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(54) **Centrifugal cleaning of paper making stock.**

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EP-A-0 058 484
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SE-C- 111 887
US-A-4 155 839

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Description

Centrifugal cleaners have been employed for many years in the paper industry for removing small particles of higher specific gravity than paper fibers from slurries of paper making fiber, especially waste paper stocks.

In centrifugal cleaners used for that purpose, in what is hereinafter referred to as "conventional centrifugal cleaning technique," the discharge outlet at the apex (tip) of the cylindrical-conical vessel is relatively small in comparison with the inlet and accepts outlets, e.g. 3.2 mm (1/8 inch) in diameter as compared with 13.4 mm (5/8 inch) diameters for the other two ports in a conventional cleaner 7.62 cm (3 inches) in diameter. In such conventional cleaning operations, therefore, the reject discharge through the apex outlet is correspondingly small in comparison with the accepts flow, e.g. 3% and 97% by volume respectively.

In comparatively recent years, there has been an increasing use of centrifugal cleaners to separate good paper fibers from contaminants of closely similar or lower specific gravity such that they cannot be readily separated by conventional centrifugal cleaning technique.

In general, cleaners for such "reverse" centrifugal cleaning have been made by modifying the construction and/or operation of a conventional cleaner to provide operating conditions which cause the good fiber to be discharged through the apex outlet as the accepts flow while the lights are discharged as reject through the base (top) outlet which is the accepts outlet in conventional centrifugal cleaning. For an extended discussion of prior and up dated reverse centrifugal cleaning developments, reference is made to Seifert et al US-A- 4 155 839 wherein the present inventor was a joint patentee.

The preamble of claim 1 is known from US-A-4 155 839 insofar as it discloses system for separating paper making fibers from light contaminants of similar and lower specific gravities, comprising

(a) means for forming a pumpable aqueous slurry wherein the solid constituents consist essentially of paper fibers and one or more light contaminants such as wax and plastic fragments similar in size to and not substantially greater in specific gravity than wet paper fibers,

(b) an internally conical vessel having an inlet port adjacent the base end thereof and the apex end thereof being open,

(c) housing means defining a chamber surrounding said open apex end of said vessel,

(d) a first outlet port from said chamber through the wall of said housing means,

(e) means for supplying said slurry to said vessel through said inlet port at a sufficiently high flow rate circumferentially of said vessel and under sufficient pressure to develop in said vessel centrifugal force conditions causing vortical separation of said slurry within said vessel into an outer fraction containing the large majority of the paper fibers and an inner fraction containing the large majority of said light contaminant materials, and

(f) means for controlling the discharge flows from both of said outlet ports.

The preamble of independent claim 3 concerning a centrifugal cleaner is also known from the above-cited US-A-4 155 839 insofar as it discloses a centrigugal cleaner particularly adapted for separating paper making fibers from light contaminants of similar and lower specific gravities, comprising:

(a) an internally conical vessel having an inlet port adjacent the base end thereof and the apex end thereof being open,

(b) housing means defining a chamber surrounding said open apex end of said vessel,

(c) a first outlet port in the wall of said housing means from said chamber. The preamble of independent claim 4 is known from GB-A-1 349 465 insofar as it discloses a multiple centrifugal cleaner assembly for separating paper making fibers from light contaminants, comprising

(a) an enclosed container,

(b) wall means within said container dividing the interior thereof into a pair of opposite end chambers,

(c) a plurality of centrifugal cleaners located within said container,

(d) each of said cleaners including a cylindrical-conical vessel having an inlet port adjacent the base thereof and the apex end thereof being open,

(e) means supporting said cleaners within said container with said inlet ports thereof in one of said chambers and the apex ends thereof in the other of said chambers,

(f) said one chamber having an inlet port for receiving an aqueous slurry of paper fibers and light contaminants for delivery to said inlet ports of said cleaners,

(g) said other chamber having a discharge port.

It is known from EP-A-0 058 484 to provide a cyclone separator comprising an internally conical vessel having an inlet port adjacent the base end thereof and the apex end being open, housing means defining a chamber surrounding said open apex end, an outlet tube extending through said chamber and into the open apex end.

It is known from DE-C-953 601 to provide a cyclone type cleaner comprising an internally conical vessel having an inlet at the base thereof and the apex end being open, a housing defining a chamber surrounding the open apex and an outlet tube extending through the chamber into the open end, the tube being adjustable axially of the vessel.

It is known from SE-C-111 887 to provide a tubular inlet to a cyclone type separator having an internally conical vessel having the tubular inlet at the base and an open apex, the tubular inlet being relatively displaceable axially of the vessel.

An object of the invention is to provide an improved centrifugal cleaner particularly adapted for reverse centrifugal cleaning wherein both of

the discharge ports, for the two fractions into which the cleaner separates the feed flow, are located adjacent the apex end of the cleaner, so that there is no reversal of flow within the cleaner as in past practice for both conventional and reverse cleaning.

According to the present invention a system having the features acknowledged to be known from US-A-4 155 839 is characterised by:

(g) an outlet tube supported in said housing means with the inner end thereof positioned in said open end of said vessel and defining therewith an annular second outlet port leading from the interior of said vessel to said chamber,

(h) said means for controlling the discharge are arranged to cause said outer fraction to discharge through said annular second outlet port into said chamber and said second fraction to discharge through said tube, said outlet port from said chamber leading to a chamber having a discharge outlet, and

(i) means for releasably securing said tube to said housing means to provide for release and temporary retraction of said tube for the relief of a blockage of said annular second outlet port.

The invention also includes a centrifugal cleaner having the features acknowledged as known from US-A-4 155 839 and being characterised by

(d) an outlet tube supported in said housing means with the inner end thereof positioned in said open end of said vessel and defining therewith an annular second outlet port leading from the interior of said vessel to said chamber, and

(e) means releasably securing said tube to said housing means to provide for release and temporary retraction of said tube for the relief of a blockage of said annular second outlet port.

The invention further includes a multiple centrifugal cleaner assembly having the features acknowledged as known from GB-A-1 349 465 characterised by:

(h) respective housing means within said other chamber associated with each said vessel and defining a chamber surrounding said open apex end of said vessel,

(i) a first outlet port in the wall of each said housing means leading from said chamber thereinto said other chamber in said container,

(j) an outlet tube supported in each said housing means with the inner end thereof positioned in said open end of the associated said vessel and defining therewith an annular second outlet port leading from the interior of said vessel to said chamber within said housing means,

(k) the other end of said tube extending to the outside of said container, and

(l) each of said cleaners including means, releasably securing each of said tubes to the related said housing means to provide for release and temporary retraction of said tube for the relief of a blockage of the related said annular second outlet port, and further comprising handle means on each of said tubes outside said container for effecting such release and retraction of each said tube.

Thus in the practice of the invention, there is a through flow of the feed stock from the base end to the apex end of the cleaner, with no reverse flow through the central part of the cleaner as in both conventional and reverse cleaning as heretofore practised. This feature is of particular value in the application of the invention to cyclone assemblies or "canister" cleaners wherein multiple individual centrifugal cleaners are assembled in parallel relation within a common canister whose interior is divided into feed, accepts and reject chambers which connect respectively with the inlet and discharge ports of all of the individual cleaners.

The invention will now be described by way of example with reference to the accompanying partly diagrammatic drawings, in which:

Fig. 1 is a view in axial section of a reverse cleaning unit known from EP-A-0 096 562 (Art.54(3), (4) EPC;

Fig. 2 is a fragmentary view similar to Fig. 1 and showing a modified inlet port arrangement known from EP-A-0 096 562 (Art.54(3), (4) EPC);

Fig. 3 is a fragmentary view illustrating the application of the unit of Fig. 1 to a canister-type cyclone assembly as known from EP-A-0 096 562 (Art.54(3), (4) EPC);

Fig. 4 is a view similar to Fig. 1 showing a reverse cleaning unit incorporating a modified discharge tube arrangement for the light fraction; and

Fig. 5 is a fragmentary exploded isometric view illustrative details of the mechanism for releasably locking discharge tube of the cleaner in Fig. 4 in operative position.

A typical reverse centrifugal cleaner indicated generally at 10 is shown in Fig. 1 is housed in a casing 11 which has its interior divided by partitions 12 and 13 into a supply or feed chamber 15 at one end of the casing 11, a reject chamber 16 at the other end of the casing, and an accepts chamber 17 located intermediate the chambers 15 and 16, each of these chambers being provided with its own port 20, 21 and 22, respectively.

The cleaner 10 comprises a main tubular vessel 25 the interior of which is cylindrical over a portion of its length and frusto-conical throughout its remaining portion. A housing 26 is threaded on the smaller end of the vessel 25, and a tubular tip piece 27 is secured within the housing 26 by a retainer nut 28 as shown. The cylindrical bore 29 within the tip piece 27 forms a continuation of the interior of housing 25 which leads to the discharge port 30.

The housing 26 has one or more radially or tangentially arranged ports 31 therethrough which provide a total flow area larger than that of the port 30 leading into the interior of the reject chamber 16. The lower end of the housing 26 is closed by a threaded cap 33 which extends through an opening in the end wall 34 of the casing 11 and clamps the casing wall against the end of housing 26 to the casing wall. The base end of the vessel 25 is provided with a closure plug 35 which is threaded into the end of the vessel 25 and also clamps the partition 13 between itself and the vessel 25.

A helical groove 40 on the outer surface of the plug 35 forms the inlet port to the interior of the

cleaner vessel 25, the spiral configuration of this groove assuring that stock to be cleaned will be delivered from the interior of the feed chamber 15 to the interior of the vessel 25 with a substantial circumferential flow component. The plug 35 is otherwise solid, but it includes a cylindrical extension 41 on its inner end which acts in part as a vortex finder but more particularly as a stabilizer for the air core which forms during operation of the cleaner. The groove 40 may be duplicated around the periphery of plug 35 to increase the effective inlet port size as needed.

In addition to the outlet port 30 at its apex, the cleaner 10 is provided with one or more outlet ports 44 at the lower end of the frusto-conical portion of vessel 25. The outlet ports 44 are preferably arranged tangentially of the vessel 25, in the same direction as the circulatory movement of stock within the vessel, and these ports lead into the chamber 17 within the casing 11. Preferably, the tip piece 27 includes a cylindrical extension 45 which projects upstream therefrom into the interior of the vessel 25 sufficiently far so that it at least radially overlies the outlet port or ports 44 and thus serves as a baffle preventing direct flow therefrom to the interior of tip piece 27 and the outlet port 30, and the upstream end of the extension 45 thus effectively is the apex outlet port of the vessel 25.

The inlet construction shown in Fig. 1 has special advantages in that it assures that all stock entering the cleaner will continue to flow with a substantial component lengthwise of the cleaner, rather than having some heavy particles tend to orbit the inlet end of the cleaner and thereby wear away its inner wall surface. The invention can be practiced, however, with the alternative inlet construction shown in Fig. 2, which is essentially the same as in the above noted patent No. 4,155,839.

It includes a plug 35' which differs from plug 35 only in having no groove 40 in its outer surface. Instead, an inlet port 40' of rectangular shape leads tangentially through the wall of vessel 25 as shown in, patent No. 4,155,839. The position of the partition 12 with relation to the vessel 25' therefore has to be shifted so that the port 40' will be open to the feed chamber 15, and the partition 13 is therefore clamped between a shoulder 46 on the vessel 25' and a nut 47 threaded on the vessel 25' in opposed relation with the shoulder 46.

In the use of a cleaner of the construction described in connection with Figs. 1 and 2, the slurry to be cleaned is delivered to the supply chamber 15 at the appropriate pressure to cause it to enter the inlet port 40 or 40' at the desired flow rate and velocity as described in patent No. 4,155,839, to develop within the vessel 25 centrifugal force conditions causing vortical separation of the slurry into an outer fraction containing the large majority of the paper fibers, an inner fraction containing the large majority of light contaminant particles, and commonly also an innermost air core.

The outer fraction will travel down the frusto-conical portion of the interior of vessel 25 until it reaches the discharge port or ports 44, and it will exit through those ports to the accepts discharge chamber 17 and its outlet port 22. The inner fraction will enter the upstream end of the extension 45 and travel therethrough and through the interior of the tip piece 27 and the outlet port 30 to the reject discharge chamber 16 and its port 21.

Separation of the heavy and light fractions which form within the cleaner as they discharge therefrom is readily controlled by regulating the respective discharge flows from the chambers 16 and 17, by means such as valves 50 and 51 on the lines 52 and 53 leading from the ports 21 and 22. Determination of the proper flow splits from the two discharge chambers will usually involve some experimentation, depending upon the nature of the feed stock, the feed flow rate and the feed pressure, and satisfactory results have been obtained under test conditions with this split varied from approximately equal flows from both discharge chambers to approximately 90% from the accepts chamber 17 and 10% from the reject chamber 16.

As a more specific example to the practice of the invention, test runs were made with a cleaner constructed as shown in Fig. 2 wherein the inlet port 40' had a flow area of 4.03cm^2 (0.625.sq.in.), the minimum flow area of the apex outlet port was 5.06cm^2 (0.785 sq.in.) and there were two outlet ports 40 each of a flow area of approximately 1.6cm^2 (0.25 sq.in). In a test run wherein the feed flow rate was 189 litres/minute (50 gallons/minute) at 2.1 kg/cm (30 p.s.i.g), satisfactory results were obtained with flows from the discharge chambers 16 and 17 of approximately 98.4 and 90.8 litres/min. (26 and 24 gallons/minute). Better results were obtained with a feed flow rate of 257.4 litres/min. (68 g.p.m.) at a feed pressure of 28 kg/cm^2 (40 p.s.i.g.) and with the flows from the discharge chamber 16 and 17 at the rate of 209 and 51 litres/min (54.5 and 13.5 g.p.m.) respectively.

The invention has also been tested with a cleaner constructed as shown in Fig.1 wherein the inlet port flow area was 4.03 cm^2 (0.625 sq.in), the minimum flow area of the apex port was 1.97 cm^2 (0.306 sq.in), and the accepts port 40 was rectangular, similarly to the inlet port 40' in Fig. 2, with dimensions of 3.81 cm x 9.5 mm (1.5 inches x 3/8 in.) and a flow area of 3.07 cm^2 (0.47 sq.in). Highly satisfactory results were obtained with a feed flow at 300 litres/min (80 gallons/minute) and a pressure of 4.22 kg/cm^2 (45 p.s.i.g.) with the flow from the chambers 16 and 17 at the rates of 32.2 and 272 litres/min (8.5 and 71.9 gallons/minute).

As pointed out hereinabove, the invention is especially applicable to cleaner assemblies of the canister type, as illustrated in Fig. 3, wherein the canister 60 has internal walls 61 and 62 dividing its interior into a central chamber 63 and opposite end chambers 64 and 65. Multiple cleaners 10 of the construction described in connection with Fig. 1 are shown as mounted within the canister 60, with the interior walls 61 and 62 and end wall 66

providing the same mounting and partitioning functions as the partitions 12 and 13 and end wall 34 in Fig. 1.

The operation of a canister cleaner assembly of the invention as shown in Fig. 3 is the same as already described in connection with Fig. 1. The chamber 64 serves as the feed chamber and is provided with an appropriately located port for receiving the inletflow of feed stock, and the chambers 63 and 65 become the reject and accept chambers as described in connection with the chambers 16 and 17 in Fig. 1. It should also be noted that the canister cleaner of Fig. 3 can in effect can be made double-ended by doubling the length of the canister, installing a second set of partition walls and cleaners opposite the set shown in Fig. 3, and then using chamber 64 as the feed chamber for both sets of cleaners.

The modified cleaner 100 in accordance with the invention shown in Fig. 4 is mounted in a canister casing 110 provided with an end head 111 and having its interior divided by a partition 113 into a supply or feed chamber 115 and an accepts (heavies) chamber 117. Each of these chambers is provided with its own port 120 and 121 respectively, but each cleaner 100 has its own outlet port for reject (lights) from the casing 110 provided by a tube 123 as described in more detail hereinafter.

The cleaner 100 comprises a main tubular vessel 125 of essentially the same construction as the vessel 25 except that it is extended somewhat longer at its apex end, and it has no outlet port in its side wall. The tip housing 126 is threaded on the smaller end of the vessel 125 in clamping relation with the partition 113, and it also serves as a mounting for the tube 123, the bore 130 of which forms the discharge port for lights from the cleaner. A guide member 131 within the housing 126 has an axial bore 132 sized to receive the tube 123 freely therein. The outer portion of the tube 123 passes through a center bore in the threaded cap 133 which clamps the end of the housing 126 to the end head 111 of the casing 110.

The bore 132 of the part 131 is provided with a circumferential groove for receiving an O-ring 135 sized to form a seal between the bore 132 and the tube 123. In addition, releasable locking means are provided between the tube 123 and the part 131, namely bayonet locking means comprising radial projections 136 on the tube 123 which are sized to cooperate in locking relation with the slotted and grooved portions at the outer end of the part 131. As shown, when the tube 123 is inserted in the part 131 with its projections 136 aligned with the slots 137 in the end of part 131, the projections 136 will seat on the bottoms of those slots, and then a quarter-turn of the tube will effect locking engagement of the projections 136 in the grooves 138.

The feed inlet port to the interior of the vessel 125 is provided by one or more tangential slots 140 of rectangular shape in the wall of the vessel adjacent its base end, which is closed by a threaded plug 142. An extension 141 on the plug 142 acts both as a vortex finder and as a stabilizer for the air core which forms during operation of the cleaner, and it may be solid as shown or of the hollow cylindrical form shown in Figs. 1 and 3.

The locking projections 136 on the tube 123 are in predetermined spaced relation with the inner end of the tube so that when they are locked in the grooves 138, the inner end of the tube is located at or within the apex end of the vessel 125 so that it defines an annular discharge port 144 from the interior of the vessel 125 into the annular chamber 145 surrounding the tube 123 on the upstream side of the part 131. A plurality of ports 146 in the wall of the housing 126 lead from this chamber 145 into the accepts chamber 117 and then to the port 121.

The operation of the cleaner assembly shown in Fig. 4 is essentially the same as described in connection with Fig. 1, with the centrifugal force conditions developed within the vessel 125 causing vortical separation of the feed slurry into an outer fraction which is discharged through the annular port 144 and an inner fraction which is discharged through the tube 123. The major advantage provided by this cleaner is that in the event of plugging of the annular port 144 by solid material, virtually immediate relief of the blocking can be effected by manually retracting the tube 123 from outside the casing 110 for a long enough interval for the flow to clear the apex end of the vessel 125, and then returning the tube 123 to its operating position established by the locked relation of the parts 136-138.

In order to take advantage of this feature of the invention, when multiple cleaners 100 are incorporated in a single canister casing 110, all of the tubes 123 project to the outside of the canister, and each is provided with its own flexible tubing 150 for conducting the reject flow therefrom to a common collection receiver. In order to facilitate the use of the tubes 123 for relieving blockage, each tube has its tubing 150 secured thereto by a clamp 151 which also acts as a handle by which the associated tube 123 can be twisted to unlocked position, temporarily retracted, and then returned and locked in its operative position.

In a typical example of the cleaner shown in Figs. 4-5 wherein the inner diameter of the cylindrical portion of the vessel 125 is 7.62 cm (three inches), the inner diameter of the apex end of the vessel is 2.9 cm (1.14 inches), there are four ports 146 2.54 cm (one inch) in diameter, the tube 123 has and outer diameter of 1.59 cm (0.625 inch) and an inner diameter of 1.27 cm (0.500 inch), and it is preferably beveled at its upstream end to minimize turbulence in the flow therepast. In addition, the space between the inner end of the cap 133 and the downstream end of the member 131 provides for at least 2.54 cm (one inch) of axial movement of the tube 123 to assure complete opening of the apex end of the vessel 125 when the tube is retracted.

Claims

1. A system for separating paper making fibers from light contaminants of similar and lower specific gravities, comprising

(a) means for forming a pumpable aqueous slurry wherein the solid constituents consist essentially of paper fibers and one or more light contaminants such as wax and plastic fragments similar in size to and not substantially greater in specific gravity than wet paper fibers,

(b) an internally conical vessel (125) having an inlet port (140) adjacent the base end thereof and the apex end thereof being open,

(c) housing means (126, 131) defining a chamber (145) surrounding said open apex end of said vessel,

(d) a first outlet port (146) from said chamber (145) through the wall of said housing means (126, 131),

(e) means for supplying said slurry to said vessel (125) through said inlet port (140) at a sufficiently high flow rate circumferentially of said vessel and under sufficient pressure to develop in said vessel centrifugal force conditions causing vortical separation of said slurry within said vessel into an outer fraction containing the large majority of the paper fibers and an inner fraction containing the large majority of said light contaminant materials, and

(f) means (50, 51) for controlling the discharge flows from both of said outlet ports, characterised by:

(g) an outlet tube (123) supported in said housing means (126, 131) with the inner end thereof positioned in said open end of said vessel (125) and defining therewith an annular second outlet port (144) leading from the interior of said vessel (125) to said chamber (145),

(h) said means (50, 51) for controlling the discharge are arranged to cause said outer fraction to discharge through said annular second outlet port (144) into said chamber (145) and said second fraction to discharge through said tube (123), said outlet port (146) from said chamber (145) leading to a chamber (117) having a discharge outlet (121) and,

(i) means (136, 137, 138) releasably securing said tube (123) to said housing means (126, 131) to provide for release and temporary retraction of said tube for the relief of a blockage of said annular second outlet port (144).

2. The system defined in claim 1, wherein said releasable securing means (136, 137, 138) maintain the inner end of said tube (123) in substantially the same radial plane with the apex end of said vessel (125).

3. A centrifugal cleaner particularly adapted for separating paper making fibers from light contaminants of similar and lower specific gravities, comprising:

(a) an internally conical vessel (125) having an inlet port (140) adjacent the base end thereof and the apex end thereof being open,

(b) housing means (126, 131) defining a chamber (145) surrounding said open apex end of said vessel,

(c) a first outlet port (146) in the wall of said housing means (126, 131) from said chamber (145), characterised by:

(d) an outlet tube (123) supported in said housing means (126, 131) with the inner end thereof positioned in said open end of said vessel (125) and defining therewith an annular second outlet port leading from the interior of said vessel (125) to said chamber (145), and

(e) means (136, 137, 138) releasably securing said tube (123) to said housing means (126, 131) to provide for release and temporary retraction of said tube for the relief of a blockage of said annular second outlet port.

4. A multiple centrifugal cleaner assembly for separating paper making fibers from light contaminants, comprising:

(a) an enclosed container (60),

(b) wall means (61, 62) within said container dividing the interior thereof into a pair of opposite end chambers (64, 65),

(c) a plurality of centrifugal cleaners (110) located within said container,

(d) each of said cleaners including a cylindrical-conical vessel (125) having an inlet port (140) adjacent the base thereof and the apex end thereof being open,

(e) means supporting said cleaners (110) within said container (60) with said inlet ports (140) thereof in one of said chambers (64) and the apex ends thereof in the other of said chambers (65),

(f) said one chamber (64) having an inlet port for receiving an aqueous slurry of paper fibers and light contaminants for delivery to said inlet ports (140) of said cleaners,

(g) said other chamber (65) having a discharge port, characterised by:

(h) respective housing means (126, 131) within said other chamber (65) associated with each said vessel (125) and defining a chamber (145) surrounding said open apex end of said vessel (125),

(i) a first outlet port (146) in the wall of each said housing means (126, 131) leading from said chamber (145) thereinto said other chamber (65) din said container (60),

(j) an outlet tube (123) supported in each said housing means (126, 131) with the inner end thereof positioned in said open end of the associated said vessel and defining therewith an annular second outlet port leading from the interior of said vessel (125) to said chamber (145) within said housing means,

(k) the other end of said tube (123) extending to the outside of said container (60), and

(l) each of said cleaners (110) including means (136, 137, 138) releasably securing each of said tubes (123) to the related said housing means (126, 131) to provide for release and temporary retraction of said tube for the relief of a blockage of the related said annular second outlet port, and further comprising handle means (151) on

each of said tubes outside said container (60) for effecting such release and retraction of each said tube.

5. A system, or a centrifugal cleaner or a multiple centrifugal cleaner assembly as claimed in any preceding claim characterised in that said or each said securing means (136, 137, 138) include means limiting movement of the associated tube (123) toward said vessel (125) to an operating position wherein said inner end of the tube (123) extends a predetermined distance into said open apex end of said vessel (125).

6. A system or a centrifugal cleaner or a multiple centrifugal cleaner assembly as claimed in any preceding claim characterised in that said or each said tube (123) is cylindrical, and the or each said securing means (136, 137, 138) comprises complementary means on said tube (123) and in said housing means which interlock and release respectively in response to partial rotation of said tube (123) in one or the other rotational sense.

7. A system or a centrifugal cleaner or a multiple centrifugal cleaner assembly as claimed in any preceding claim, characterised in that said or each said tube (12) is of sufficient length that when the tube (123) is in an operating position, an outer end portion thereof projects into a space outside of said housing (126) to form a handle for rotation and withdrawal thereof.

8. A system or a centrifugal cleaner or a multiple centrifugal cleaner assembly as claimed in any preceding claim characterised in that said or each said housing means (126, 131) includes means (135) sealing against leakage of liquid between the outer surface of said tube (123) and said housing means (131).

Patentansprüche

1 System für die Trennung von Fasern für die Papierherstellung von leichten Verunreinigungen ähnlicher und niedrigerer Wichte, bestehend aus -

(a) einer Anordnung für die Aufbereitung einer pumpfähigen wässerigen Aufschlämmung, in der sich die festen Bestandteile im wesenntlichen aus Papierfasern und einem oder mehreren verunreinigenden Materialien wie Wachs- und Kunststoff-Fragmenten ähnlicher Größe und nicht wesentlich höherer Wichte als die nasser Papierfasern zusammensetzen,

(b) einem innenseitig konisch ausgebildeten Hohlgefäß (125) mit einer Einlaßöffnung (140) benachbart dem Basis-Ende desselben und mit einem offennen Scheitelpunkt-Ende,

(c) einer Gehäuse-Anordnung (126, 131), die eine das offene Ende am Scheitelpunkt umgeifende Kammer (145) ausbildet,

(d) einer aus der Kammer (145) durch die Wandung der Gehäuse-Anordnug (126, 131) herausführende ersten Auslaßöffnung (146),

(e) einer Anordnung zur Zuführung dieser Aufschlämmung durch die Einlaßöffnnung (140) in das Hohlgefäß (125) mit einer ausreichend hohenn Strömungsgeschwindigkeit um den innenseitigen Umfang dieses Hohlfäßes und unter ausreichendem Druck zum Aufbau von Zentrifugalkraft-Bedingungen für die durch Verwirbelung im Hohlgefäß herbeizuführende Trennung der Aufschlämmung in eine äußere, einen großen Anteil an Papierfasern enthaltende Fraktion, und eine innere, einen großen Anteil an leicht verunreinigten Material enthaltende Fraktion, und -

(f) einer Ventil-Anordnung (51, 52) zur Steuerung des Ausströmmenge aus den beiden Auslaßöffnungen, gekennzeichnet durch -

(g) ein in der Gehnäuse-Anordnung (126, 131) gelagertes Auslaufrohr (123), dessen inneres Ende in dem offenen Ende des Hohlgefäßes (125) angeordnet ist und dadurch eine ringförmige zweite Auslaßöffnung (144) ausbildet, die aus dem Inneren des Hohlgefäßes (125) zu der Kammer (145) führt,

(h) die Anordnung der die Ausströmmenge steuernden Ventile (50, 51) derart, daß der Abfluß der äußeren Fraktion durch die ringförmige Auslaßöffnung (144) in die Kammer (145) und der der zweiten Fraktion durch das Rohr (123) bewirkt wird, wobei die Auslaßöffnung (146) der Kammer (145) in eine Kammer (117) mit einer Austrittsöffnung (121) führt, und -

(i) eine das Rohr (123) an der Gehäuse-Anordnung (126, 131) wiederlösbar festlegende Anordnung (136, 137, 138) für das Lösen und vorübergehende Zurückziehen des Rohres bei Verstopfung der ringförmigen zweiten Auslaßöffnung (144).

2. System nach Anspruch 1, dadurch gekennzeichnet, daß die wiederlösbar das Rohr festlegende Anordnung (136, 137, 138) das innere Ende dieses Rohres (123) im wesentlich in der gleichen Radialebene mit dem Scheitelpunkt-Ende des Hohlgefäßes (125) hält.

3. Zentrifugalreiniger, insbesondere zur Trennung von Fasern für die Papierherstellung von leichten Verunreinigungen ähnlicher und niederer Wichte, bestehend aus -

(a) einem innenseitig konisch ausgebildeten Hohlgefäß (125) mit einer Einlaßöffnung (140) benachbart dem Basis-Ende desselben und mit einem offenen Scneitelpunkt-Ende,

(b) einer Gehäuse-Anordnung (126, 131), die eine das offene Ende dieses Hohlgefäßes umgreifende Kammer (145) ausbildet,

(c) einer aus der Kammer (145) durcn die Wandung der Gehäuse (126, 131) herausführenden ersten Auslaßöffnung (146), gekennzeichnet durch -

(d) ein in der Gehäuse-Anordnung (126, 131) gelagertes Auslaßrohr (123), dessen inneres Ende in dem offenen Ende des Hohlgefäßes (125) angeordnet ist, und dadurch eine ringförmige zweite Auslaßöffnung (144) ausbildet, die aus dem Inneren des Hohlgefäßes (125) zu der Kammer (145) führt, und -

(e) eine das Rohr (123) an der Gehäuse-Anordnung (126, 131) wiederlösbar festlegende Anordnung (136, 137, 138) für das Lösen und vorübergehende Zurückziehen des Rohres bei Verstopfung der ringförmigenn zweiten Auslaßöffnung (144).

4. Mehrfach-Zentrifugalreiniger-Anordnung zu

Trennung von Fasern für die Papierherstellung von leichten Verunreinigungen, bestehend aus -
(a) einen geschlossenen Behälter (60),
(b) Wandungen (61, 62) innerhalb des Behälters für die Unterteilung des Inneren desselben in ein Paar gegenüberliegender End-Kammern (61, 61),
(c) einer Anzahl Zentrifugalreiniger (110) innerhalb des Behälters, wobei -
(d) jeder dieser Reiniger ein zylindrisch-konisches Hohlgefäß (125) einschließt, welches-eine Einlaßöffnung (140) benachbart dem Basis-Ende desselben und ein offenes Scheitelpunkt-Ende aufweist,
(e) eine Anordnung zur Lagerung der Reiniger (110) innerhalb des Behälters (60), mit den Einlaßöffnungen (140) in einer der Kammern (64) desselben und die Scheitelpunkt-Enden in der anderen der Kammern (65),
(f) die eine Kammer (64) mit einer Einlaßöffnung die Aufnahme einer wässerigen Aufschlämmung aus Papierfasern und leichten Verunreinigungen für die Zuführung zu den Einlaßöffnungen (140) der Reiniger, und -
(g) die andere Kammer (65) mit einer Autrittsöffnung, gekennzeichnet durch -
(h) Gehäuse-Anordnungen (126, 131) innernalb der anderen Kammer (65), zugeordnet jedem dieser Hohlgefäße (125) und jeweils eine das offene Scheitelpunkt-Ende des Hohlgefäßes (125) umgreifende Kammer (145) ansbildend,
(i) eine erste Auslaßöffnung (146) in der Wandung jeder dieser Gehäuse-Anordnungen (126, 131), die von der Kammer (145) in die andere Kammer (65) des Behälters (60) führt,
(j) ein Auslaßrohr (123) in jeder der Gehäuse-Anordnungen (126, 131) gelagert, dessen inneres Ende in dem offenen Ende des zugeordneten Hohlgefäßes angeordnet ist und dadurch eine ringförmige zweite Auslaßöffnung (144) ausbildet, die aus dem Inneren des Holgefäßes (125) zur Kammer (145) innerhalb der Gehäuse-Anordnung führt, wobei -
(k) das andere Ende des Rohres (123) sich zur Außenseite des Behälters (60) erstreckt, und -
(1) jeder der Reiniger eine Anordnung (136, 137, 138) einschließt, die wiederlösbar jedes der Rohre (123) an der zugehörigen Gehäuse-Anordnung (126, 131) festlegt, um das Lösen und vorübergehende Zurückziehen des Rohres bei Verstopfung der jeweiligen ringförmigen zweiten Auslaßöffnung zu bewirken, und ferner ein Griffstück (151) an jedem Rohr außerhalb des Behälters (60) angeordnet ist, um das Lösen und Zurückziehen jedes der Rohre zu auszuführen.

5. System oder Zentrifugalreiniger oder Mehrfach-Zentrifugalreiniger-Anordnung nachn einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die oder jede der Festlege-Anordnungen (136, 137, 138) Elemente zur Begrenzung der Bewegung des zugeordneten Rohres (123) in eine Betriebsstellung in Richtung zum Hohlgefäß (125) einschließt, wobei sich das innere Ende des Rohres (123) eine vorbestimmte Strecke in das offene Scheitelpunkt-Ende des Hohlgefäßes (125) erstreckt.

6. System oder Zentrifugalreiniger oder Mehrfach-Zentrifugalreiniger-Anordnung nach einem der vorhergehenden Ansprüche, durch gekennzeichnet, daß das oder jedes der Rohre (123) zylindrisch ausgebildet ist, und die oder jede der Festlege-Anordnungen (136, 137, 138) komplementäre Elemente an dem Rohr (123) und in der Gehäuse-Anordnung einschließen, mittels der durch eine partielle Drehbewegung des Rohres (123) in die einne oder andere Drehrichtung des Rohr verriegelt bzw. entriegelt wird.

7. System oder Zentrifugalreiniger oder Mehrfach-Zenrifugalreiniger-Anordnung nach einem der vorhergeheden Ansprüche, dadurch gekennzeichnet, daß das oder jedes der Rohre eine derart ausreichende Länge aufweist, so daß mit dem Rohr (123) in einer Betriebsstellung der äußere Rohr-Endbereich sich bis in einen Raum außerhalb des Gehäuses (126) zur Ausbildung eines Griffstücks für die Drehung und das Zurückziehen des Rohres erstreckt.

8. System oder Zentrifugalreiniger oder Mehrfach-Zenntrifugalreiniger-Anordnung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die oder jede der Gehäuse-Anordnungen (126, 131) Dichtungselemente (135) für die Abdichtung zwischen der Außenfläche des Rohres (123) und dem Gehäuse (131) gegen austretende Flüssigkeit einschließt.

Revendications

1. Dispositif pour séparer, au sein de fibres de papier, de légers déchets ayant un poids spécifique similaire ou inférieur, comportant
(a) des moyens pour gormer une boue liquide aqueuse pompable ou les constituants solides se composent essentiellement de fibres de papier et de un ou plusieurs déchets légers tels que de la cire et des fragments de plastique de dimensions similaires et pas sensiblement plus grands en poids spécifique que les fibres de papier mouillé,
(b) un récipient conique intérieurement (125) ayant un orifce d'entrée (140) adjacent à sa base et dont l'extrémité de pointe estouverte,
(c) des moyens de capotage (126, 131) définissant une chambre (145) entourant ladite extrémité de pointe dudit récipient,
(d) un premier orifice de sortie (146) de ladite chambre (145) à travers la paroi desdits moyens de capotage (126, 131),
(e) des moyens pour fournir ladite boue audit récipient (125) par ledit orifice d'entrée (140) à un taux d'écoulement suffisamment élevé à la circonférence dudit récipient et sous une pression suffisante pour créer dans ledit récipient des conditions de force centrifuge causant la separation tourbillonnaire de ladite boue à l'intérieur dudit récipient en une fraction extérieure contenant la grande majorité des fibres de papier et en une fraction intérieure contenant la grande majorité desdits matériaux de déchets légers, et,
(f) des moyens (50, 51) pour commander les écoulements d'évacuation au sortir desdits deux orifices de sortie, caractérisé par:

(g) un tube de sortie (123) supporté dans lesdits moyens de capotage (126, 131) dont l'extremité interieure est positionnee dans ladite extrémité ouverte dudit récipient (125) et définissant avec celui-ci un second orifice de sortie annulaire (144) conduisant de l'intérieur dudit récipient (125) dans ladite chambre (145),

(h) lesdits moyens (50, 51) pour commander l'évacuation sont agencés pour provoquer l'évacuation de ladite fraction extérieure à travers ledit second orifice de sortie annulaire (144) dans ladite chambre (145) et l'évacuation de ladite seconde fraction à travers ledit tube (123), ledit orifice de sortie (146) de ladite chambre (145) conduisant à une chambre (117) ayant un orifice d'évacuation (121), et

(i) des moyens (136, 137, 138) assujettissant de façon démontable ledit tube (123) auxdits moyens de capotage (126, 131) pour permettre le desserrage et la rétraction temporaire(s) dudit tube pour le degagement d'un blocage dudit second orifice de sortie annulaire (144).

2. Dispositif selon la revendication 1, ou lesdits moyens d'assujettissement (136, 137, 138) desserrables maintiennent l'extrémité intérieure dudit tube (123) dans sensiblement le même plan radial que l'extrémité de pointe dudit récipient (125),

3. Epurateur centrifuge particuliérement adapté pour la séparation, au sein de fibres de papier, de déchets légers ayant un poids spécifique équivalent ou inférieur, comportant:

(a) un récipient conique intérieurement (125) ayant un orifice d'entree (140) adjacent à son extrémité de base et dont l'extrémité de pointe est ouverte,

(b) des moyens de capotage (126, 131) définissant une chambre (145) entourant ladite extrémité de pointe ouverte dudit récipient,

(c) un premier orifice de sortie (146) dans la paroi desdits moyens de capotage (126, 131) à partir de ladite chambre (145), caracterisé par:

(d) un tube extérieur (123) supporté dans lesdits moyens de capotage (126, 131) dont l'extrémité intérieure est positionnée dans ladite extrémité ouverte dudit réciplent (125) et définissant avec lui un second orifice de sortie annulaire conduisant de l'Intérieur dudit, récipient (125) à ladite chambre (145), et

(e) des moyens (136, 137, 138) assujettissant de façon démontable ledit tube (123) auxdits moyens de capotage (126, 131) pour permettre le desserrage et la rétraction temporaires dudit tube pour le dégagement d'un blocage dudit second orifice extérieur annulaire,

4. Assemblage d'épurateur centrifuge multiple pour séparer, au sein de fibres de papier, des déchets légers, comprenant:

(a) un conteneur fermé (60),

(b) des moyens de cloisonnement (61, 62) à l'intérieur dudit conteneur, divisant l'Intérieur de celui-ci en deux chambres d'extrémité opposée (64, 65),

(c) une pluralité d'épurateurs centrifuges (110) logés à l'intérieur dudit conteneur,

(d) chacun desdits épurateurs comportant un récipient cylindrique-conique (125) ayant un orifice d'entrée (140) adjacent à sa base et une extrémité de pointe de celui-ci étant ouvete,

(e) des moyens pour supporter lesdits épurateurs (110) à l'intérieur dudit conteneur (60), lesdits orifices d'entrée (140) de ceux-ci étant dans une desdites chambres (64) et les extrémités de pointe de ceux-ci étant dans l'autre desdites chambres (65),

(f) ladite chambre (64) ayant un orifice d'entrée pour recevoir une boue liquide aqueuse de f1bres de papier et de déchets légers pour qu'ils soient fournis audit orlfice d'entrée (140) desdits épurateurs,

(g) ladite seconde chambre (65) ayant un orifice d'évacuation, caracterisé par:

(h) des moyens de capotage respectifs (126, 131) à l'intérieur de ladite autre chambre (65) associés à chacun desdits recipients (125) et définissant une chambre (145) entourant ladite extrémité de pointe ouverte dudit récipient (125),

(i) un premier orifice de sortie (146) dans la paroi de chacun des moyens de capotage (126, 131) conduisant de ladite chambre (145) a l'intérieur de ladite autre chambre (65) située dans ledit conteneur (60),

(j) un tube de sortie (123) supporté dans chacun desdits moyens de capotage (126, 131) dont l'extrémité intérieure est positionnée dans ladite extrémité ouverte dudit récipient associé et définissant avec lui un second orifice de sortie annulaire conduisant de l'intérieur dudit récipient (125) à ladite chambre (145) à l'intérieur desdits moyens de capotage,

(k) l'autre extrémité dudit tube (123) s'étendant vers l'extérieur dudit conteneur (60), et,

(l) chacun desdits épurateurs (110) comportant des moyens (136, 137, 138) assujettissant de façon demontable chacun desdits tubes (123) auxdits moyens de capotage (126, 131) mentionnés pour permettre le desserrage et la rétraction temporaires dudit tube pour le dégagement d'un blocage du second orifice de sortie annulaire mentionné, et comportant en outre des moyens de prehension (151) sur chacun desdits tubes a l'extérieur dudit conteneur (60) pour effectuer un tel desserrage et une telle rétractation de chacun-desdits tubes.

5. Dispositif, ou épurateur centrifuge ou assemblage d'épurateurs centrifuges multiple selon une des revendications précédentes, caractérisé en ce que lesdits -ou chacun desdits moyens d'assujettissement (136, 137, 138) comportent des moyens de limitation de mouvement du tube associé (123) en direction dudit récipient (125) vers une position de fonctionnement ou ladite extrémité intérieure du tube (123) s'étend d'une distance prédéterminée à l'intérieur de ladite extrémité de pointe ouverte dudit récipient (125).

6. Dispositif, ou épurateur centrifuge ou assemblage d'épurateurs centrifuges multiple selon une des revendications précédentes, caractérisé en ce que ledit -ou chacun desdits- tube (123) est cylindrique et en ce que chacun desdits moyens

d'assujettissement (136, 137, 138) comporte des moyens complémentaires sur ledit tube (123) et dans lesdits moyens de capotage qui se verrouillent et se déverrouillent respectivement en réponse à une rotation partielle dudit tube (123) dans l'un ou dans l'autre sens de rotation.

7. Dispositif, ou épurateur centrifuge ou assemblage d'épurateurs centrifuges multiple selon une des revendications précédentes, caractérisé en ce que ledit -ou chacun desdits tube (12) est d'une longueur suffisante pour que, lorsque le tube (123) est en position de fonctionnement, une portion d'extrémité extérieure de celui-ci fasse saillie à l'intérieur d'un espace extérieur audit capotage (126) pour former un manche pour sa rotation et son retrait.

8. Dispositif, ou épurateur centrifuge ou assemblage d'épurateurs centrifuges multiple selon une des revendications précédentes, caractérisé en ce que ledit -ou chacun desdits- moyen de capotage (126, 131), comporte des moyens (135) d'étanchéité contre la fuite de liquide entre la surface extérieure dudit tube (123) et lesdits moyens de capotage (131).

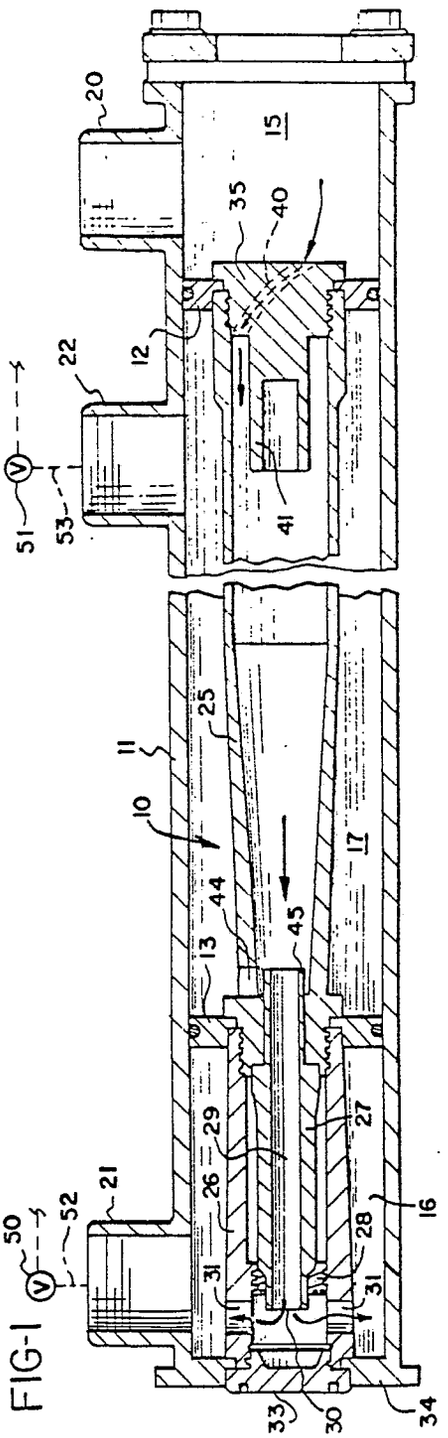


FIG-1

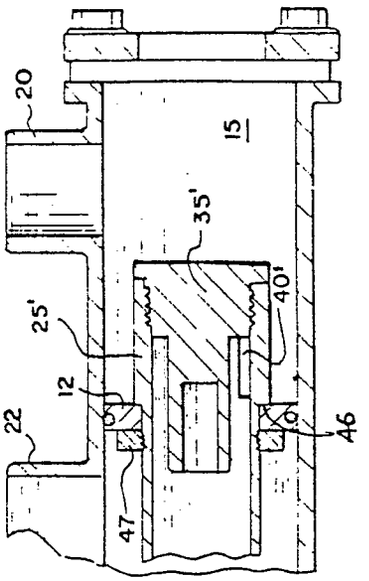


FIG-2

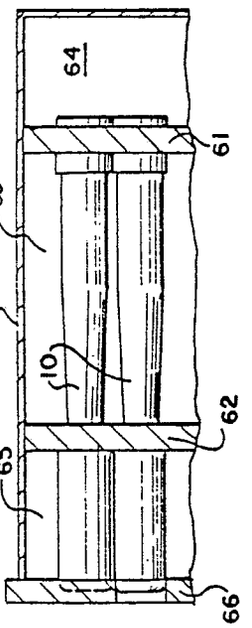
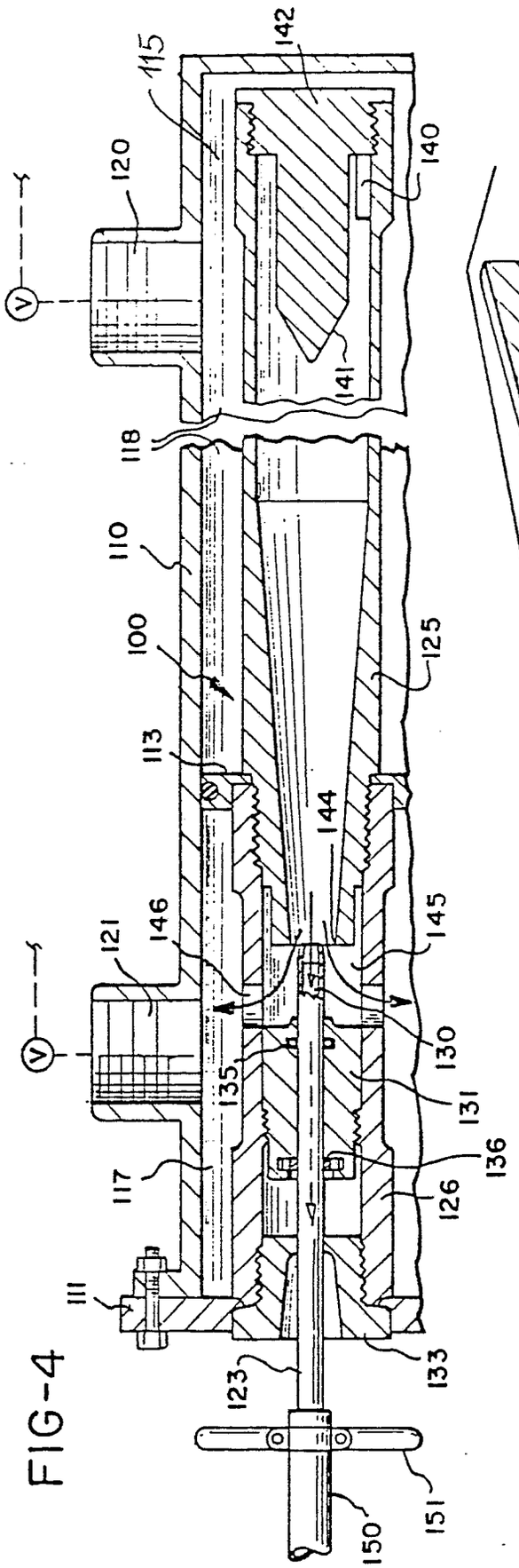


FIG-3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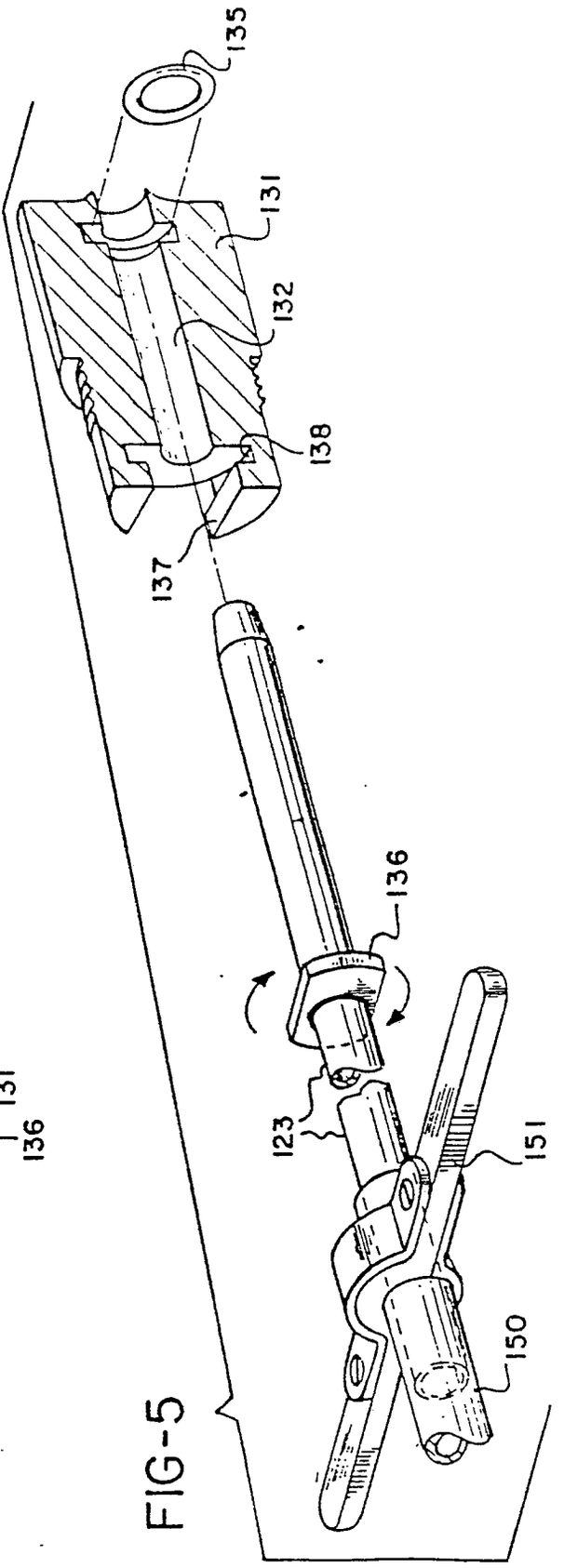
150

FIG-4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132
138
137
136
123
151
150

FIG-5