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Bruning

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[54] **SELF CLEANING CENTRIFUGE DRUM WITH A PISTON VALVE DEFINING ONE SIDE OF THE SLUDGE CHAMBER**

[75] Inventor: **Paul Bruning,** Oelde, Germany

[73] Assignee: **Westfalia Separator AG,** Oelde/Westfalen, Germany

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[51] **Int. Cl.** **B04b 11/00**

[58] **Field of Search** ..... 233/14 R, 14 A, 19 R, 233/19 A, 20 R, 20 A

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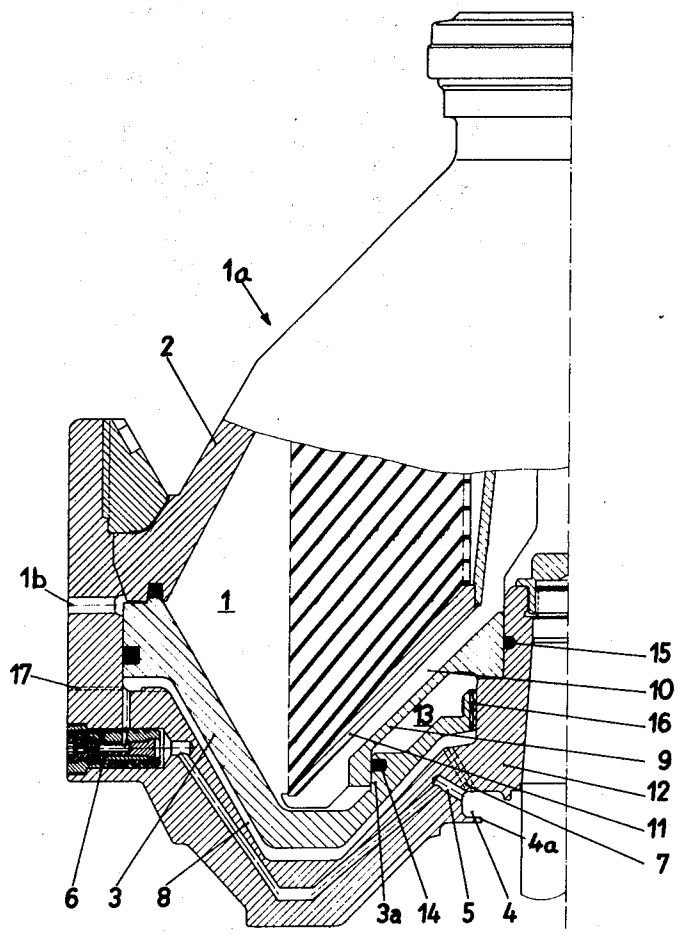
Primary Examiner—George H. Krizmanich

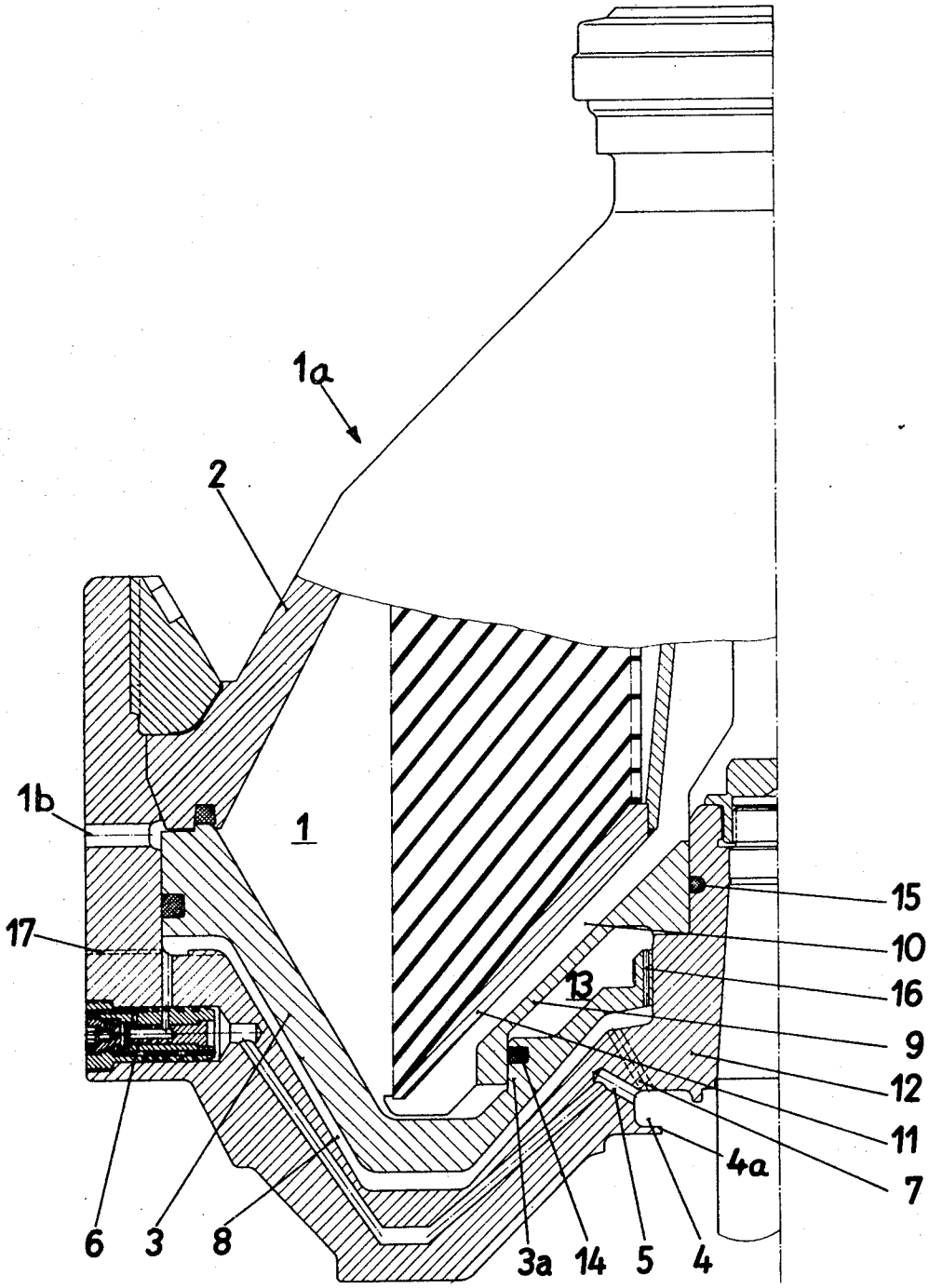
Attorney—Ralph D. Dinklage and Arnold Sprung

[57] **ABSTRACT**

A centrifugal separator constructed for intermittent discharge of sludge. One end member of the separator drum is a valve piston closure movable vertically to open and close sludge discharge nozzles disposed at the outer periphery of the drum. The valve piston closure forms one end of the sludge chamber in the drum. Radially inwardly of the sludge chamber, a cap is mounted in the separator drum covering a part of the valve piston closure and the cap and valve piston closure are in sliding sealing contact, providing a chamber on the drum side of the valve piston closure for receiving and holding fluid to force the valve piston closure to the open position. On other side of the valve piston closure, a chamber is provided for receiving fluid for closing of the valve.

4 Claims, 1 Drawing Figure





INVENTOR
PAUL BRÜNING
BY
BURGESS, DINKLAGE & SPRUNG
ATTORNEYS

SELF CLEANING CENTRIFUGE DRUM WITH A PISTON VALVE DEFINING ONE SIDE OF THE SLUDGE CHAMBER

BACKGROUND

The invention relates to centrifuge drums in which the valve piston closure (sometimes herein called "the piston valve") which opens and closes the sludge ejection apertures in the periphery of the drum, defines one end of the sludge chamber. Drums of this type of construction have only one control chamber located on the outer side of the piston valve i.e., the side opposite the one facing the sludge chamber. When control fluid is pumped into this control chamber, the fluid pressure which builds up and acts on the outer side of the piston valve displaces the latter to its closed position. When the control fluid is released from this chamber, the pressure of the drum charge acting on its inner side shifts it to the open position. A drum of this kind is known, for example, through German Pat. No. 963,139.

German Pat. No. 1,000,292 discloses another drum construction in which the piston valve is disposed between two control chambers into which control fluid can be pumped. In this design the piston valve is not affected by the pressure of the drum charge. What determines its movements to the closed or open position is the pressure difference which is brought about in each case by means of the control fluid and which results from the two pressures exerted on its outer and inner sides by the fluid in the control chambers. The introduction of control fluid into the valve opening chamber located on the inner side of the valve displaces the valve to its open position. During the desludging operation, the valve opening chamber remains virtually filled with control fluid so that the valve opening pressure acting on the piston valve is sustained until the drum is completely emptied, thereby assuring that the valve will remain all the way open. The annular gap between the piston valve and the adjacent vertically spaced part of the drum (the gap through which the solids are discharged), therefore, will attain its full width, so that the solids that have collected in the sludge chamber of the drum will be entirely ejected.

In contrast to this, in the case of drum designs in which the piston valve defines one end of the sludge chamber, the pressure acting on the piston valve to open it diminishes steadily as the level of the drum charge recedes. As a result, the annular gap never attains its full width, so that there is no assurance of a uniform ejection of any solids that tend to cake up. And solids that remain in the drum in an irregular pattern can result in severe imbalance in the drum.

THE INVENTION

The invention is addressed to the problem of constructing a centrifuge drum with a piston valve defining one end of the sludge chamber in such a manner that, in its movement towards the open position, the valve will be certain to reach the end of its stroke in which the annular gap between it and the adjacent, vertically spaced drum part (the gap through which the solids are discharged) has its greatest width. The valve can thenbe held in this full open condition.

The invention is characterized by a cap which covers the central position of the piston valve and is sealingly guided by an axially projecting portion of the piston valve, and which forms with the piston valve an externally closed chamber which is in communication at the inner end thereof with the valve closing chamber.

After the valve closing chamber is filled with control fluid the chamber between the piston valve and the cap is also filled with control fluid which acts on the piston valve in the opening sense. This, however, does not necessitate a greater valve closing pressure, because in prior-art drums of this kind which do not have the above-described cap, the drum charge in this area exerts the same pressure on the piston valve in the opening sense. On the other hand, however, the operning pressure in the chamber remains in full force when the drum opens and the liquid level of the charge shifts outwardly and finally no more liquid remains in the drum.

Thus the invention is directed to an improvement in centrifugal separators constructed for intermittent discharge of sludge, comprising a rotably mounted separator drum having an upper end member and a lower end member, at least one sludge discharge passageway disposed at the radially outward periphery thereof, a distributor disposed centrally within the drum, and a sludge chamber disposed outwardly of the distributor. One of the said end members is valve piston closure movable vertically to open and close the sludge discharge passageway for desludging. The valve piston closure defines one end of the sludge chamber. A closing chamber is disposed outwardly of the piston closure member, extending from adjacent the axis of the drum to adjacent the radially periphery thereof. The closing chamber is defined in part by the axially outward side of the piston closure member. This closing chamber is for receiving and discharging fluid for, respectively, forcing the piston closure member to the closed position and relieving force holding the piston closure member in the closed position. Means are provided for supplying fluid to the closing chamber and for the discharge of fluid therefrom.

The invention provides the improvement which comprises a cap mounted in the drum covering at least a portion of the valve piston closure on the axially inwardly disposed side thereof, and on the radially inwardly disposed side of the sludge chamber. The cap, together with the portion of the valve piston closure covered thereby, defines an opening chamber for receiving and holding fluid for forcing the valve piston closure to the open position when fluid in the closing chamber has been discharged. Means are included for supplying fluid to the opening chamber for said holding of fluid thereby.

The valve piston closure is in sliding, sealing contact with a radially outwardly disposed portion of the cap. Desirably, the valve piston closure has an axially extending projection in said sliding sealing contact.

The fluid supplying means for the opening chamber can be a bore communicating the closing chamber with a radially inwardly disposed part of the opening chamber.

THE DRAWING

An example of the embodiment of the invention is represented in the drawing.

The drawing shows a centrifugal separator comprising a rotatably mounted drum having sludge discharge nozzle **1***b*, a distributor **11** disposed centrally, therein, and a sludge chamber **1** disposed outwardly of the distributor.

The upper end of the sludge chamber **1** is defined by the drum top **2** and the lower end is defined by the piston valve **3**. As the delivery of control fluid to the fluid capturing channel **4** begins, the relief valve **6** is closed in a prior-art manner through the passage **5** extending from the outer periphery of the channel **4**, and a steady feed of a small amount of control fluid is employed in order to hold relief valve **6** in its closed state. After passage **5** is filled up, the control fluid overflows through passage **7** into the valve closing chamber **8**. This shifts the piston valve **3** to the closed position. As thus far described, the construction and operation are well known.

In accordance with the invention, the central portion of the piston valve **3** is covered by a cap **9** which in this embodiment is held in a fixed position on the hub **12** by the ribs **10** of the distributor **11**. On this cap **9** an axial projection **3a** of the valve **3** is guided in its axial movements. Between the cap **9** and piston valve **3** there is formed an opening chamber **13** which is sealed from the interior of the drum by means of sealing rings **14** and **15** and which communicates with the valve closing chamber **8** through a bore **16**, which is disposed radially outwardly of the inner lip **4a** of capturing channel **4** so that the opening chamber **13** will be filled.

After the valve closing chamber **8** is filled, chamber **13** is also filled with liquid through the passage **16**, and this liquid remains in this chamber during the centrifuging operation including the portion of the operating cycle in which the sludge is discharged.

For the ejection of the sludge, the delivery of control fluid is shut off. This causes the relief valve **6** to open and, in a known manner, let the valve closing fluid escape from the valve closing chamber **8** via relief valve **6**, while the piston valve **3** moves downwardly. The drum charge is discharged by the centrifugal force through the annular gap that forms between the piston valve **3** and the drum top **2**, while the level of the liquid in the drum recedes, causing a constant reduction of the pressure acting on piston valve **3** in the opening sense. The fluid pressure prevailing in opening chamber **13**, however, assures that the piston valve will be displaced all the way down to its lowermost limit and that the annular gap will be held completely open for the throughout the time for the ejection of the solids.

The closing chamber **8** can be provided with a calibrated relief bore **17** instead of the hydraulically operated relief valve **6**, in known manner.

What is claimed is:

1. In a centrifugal separator constructed for intermittent discharge of sludge, comprising:

a. a rotatably mounted separator drum having an upper end member and a lower end member, at least one sludge discharge passageway disposed at the radially outward periphery thereof, a distributor disposed centrally within the drum, and a sludge chamber disposed outwardly of the distributor,

b. one of said end members being a valve piston closure movable vertically to open and close the sludge discharge passageway for desludging, said valve piston closure defining one end of the sludge chamber,

c. a closing chamber disposed outwardly of the piston closure member extending from adjacent the axis of the drum to adjacent the radially outward periphery thereof, defined in part by the axially outerward side of the piston closure member, for receiving and discharging fluid for, respectively, forcing the piston closure member to the closed position and relieving force for initiating the moving of the piston closure member to its open position under the influence of material filling the drum,

d. means for supplying fluid to the closing chamber and means for discharging fluid therefrom,

the improvement which comprises:

e. a cap having a radially outwardly disposed portion, mounted in the drum covering at least a portion of the valve piston closure on the axially inwardly disposed side thereof, and on the radially inwardly disposed sid of the sludge chamber, the valve piston closure being in sliding, sealing relation with a radially outwardly disposed portion of the cap, said cap defining with the covered portion of the valve piston closure an opening chamber for receiving and holding fluid for assisting the positioning of the valve piston closure into the open position when material filling the drum recedes outwardly after the movement of the valve piston is initiated by discharging the fluid from the closing chamber, and

f. means for supplying fluid to the opening chamber for said holding of fluid thereby.

2. Separator according to claim **1**, said valve piston closure having an axially extending projection in said sliding, sealing contact.

3. Separator according to claim **1**, said opening chamber having a radially inwardly disposed portion, said fluid supplying means for the opening chamber (*f*), comprising a bore communicating the closing chamber with said radially inwardly disposed part of the opening chamber.

4. Separator according to claim **2**, said opening chamber having a radially inwardly disposed portion, said fluid supplying means for the opening chamber (*f*), comprising a bore communicating the closing chamber with said radially inwardly disposed part of the opening chamber.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,754,701 Dated August 28, 1973

Inventor(s) Paul Bruning

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

1. First page, References Cited, "3,160,580" should be --3,160,589.

2. Col. 4, line 27, change "sid" to --side--.

Signed and sealed this 3rd day of December 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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