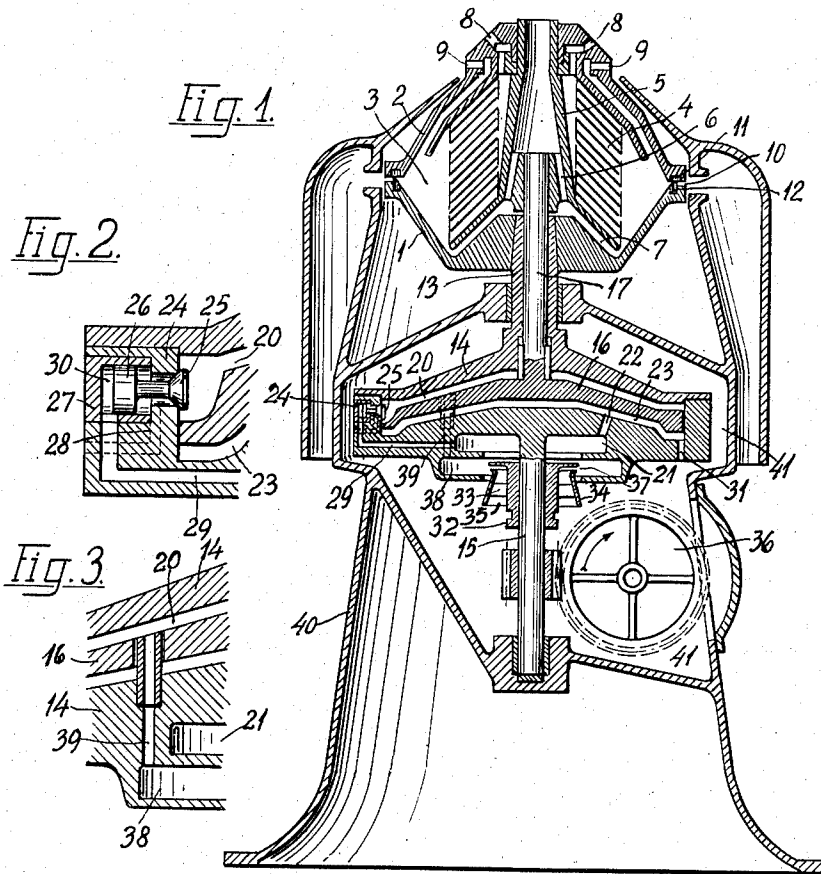


April 21, 1959

L. E. J. JENSEN
CENTRIFUGAL SEPARATOR

2,883,102

Filed June 20, 1958



LEO EJNER JORGEN JENSEN
INVENTOR.

BY
H. B. Willson & Co.
ATTORNEY

1

2,883,102

CENTRIFUGAL SEPARATOR

Leo Einar Jorgen Jensen, Rungsted Kyst, Denmark

Application June 20, 1958, Serial No. 743,351

3 Claims. (Cl. 233—20)

The present invention relates to an improvement in centrifugal separators to separate sludge from liquids and the separator is of the type having a centrifugal bowl placed on a rotatable spindle and being provided with a separating chamber and formed by two bowl parts, one of which is displaceable in the axial direction in relation to the other part, thereby constituting a closing and opening member for a sludge discharge opening. Said displaceable bowl part can be actuated to reciprocate into open or closing position for the discharge opening by means of the pressure of liquid under influence of centrifugal force, and thereby effect intermittent discharge of sludge collected within the bowl.

The term "sludge" as used herein is to be considered as designating not only impurities in liquid, but any materials including a large proportion of solid of higher specific gravity than the liquid in which they are suspended.

The feature of the invention comprises the arrangement of the separator in such a manner that the lubricating oil for the separator can also be used as operating liquid to actuate the displaceable part of the bowl to reciprocate.

Fig. 1 shows a sludge separator partly in section along the axis of rotation,

Fig. 2 shows a detail view of the valve, and Fig. 3 shows a detail view of the inlet means to the cylinder at the upper side of the piston.

The sludge separator has a centrifugal bowl which is divided into a lower part 1 and an upper part 2 with a separating chamber 3. In the separating chamber is arranged a stack of distributing plates 4. Moreover, the centrifugal bowl has a central tube 5 for the introduction of the separating material in the separator. From the tube 5 the separating material is conducted through channels 6 and 7 to a separating chamber 3. To remove the separated components of the separating material from the separator the latter has a discharge opening for continuous discharge of a lighter component and a discharge opening 9 for continuous discharge of a heavier component. The component, which consists of sludge or solid material, is ejected intermittently through a peripheral slot 10 between the lower part 1 and the upper part 2 of the separator. This slot extends the entire length of the circumference of the centrifugal bowl and is kept closed during the separation of the separating material by means of a gasket 11 which is arranged in the bowl part 1, and which fits tightly against a gasket 12, which is arranged in the bowl part 2. The bowl part 1 is by means of a tubular part 13 connected to a member adapted to receive the operating liquid. This member is shaped as a cylinder 14 which is connected with the spindle 15 of the centrifugal bowl, and the interior cylindrical chamber of which has a diameter greater than that of the separating chamber. In the cylinder 14 is arranged a member axially displaceable in the latter and having the form of a piston 16, which has a piston rod 17 passed through the tubular part 13 and connected to the central tube 5 and thus to the bowl part 2. To admit the op-

2

erating liquid to the cylinder 14, the latter has an annular groove 38 and from the latter a channel 39 to a space 20 in the interior of the cylinder at the upper side of the piston 16. During the operation of the separator the operating liquid will by the centrifugal force be subjected to a hydrostatic pressure which is greater than the hydrostatic pressure prevailing in the separating chamber, in which manner the gaskets 11 and 12 will be pressed against each other, thus keeping the slot 10 closed. To admit the operating liquid to the cylinder 14, the latter has furthermore an annular channel 21 and from the latter a channel 22 to a space 23 in the interior of the cylinder at the lower side of the piston 16. In the circumference wall of the cylinder 14 is arranged a valve 24, which has a valve cone 25 in connection with a piston 26, which can be displaced in the cylinder 27, and the valve is kept closed partly by the hydrostatic pressure in the space 20 and partly by the centrifugal force. The valve 24 may form a connection between the space 20 through a channel 28 to the outer surroundings of the cylinder 14. Moreover, there is from the annular channel 21 a channel 29 to a chamber 30 in the cylinder 27 outside the piston 26. When the supply of separating material to the separating chamber 3 is stopped, and operating liquid is conducted to the annular channel 21, the operating liquid will be flung through the channel 29 to the chamber 30 and through the achievement of the hydrostatic pressure in the chamber 30 press the piston 26 with the valve cone 25 inwardly, in which manner the valve is opened for the discharge of the operating liquid from the space 20. The hydrostatic pressure in the space 23 in connection with the hydrostatic pressure in the separating chamber 3 will displace the piston 16 and its connected bowl part 2 upwardly, in which manner the slot 10 is with great speed opened for the ejection of the separated sludge and solid parts from the separating chamber 3. When the supply of operating liquid to the channel 21 is interrupted, the operating liquid in the space 23 is ejected through a channel 31 which is constantly open but has a minor flow area than the flow area of the channel 22, and when thereafter operating liquid is again admitted to the channel 38 and from there through the channel 39 to the space 20, the piston 16 and its connected bowl part 2 are displaced in the downward direction thus closing the discharge slot 10, whereafter separating material is again conducted to the separating chamber 3.

The cylinder 14 with the piston 16 is placed in the room of the separator frame 40 constituting the reservoir 41 for lubricating oil for the separator, and so the lubricating oil can also be used as operating liquid. In order to convey the lubricating oil from the reservoir 41 to the cylinder, the separator has a catching member mounted for vertical reciprocation on the separator spindle. This member has a tubular part which by means of the connecting pieces 33 is connected to another tubular part 34 with a greater diameter, so that an annular channel 35 is formed between the two parts 32 and 33. The member 32, 33, 34, 35 is arranged for axial displacement on the spindle 15 of the separator and rotates together with the same and is moreover arranged in such a manner relative to the driving wheel 36 of the separator extending down into the lubricating oil that during the rotation of the driving wheel in the direction indicated by the arrow the lubricating oil will be ejected into the channel 35. The cylindrical parts 32 and 34 are constructed in such a manner that the channel 35 has a peripheral opening 37 which can be set opposite the annular groove 38 in which manner the operating liquid is impelled out into said groove, from where the operating liquid is flung on through the channel 39 to the space 20 of the cylinder 14. When the peripheral opening 37 is

3

located opposite the annular channel 21 the operating liquid is ejected out into this channel, from where the operating liquid is flung on through the channel 22 to the space 23 of the cylinder 14 and through the channel 29 to the chamber 30 of the cylinder 27.

The operating liquid ejected through the valve 24 and the channel 31 will automatically run back to the chamber 41 from where the operating liquid is taken. The operating liquid used is consequently not wasted.

I declare that what I claim is:

1. In a centrifugal separator the combination of a centrifugal bowl divided into an upper bowl part and a lower bowl part relatively displaceable and mounted for rotation on a vertical spindle to effect continuous discharge of liquid effluents and provided with peripheral sludge discharge opening for material collected within the bowl, a gasket for sealing said sludge discharge opening, a piston connected with said upper bowl part for controlling sludge discharge through said opening, said piston mounted for axial reciprocation within a cylinder coaxially connected with said lower bowl part and placed in the room of the separator frame constituting the reservoir for lubricating oil for the separator, means to conduct lubricating oil from said reservoir into two annular grooves in the bottom of said cylinder in which the oil is influenced by centrifugal force and constitutes the operating liquid to actuate said piston to intermittent displacement for closing and opening said sludge discharge opening, channels in the wall of said cylinder and in said piston to conduct the operating liquid from one of said annular grooves to a space within said cylinder above

4

said piston for intermittent displacement of said piston together with said upper bowl part for closing said discharge opening, means to discharge the operating liquid from said space above said piston and channels in the wall of the said cylinder and simultaneously conducting the operating liquid from the other of said annular grooves to a space within said cylinder below said piston to intermittent displacement of said piston together with the upper bowl part for opening said sludge discharge opening.

2. In a structure of a centrifugal separator as described in claim 1, in which the means to conduct the lubricating oil from said reservoir to said cylinder comprises a catching member mounted for vertical reciprocation on the separator spindle and having a tubular element to catch the oil flying from the spindle driving wheel and a peripheral opening which can be positioned to direct the oil either into one or the other of said annular grooves.

3. In a structure of a centrifugal separator as described in claim 1, in which the means to discharge the operating liquid from said space above said piston comprises a valve member constructed for closing by centrifugal force and for opening for operating liquid under pressure from centrifugal force.

References Cited in the file of this patent

UNITED STATES PATENTS

2,551,041 Nielsen May 1, 1951

FOREIGN PATENTS

887,232 Italy Nov. 8, 1943