

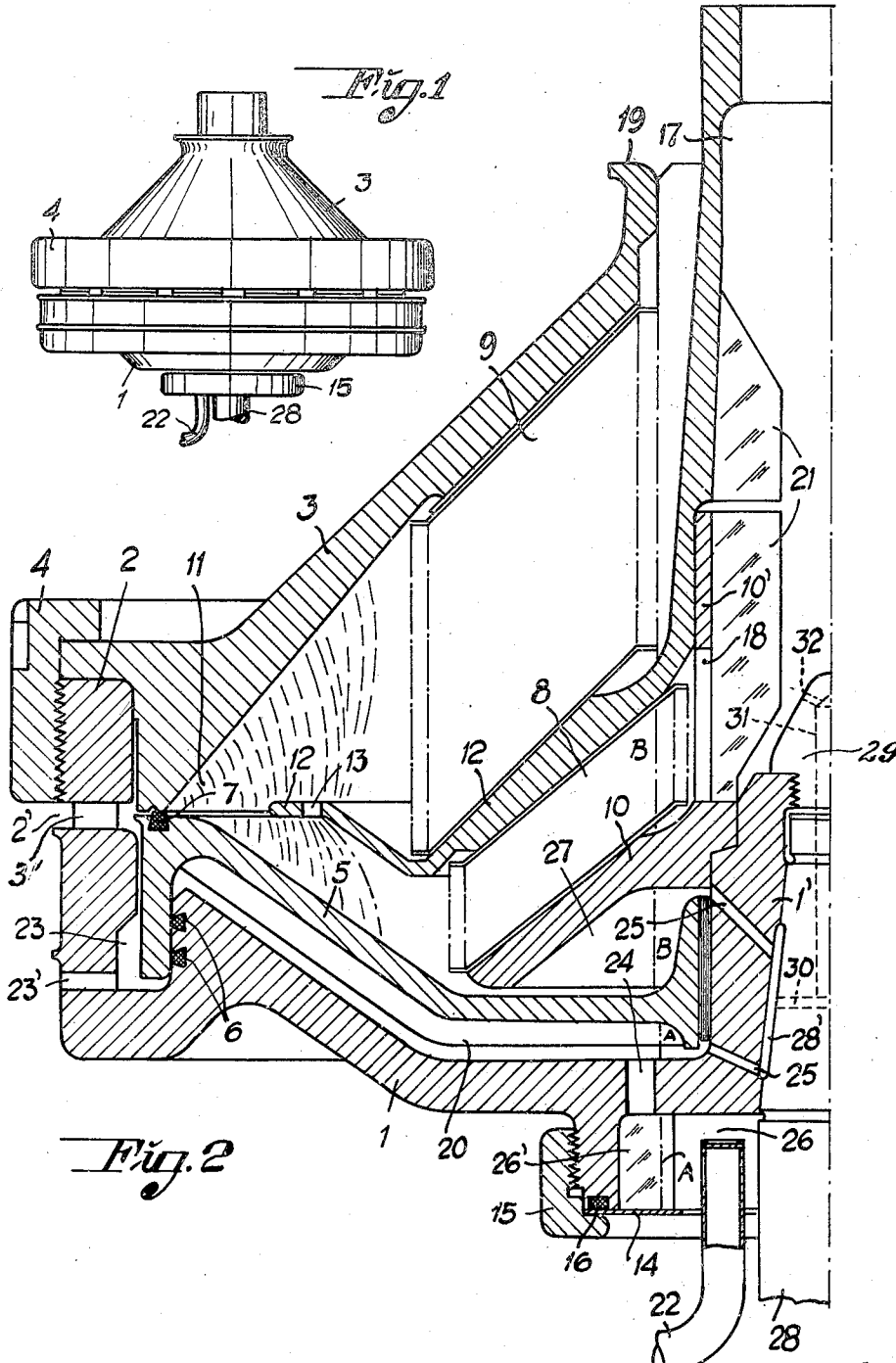
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AUTOMATICALLY OPENING SEPARATOR BOWL

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AUTOMATICALLY OPENING SEPARATOR
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den, assignor to Aktiebolaget Superior, Stock-
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1 Claim. (Cl. 233—20)

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The present invention relates to a separator bowl in which the heavier components of a liquid to be separated are automatically discharged from the bowl.

In a known separator bowl of this type, the heavier components of the liquid having constituents of different specific gravity are deposited during the separation in a space outside the actual separating chamber of the bowl, in order to be periodically discharged through an opening adapted to be uncovered by a slide, plunger or the like which is influenced by the liquid pressure in the separating chamber on one side thereof and by the pressure in the external chamber on the other side thereof. In this known arrangement, the last-mentioned chamber communicates through a channel system with the sludge chamber of the separator bowl. A certain quantity of separation liquid flows continuously from the chamber, by reason of which the chamber loses some of its contents with a lowering of the pressure in consequence thereto when the channels are clogged up in connection with the opening of the bowl. To obtain a reasonably rapid closure, liquid must then be supplied to the chamber from a separate source of pressure, whereby the system obtains a certain inertia.

The primary object of the present invention is to provide an automatically opening separator bowl which does not suffer from the drawbacks inherent in the separators previously known. In connection therewith the invention has for its object to provide a separator bowl having a rapid opening and closing movement in discharging the sludge, said movement being responsive to the augmenting deposition of the sludge itself.

A further object of the invention is to provide preseparating means and main separating means in the separator bowl to enable an efficient separation of sludge and deposition thereof in a sludge chamber adjacent the outlet for the sludge.

A still further object of the invention is to provide means keeping the guide surface for the slide in the bowl free from sludge particles to avoid undue wear thereof.

Further objects of the invention and advantages involved thereby will appear from the following description of a form of embodiment disclosed in the accompanying drawing, in which Fig. 1 is an elevation of a separator bowl constructed according to the invention, and Fig. 2 is an axial section illustrating one half of said separator bowl.

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As will be seen from the drawing, the separator bowl comprises a bowl body 1 carried by a separator spindle 28 and having a ring 2 bolted as at 3' thereto, a bowl cap 3 and a locking ring 4 securing the cap to the ring 2. The bolting of the ring is effected in such a manner that an intermediate space 2' is formed between the ring and the bowl body 1. An axially movable slide 5 is provided in the separator bowl. Said slide is connected with the hub portion 1' of the bowl body so as to be axially displaceable thereon, and may slide in contact with a guide portion of the bowl body provided with packings 6. The slide 5 has arranged therein a packing 7 to provide a tightening means against the bowl cap 3 which is formed with a narrow tightening edge at the bottom thereof. Between the packing 7 and the tightening edge of the bowl cap is formed an outlet opening for the sludge, when the slide is displaced downwardly from the closed position shown. Extending outwardly from the hub portion inside the separator bowl is a partition 12 terminating with its outer edge at a distance inside the external wall of the bowl, preferably right opposite the outlet opening for the sludge, so as to divide the inner space into an upper and a lower portion, one of which contains preseparating members in the form of a set of conical laminae or plates 8, while the other contains main separating members in the form of a set of conical laminae or plates 9. Only the topmost and lowermost plates of the sets of plate 8 and 9 are illustrated but it will be evident that the intermediate plates indicated by chain-dotted vertical lines in Figure 2 are formed similarly. Outside the outer edges of the sets of plates, above and below the partition 12, and between the latter and the tightening place at the packing 7, is formed a sludge space 11 in which the heavier component of the separated liquid collects. Near its peripheral portion the partition 12 is provided with a number of apertures 13.

The lower set of plates 8 rests on and is guided by a member 10 keyed to the hub portion 1' of the bowl body, said member 10 being provided with a hollow, upwardly projecting hub portion 10' with inlet openings 18 for the liquid to be separated. The upper set of plates 9 rest on the partition 12, which is guided on the hub portion of the member 10, and which is itself formed with an upwardly projecting hollow hub portion forming an inlet passage 17 for the liquid. The outlet for the separated liquid is formed between the upper opening edge of the bowl cap, i. e., the

discharge edge 19 and the hub portion of the partition 12.

Provided between the bowl body 1 and the slide 5 is a chamber 20, which is constantly kept filled with liquid other than the liquid to be separated and preferably consisting of water. The inlet for this liquid is formed by a number of apertures 24 in the lower side of the bowl body 1. Liquid leaking from the chamber 20 past the packings 6 enters a leak chamber 23 formed in the bowl body and provided with an outlet hole 23'. A replaceable washer 14 provided with a central aperture and retained by means of a locking ring 15 against a flange with a packing 16 on the lower side of the bowl body forms, together with said flange, an inlet chamber 26, wherein a liquid level A determined by the opening edge of the washer 14 may be maintained. The inlet chamber may have carrier members in the form of wings 26' provided therein which carry along the liquid during their rotation. The liquid is supplied to this inlet chamber through one or more pipes 22.

The bowl body 1 is secured with its hub portion 1' to the upper conical portion of the separator spindle 28. Provided in the hub portion 1' are passages 25 extending therethrough, said passages effecting communication between the chamber 20 and a space 21 formed underneath the member 10 by means of a channel 28', which is formed, for instance, by a reduced portion turned into the spindle 28. The spindle 28 and a cap nut 29 inserted at the top into the hub portion 1' have passages 30, 31, 32 provided therein, through which the channel 28' is brought into communication with the atmosphere. The channel 32 is directed outwardly and thus prevents any penetration of liquid into the cap nut.

The arrangement operates in the following manner.

The rotary movement of the separator bowl having been started, the sludgy liquid, for example, which is to be separated, is introduced into the inlet 17. It is carried along by the wings 21 and is forced outwardly through the inlet openings 18 by the centrifugal force and down through the set of plates 8. The liquid in the bowl will form a level B as indicated by chain-dotted lines on a radius corresponding to the discharge edge 19 for separated liquid. At the same time, some suitable liquid, such as water, is supplied, to the inlet chamber 26 a certain quantity of oil being suitably mixed with the water. The liquid is carried along by the wing 26' and is introduced through the apertures 24 into the chamber 20, whence any liquid leaking past the packings 6 may be diverted through the apertures 23'. Liquid is preferably supplied through the pipes during the whole separation period. The liquid level A indicated by a chain-dotted line in the inlet chamber 26 communicating with the chamber 20 is regulated by means of the washer 14 so that it will take a position on a smaller radius than the liquid level B. Hereby a pressure will be obtained on the slide 5 from the chamber 20, said pressure exceeding the corresponding pressure within the separating space 27. This difference in pressure is regulated so that the requisite lift will be had on the slide 5 to provide a tightening effect between the packing 7 and the bowl cap 3 against the liquid or sludge which is kept under a high pressure in the sludge space 11.

A portion of the sludge in the liquid is separated in the set of plates 8. This sludge will

slide towards the peripheral portion on the lower side of the plates and discharges in thin flakes, as it were, together with the liquid. Through this preliminary separation the sludge will rapidly separate from the liquid and precipitate with greater facility, which in regard to a portion of the sludge takes place already in the lower part of the sludge space, that is to say underneath the partition 12. The liquid with the remaining sludge flows past the peripheral portion of the partition 12 through the set of plates 9, where the final separation takes place in known manner. The separated liquid rushes out over the edge 19. As long as the path is free past the partition 12, the liquid in the space 27 will be well-nigh on the same radius as the discharging separated liquid. According as the sludge is separated and deposits in the sludge space 11, the free space on the outside of the partition 12 becomes smaller and smaller, and finally the sludge will clog up the path between the peripheral portion of the partition and the bowl. The liquid then passes through the apertures 13, which represent a definite limited passage area. The longer the separation goes on, the larger is the quantity of sludge collecting in the sludge space. This sludge accumulates approximately as shown in the drawing, and tends to clog up the apertures 13. Funnel-shaped channels will be kept open about the apertures, until the quantity of sludge is so large that the downfall angle of the sludge is exceeded. In the section flush with the partition 12 the sludge then offers so great a resistance to the liquid that the level in the lower part of the bowl, that is to say in the spaces between the screen 12 and the slide, moves inwardly to a smaller radius. Hereby the liquid pressure is augmented in the separating space 27, which results in that the difference in pressure on both sides of the slide is decreased. When the tightening strain in the packing 7 falls below the pressure to which the sludge is subjected, the latter tends to force its way out. A sufficient increase of the pressure having been obtained in the sludge space on account of the change of the level, the slide is caused to open, so that the sludge is permitted to rush out. During a very short moment the bowl loses a comparatively large volume of its contents, which results in an immediate drastic change of the level toward the peripheral portion of the bowl. At the same moment, the lifting force on the slide due to the liquid pressure in the chamber 20 will thus largely overbalance the internal force, which results in that the slide is caused immediately to close. Through these opening and closing forces acting well-nigh simultaneously, the period of opening will last for so short a moment that only a portion of the sludge will have time to rush out through the narrow gap then formed. The use of the set of preseparating plates 8 ensures a uniform deposit of the sludge in the sludge space on both sides of the partition 12. This involves the advantage that, when the slide is opened, the sludge is caused to slide down from both sides of the bowl toward the gap, liquid being thus prevented from discharging. The sludge thus hurled out is comparatively free from liquid, a state of things aimed at in the solution of most sludge problems. In addition to the contribution in power through the raising of the liquid level in the separating space, the slide is actuated by an extra force working in the same direction, that is to say by the increased pres-

sure caused by the higher specific weight of the sludge.

By regulating the level A by means of the washer 14, which is controllable and/or exchangeable and may be replaced by washers with another central opening, the forces from the separating space may be counteracted so that the sensitiveness of the bowl in opening varies according to the various problems occurring.

The levels A and B are not interfered with by air cushions at the center, inasmuch as the spaces 20 and 27 communicate with the atmosphere through the above-mentioned channels 25, 28', 30. The space 27 is also effective towards equalizing the level fluctuations occurring at the inlet for the separation liquid. Between the outer edge of the member 10 and the upper side of the slide 5 is formed a gap through which the space 27 communicates with the lower part of the separator bowl, whereby the space 27 also becomes a separating space preventing the supply of sludge particles to the inner sliding surface of the slide.

In order to make the separated sludge as homogeneous as possible so as to permit the same to discharge round the whole of the peripheral portion, the separation liquid may preferably be strained or filtered.

The tightening means between the slide and the cap of the bowl may be constructed in many different ways, one of which is represented by the packing 7. A conical packing may be used to obtain a more pronounced momentary opening, the high pressure of the sludge not then acting in the same degree toward an opening of the bowl. Obviously, the sludge discharge need not take place through an annular gap, but may be effected in a known manner through a number of apertures adapted to be uncovered and closed by the slide.

What I claim is:

A centrifugal separator including a rotary bowl, a bowl cap connected to said bowl to rotate therewith and forming a sludge outlet at the periphery thereof, a slide axially displaceable in the bowl and adapted to contact and be moved away from said cap to control the discharge of the sludge through said outlet, said slide being spaced from the bottom of said bowl to provide a pressure chamber, means for conducting fluid into said pressure chamber for moving said slide

against said cap to close the sludge outlet, partition means in said bowl above said slide and dividing the interior of the bowl into an auxiliary pressure and preseparating chamber and a main separating chamber, a set of separating disks in each of said chambers and terminating radially inward from the outlet of the bowl to leave a sludge space, said partition terminating an appreciable distance outwardly of said disks, but inwardly of said outlet to form a sludge passage, a liquid overflow means in an upper and radially inner portion of said main separating chamber, a dividing member beneath the disks in said auxiliary pressure and preseparating chamber forming a third separating chamber extending radially inward of said liquid overflow, communicating with said pressure chamber and said auxiliary pressure and preseparating chamber, said slide forming the bottom wall of said auxiliary pressure and preseparating chamber and said third chamber, the parts being constructed and arranged so that normally the pressure of the liquid in the pressure chamber maintains the slide in closing engagement with the bowl cap, and when the sludge passage is closed by the accumulation of sludge, the increased pressure in the auxiliary pressure and preseparating chamber and in said third chamber forces the slide away from the bowl cap so that the sludge discharges through said sludge outlet.

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