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[54] **DECANTING CENTRIFUGE FOR DRAINING OFF WATER FROM SEWAGE SLUDGE**

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[51] **Int. Cl.** **B04b 1/20**

[58] **Field of Search** 233/2, 7, 27, 28

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[57] **ABSTRACT**

Decanting centrifuge for draining off water from sewage sludge, which centrifuge has a rotating bowl and helical walls rotating therein to scrape the sludge towards the end of the bowl to discard it. The rotating bowl has a conical entrance section in which the helical walls are provided, where the progression of the sludge through the conical section is retarded, the conical shape of the section being important to secure a gradual increase of velocity and to reduce any tendency to create turbulence.

8 Claims, 2 Drawing Figures

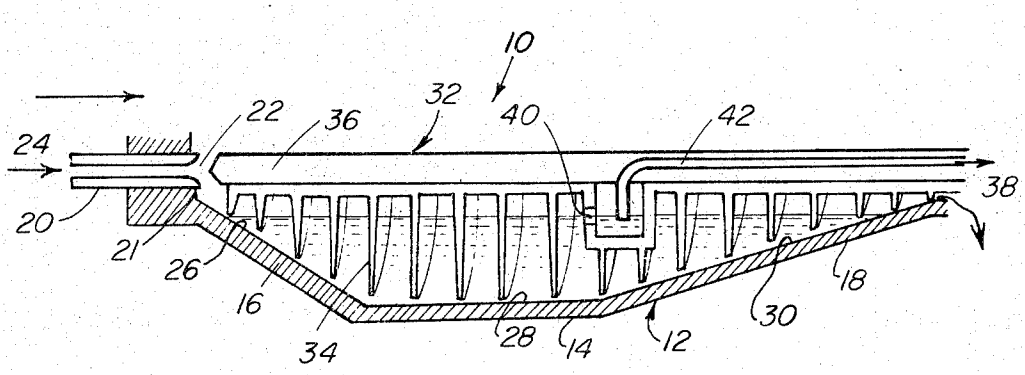


Fig. 1

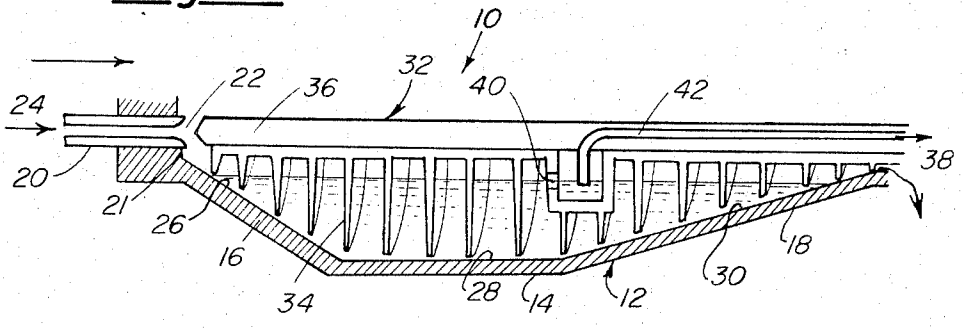
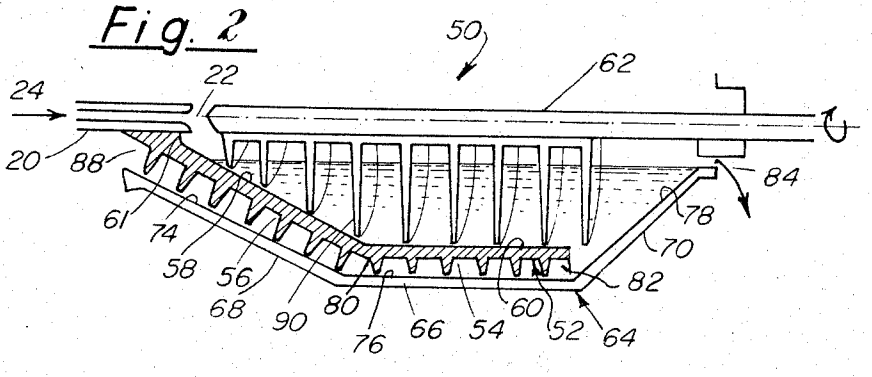

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Fig. 2


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DECANTING CENTRIFUGE FOR DRAINING OFF WATER FROM SEWAGE SLUDGE

The present invention relates to a decanting centrifuge for draining off water from sewage sludge introduced into the centrifuge through or near the shaft thereof. In such centrifuges it is in some cases of considerable importance that the sludge introduced be subjected as little as possible to the risk of hitting the inner rotating surface of the centrifuge with such power that the flocks of the sludge are decomposed into such fine particles that they can only with difficulty or not at all be precipitated in the centrifuge. Furthermore, it is of importance that the inflow period in the centrifuge, i.e., the period during which the flowing sludge is accelerated to follow the rotating movement of the centrifuge, is increased in order to avoid the undesirable effects of turbulence occurring when the sludge is rapidly progressed through the inflow portion of the centrifuge. These objectives are achieved by using a decanting centrifuge, in which the rotating bowl has a small diameter in the region where the introduction takes place, so as to restrict the free drop of the sludge to a small distance, and at the same time providing a smooth passage, such as a conus, from the narrow part of the bowl to the wider part thereof, and providing in parts of the bowl, where the diameter increases, means by which the progression of the sludge through the narrow part of the bowl is prolonged. Owing to the fact that the rotating bowl of the centrifuge is narrowed at the inlet end so that the free drop of the introduced sludge will be small, there will be more time for the sludge to be accelerated to the high velocity at which the inner surface of the remaining part of the centrifuge bowl is moving, and because of the smooth transition to those parts of the centrifuge having an increased diameter, the subsequent increase in speed is equalized. The helical walls built into the centrifuge bowl and essentially following the movement thereof serve to increase the distance which the sludge has to progress before leaving the narrower part of the centrifuge bowl, said part enlarging towards the main part of the centrifuge. Consequently, the sludge is not subjected to any violent turbulence-causing influence.

The helical wall or walls can rotate with a speed which is differing to some extent, for example by 1/2 – 10 percent, from that of the centrifuge bowl. As a result the edges of the helical bodies exert a conveying effect on the sludge particles, which deposit on the inner surface of the centrifuge bowl. This conveying effect can be used for carrying the sludge to a suitable place on the centrifuge bowl, where the sludge can be ejected, for example at the other end of the bowl. For this purpose, the helical walls must continue through the whole or essentially the whole length of the centrifuge bowl.

The invention will be explained more detailed with reference to the accompanying drawing, on which

FIG. 1 shows schematically, in a longitudinal semi-section shows one embodiment, in which the deposited sludge particles are ejected at the end of the centrifuge, which is remotest from the inlet, and

FIG. 2 shows schematically a second embodiment, in which the deposited sludge particles are ejected at the end of the centrifuge, where the inlet is placed.

In the FIGS., the same number is used for an identical part wherever it occurs.

In the embodiment of FIG. 1 a centrifuge **10** is shown having a rotating drum **12** with a drum cylindrical portion **14** and two conically tapered end portions **16** and **18** integral with said cylindrical portion. A hollow shaft **20** fitted into the tapered end of the conical end portion **16** at the end portion's point of smallest diameter **21** provides an inlet of smaller diameter than the drum cylindrical portion **14** at point **22** for the sludge to be dewatered. The sludge enters the centrifuge through the opening **24** of the hollow shaft passing on to the sloping inner surface **26** of the conical end portion **16.** The inner surface **26** of end portion **16,** the inner surface **28** of cylindrical portion **14** and the inner surface **30** of end portion **18** form a continuous liquid-tight drum surface. Inside the centrifuge **10,** a rotating helical conveyor **32** is provided, the speed of rotation of which is small as compared with the speed of rotation of drum **12.** Helical blade **34** of the conveyor is carried by a shaft **36** and extends substantially from the opening **22** adjacent the inner surface **26** for substantially the length of the centrifuge. The pitch of the helical conveyor **32** is designed to retard the flow of the sewage and at the same time guide it towards the exit **38** of the centrifuge **10,** thereby allowing more time for the water to be separated from the sludge. The partially dewatered sludge leaves the centrifuge **10** at the exit **38.** The separated water is drawn off in known manner through an opening **40** of the siphon arrangement **42** in shaft **36.**

Another embodiment for removing the separated water and the partially dewatered sludge is shown in FIG. **2.** In FIG. **2,** a centrifuge **50** is shown having a rotating liquid-tight drum **52** with a drum cylindrical portion **54** and a conically tapered end portion **56.** Inner surface **58** of drum end portion **56** and inner surface **60** of drum cylindrical portion **54** form a continuous liquid-tight drum surface. Hollow shaft **20,** inlet **22** of smaller diameter than drum cylindrical portion **54** and opening **24** are provided as described for the embodiment of FIG. **1.** Similar to the embodiment of FIG. **1,** the sludge enters the centrifuge through opening **24** and passes to the sloping inner surface of conical end portion **56** at the point of smallest diameter **61** of end portion **56.** Inside centrifuge **50,** similar to FIG. **1,** a rotating helical conveyor **62** is provided which rotates and operates as described hereinabove for FIG. **1.** Conveyor **62** and drum **52** are enclosed by a rotating bowl **64** having a cylindrical portion **66** and two conically tapered end portions **68** and **70.** A continuous liquid-tight bowl surface is formed by inner surfaces **74, 76** and **78** of bowl portions **68, 66** and **70,** respectively. The conveyor **62** and drum **52** extend substantially from opening **22** adjacent the point of smallest diameter **61** substantially for the length of the bowl end portion **68** and bowl cylindrical portion **66.** Helical conveyor blades **80** are provided on drum **52** in the space or compartment **82** provided between drum **52** and bowl **64.** The drum end portion **56** and the bowl end portion **68,** and the drum cylindrical portion **54** and the bowl cylindrical portion **66** are in substantial alignment.

The sludge and water, after dropping to surface **58,** are conveyed towards the drum cylindrical portion **54.** The separated water leaves through exit **84** and the partially dewatered sludge falls into compartment **82** where it is moved by the helical conveyor blades **80** which are pitched to convey the sludge towards exit **88.**

In the FIGS., casings, guard plates, packings and similar portions are well known and therefore not shown. These parts are well known and can be chosen by one of ordinary skill in the art.

We claim:

1. A decanting centrifuge for drawing off water from sewage sludge comprising:

1. a horizontally disposed rotary drum having a drum cylindrical portion and at least one conically tapered drum end portion disposed adjacent said drum cylindrical portion, said at least one drum end portion providing an opening at one end of said drum of smaller diameter than that of said drum cylindrical portion, said drum cylindrical and said at least one drum end portion forming a continuous light-tight drum surface,;
2. means for feeding sludge into said opening and against the tapered surface of said first drum end portion at its point of smallest diameter;
3. a first helical conveyor in the interior of said rotary drum disposed to rotate separate from said rotary drum, said helical conveyor extending substantially from said at least one drum end portion through said drum cylindrical portion and being pitched to guide the sewage sludge and separated water in a common direction away from said opening;
4. means for removing the separated water from said rotary drum; and
5. means for removing the sewage sludge from said rotary drum.

2. A decanting centrifuge as claimed in claim 1 wherein said helical conveyor and said rotary drum rotate at different speeds.

3. A decanting centrifuge as claimed in claim 2 wherein said rotary drum comprises two conically tapered drum end portions, said drum cylindrical portion being disposed between first and second drum end portions, said drum portions forming a continuous liquid-tight drum surface, and said means for removing said sewage sludge comprises a discharge unit disposed in said second drum end portion.

4. A decanting centrifuge as claimed in claim 2 wherein said means for removing the separated water is disposed in the interior of said drum where said drum cylindrical portion are joined and said second drum end portion.

5. A decanting centrifuge as claimed in claim 2, further comprising a rotating bowl about which said rotary drum rotates, said bowl comprising conically tapered first and second bowl end portions and a bowl cylindrical portion disposed between said bowl end portions, said bowl end and cylindrical portions providing a continuous liquid-tight surface in said bowl, the diameter of said bowl end portions increasing in the direction of said bowl cylindrical portion, said bowl cylindrical portion and said drum cylindrical portion, and said bowl first end portion and said drum first end portion being substantially aligned.

6. A decanting centrifuge as claimed in claim 5 wherein said means for removing the separated water comprises a discharge exit disposed in said second bowl end portion.

7. A decanting centrifuge as claimed in claim 5 wherein said bowl and said drum are disposed so that a space is provided therebetween, and said means for removing sewage sludge comprises a second helical conveyor secured to said rotary drum and disposed in said space between said rotary drum and said bowl, said second helical conveyor being pitched to guide the sewage sludge in a direction opposite to that of said first helical conveyor.

8. means decanting centrifuge as claimed in claim 7 wherein said menas for removing sewage sludge further comprises a discharge exit disposed between the tapered surfaces of said first drum end portion and said first bowl end portion at the points of smallest diameter of said respective end portions.

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