 turning the ring 68 to apply or release pressure exerted through the washer 66 on the weir 64.

In practice the skin of the weir is formed of a plastic such as Viton, mentioned above. The skin may be filled with an incompressible material such as water or a light 40 oil which will freely communicate the pressure exerted by the washer 66 by urging the inner surface of the weir inwardly.

It should be understood that I do not wish to limit my invention to centrifuge bowls which rotate about a vertical axis. The invention is applicable to devices having 45 axes other than vertical. Similarly, the form of the accelerator means within the bowl need not be a disc stack. Vanes or equivalent rotation imparting devices are suitable. Moreover, the invention while disclosed as embodied in the heavy discharge of a separator bowl is equally applicable to the light discharge or to the liquid discharge of a clarifier.

Having more particularly described my invention, it is to be understood that my description is by way of illustration and not by way of limitation. Other modifications will occur to persons skilled in the art. Accordingly, it is intended that the patent shall cover by suitable expression 50 in the claims the various inventions of patentable novelty residing in the invention.

I claim:

1. A centrifuge comprising a bowl mounted to rotate about an axis and having a separating zone and an outlet for a separated component spaced from the zone, an expandible fluid chamber mounted in the bowl inter- 65

mediate the centrifuging zone and the outlet and having an inward portion comprising weir means and adapted to move radially of the bowl when fluid pressure in the chamber is changed to thereby control the level of liquid in the bowl, an annular pocket in the bowl facing inwardly toward the axis, passage means connecting the pocket and the expandible fluid chamber, and control means mounted adjacent the bowl and adapted to control the level of liquid in the pocket to control the fluid pressure in the chamber.

2. A centrifuge as described in claim 1 wherein the inward portion of the expandible fluid chamber comprises a portion of a flexible resilient annular band having upper and lower edges held by the bowl about the axis and wherein the chamber is defined by the band and the bowl.

3. A centrifuge as described in claim 2 wherein the band is of elastomer and the edges are weighted so as to be thrown against the bowl by centrifugal force during operation.

4. A centrifuge as described in claim 3 wherein the band is of molded synthetic rubber into the edges of which are cast particles of material of greater density than the rubber.

5. A centrifuge as described in claim 1 wherein the control means comprises a skimmer element adapted to remove liquid from the pocket.

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