Feb. 7, 1950 W. RYMANN 2,496,359

PUMP DISINTEGRATOR

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Fig. 1

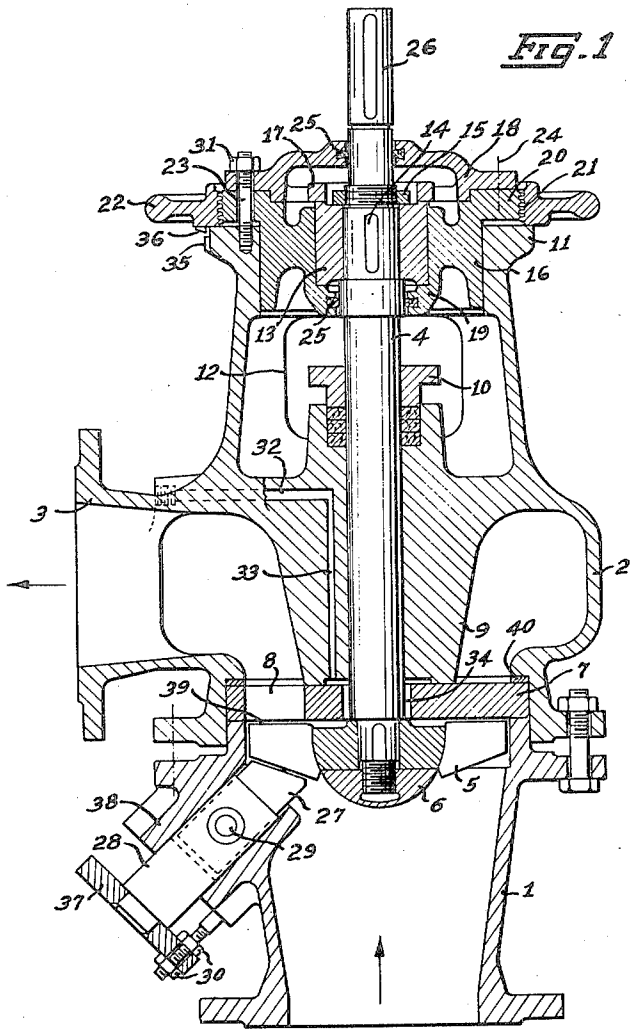
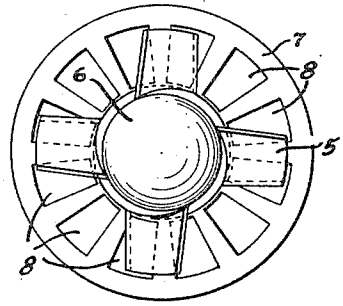



Fig. 2




INVENTOR.
Walter Rymann

Pennie, BY Edmonds, Morton & Barrows
ATTORNEYS

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## PUMP DISINTEGRATOR

Walter Rymann, Winterthur, Switzerland, assignor to Sulzer Freres, Societe Anonyme, Winterthur, Switzerland

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The invention relates to a disintegrator.

Known disintegrators, which serve for breaking up and/or cutting up solid substances in waste water and sewage, above all in the sewage from municipal sewage plants, have as cutting device a stationary grating and knives rotating over it which are fitted on the blade ends of a radial pump. Because of the greatly variable character of the solid substances, not only must the cutting blades be hard and sharp, but also the clearance between the rotating blades and the fixed grating must be capable of being easily and accurately adjusted.

Since this clearance increases very rapidly because of wear in the cutting parts, and then leads to fibrous matter jamming between the knives and the grating, it is necessary for later adjustment that these fibrous matters, which turn round with the rotating part of the cutting device, should be removed, since the requisite small clearance can otherwise not be obtained at all.

To allow this later adjustment to be made known disintegrators must be stopped, since the bolted connections provided for setting of the knives can only be undone and again put together when the machine is at rest. The cleaning of the cutting device by hand makes such later adjustments very troublesome, since this cleaning, in addition to the work entailed in opening the disintegrator, involves many kinds of difficulties; in particular the complete removal of the jammed-in fibrous substances adhering firmly to the cutting knives, is anything but a simple matter.

According to the invention these drawbacks are overcome in that adjusting means are provided at least for the rotating part of the cutting device, so that this part can be displaced while the machine is rotating, in order to adjust the clearance between the rotating part and the stationary part of the cutting device.

Since the setting can take place while the cutting knives are rotating, it is now possible, first of all by increasing the clearance, to wash away all loose material between the cutting knives and the grating. By approaching the cutting knives several times towards the grating, it is also possible to remove the harder pieces adhering to the knives, so that the knives can be completely cleaned in a simple manner and be set exactly to the smallest possible clearance without opening the disintegrator.

One example of execution according to the invention is shown diagrammatically in the drawing.

Fig. 1 is a longitudinal section through the disintegrator.

Fig. 2 shows the breaking-up knives and the grating, viewed from below.

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The disintegrator in Fig. 1 with vertical shaft is connected at the bottom through the suction branch 1 to a sewage system (not shown in the drawing), where solid substances are carried in the liquid. In particular in waste water from town sewers, all kinds of substances are carried along with the liquid, and this may under certain circumstances choke the pumps handling the sewage. On the suction branch 1 is set the casing 2 of the disintegrator with the delivery branch 3 to which a pipe is connected leading the broken-up solid substances to a delivery pump, a settling tank or such like. On the shaft 4 is keyed a knife-cross 5, which is provided with several knives and is held firmly by means of the nut 6. Above the knife-cross 5 the grating 7 with slit-shaped passages 8 is provided. The shaft 4 is supported in the bearing 9 of the casing 2 and rendered tight at its upper end by means of the stuffing-box 10.

In the upper part 11, with the openings 12 for tightening up the stuffing-box 10, the step bearing 13 is provided, which is fixed to the shaft by means of the key 14 and the nut 15 and can be axially displaced. The step bearing 13 is held axially in the step-bearing casing 16 between the ring 17 on the cover 18 and the bottom 19 of the casing.

The flange 20 is provided with a screw thread 21, which engages the counter screw thread within the hand wheel 22. The step-bearing casing 16 is led and held axially by means of the stud-bolts 23 which project through the flange 20 and the cover 18. The cover 18 is fixed to the flange 20 of the casing 16 by means of the stud-bolts 24. The shaft is rendered oil-tight by means of the packing pieces 25. To the end 26 of the shaft 4 a coupling (not shown in the drawing) is keyed; this couples the shaft 4 to the driving motor (also not shown) for the cutting knives 5. The counter knife 27, which works together with the underside of the knife-cross 5, is fixed to the displaceably-carried supporting member, the cylindrically-shaped piston 28, by means of a screw or bolt 29. The supporting member 28 is fixed to the suction branch 1 by means of the nuts 30 for adjusting the counter knife 27.

The method of working is as follows:

If the cutting edges of the knife cross 5 have become worn and an adjustment has to be made because the cutting qualities of the disintegrator have diminished, it is not at all necessary to stop the motor driving the cutting knife 5, since the adjustment of the new clearance between the rotating and the stationary part of the cutting device may be made while the machine is working.

It will only be preferable to shut the suction branch 1 off from the sewers and to connect it to a source of pure water. First of all the nuts 31 of the stud-bolts 23 determining the position of

the step-bearing 16 are loosened, and then the hand wheel 22 is first of all turned so that the clearance between the knife-cross 5 and the grating 7 is increased, in order that pieces jammed between them may be removed as well as possible by the rotation of the knife-cross 5. The cutting plane of the knives is arranged obliquely to the shaft 4, Fig. 2, and results in a certain delivery action, which serves for drawing the sewage into and delivering it through the disintegrator. The knife-cross 5 is consequently formed similarly to the impeller of an axial pump. By delivering the pure water, a certain washing effect is obtained. In addition to that, passages 32, 33 are provided in the bearing 9 and are connected to a water pipe (not shown). The passages 32, 33 lead water under pressure to the annular slot 34, from which it is led through the nut 6 and the grating 7 to the knives of the knife-cross 5 and serves to cleam them. In addition to that the introduction of water under pressure through the slot 34 while the machine is working, prevents the bearing 9 from becoming dirty.

The hand wheel 22 is then turned in the contrary direction, thus drawing the knife-cross 5 towards the grating 7. This loosening and tightening up again is preferably repeated several times one after the other, in order to remove all impurities which occasionally adhere firmly as a hard deposit on the knife edges. After that, the clearance between the knife-cross 5 and the grating 7 can be adjusted again. To do this, the new setting of the hand wheel 22 can be read on the scale 35 on the casing 11 by means of a pointer 36 at the moment when the knife-cross 5 touches the grating, and then by turning the hand wheel 22 back through a certain distance along the scale 35, a clearance of, for instance 0.1 mm., can be accurately adjusted. After this, the nuts 31 of the stud-bolts 23 are again tightened firmly and the clearance adjusted will remain unchanged in service, even under great vibrations.

After the clearance between the stationary grating 7 and the rotating knife-cross 5 has been accurately adjusted, the counter-knife 27 is newly set with respect to the knife-cross 5. First of all the nuts 30 are loosened and the supporting member 28 is pushed backwards and forwards several times in order that any impurities on the counter knife 27 may be removed by the rotating knife-cross 5. After that, the piston 28 is pushed in so far that the counter knife 27 touches the underside of the knife cross 5, after which the piston 28 is pulled back through a distance equal to the required clearance and then fixed in this position by means of the nuts 30. The amount of the clearance can be accurately measured at the suction branch 1 between the flange 37 of the piston 28 and the branch piece 38 on the suction branch 1.

If the grating 7 has to be ground from time to time on the side of the cutting plane 39 in order to improve the cutting action of the disintegrator, it will be advisable to provide insert rings 40 on the upper side of the grating 7, between it and the casing 2, in order to be able to keep the cutting plane 39 as far as possible at the same position in the casing 2. Thereby the adjusting of the knife cross 5 and/or the step-bearing casing 16 can be limited. In the case of smaller amounts of adjustment of the casing 16, the adjusting screw-thread 21 can have a smaller pitch, so that for one and the same clearance the adjusting angle through which the hand wheel 22 turns is greater, and consequently the accuracy of the adjustment and of the reading on the scale 35 is improved.



The breaking-up of the solid substances in the sewage accelerates fermentation in the fermenting chambers, so that the time required for fermentation depends to a large degree on the accurate setting of the cutting device. Because of the great differences in the kinds of sewage substances, as well as in their quantities, it is very important that the setting can be effected while the rotating cutting knives are in service. The adjusting of the step-bearing casing 16 with respect to the casing 2 of the disintegrator could also be effected by means of a lever, an eccentric, etc.

I claim:

1. In a bearing structure permitting the axial adjustment of a rotating shaft, the combination including a shaft, a bearing sleeve assembly in which said shaft is journaled and held against relative axial movement in either direction, a stationary frame structure in which said bearing assembly is mounted slidable axially, an internally threaded adjusting member engaging external threads on said bearing assembly, and adjustable retaining means fixing said bearing assembly against rotation in said frame and adjustably limiting its axial movement relative thereto without engaging said adjusting member.

2. A disintegrator device which includes in combination a stationary frame structure, a bearing sleeve assembly mounted slidable axially in said frame structure, a shaft journaled in said bearing assembly and held against relative axial movement in either direction, a rotating shearing member carried by said shaft, a stationary shearing member carried by said frame structure adjacent to and cooperating with said rotating member, and adjusting means acting on said shaft in an axial direction to adjust the shearing clearance between said rotating member and said stationary member, which adjusting means includes an internally threaded adjusting member engaging external threads on said bearing assembly, and adjustable retaining means fixing said bearing assembly against rotation in said frame and adjustably limiting its axial movement relative thereto without engaging said adjusting member.

3. In a disintegrator which includes a casing body and cutting apparatus within said casing body, said cutting apparatus including a stationary part, a rotating part and adjustment means by which sid rotating part can be moved during rotation for the adjustment of the clearance between it and said stationary apparatus, the improvement in which said adjustment means include a bearing housing, means fixing said housing against rotation in said casing body, a bearing journalling said rotating part in said housing and fixing said rotating part against axial movement relative to said housing, movement producing means engaging said bearing housing and said casing body for producing relative movement parallel to the axis of said rotating part between said housing and said casing body, and adjustable movement restraining means operatively interconnecting said bearing housing and said casing body whereby the permissible relative movement between said bearing housing and said casing body in the direction which reduces said clearance is positively limited.

4. A disintegrator including a casing body, a rotating shearing member carried by said casing body, a stationary shearing member carried by

said casing body displaced axially from said rotating member and cooperating therewith, and adjusting means acting on said rotating member in an axial direction which can be manipulated during rotation to displace said rotating member and thus to adjust the shearing clearance between said rotating member and said stationary member and which includes a shaft carrying said rotating member, a bearing housing fixed against rotation in said casing body, and displaceable therein in an axial direction in which said shaft is journalled fixed against axial displacement, a screw thread on said bearing housing, a setting nut engaging said screw thread and said casing body for displacing said bearing housing in an axial direction, and a stop screw clear of said nut engaging said bearing housing and said casing body to limit their relative axial movement in the direction which reduces said clearance.

5. A disintegrator according to claim 4 in which there is a flange around the bearing housing, the screw thread is cut around the periphery of said flange, the setting nut is a handwheel, and the stop screw is a positioning clamp bolt passing through said flange.

6. In a disintegrator including a casing body, a rotating shearing member carried by said casing body and a stationary shearing member carried by said casing body displaced axially from said rotating member and cooperating therewith, the improvement which includes a counter knife arranged to cooperate with said rotation member on the opposite side thereof from said stationary member, a supporting member for said counter knife, watertight means whereby said supporting member is displaceably carried through said casing body, and adjusting bolts exterior said casing body for positioning said counter knife inside said casing body.



WALTER RYMANN.


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