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(54) **Centrifugal dehydrator**

Zentrifugaldehydrator

Déshydrateur centrifuge

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(56) References cited:
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JP-A- 8 294 644

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Description

Background of the Invention

[0001] The present invention relates to a centrifugal dehydrator and more particularly to a centrifugal dehydrator which dehydrates sludge generated in the process of biological treatment of industrial waste water or sewage flowing in a public sewage system and produces concentrated sludge.

[0002] In the process of treating sewage water in a public sewage system, the sludge generated at the final step is dehydrated in order to decrease its volume to make its transportation or incineration easy. In the sewage treatment process, the moisture content of sludge before dehydration is 95% or more. Transportation of sludge with a high moisture content virtually means transportation of water, resulting in a high transportation cost. In addition, transportation and disposal of such sludge are troublesome. For this reason, the moisture content of sludge is often reduced to approximately 80% or less by dehydrating it mechanically before transportation. One example of such a mechanical dehydration technique is described in Chapter 4 Enshin-bunri (centrifugation) (3) Decanter of "Shokuhin-kogaku-kiso-koza 7 koeki bunri" (food engineering basics lecture series Vol. 7, solid-liquid separation), authored by Murase et al, page 124, published by Korin Publishing Co., Ltd. on September 16, 1988.

[0003] Another example of a mechanical dehydrator is disclosed in JP-A No. HEI8 (1996)-294644. The centrifugal dehydrator described in this gazette has a spiral screw impeller blade fitted to a rotary shaft. Scrapers made of elastic material are attached to the peripheral surfaces of the screw impeller blade and the scrapers can move radially to scrape off cakes as the rotary shaft rotates.

[0004] In the abovementioned centrifugal dehydrators in the related art, sludge is put in a rotary drum and the drum is rotated. Then, the solid content and moisture of the sludge are separated by centrifugal sedimentation utilizing the difference in specific gravity inside the rotary drum. In the separation process, the sludge's solid content is collected on the peripheral side of the rotary drum while its moisture is collected inside it. The sludge's solid content separated and accumulated on the peripheral surface is forced out of the rotary drum by a conveyance mechanism such as a screw attached to the rotary shaft. On the other hand, the collected moisture is discharged from the drum through a barrage installed adjacently inside the drum.

[0005] As described above, conventional centrifugal dehydrators require considerable power consumption because a large volume of sludge and moisture are rotated inside the rotary drum. The major reason for considerable power consumption is that as the rotary drum rotates, sludge turbulence occurs inside the drum and the kinetic energy of this sludge turbulence is wastefully dissipated. Particularly, in order to achieve a prescribed rate of centrifugal dehydration, the axial length of the rotary drum must be long enough to allow the sludge to stay inside the drum for a specified time period and consequently a large volume of sludge is held inside the drum, resulting in considerable power consumption. When the rotary drum is axially longer, the centrifugal dehydrator size should be larger.

Summary of the Invention

[0006] The present invention has been made in view of the above problem of the related art and an object thereof is to reduce the energy required for dehydrating operation of a centrifugal dehydrator in order to contribute to energy saving in a sewage disposal plant. Another object of the present invention is to realize a lighter, smaller centrifugal dehydrator.

[0007] According to one aspect of the present invention, there is provided a centrifugal dehydrator which includes: a hollow shaft having a cavity in which sludge can flow and a discharge port for discharge of sludge from the cavity; a support means which supports the hollow shaft rotatably; a discharge means which is provided on the hollow shaft's outer periphery and can convey sludge in an axial direction; and a drum which is located radially in a more outer position than the discharge means and almost coaxial with the hollow shaft and can rotate at a rotation speed different from the hollow shaft's rotation speed. The drum has a filter and many blades spaced at intervals in its circumferential direction on the filter's outside diameter side.

[0008] Here it is preferable that the blades be forward-oriented with radially outer portions inclined toward the drum's rotation direction and inclination angle θ of the forward-oriented blades be in a range of 135 to 150 degrees as measured from a radial line. It is also preferable that the filter be produced by making many tiny holes in a thin plate formed into a cylindrical surface and the tiny holes be oblong holes perpendicular to the filter's cylindrical shaft and these tiny holes' longitudinal size be almost equal to inter-blade distance of the many blades.

[0009] The discharge means may be a screw which is spiral and integral with the hollow shaft and may have plural ridges in terms of length. Its axial relative position with respect to the hollow shaft may be variable and a driving means to drive the discharge means axially may be provided.

[0010] According to the present invention, almost simultaneously when sludge is put into the rotary drum of the dehydrator, the sludge is dehydrated by centrifugal force, so the time for which the sludge stays in the rotary drum is reduced. Hence, the volume of sludge in the rotary drum is decreased and energy saving is achieved in the centrifugal

dehydrator and sewage disposal plant. Also, the filter attached to the rotary drum of the centrifugal dehydrator is cleaned and revived with high efficiency, so an energy saving dehydration system is realized and the centrifugal dehydrator can be lighter and smaller.

Brief Description of the Drawings

[0011]

Fig. 1 is a longitudinal sectional view of a centrifugal dehydrator according to an embodiment of the present invention;
Fig. 2 is a sectional view taken along the line A-A in Fig. 1;
Fig. 3 illustrates how the centrifugal dehydrator shown in Fig. 1 functions; and
Fig. 4 is a longitudinal sectional view of a centrifugal dehydrator according to another embodiment of the present invention.

Description of the Preferred Embodiments

[0012] Next, the preferred embodiments of the present invention will be described in detail referring to the accompanying drawings. Fig. 1 is a longitudinal sectional view of a centrifugal dehydrator 100 according to an embodiment. The centrifugal dehydrator 100 is designed for use in a sewage disposal plant and uses a horizontal shaft. The centrifugal dehydrator 100 is structured as follows.

[0013] Around the driving shaft 2 which is hollow in the portion from one end to the middle point in the axial direction, a screw (discharge mechanism) 7a having a shape of plural ridges spirally wound therearound, radially stretching as far as a few times the outside diameter of the shaft 2, is integrally formed with the driving shaft 2. The hollow portion of the driving shaft 2 has plural material sludge discharge holes 7c spaced at intervals in the circumferential direction. The diameter of each of these holes 7c is large enough to discharge the material sludge into the space formed by the screw 7a and rotary drum 10.

[0014] A hollow sludge supply shaft 1 with a flange is inserted through the left end of the hollow portion of the driving shaft 2. The hollow sludge supply shaft 1 is connected with a pump for sludge supply (not shown) which supplies sludge into the hollow sludge supply shaft 1. The outer peripheral surface of the hollow shaft 1 and the inner peripheral surface of the driving shaft 2 function as a plain bearing so that the hollow shaft, stationary, can supply sludge even during rotation of the driving shaft 2.

[0015] The driving shaft 2 is rotatably supported by inner plain bearings 3 and 5 at the left and right ends. The left inner bearing 3 is held on the inner side of a member 10f. On the other hand, the right inner bearing 5 is held on the inner side of a rotary drum driving shaft joint 8 with a flange which is intended to drive the rotary drum 10 which will be detailed later. The rotary drum driving shaft joint 8 has a hollow portion to be coupled with the driving shaft 2 and the inner bearing 5 and the small-diameter end portion of the driving shaft 2 are housed in this hollow portion. An outer bearing 6 is fitted to the outer surface of the rotary drum driving shaft joint 8. The flange of the rotary drum driving shaft joint 8 is connected with a driving machine (not shown) such as a motor.

[0016] The rotary drum 10 is constructed as follows: many tiny holes 9b are made in a metal sheet with a thickness of several millimeters or less; the metal sheet with tiny holes 9b is rounded into a cylinder which serves as a cylindrical filter 9a; many blades 10a are spaced at intervals circumferentially on the outer periphery of the cylindrical filter 9a; and end plates 10c and 10d in the form of rings are attached to both shaft ends of the cylindrical filter 9a; and these are integrally formed to constitute the drum. Although Fig. 1 only shows some tiny holes 9b, tiny holes 9b are distributed all over the surface of the cylindrical filter 9a.

[0017] The tiny holes 9b of the cylindrical filter 9a are oblong in the circumferential direction and mechanically formed by punching or a similar method. The left end plate 10c of the rotary drum 10 is coupled through a member 10g. On the other hand, the right end plate 10d of the rotary drum 10 is coupled through a member 10h to the rotary drum driving shaft joint 8. The blades 10a on the outer periphery of the cylindrical filter 9a are forward-oriented blades with radially outer portions inclined toward the rotary drum's rotation direction. The ratio between the inside and outside radial distances of each blade 10a is almost 1 and its length (distance between its inner and outer ends) in the direction of flow is short. The width of the inter-blade flow channel 10b as the interval between neighboring blades 10a is equal to or smaller than the length of the blade 10a in the direction of flow (see Fig. 2).

[0018] A virtually cylindrical casing 11 covers the rotary drum 10. The outer bearing 4 is located on the member 10g constituting the left side of the rotary drum and the outer bearing 6 is located between a partition plate 12 constituting the right side of the casing and the outer surface of the rotary drum driving shaft joint 8. The casing 11 is concentric with the rotary drum 10 and a given ring-like space is formed between the inner surface of the casing 11 and the outer surface of the rotary drum 10. A discharge channel through which dehydrated sludge is discharged is formed on the right of the partition plate 12 of the casing 11 by members 16b and 16c. A water drain port 17 through which water resulting from

dehydration by the rotary drum is drained is formed at the bottom of the casing 11 near the left end in the axial direction.

[0019] Fig. 2 is a transverse sectional view taken along the line A-A in Fig. 1 which shows the center of the centrifugal dehydrator 100 in the axial direction. The centrifugal dehydrator 100 has cleaning nozzles 13 at the top point and the left and right points approximately 45 degrees away from the top point in the circumferential direction. Each cleaning nozzle 13 is formed as an axially long notch in the casing which stretches virtually from the end plate 10C to the end plate 10d in the axial direction. The cleaning nozzle 13 has parallel wall portions and tapered portions continuous with the parallel wall portions with a contracted flow path formed therein. At least one cleaning water supply hole 14 is provided on the side surface of the cleaning nozzle 13.

[0020] Next, how the centrifugal dehydrator 100 thus structured works will be explained. The material sludge 30 which is supplied to the centrifugal dehydrator 100 is prepared by adding flocculant to untreated sludge and includes relatively large flocs (several millimeters). The material sludge 30 is introduced through the hollow portion of the hollow shaft 1 into the inside of the centrifugal dehydrator 100 using a pump (not shown). The material sludge 30 introduced through the hollow portion of the hollow shaft 1 into the driving shaft 2 of the discharge mechanism is radially ejected through plural supply holes 7c made in the side surface of the hollow portion of the driving shaft 2 by centrifugal force. Then it reaches the filter 9a on the inner surface of the rotary drum 10.

[0021] As for the material sludge 30 which has reached the filter 9a, its solid content and moisture firmly adhering to it only cannot pass through the tiny holes 9b, which are smaller than the floc size of the material sludge 30, and the rest of the moisture flows through the tiny holes 9b into the inter-blade flow channels 10b formed by the blades 10a on the back side of the filter 9a due to centrifugal force. The material sludge 30 is thus dehydrated.

[0022] In the centrifugal dehydrator 100 in this embodiment, the rotary drum 10 with the filter 9a rotates and many forward-oriented blades 10a are located on the back side of the filter 9a so that the blades 10a apply a centrifugal force to the moisture contained in the material sludge 30 to enhance the dehydrating effect. In other words, a pressure difference as calculated by Equation 1 below is generated due to the blades:

$$P = \frac{(U_2^2 - U_1^2)}{2}\rho = \frac{62.8^2 - 56.5^2}{2}1000 = 0.37\text{MPa} \qquad \text{(Equation 1)}$$

[0023] Here, it is assumed that the outside diameter of the rotary drum 10 is 400 mm, the inside diameter of the drum 10 is 360 mm, and the rotation speed of the drum 10 is 3000 rpm. The speed difference between the inside diameter and outside diameter of the rotary drum 10 corresponds to a pressure generated by the centrifugal force. Since the blades 10a lie on the back side of the filter 9a made of sheet metal, they should have enough supporting strength to ensure that deformation of the filter 9a does not occur and the drum rotates stably even if a large centrifugal force (2000 G in the above case) is applied to the material sludge 30.

[0024] The dehydrated material sludge 30 accumulates on the inner surface of the filter 9a. On the other hand, material sludge 30 continues to be supplied through the material sludge discharge holes 7c. In order to dehydrate almost continuously supplied material sludge 30 smoothly, the driving shaft 2 is rotated to rotate the screw 7a with a rotation speed difference of several revolutions per minute with respect to the rotary drum 10. Since the screw 7a is spiral, as it rotates, its tips touch the dehydrated material sludge 30 accumulated on the filter 9a. The tips scrape off the material sludge 30 and put the material sludge 30 on the surface of the screw 7a to convey it from left to right.

[0025] Specifically, the dehydrated material sludge 30 accumulated on the inner surface of the rotary drum 10 is conveyed to the partition plate 12 by the screw 7a, which has an outside diameter almost equal to the inside diameter of the filter 9a, and to the discharge port 16 through the discharge channel formed axially outside the partition plate 12. Here, as the material sludge 30 is conveyed axially from left to right by the screw 7a, the rotary drum 10 always applies a centrifugal force to the material sludge 30, so the material sludge 30 is continuously dehydrated. When it reaches the right end, it becomes dehydrated sludge 33 whose moisture content has decreased to about 80%. In other words, the axial length of the screw 7a is determined so that the moisture content of the dehydrated sludge 33 is below a prescribed level. In this operational sequence, the inner surface of the filter 9a is cleaned by the screw 7a.

[0026] The separated water which has passed through the tiny holes 9b of the filter 9a and the inter-blade flow channels 10b and entered the ring space between the casing 11 and rotary drum 10 flows downstream in the ring space and gets out of the centrifugal dehydrator 100 through a drain port 17 located at the left end of the casing 11. The partition plate 12 is provided to prevent the dehydrated sludge 33 and the water separated from the material sludge 30 from being mixed again.

[0027] In this embodiment, cleaning nozzles 13 are provided at plural points in the circumferential direction. Each cleaning nozzle 13 works as follows. As the centrifugal dehydrator 100 is activated, material sludge 30 is accumulated on the inner surface of the filter 9a. When the material sludge 30 accumulated on the filter 9a is conveyed and discharged, the outer peripheral ends of the screw 7a scrape off the material sludge 30. Such scraping tends to cause many tiny

holes 9b of the filter 9a to be clogged with material sludge 30. If they should be clogged with material sludge 30, the dehydrating effect would deteriorate; thus the material sludge must be removed in one way or another. In this embodiment, cleaning water 15 is supplied through the cleaning nozzles 13 with ejection holes like slits to clean the tiny holes 9b.

[0028] The principle of cleaning is explained below referring to Fig. 3. In Fig. 3, the circumferential direction corresponds to the vertical direction and the left-right or horizontal direction corresponds to the radial direction. Tap water or industrial water is supplied through the cleaning water supply hole 14 of a cleaning nozzle 13. The cleaning water pressure is as low as 0.1 to 0.3 MPa.

[0029] When the cleaning water ejection velocity is expressed by V (m/s) and the average circumferential velocity of the rotary drum 10 is expressed by U (m/s), the relative velocity of cleaning water with respect to the blades 10a of the rotary drum 10, W (m/s), is higher than the average circumferential velocity U as illustrated in the figure because the blades 10a are forward-oriented. For the rotary drum 10 which provides a pressure difference as calculated by Equation 1, if the cleaning water ejection velocity V is 10 m/s, the relative velocity W is expressed by the following equation:

$$W=\sqrt{V^2+U^2}=\sqrt{10^2+60^2}=60.8\text{m/s} \quad \text{(Equation 2)}$$

[0030] The level of relative velocity W is reduced to approx. 1.9 MPa in terms of pressure. Since this pressure level is far higher than the cleaning water supply pressure (0.1 to 0.3 MPa), it is possible to generate a sufficiently high pressure to remove the material sludge 30 clogging the tiny holes 9b. As apparent from Equation 2, the pressure generated by the cleaning nozzle 13 largely depends on the average circumferential velocity U of the rotary drum 10. Regarding the angle of the relative velocity W, since the blades 10a are forward-oriented (θ > 90 degrees or more), its angle with respect to the circumferential direction is smaller than the blades 10a's. Therefore, cleaning water collides into the blade surface and reflects on it or turns and goes toward the filter 9a on the inside diameter side. As a result, the water reaches tiny holes 9b of the filter 9a and cleans the filter 9a.

[0031] Since a tiny hole 9b lies between blades 10a, the slit-like cleaning nozzle 13 guides cleaning water to the tiny hole 9b efficiently. In this embodiment, three cleaning nozzles 13 are provided in the circumferential direction of the rotary drum 10. However, the number of cleaning nozzles is not limited to 3 and at least one cleaning nozzle is required. If an area where clogging may easily occur is predicted by simulation or the like, cleaning nozzles may be concentrated on that area.

[0032] When the filter 9a is cleaned, the cleaning effect is enhanced by increasing the rotation speed of the blades 10a of the rotary drum 10. In cleaning, by making the blade angle equal to the relative inflow angle of cleaning water, cleaning water can flow along the blades and reach the cylindrical filter 9a, located in a more inner position. Therefore, the optimum blade angle is in a range of 135 to 150 degrees. As described above, as the higher the circumferential velocity is, the larger the cleaning effect is. So, in operation of the centrifugal dehydrator 100, when the rotation speed is set to a relatively low level in the dehydration mode and set to a relatively high level in the cleaning mode, the dehydrating efficiency is increased. Thus the filter 9a can be cleaned from the outer periphery side by the forward-oriented blades efficiently.

[0033] Also the machine can operate continuously while performing dehydration and cleaning simultaneously. Material sludge 30 is supplied through the hollow material sludge supply shaft 1 and the driving shaft 2 is rotated to activate the screw. Cleaning water is supplied to the cleaning nozzles 13. By setting the rotation speed of the rotary drum 10 and that of the driving shaft 2 adequately so as to achieve balance between dehydration performance and cleaning performance, it is possible to obtain dehydrated sludge 33 with a moisture content below a prescribed level while avoiding clogging of the filter 9a. In this case, the rotation speed of the rotary drum 10 and that of the driving shaft 2 are determined according to the density, viscosity and granularity of the material sludge 30. Therefore, in the centrifugal dehydrator 100, it is desirable that the rotation speed of the rotary drum 10 and that of the driving shaft 2 be both variable.

[0034] In the above embodiment, the screw 7a which is integral with the driving shaft is used as a mechanism to convey and discharge material sludge 30. However, a means to convey and discharge material sludge 30 is not limited to a screw. Next, another example of a discharge mechanism will be explained referring to Fig. 4. In this second embodiment, the discharge mechanism uses a discharge rod 18b driven by a hydraulic unit and a discharge plate 18a attached to the tip of the discharge rod 18b. The rotary drum 10, casing 11 and cleaning nozzles 13 are almost the same as in the above first embodiment and their descriptions are omitted here.

[0035] The hollow material sludge supply shaft 1 stretches to the partition plate 12 and the hollow shaft 1 has plural material sludge discharge holes 7c on the cylindrical side surface. The discharge rod 18b, which has a flange outside the machine, is slidably fitted to the outer periphery of the hollow shaft 1. One end of the discharge rod 18b is outside the machine and the other end is inside the rotary drum 10. The discharge plate 18a, the outside diameter of which is almost the same as the inside diameter of the rotary drum 10, is located in the discharge rod 18b's portion which lies inside the rotary drum 10. The discharge plate 18a has the form of a disc with a trapezoidal cross section in which the

central portion is thick in the axial direction.

[0036] A hydraulic unit 18c is connected with the flange of the discharge rod 18b, located outside the machine, so that the discharge rod 18b can move axially by oil pressure. Specifically, the discharge rod 18b and the discharge plate 18a, supported by the bearing 3, reciprocate and intermittently discharge sludge. This discharge motion may be made while the rotary drum 10 is rotating or while the rotary drum 10 is slowing down. By controlling the rotation speed of the rotary drum 10, dehydration, sludge discharge and filter cleaning are cyclically repeated until dehydration of the material sludge 30 is finished. This operation cycle is controlled by a controller (not shown).

[0037] In any of the above embodiments, the volume of material sludge held in the rotary drum is smaller than in conventional machines, leading to energy saving. In addition, the centrifugal dehydrator can be smaller and lighter.

Claims

1. A centrifugal dehydrator comprising:

   a hollow shaft (2) having a cavity in which sludge (30) can flow and a discharge port (7c) for discharge of sludge (30) from the cavity;
   a support means (3, 5) which supports the hollow shaft rotatably;
   a discharge means (7a) which is provided on the hollow shaft's outer periphery and can convey sludge in an axial direction; and
   a drum (10) which is located radially in a more outer position than the discharge means and almost coaxial with the hollow shaft and having a filter (9a);
   characterized in that the drum (10) can rotate at a rotation speed different from the hollow shaft's rotation speed and has many blades (10a) spaced at intervals in its circumferential direction on the filter's outside diameter side.

2. The centrifugal dehydrator according to Claim 1, wherein the many blades (10a) are forward-oriented with radially outer portions inclined toward the drum's rotation direction and inclination angle θ of the forward-oriented blades (10a) is in a range of 135 to 150 degrees as measured from a radial line.

3. The centrifugal dehydrator according to Claim 1 or 2, wherein the filter (9a) is produced by making many tiny holes (9b) in a thin plate formed into a cylindrical surface and the tiny holes (9b) are oblong holes perpendicular to the filter's cylindrical shaft and these tiny holes' longitudinal size is almost equal to inter-blade distance of the many blades (10a).

4. The centrifugal dehydrator according to anyone of Claims 1 to 3, wherein the discharge means (7a) is a screw which is spiral and integral with the hollow shaft and has a plurality of ridges in terms of length.

5. The centrifugal dehydrator according to anyone of Claims 1 to 3, wherein the axial relative position of the discharge means with respect to the hollow shaft is variable and a driving means (18c) to drive the discharge means axially is provided.

Patentansprüche

1. Zentrifugaltrockner, der aufweist:

   eine Hohlwelle (2), die einen Hohlraum, in dem ein Schlamm (30) fließen kann, und eine Austrittsöffnung (7c) zum Abführen von Schlamm (30) aus dem Hohlraum aufweist,
   eine Stützeinrichtung (3, 5), die die Hohlwelle drehbar stützt,
   eine Ableitungseinrichtung (7a), die am äußeren Umfang der Hohlwelle ausgebildet ist und Schlamm in einer axialen Richtung fördern kann, und
   eine Trommel (10), die radial etwas weiter außen als die Ableitungseinrichtung und in etwa koaxial zur Hohlwelle angeordnet ist und einen Filter (9a) aufweist,
   dadurch gekennzeichnet, dass die Trommel (10) mit einer von der Drehgeschwindigkeit der Hohlwelle verschiedenen Drehgeschwindigkeit rotieren kann und mehrere Schaufeln (10a) aufweist, die durch Zwischenräume beabstandet in deren Umfangsrichtung an der Seite des Außendurchmessers des Filters angeordnet sind.

2. Zentrifugaltrockner nach Anspruch 1, wobei die mehreren Schaufeln (10a) nach vorne ausgerichtet sind, und wobei die äußeren Bereiche zur Rotationsrichtung der Trommel hin geneigt sind und der von einer radialen Linie gemessene Neigungswinkel θ der nach vorne gerichteten Schaufeln (10a) im Bereich von 135 bis 150 Grad liegt.

3. Zentrifugaltrockner nach Anspruch 1 oder 2, wobei der Filter (9a) durch Ausbilden von vielen kleinen Löchern (9b) in einer dünnen Platte gefertigt wird, die in eine Zylinderfläche gebogen wird, wobei die kleinen Löcher (9b) senkrecht zur Zylinderwelle verlaufende Längslöcher sind und die Größe der kleinen Löcher in deren Längsrichtung dem Abstand zwischen den vielen Schaufeln (10a) nahezu entspricht.

4. Zentrifugaltrockner nach einem der Ansprüche 1 bis 3, worin die Ableitungseinrichtung (7a) eine Schnecke ist, die schraubenförmig und einstückig mit der Hohlwelle ausgebildet ist und in Bezug auf die Länge mehrere Spitzen aufweist.

5. Zentrifugaltrockner nach einem der Ansprüche 1 bis 3, worin die axiale Lage der Ableitungseinrichtung relativ zur Hohlwelle variabel ist und eine Antriebseinrichtung (18c) zum axialen Antreiben der Ableitungseinrichtung vorgesehen ist.

Revendications

1. Déshydrateur centrifuge comprenant :

   un arbre creux (2) ayant une cavité dans laquelle les boues (30) peuvent circuler et un orifice d'évacuation (7c) pour l'évacuation des boues (30) hors de la cavité ;
   un moyen de support (3, 5) qui supporte l'arbre creux en rotation ;
   un moyen d'évacuation (7a) qui est prévu sur la périphérie externe de l'arbre creux et peut acheminer les boues dans une direction axiale ; et
   un tambour (10) qui est situé radialement dans une position plus externe que le moyen d'évacuation et quasiment coaxial avec l'arbre creux et ayant un filtre (9a) ;
   caractérisé en ce que le tambour (10) peut tourner à une vitesse de rotation différente de la vitesse de rotation de l'arbre creux et comporte de nombreuses pales (10a) espacées à des intervalles dans sa direction circonférentielle sur le côté de diamètre extérieur du filtre.

2. Déshydrateur centrifuge selon la revendication 1, dans lequel les nombreuses pales (10a) sont orientées vers l'avant avec des parties radialement externes inclinées vers la direction de rotation du tambour et un angle d'inclinaison θ des pales orientées vers l'avant (10a) se trouve dans une plage de 135 à 150 degrés mesuré depuis une ligne radiale.

3. Déshydrateur centrifuge selon la revendication 1 ou 2, dans lequel le filtre (9a) est produit en réalisant de nombreux trous minuscules (9b) dans une plaque mince formée dans une surface cylindrique et les trous minuscules (9b) sont des trous oblongs perpendiculaires à l'arbre cylindrique du filtre et la dimension longitudinale de ces trous minuscules est quasiment égale à une distance entre les pales des nombreuses pales (10a).

4. Déshydrateur centrifuge selon l'une quelconque des revendications 1 à 3, dans lequel le moyen d'évacuation (7a) est une vis qui est hélicoïdale et d'un seul tenant avec l'arbre creux et a une pluralité de crêtes en termes de longueur.

5. Déshydrateur centrifuge selon l'une quelconque des revendications 1 à 3, dans lequel la position relative axiale du moyen d'évacuation par rapport à l'arbre creux est variable et un moyen d'entraînement (18c) pour entraîner axialement le moyen d'évacuation est prévu.

FIG. 1

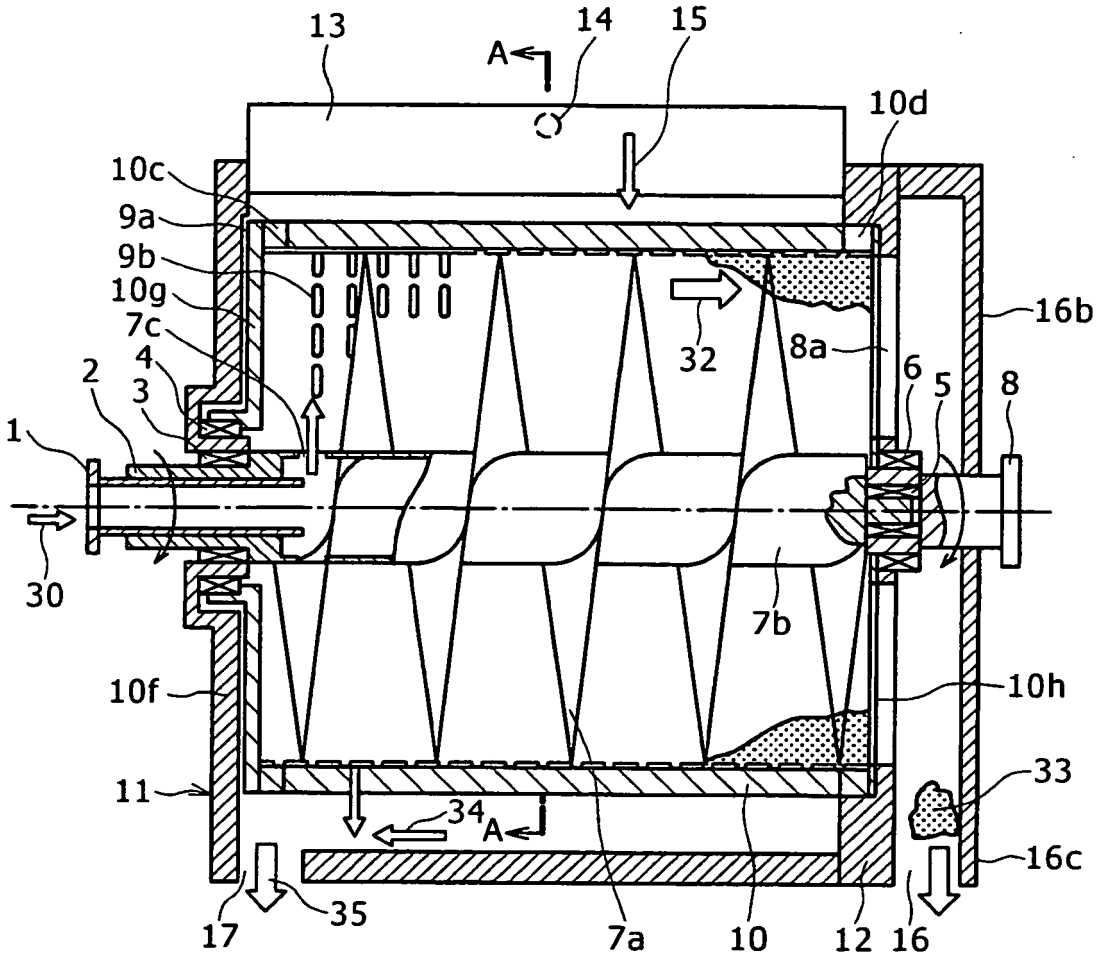

13
14
15
A
10d
10c
9a
9b
10g
7c
4
3
2
1
30
32
8a
6
5
8
16b
7b
10f
10h
11
34
A
33
16c
17
35
7a
10
12
16

FIG. 2

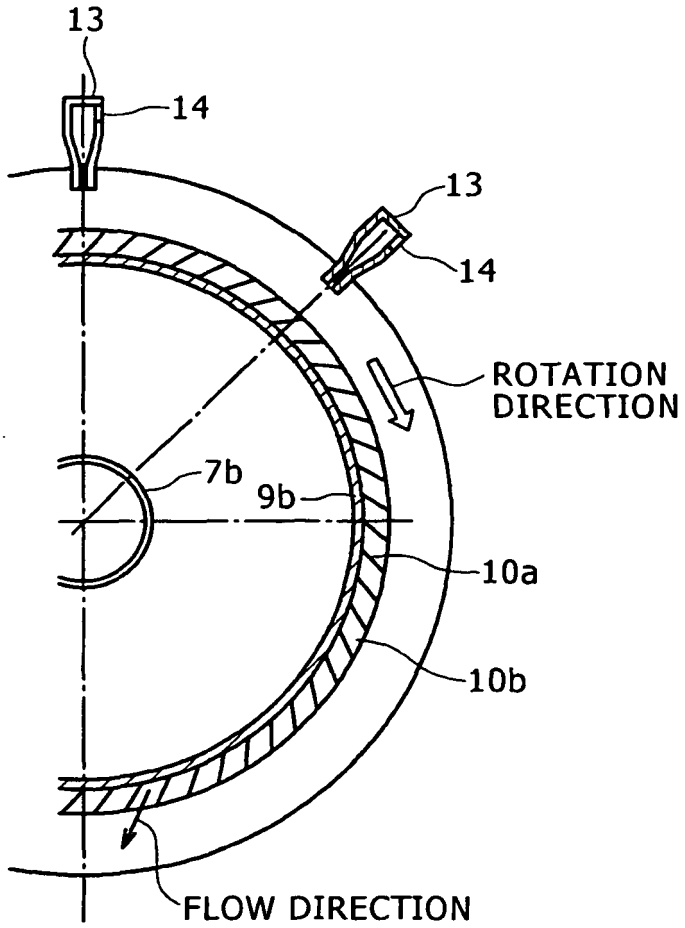


FIG. 3

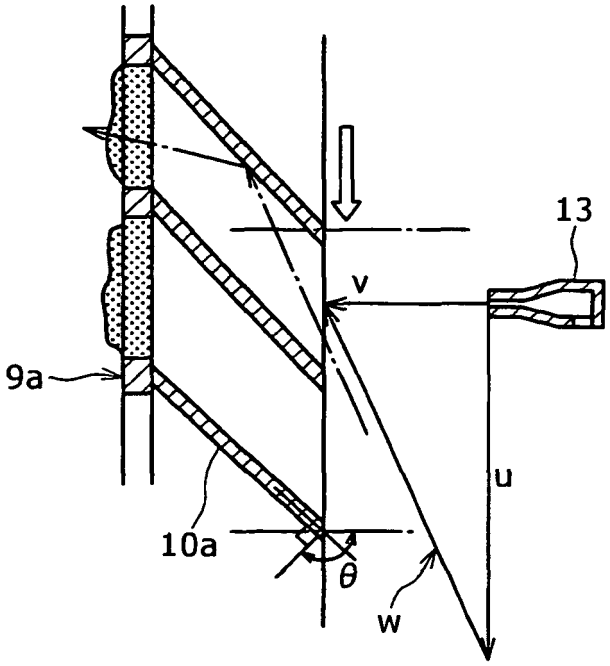
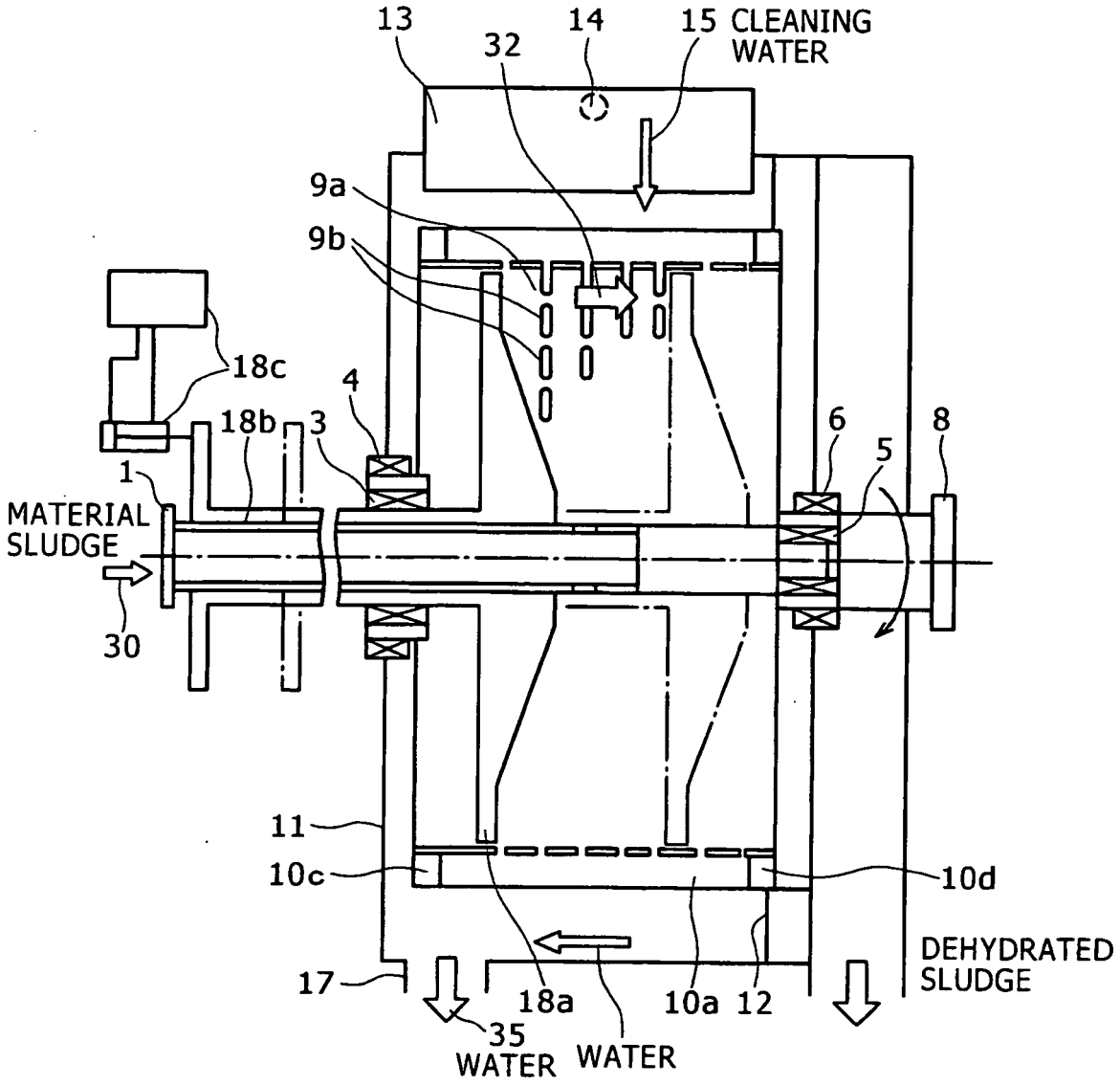


FIG. 4


13
32
14
15 CLEANING WATER
9a
9b
18c
4
18b
3
6
8
5
1
MATERIAL SLUDGE
30
11
10c
10d
17
18a
10a
12
DEHYDRATED SLUDGE
35
WATER
WATER

REFERENCES CITED IN THE DESCRIPTION

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