

A solid-wall screw centrifuge with overflow weir

The invention relates to a solid-wall screw centrifuge according to the preamble of claim 1.

Solid-wall screw centrifuges are known in a large variety of embodiments.

DE 102 03 652 B4 discloses a solid-wall screw centrifuge comprising a device for discharging clarified fluid from a drum having a drum cover with a passage, which is associated with a throttle device, especially an orifice gauge, the distance of which to the passage is variable. The passage is further associated with nozzles for the discharge of the clarified fluid, which nozzles are aligned obliquely in relation to the radial direction through the drum axis for saving energy.

Nozzles on solid-wall screw centrifuges and their effect of energy saving in a respective alignment obliquely in relation to the drum axis are further known from DE 39 004 151 A1.

The publication of "Patent Abstracts of Japan", No. 11179236A, discloses that guide plates can be associated with passage openings in the drum cover which are respectively partly sealed by a weir plate forming an overflow weir, which guide plates provide fluid exiting the drum with a twist, wherein the occurring repulsion effect is to be used for energy saving. The guide plates are attached to the outside of the overflow weir on the weir plates for example. They are arranged as flat plates for example which are aligned parallel to the rotational axis of the drum, wherein the plane in which the flat plates are disposed does not intersect the drum axis and encloses an angle of approximately 45° with the radially extending straight line which respectively extends through the rotational axis of the drum and the respective passage opening.

Embodiments of the invention seek to provide a solid-wall screw centrifuge which is further optimized with respect to energy saving.

The deflecting device is accordingly arranged in such a way (preferably on the weir plate) that by maintaining the overflow weir an exiting fluid flow is subjected to a twist in the circumferential direction at the overflow edge in the axial extension of the passage opening.

This can be achieved according to an especially preferred embodiment in such a way for example that the deflecting wall is disposed in any case partly directly in axial extension of the region of the passage opening not covered by the respective weir plate axially outside before the passage opening, and axially partly or fully covers said opening.

It is also known (e.g. from US 2004/0072668 A1 or WO 2008/138345 A1) to arrange a housing instead of an overflow weir on the weir plate of the passage opening, with the overflow weir or a nozzle being then arranged in an oblique side of the housing on the passage opening. These constructions are disadvantageous however in that co-rotating fluid chambers are formed on the outside of the drum cover, which fluid chambers form a part of the rotating system, so that the clarification or separation process can still continue in the fluid chambers. This separation process may lead to undesirable deposits in the chambers which lead to cleaning problems.

According to an aspect of the present invention, there is provided a solid-wall screw centrifuge, comprising at least one discharge for discharging clarified fluid from a drum which comprises at least one or several passages in a drum cover, which is or are respectively associated with a weir plate, which respectively form an overflow weir on their radial inner edge, with further at least one deflecting device being arranged on the outside on the drum cover, which deflecting device is arranged in such a way that an exiting fluid flow is deflected in the circumferential direction or subjected to a twist in the circumferential direction, characterized in that the at least one deflecting device is arranged in such a way that by maintaining the overflow weir the escaping fluid flow is deflected in the circumferential direction at the overflow edge of the at least one weir plate, directly in the axial extension of the region of the passage opening which is not covered by the respective weir plate.

It is therefore advantageous that embodiments of the present invention leave the overflow weir directly on the weir plates on the drum cover, and only the fluid which has already left the rotating system via the overflow weir will be deflected in the circumferential direction. After the exit from the drum no clarification effect can occur any more. Instead, the entire exiting fluid jet will rather be deflected by the deflecting device in the circumferential direction.

Further advantageous embodiments are provided in the remaining dependent claims.

The invention will be described in closer detail below by reference to the drawings, wherein:

Fig. 1 shows a schematically illustrated drum cover of a solid-wall screw centrifuge in accordance with the invention, and

Fig. 2 shows a schematic view of a known solid-wall screw centrifuge.

Fig. 2 illustrates the principal configuration of a solid-wall screw centrifuge. The drive and the control unit, a hood and further elements which are obvious to the person skilled in the art are not shown here.

Fig. 2 shows a solid-wall screw centrifuge 1 with a drum 3 which is rotatable about a rotational axis D and in which a similarly rotatable screw 5 is arranged. The drum 3 and the screw 5 respectively comprise a substantially cylindrical section and a conically tapering section here.

An axially extending centric inlet tube 7 is used for feeding the material for centrifuging via a distributor 9 into the bowl 11 between the screw 5 and the drum 3.

When a sludgy mash is guided into the centrifuge for example, larger solid particles will deposit on the drum wall. A fluid phase will form further to the inside.

The screw 5 will rotate with a slightly lower or higher speed than the drum 3 and will convey the ejected solid material towards the conical section from the drum 3 to the solid outlet 13. The fluid on the other hand flows towards the larger drum diameter at the rear end of the cylindrical section of drum 3 and is discharged there via a weir comprising passage openings 15 in a drum cover 17, wherein each passage opening 15 is associated with a weir plate 19 which is radially adjustably attached to the outside of the drum cover. The inner radial edge of the weir plate therefore defines an overflow edge and is therefore also the actual weir or overflow weir 21.

In accordance with the invention, the drum cover or the at least one weir plate on the drum cover can be replaced by the drum cover or the weir plate of Fig. 1 in a solid-wall screw centrifuge of the kind according to Fig. 2.

In accordance with Fig. 1, the drum cover 17 also comprises passage openings 15, which are respectively associated with a weir plate 19. The weir plates 19 are preferably disposed directly outside on the drum cover 17, in parallel alignment on said cover.

The weir plates 19 respectively form an overflow edge, and thereby an overflow weir 21, on their radius R_K which is on the inside relative to the rotational axis D.

A deflecting device 23 is preferably arranged on the outside on each of the weir plates 19. The deflecting device 23 preferably respectively comprises a support wall 25 extending parallel to the weir plate (an axial wall section) and a deflecting wall 27 which is aligned at a right angle thereto. The axial wall section can be flat or provided with a round configuration. The connecting line between the support wall 25 and the weir plate 19 is provided with a reference numeral 31.

The support wall 25 is preferably in alignment with the overflow edge on the radius R_K of the weir plate 19. It is advantageously achieved in this manner that the actual weir 21 is not changed with respect to its position. It is still formed by the inside edge or overflow edge R_K of the weir plates 19. This leads to the advantage that the advantageous properties of such an overflow weir 21 on a weir plate 19 are maintained.

It is also possible that the support wall 25 is offset slightly radially to the outside relative to the support wall, so that the connecting line 31 extends radially slightly to the outside, e.g. 0.5 mm to 3 mm further to the outside.

The deflecting wall 27 on the other hand produces the actual deflection of the exiting product flow or the application of a twist in the circumferential direction, but does not change the position of the weir or overflow edge. The deflecting wall 27 merely ensures that the fluid which has flown over the overflow weir is deflected from the axial direction. A deflection of the fluid jet is thereby substantially achieved in the circumferential direction, thus collectively resulting in saving energy as compared with a fluid outlet in the axial direction.

In order to achieve this it is advantageous if the deflecting wall comprises an arc-shaped wall section 27a and an adjacent flat wall section 27b.

The arc-shaped wall section 27a causes a deflection of the fluid phase flowing in the axial direction X from the drum 3 into the circumferential direction, or the application of a twist in the circumferential direction (against the rotational direction). The flat wall section 27b continues to guide the product flow to some extent in this direction.

Preferably, the arc-shaped section 27a is dimensioned in such a way that the deflection of the product flow from the axial direction X against the rotational direction U occurs substantially here, so that a repulsion effect is produced which leads to saving energy or energy recuperation.

The chosen deflection angle α , which corresponds to the alignment of the planar wall section relative to the axial direction, is preferably smaller than 90° ; preferably, the deflection angle α is approximately 70 to 85° . By providing the deflection angle α with an angle preferably less than 90° , it is ensured in a simple way that an excessive amount of fluid flowing out of or exiting from the drum 1 will not be deflected too far out of the axial direction so that fluid will splash against the outside of the drum cover 17, which again would lead to certain energy losses.

It is especially advantageous that the deflecting wall 27 is disposed in any case at least directly in the axial extension outside before the passage opening and fully or partly covers said opening axially on the radius of the passage opening.

As a result, an advantage is achieved over the generic JP 11-179236 in that a larger fraction of the outflowing fluid is deflected already on the smaller radius of the passage opening in the circumferential direction, so that higher amount of energy saving is achieved than in this specification, according to which the deflection always occurs on the larger radius. On the other hand, the invention ensures that the radial position of the actual weir will not change, but will still be defined by the edge of the weir plates.

It is especially advantageous when the weir plate 19 and the deflecting device 23 are materially connected with one another and thereby form a constructional unit.

Preferably, the weir plates 19 and the deflecting device 23 attached thereto are jointly radially adjustable, e.g. by means of screws (not shown) with which the weir plates 19 can respectively be screwed onto the drum cover 17. Several screw bores 29 are respectively preferably distributed in a radially offset way on the weir plates, so that by suitably choosing the screw bores 29 the radial position of the weir plates 19 on the drum cover 17 is easily adjustable.

It is especially advantageous that the construction in accordance with the invention can be cleaned easily. By maintaining the position of the overflow weir 21, it is prevented that a space is formed in which dirt can easily accumulate.

List of reference numerals

A solid-wall screw centrifuge	1
Drum	3
Screw	5
Inlet tube	7
Distributor	9
Bowl	11
Outlet for solids	13
Passage openings	15
Drum cover	17
Weir plate	19
Overflow weir	21
Deflecting device	23
Support wall	25
Deflecting wall	27
Bores	29
Rotational axis	D
Radius	R_k

CLAIMS:

1. A solid-wall screw centrifuge, comprising at least one discharge for discharging clarified fluid from a drum which comprises at least one or several passages in a drum cover, which is or are respectively associated with a weir plate, which respectively form an overflow weir on their radial inner edge, with further at least one deflecting device being arranged on the outside on the drum cover, which deflecting device is arranged in such a way that an exiting fluid flow is deflected in the circumferential direction or subjected to a twist in the circumferential direction, characterized in that the at least one deflecting device is arranged in such a way that by maintaining the overflow weir the escaping fluid flow is deflected in the circumferential direction at the overflow edge of the at least one weir plate, directly in the axial extension of the region of the passage opening which is not covered by the respective weir plate.
2. A solid-wall screw centrifuge according to claim 1, characterized in that the deflecting device is disposed in any case partly directly in axial extension on the outside before the passage opening on its radius and axially fully or partly covers said opening directly in axial extension of the region not covered by the respective weir plate.
3. A solid-wall screw centrifuge according to claim 1, characterized in that one deflecting device is respectively attached to several, preferably all, of the weir plates.
4. A solid-wall screw centrifuge according to claim 1 or 2, characterized in that the at least one deflecting device respectively comprises a support wall and a deflecting wall which is aligned angularly in relation to said support wall.
5. A solid-wall screw centrifuge according to claim 3, characterized in that the support wall is arranged as an axial wall section, and that the deflecting wall is arranged at a right angle to the support wall.

6. A solid-wall screw centrifuge according to one of the preceding claims, characterized in that the support wall is in alignment with the overflow edge on the radius R_k of the weir plate forming the overflow weir.
7. A solid-wall screw centrifuge according to one of the preceding claims, characterized in that the deflecting wall comprises an arc-shaped wall section.
8. A solid-wall screw centrifuge according to claim 7, characterized in that the deflecting wall further comprises a flat wall section adjacent to the arc-shaped wall section.
9. A solid-wall screw centrifuge according to claim 8, characterized in that the arc-shaped section is arranged in such a way that it produces a deflection of the fluid phase flowing in the axial direction X from the drum 3 substantially into the circumferential direction.
10. A solid-wall screw centrifuge according to one of the claims 7 or 8, characterized in that the arc-shaped section is dimensioned in such a way that a deflection of the product flow occurs from the axial direction X against the rotational direction U about a deflecting angle α which is smaller than 90° or equal to 90° , and is preferably approx. 70 to 85° .