DECANTER CENTRIFUGE

The invention relates to a decanter centrifuge with a rotating bowl provided with at least one solids discharge port and at least one clarified liquid discharge port and a screw conveyor disposed coaxially within said rotating bowl so as to be included in said rotating bowl rotated in the same direction with a differential rotational speed, where a feed suspension to be separated is introduced into a ring shaped space formed between said rotating bowl and said screw conveyor through a central feed pipe fixed to the end of the screw conveyor and supported in at least one bearing and can be separated by centrifugal force into a solid and a liquid phase so that said solid phase is discharged from said solid discharge port and said liquid phase is discharged from said clarified liquid discharging apparatus, whereby a liquid phase conduit is arranged in the shaft guiding the liquid phase outside of the bearings, a liquid phase valve provided outside the bearing on the side facing away from the bowl and screw.

A decanter centrifuge in the state of the art is shown in EP 0 447 742 A2 where the solid discharge port is arranged at the inside of the feed pipe end bearing. The liquid discharge port for the clarified liquid is on the side of the end plate connected to the drive shaft of the bowl and is equipped with a weir, which can be adjusted in its height by an adjusting weir board. As the drive shaft has to have a certain diameter, usually in the range of the screw shaft, the liquid outlet can only be a great distance away from the axis. This leads to high energy consumption. Also JP 2002 336735 shows a decanter centrifuge with a rotating bowl and rotating screw with a liquid phase conduit arranged in the shaft with a discharge valve.

The goal of the invention is thus a reduction of power loss from accelerated liquids and solids by reducing the discharge radius to an absolute minimum.

This is achieved by a sealing at the end of the feed pipe and the liquid phase valve being adjustable during operation of the decanter centrifuge. As the feed pipe has a small diameter with regard to a usual drive shaft and the clarified liquid is discharged via a conduit around the feed pipe, the energy consumption is very low.

A further embodiment of the invention is characterized by the sealing at the end of the feed pipe being provided as a double axial sealing. So it can be managed that one seal seals between the rotary feed pipe and the stationary supply pipe for the feed suspension and another seal seals between the headwall shaft of the rotor and the stationary part of the decanter centrifuge. This means that it will be possible to use the pressure from the feed pump

to support the cake transport in the solids transporting part of the bowl, thereby eliminating the need for variable speed conveyor control and equipment.

Another embodiment of the invention is characterized by a liquid phase outlet for the clarified liquid being arranged between the bearing and the sealing.

Yet another favourable arrangement of the invention is characterized by the liquid phase valve being adjustable by a motor. The pressurization is created by this valve to the liquid phase discharge, thereby applying the pump pressure to support the cake transport in the solids part of the rotor in a controlled way.

A further advantageous embodiment of the invention is characterized by a channel for lubrication water being provided between the two seals and a bearing at the end of the rotating screw, which is arranged concentrically between the shaft of the rotating bowl and the shaft of the rotating screw.

Another favourable embodiment of the invention is characterized by the liquid phase conduit being arranged in the shaft of the rotating bowl. So it is incorporated in the main part and no separate part.

The invention is now described with reference to the accompanying drawings, wherein preferred embodiments of the invention are clearly shown.

Fig. 1 illustrates a decanter centrifuge according to the present invention,

Fig. 2 shows the feed end of the decanter centrifuge with the liquid phase valve,

Fig. 3 shows an alternative arrangement for a three-phase application.

In Fig. 1 is shown a decanter centrifuge according to the invention, which has the following structure. A rotating bowl 1 is a combination of a conical section and a cylindrical section. A bowl-head 3 is fixed at the larger radius side of the rotating bowl 1 so as to close the rotating bowl 1. The hollow shaft 8 of the bowl-head 3 is extended from the bowl-head 3 so as to communicate with the hollow of the rotating bowl 1. On the other side, at the smaller radius of the rotating bowl 1, the hollow shaft 9 is extended from the back end of the bowl 1, so as to communicating with the hollow of the rotating bowl 1. The hollow shaft 8 of the bowl-head 3 and the hollow shaft 9 of the bowl 1 are pivoted in bearings 18 and 19 respectively. Accordingly, the rotating bowl 1 can be supported horizontally and rotated with a high speed by a rotational force, which is transmitted by rotating driving means (not shown).

Claims:

1. A decanter centrifuge with a rotating bowl with a shaft provided with at least one solids discharge port and at least one clarified liquid discharge port and a screw conveyor disposed coaxially within said rotating bowl rotated in the same direction with a differential rotational speed, where a feed suspension to be separated is introduced into a ring shaped space formed between said rotating bowl and said screw conveyor through a central feed pipe fixed to the end of the screw conveyor and supported in at least one bearing and can be separated by centrifugal force into a solid and a liquid phase so that said solid phase is discharged from said solid discharge port and said liquid phase is discharged from said clarified liquid discharging apparatus, **whereby** a liquid phase conduit is arranged in the shaft guiding the liquid phase outside of the bearings, a liquid phase discharge valve is provided outside the bearings on the side facing away from the bowl and screw, characterized by the liquid phase discharge valve being varied during operation of the decanter centrifuge by a hand wheel via a transmission or by a motor and a sealing at the end of the feed pipe .

2. Decanter centrifuge according to claim 1, **wherein** the sealing at the end of the feed pipe is provided as a double axial sealing.

3. Decanter centrifuge according to claim 1, **wherein** a liquid phase outlet for the clarified liquid is arranged between the bearing and the sealing.

4. Decanter centrifuge according to claim 2, **wherein** a channel for lubrication water is provided between the two seals and a bearing at the end of the rotating screw, which is arranged concentrically between the shaft of the rotating bowl and the shaft of the rotating screw.

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A decanter centrifuge in the state of the art is shown in EP 0 447 742 A2 where the solid discharge port is arranged at the inside of the feed pipe end bearing. The liquid discharge port for the clarified liquid is on the side of the end plate connected to the drive shaft of the bowl and is equipped with a weir, which can be adjusted in its height by an adjusting weir board. As the drive shaft has to have a certain diameter, usually in the range of the screw shaft, the liquid outlet can only be a great distance away from the axis. This leads to high energy consumption. Also JP 2002 336735 shows a decanter centrifuge with a rotating bowl and rotating screw with a liquid phase conduit arranged in the shaft with a discharge valve.

The goal of the invention is thus a reduction of power loss from accelerated liquids and solids by reducing the discharge radius to an absolute minimum.

This is achieved by a sealing at the end of the feed pipe where the sealing at the end of the feed pipe being provided as a double axial sealing. So it can be managed that one seal seals between the rotary feed pipe and the stationary supply pipe for the feed suspension and another seal seals between the headwall shaft of the rotor and the stationary part of the decanter centrifuge. This means that it will be possible to use the pressure from the feed pump to support the cake transport in the solids transporting part of the bowl, thereby eliminating the need for variable speed conveyor control and equipment. As the feed pipe has a small

diameter with regard to a usual drive shaft and the clarified liquid is discharged via a conduit around the feed pipe, the energy consumption is very low.

Another embodiment of the invention is characterized by a liquid phase outlet for the clarified liquid being arranged between the bearing and the sealing.

Yet another favourable arrangement of the invention is characterized by the liquid phase valve being adjustable by a motor. The pressurization is created by this valve to the liquid phase discharge, thereby applying the pump pressure to support the cake transport in the solids part of the rotor in a controlled way.

A further advantageous embodiment of the invention is characterized by a channel for lubrication water being provided between the two seals and a bearing at the end of the rotating screw, which is arranged concentrically between the shaft of the rotating bowl and the shaft of the rotating screw.

Another favourable embodiment of the invention is characterized by the liquid phase conduit being arranged in the shaft of the rotating bowl. So it is incorporated in the main part and no separate part.

The invention is now described with reference to the accompanying drawings, wherein preferred embodiments of the invention are clearly shown.

Fig. 1 illustrates a decanter centrifuge according to the present invention,

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In Fig. 1 is shown a decanter centrifuge according to the invention, which has the following structure. A rotating bowl 1 is a combination of a conical section and a cylindrical section. A bowl-head 3 is fixed at the larger radius side of the rotating bowl 1 so as to close the rotating bowl 1. The hollow shaft 8 of the bowl-head 3 is extended from the bowl-head 3 so as to communicate with the hollow of the rotating bowl 1. On the other side, at the smaller radius of the rotating bowl 1, the hollow shaft 9 is extended from the back end of the bowl 1, so as to communicating with the hollow of the rotating bowl 1. The hollow shaft 8 of the bowl-head 3 and the hollow shaft 9 of the bowl 1 are pivoted in bearings 18 and 19 respectively. Accordingly, the rotating bowl 1 can be supported horizontally and rotated with a high speed by a rotational force, which is transmitted by rotating driving means (not shown).

Claims:

1. A decanter centrifuge with a rotating bowl (1) with a shaft (8, 9) provided with at least one solids discharge port (11) and at least one clarified liquid discharge port and a screw conveyor (2) disposed coaxially within said rotating bowl (1) rotated in the same direction with a differential rotational speed, where a feed suspension to be separated is introduced into a ring shaped space formed between said rotating bowl (1) and said screw conveyor (2) through a central feed pipe (10) fixed to the end of the screw conveyor (2) and supported in at least one bearing (16, 17) and can be separated by centrifugal force into a solid and a liquid phase so that said solid phase is discharged from said solid discharge port (11) and said liquid phase is discharged from said clarified liquid discharging apparatus (5), whereby a liquid phase conduit (4) is arranged in the shaft (8) guiding the liquid phase outside of the bearings (18), a liquid phase discharge valve (14) is provided outside the bearings (18) on the side facing away from the bowl (1) and screw (2), whereby the liquid phase discharge valve (14) being varied during operation of the decanter centrifuge by a hand wheel (23) via a transmission or by a motor, **characterized by** a sealing (6) at the end of the feed pipe (10), where the sealing (6) at the end of the feed pipe (10) is provided as a double axial sealing.

2. Decanter centrifuge according to claim 1, **wherein** a liquid phase outlet (5) for the clarified liquid is arranged between the bearing (18) and the sealing (6).

3. Decanter centrifuge according to claim 1, **wherein** a channel (25) for lubrication water is provided between the two seals (6, 7) and a bearing (18) at the end of the rotating screw (2), which is arranged concentrically between the shaft (8) of the rotating bowl (1) and the shaft of the rotating screw (2).