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(54) METHOD FOR THE CLASSIFICATION BY SIZE OF POLYDISPERSE MATERIALS AND DEVICE FOR IMPLEMENTING SAME

(57) The invention relates to the field of powder technology. The method for the classification by size of polydisperse materials involves generating a centrifugal field in a classification zone, feeding polydisperse material into said classification zone in a flow of liquid, generating an outlet flow in the classification zone, which flows in the opposite direction to the action of the forces of the centrifugal field at a speed close to the speed of movement of the particles of the material with a set size under the action of the centrifugal field, discharging a first outlet flow from the classification zone in the opposite direction to the action of the forces of the centrifugal field, and discharging the particles of material having a size greater than the set size from the classification zone in the direction of action of the forces of the centrifugal field. Liquid that is free of material is fed at a set volumetric flow rate into the classification zone over a section situated downstream of the inlet for the polydisperse material in the direction of action of the centrifugal forces. The method is carried out with the aid of a device comprising a hollow rotor having an axis of rotation and at least one classification channel provided with a second inlet for feeding pure liquid into said channel, said inlet being situated downstream of a first inlet in the direction away from the axis of rotation of the rotor and being connected to a means for supplying said liquid to the rotor. The technical result is an increase in the efficiency with which material is separated into set fractions.

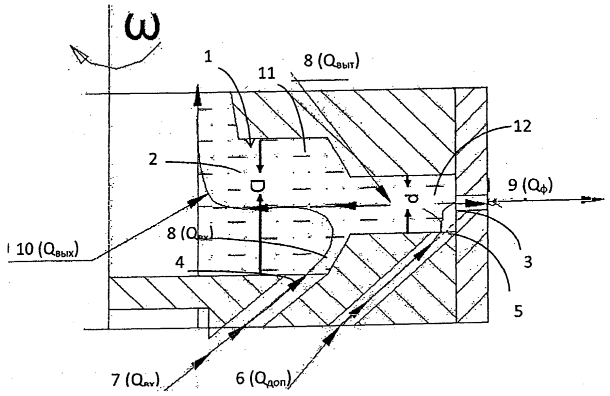

FIGURA 1

EP 2 767 342 A2

Description

FIELD OF THE INVENTION

[0001] The invention relates to the field of powder technology, specifically to methods for size classification of polydispersed materials, e.g. materials such as diamond, silicon carbide, tungsten carbide, boron carbide, corundum, boron nitride, titanium dioxide, microcalcite etc.

BACKGROUND

[0002] Currently well known are the methods of classification of polydispersed materials in dynamic flux.

[0003] Known, for example, a method based on separation of polydispersed materials, in particular of abrasive particles in a dynamic stream (Certificate of authorship USSR No. 619208, class B 03 B 5/62 1978).

[0004] The method consists in that the initial mixture is water jet containing several fractions of abrasive particles is sent with a constant volume flow in a direction opposite to the forces of the gravitational field. As part of the lifting the part of flow merges. On the basis of the law of hydrodynamics speed of homogeneous particles under the influence of the field force is proportional to the square of its diameter. Particles larger than a predetermined size (in which the velocity of the stationary liquid layer over a linear flow rate of moving opposite the gravitational force field) move in the direction of the force field and makes the appropriate flow. Particles smaller than a predetermined size are moved to the opposite direction to the gravitational field, and makes the flow of the labeling zone. In the process of separation of the two streams are formed: one containing only particles smaller than a predetermined size (the size is mainly determined by the flow rate), and the second containing larger particles of a given size of the particles and smaller than the predetermined size.

[0005] The method allows preliminary separation of abrasives having a particle size larger than 10 microns in the continuous mode. However, complete separation of the fine and coarse fraction by this method is not due to an inevitable and considerable (up to 90%) entering the flow of coarse fraction from the fine particles. Also, this method is virtually impossible to classify materials micron (particle size less than 10 microns) and submicron (particle size less than 1 micron) range.

[0006] Closest to the present invention include a method of classification of polydispersed materials and device for its implementation Patent RU 2130806.

[0007] In the known method separation of a polydispersed materials carried in a liquid medium in the classification zone formed in the form of a channel (the channel classification or feed) located along the direction of action of centrifugal force, having sequentially arranged along the centrifugal force, and first and second outputs between input slurry feed material is polydisperse. The process is fed through said inlet into the slurry flow channel classification polydispersed material "slurry feed stream separation polydispersed material into two streams, the first of which, with particles of a predetermined size (separated fraction) is withdrawn in the direction opposite the action of the centrifugal force field through the first output and a second stream suspension with particles of size greater than a predetermined which is output in the direction of the centrifugal force field through the second exit.

[0008] Device for implementing the method comprises a hollow shaft with a rotation axis, formed as a cylindrical container, means for supplying suspension to the rotor polydispersed material slurry outlet means with a predetermined fraction of the selected size, means for removal of slurry from a coarse fraction and a rotor assembly mounted in the labeling, to form a a rotor assembly over said material deposition chambers connected with the liquid flow outlet means and the cavity along the axis of the rotor. The node classification includes at least one channel classification perpendicular to the axis of rotation of the rotor, having in the direction of the axis of rotation of the first rotor outlet open into said cavity of the rotor, and a second outlet with a nozzle mounted thereon, which outlet diameter much smaller than the first outlet. The nozzle is connected with means to discharge the slurry larger fraction. Between the outputs of the channel formed in the inlet flow of slurry to polydispersed materials, wherein said inlet is connected with means for supplying suspension to the rotor inlet passage polydispersed materials formed in said node at an angle to the separation channel.

[0009] The method is performed as follows. In separating the inclined channel input channel is fed liquid flow polydispersed material (slurry flow polydispersed material) in the direction of the centrifugal force field with the specified flow rate. Due to the size of the outlet nozzle at the second output, which is considerably smaller than the first outlet, the second outlet flow resistance created by the hydraulic suspension. When this volume flow supplied to the slurry feed and the diameter of the separation channel of the set conditions of separation in the separation channel polydispersed feed material into two streams, the first of which the material of the particles of a given size under the influence of the liquid flow stream is withdrawn as a suspension in an opposite direction to the centrifugal force field through the first outlet and a second stream of particles that are larger than the specified, output in the direction of the centrifugal force field through the second exit along with the second fluid flow. To this end, form a liquid stream, which flows in a direction against the forces of the centrifugal field in such a way that its speed was at or near a predetermined speed of the particle size by the action of a centrifugal force field. In the rotor chamber (in the opposite direction to the centrifugal force field through the first outlet) of the liquid flow are carried particle velocity at which the centrifugal force is less than the fluid velocity in the separation channel. Particles whose speed exceeds the speed of flow in the channel of the separation zone located along the flow Qc <j, через форсунку. Thus, the speed of movement of particles under the influence of centrifugal force is determined by the formula:

$$V_{част} = \frac{d^2 \Delta \omega^2 R_{разд}}{18\mu}$$

Where $V4_{aCT}$- particle velocity, m/s;
d - particle diameter, m;
Δ - the difference in particle and fluid density, kg/m;
μ - liquid viscosity, Pa*s;
$R_{разд}$ a distance from the axis of rotation of the rotor to the entrance polydispersed suspensions material channel.

[0010] Feed slurry with particles of a predetermined size, stemming from the first outlet (first slurry flow) is supplied to the deposition chamber where it is isolated from a given material.

[0011] The liquid stream is separated from the material stream is combined with the slurry, which flows through the nozzle and recycled to the suspension tank with the source from which it is again supplied to the device for further classification of the classification. Thus, the initial slurry is circulated in the classification zone and out of the fine fraction of the powder is drawn, which is deposited in the rotor, namely, a deposition chamber in the rotor arranged on the separating assembly. Once the selection of the fine fraction of the suspension will be fully completed, the process is stopped and the rotor of the fine fraction is discharged. The remaining suspension without fines start again on separation in the other modes, and it is isolated from the next fraction of powder.

[0012] In the known method and apparatus polydispersed material may be divided into any number of fractions. However, the separation process is characterized by low productivity, since a complete separation of the starting material is carried out only for a few cycles of the passage of the slurry flow flowing from the nozzle as part of a predetermined particle size separation flows through the nozzle channel.

[0013] Volumetric flow rate flowing through the nozzle is constant and depends on the diameter of the nozzle, the magnitude of the centrifugal force and the magnitude of the fluid before the nozzle layer (this value is determined by the structural elements of the rotor). The volumetric flow rate and the fraction is adjusted depending on the desired size of the particles displaced by the. Typically flow rates of the two streams are similar in magnitude, i.e. approximately half the initial flow outwards out of the rotor together with small particles. Because of this need to return back to this stream classification for re-allocation of a fine fraction. For complete isolation requires 20-30 cycles, which significantly limits the performance of the known method and apparatus.

DISCLOSURE OF THE INVENTION

[0014] The present invention is to eliminate any particles the size of which is equal to or less than a predetermined, in a stream with a larger fraction arising from the labeling zone in the direction of action of centrifugal forces and, thus, provide for the passage of one cycle of the classification zone selection of a polydispersed source a predetermined size of the particulate material in order to increase the effectiveness of the method and device size classification polydispersed materials.

[0015] The problem is solved in that in the method of polydispersed size classification of materials in a liquid medium in a centrifugal force field generated in the labeling zone, formed along the direction of the centrifugal force. Wherein the method comprises feeding to the labeling zone polydispersed material in a fluid stream with a predetermined volume flow rate , establishing a classification zone effluent flowing in a direction against the action of the centrifugal field of forces at a speed close to the speed of movement of the material particles of a given size under the influence of the centrifugal field and including said particles of a predetermined material size , the output of said classification zone effluent stream in a direction against the action of the centrifugal force field , the output of the classification zone of the material particles which are larger than a predetermined , in the direction of the centrifugal force field , according to the present invention, the labeling zone at a portion located at the course of action of the centrifugal forces of the entrance of a polydispersed material is supplied with a given volumetric flow rate without material.

[0016] A liquid stream comprising a polydispersed particle material (supplied polydispersed suspension of the material), falling into the classification zone, under the influence of the additional net liquid flow is not split into two streams, as in the known solution, and is set against the direction of centrifugal force. Flow reversal occurs, including through the establishment of an additional liquid flow resistance at the outlet of the classification zone in the direction of the centrifugal forces. Under the action of liquid stream flowing in the direction against the forces of the centrifugal field with a velocity close to the speed of movement of the material particles of a given size, a predetermined particle size move along with the flow and the output from the labeling zone.

[0017] Thus, owing to the rotation of the feed stream against the direction of centrifugal force, material particles whose size is equal to or less than the predetermined without flow under pressure in the direction of the centrifugal force and thus substantially eliminates their penetration into the stream of particles that come out of the classification zone the direction of the centrifugal force.

[0018] Thus, polydispersed material supplied during one cycle, i.e. one passageway classification zone is produced almost complete separation of mother predetermined fraction in a fairly narrow range, which provides high efficiency of the proposed method.

[0019] Suitably, the feed stream of clean liquid, without material in the classification zone to form a first liquid stream flowing in a direction against the action of the centrifugal force field and the incoming downstream of the output stream and a second liquid stream flowing in the direction of the centrifugal force field at said first liquid stream is formed so that its speed was close to the speed of movement of the material particles of a given size under the influence of the centrifugal field, with said second liquid stream comprises particles of material which are larger than a predetermined size.

[0020] The first stream of clean liquid that flows in a direction against the centrifugal field affects the particles of a given size, displacing them towards the first exit. As a result, ingress of particles is eliminated, a predetermined size or smaller to the larger particle flow flowing in the direction of action of centrifugal forces.

[0021] Due to the fact that the first fluid stream flowing in a direction against the forces of the centrifugal field, it has a speed close to the speed of movement of the material particles of a given size, the combined output stream will also have a velocity close to the velocity of a given particle fraction, which provides a narrow range separation specify the material fractions, ie eliminates output particles of a given size in the direction of the centrifugal force field.

[0022] It is advisable that volumetric flow rates supplied to the zone classification of fluid flows with a polydispersed material and pure liquid, without material were determined from the condition:

$$Q\text{вх}+(Q\ \text{доб}-Q\text{ф})=Q\text{вых},$$

where

Q_{BX} - volumetric flow rate of the source liquid with polydispersed material fed into the classification zone,

$Q\ \text{доб}$ - - volumetric flow rate of material without (clear liquid) supplied to the classification zone;

$Q\ \text{ф}$-. - - Volumetric flow rate of the effluent through the second exit, including the material particles that are larger than the specified:

$Q\text{вых}$ - - volumetric flow rate of effluent flowing through the first outlet, the material comprising particles of a given size.

[0023] The authors found that the above mentioned volumetric flow ratio ensures that (or similar values), flow rate flowing in a direction against the action of a centrifugal force field to speed predetermined particle size by the action of a centrifugal field, namely, the combined output stream (feed fluid stream comprising particles the first material and the net flow of the liquid) and the first flow of clean liquid.

[0024] Advantageously, the liquid material without (clear liquid) supplied to the classification zone at a portion upstream of the action of centrifugal force at a distance from the entrance of the feed slurry polydispersed material. Thanks spacing inputs for feed streams provided by the formation of a laminar flow clean liquid that improves the efficiency of the separation.

[0025] Thus, for forming a laminar flow of said distance between the input filter is preferably not less than the diameter of the net flux of fluid flowing in the direction against the forces of the centrifugal field.

[0026] One way of implementing the method is to create zones in the classifying rotor in the form of a channel arranged perpendicular to the axis of rotor rotation and having arranged in series along the centrifugal force the first and second outputs and between the first inlet for supplying a flow of polydispersed liquid material and a second input for feeding unflavoured material disposed proximate to the second exit. Thus, the second outlet orifice creates a smaller diameter than the first.

[0027] To ensure equal flow rates, current in a direction against the forces of the centrifugal field, it is advantageous for the channel portion to the second output of the first carry input of smaller diameter than the first section of the channel from the inlet to the first outlet.

[0028] Advantageously, the length of the narrow portion of the channel to perform at least the diameter of the narrow channel and higher. It is necessary to calm the flow velocities of the moving parts on the channel and the equalization of the cross section.

[0029] The task is also solved in that a device for classifying a polydispersed materials in a liquid medium containing a hollow shaft with an axis of rotation and in the form of a cylindrical vessel, means for supplying to the rotor of polydispersed materials in the fluid stream, a first fluid outlet means with particles of a predetermined size, the second fluid outlet means with particles of larger size, and installed in the rotor assembly to form a classifying rotor in the cavity along its axis of rotation, connected to said first discharge means comprising at least one channel classification perpendicular to the axis of rotation of the rotor, having in the direction of the axis of rotation of the first rotor outlet open into said cavity of the rotor, and a second output coupled to said second discharge means, while the second exit orifice is less than the flow section of the first outlet to create the hydraulic resistance to fluid flow at the second output, a first input for supplying a polydispersed materials in the fluid stream, bred between said output and connected to said means for supplying to the rotor polydispersed materials according to the present invention, the classification channel is formed for supplying a second input to a liquid located for the first input in a direction from the rotational axis of the rotor and connected to means for supplying said liquid to the rotor.

[0030] Having a second entry allows you to enter the channel classification additional flow of liquid without suspension (pure liquid) and thus improve the accuracy and efficiency of the separation on the specified fractions of a polydispersed material.

[0031] It is advisable that the classification unit comprises a first and second input channels, respectively connecting the first second inputs to the respective supply means, said input channels are preferably made inclined classification channel towards the second exit.

[0032] Sloping channels provide input to the zone classification feed streams under the action of the centrifugal field.

[0033] Advantageously, the device comprises two or more of the classification channels. Large number of channels to improve performance of the device.

[0034] The number of channels in the device defined by the structural features of the device, in particular, the number of channels depends on the dimensions of the device and the desired slurry streams, i.e. the volumes of polydispersed suspension of processed material.

[0035] The variant of the device, according to which the rotor of the separating unit has performed the deposition chamber.

[0036] Such a variant of the device can be used for the separation of small amounts of material by volume, for example research.

[0037] In what follows the invention is expected to be disclosed in more detail by examples with reference to the drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0038]

Fig. 1 is a schematic diagram of the method
Fig. 2 - shows a diagram of the embodiment of the method
Fig. 3 - shows schematically the device size classification of polydispersed materials
FIG. 4 - shows a schematic embodiment of a device classification polydispersed materials

DETAILED DESCRIPTION OF THE INVENTION

[0039] Size classification method polydispersed materials preferred embodiment shown in FIG. 1, as follows. In the field of centrifugal force, along the direction of these forces creates classification zone 1 (Fig. 1), for example in the form of a channel in the rotor, perpendicular to the axis of rotation of the rotor. Classification Area 1 is sequentially arranged along the first centrifugal force output 2 for the selected output stream pictures predetermined fraction i.e. the particles whose size lies within a predetermined range (the first stream of slurry) and a second outlet 3 for material flow to the particles whose size more specified. Between these a first input-output 4 is for supplying liquid feed stream with poly-dispersed material and a second input 5 for supplying a liquid material without (clear liquid).

[0040] When the first and second inputs 4 and 5 are spaced relative to each other along the length of the labeling zone 1, a second input 5 is located near the second output 3.

[0041] The second outlet 3 create hydraulic flow resistance of the fluid flowing out by centrifugal force, for example by creating second outlet passage section 3 significantly smaller compared to the first flow section 2 and the width of the exit zone 1 classification. In the field of action of the centrifugal forces in the labeling zone simultaneously supplied two streams: 5 through the second input is fed with a predetermined volume flow ›п., fluid flow 6 without material (clean fluid) through the first inlet 4 is supplied with a specified volumetric flow rate Q_{BX} 7 fluid feedstream with polydispersed material (hereinafter referred to as "initial poly-dispersed slurry material).

[0042] The establishment of a hydraulic resistance at the outlet 3 a second stream of pure liquid in classification zone divided into two flows: 8, a first stream which flows in the opposite direction to the centrifugal force, and a second stream 9 - in the direction of action of these forces.

[0043] Under the influence of a first flow of clean liquid 8, the liquid feed stream 7 supplied with polydispersed material into zone 1 of classification takes place by combining the first flow of clean liquid 8 forms the output stream 10, which flows in a direction opposite to the forces of the centrifugal field, and output classification of areas through the first outlet 2.

[0044] Thus, a polydispersed particle material on the zone classification centrifugal force and the pressure outlet flow of the first stream 10 and 8 clean liquid that flows in the opposite direction to the centrifugal forces.

[0045] To ensure isolation of the desired starting material fraction of a polydispersed form a combined output stream 10 and stream 8 flowing in the direction against the forces of the centrifugal field, so that their speeds were close to the speed of movement of particles of a given size under the influence of the centrifugal field.

[0046] Material particles, the velocity at which the centrifugal force is less than the velocity of the combined output stream 10 and stream 8 liquid medium move under the influence of the flow in the direction against the forces of the centrifugal field, along with the stream, and they are displaced from the labeling zone through the first outlet 2 . Material particles, the velocity at which the centrifugal force exceeds the velocity of the combined output stream 10 and stream 8 moving under the influence of centrifugal forces in the direction of the second output 3 and output from the labeling zone through said second outlet 3, together with stream 9.

[0047] As a result, three zone classification formed slurry flow of material: a first combined output stream 10 and stream 8 with a predetermined fraction of the selected material, the current field against the centrifugal forces arising, and through the first outlet 2 and the third slurry stream (stream 9 of liquid with particulate material, dimensions are larger than the specified), the current in the direction of the centrifugal force field and flowing through the second exit 3.

[0048] Specifying, in particular, the angular velocity zone classification, i.e. a certain level of centrifugal force and the diameter of zone 1 classification, which in turn define the flow rate of the output 10 in zone 1 classification, provide dimensional classification poly particulate starting material, namely, selection of a polydispersed particle material with the size of the material in a predetermined range.

[0049] Due to the fact that the original fluid flow with a polydispersed material getting into the zone classification is not split into two streams, as in the prototype, and unfolds under the action of 8 pure liquid formed by the hydraulic resistance of the nozzle of the second output is virtually eliminated small particles (within a predetermined range) a stream of particles that move under the centrifugal force and discharged with the flow 9 of liquid through the second outlet 3.

[0050] Wherein the first thread 8 of the clean fluid displaces the labeling zone 1 to exit the first material particles 2, which is less than a predetermined size and which fall within the stream larger particles, for example, by dispersion or sticking to the larger particles.

[0051] Thus, the labeling zone feed polydispersed material during one cycle, i.e. one pass classification zone is allocated to all the material particles of a given size.

[0052] For more efficient size classification of forming a first stream of clean liquid, which flows in a direction against the centrifugal force, so that its speed was close to the speed of movement of particles of a given size under the action of a centrifugal field, so that the combined output flow rate was close to 10 speed of motion of particles of a given size under the influence of the centrifugal field.

[0053] To ensure equal flow velocities of the liquid 8 flowing against the action of centrifugal force and the combined output flow 10, volumetric flow rates of input streams 6 and 7, supplied to the classification zone 1 via first and second inputs 4 and 5, respectively, and output volumetric flow rates of streams 10 and 9 through the first and second outputs 2 and 3 are determined from the condition:

$$Q_{вх} + (Q_{доб} - Q_{ф}) = Q_{вых}$$

where:

Q_{BX} - the volumetric flow rate of the liquid feed stream 7 with polydispersed material fed through the first inlet 4,

$Q_{доб}$- volumetric flow rate of 6 clean liquid supplied through the second inlet 5;

Qф - volumetric flow rate of liquid 9 from the material particles (the second slurry flow) flowing through the second Output 3:

Qвых, - volumetric flow rate of effluent liquid material 10 separated fraction (first slurry flow) flowing through the second exit:

[0054] The most simple and manufacturable method of forming such a flow, as shown in FIG. 1, threading of different diameters that provided, for example, 1-division classifying zone into two Parts 1 1 and 12 of different diameters, namely, execution of the classification zone 2 (or the labeling of the channel) in the region of 3 to the second output of the first input 4 of a smaller diameter than the diameter of portion 11 of zone 1 Classification (channel) on the site of the first input of the first 4 to output 2.

[0055] At the same volumetric flow rate of the pure liquid is determined from the condition:

$$Q_{доб} = Q_ф + Q_{вых} ? d^2/D^2$$

where d - diameter of the narrow portion 12 of zone 1 classification,

D - diameter of the wide portion 11 of the labeling zone 1.

[0056] Preferably, the narrow diameter portion 12 to receive 1.4 - 4.5 times smaller than the diameter of the wide portion 11, which reduces the consumption of clean liquid (stream 8), in 2 - 20 times as compared with the flow 10 in the wide portion 11 (on the basis of the conditions equal flow rates of 10 and 8 in the wide and narrow portions 11 and 12, respectively, the area classification) and 5-50% of the flow rate in the wide part 10.

[0057] And possibly other parts of the area ratio of the diameters of the labeling, wherein the volumetric flow rate of liquid into 8 clean narrow channel portion 12 0.1% to 99.9% of the volumetric flow rate in the wide part 10 of the channel.

[0058] The authors found that the lower the percentage of the volume flow in the narrow part, the better the performance, but there is a possibility of creating an excess concentration of the slurry in the narrow channel portion 11, resulting in clogging at the second outlet 3.

[0059] Therefore, these parameters are selected by the known calculation and/or empirically based on the particular conditions of separating suspension, in particular depending on the type of material, concentration of the form of the integral curve of the particle size distribution of the initial suspension, which determines the ratio of small and large fractions on the border of separation.

[0060] To ensure laminar flow of liquid in classification zone 12, the length of the narrow part of the channel is set equal to or greater than its diameter.

[0061] Due to the labeling zone in alignment velocity clean liquid 8 flows (flow in a narrow channel portion 12) and the output stream of different diameters, all of the particles together with a predetermined fraction of the output stream of fluid flow from the labeling zone through the first outlet 2, which enables separation of the material in a sufficiently polydispersed narrow range. As stated earlier, the rate of flow of fluid in the zone division classification determines the diameter of the particles. When different volumetric flow rate of flow stream in the wide and narrow portions 11 and 12 respectively, are identical. Since flow rates of 10 and 8 in the narrow and wide parts of the channel are the same, all particles are in both parts 12 and 11 are in the same channel conditions, and accordingly, the particle diameter is less than the separation of the two parts moving in a channel inside the rotor against the action of centrifugal forces, f larger particles move out of the rotor by centrifugal force direction. If the narrow channel portion 12 gets smaller particles, for example by diffusion, adhesion is not larger particles, it will be expelled from the channel 8 into the rotor stream of clean liquid.

[0062] Possibly, the process of the classification zone without separation not honor different diameters, as shown in Fig. 2. It is preferred that the volume flow supplied substantially pure liquid 6 does not exceed 9 volume flow through the second flow outlet 3. In this case, fed into the classification zone of clean hydraulic fluid 6 creates the second output resistance is not 3, which reverses the original liquid stream 7 is fed via a first input with polydispersed material 4 in the direction against the effect of centrifugal forces. As a result, the classification zone is formed in the combined fluid output flow 10 flowing in a direction against the action of a centrifugal force field. Subject to the condition of equality of speeds liquid stream 10 flowing in a direction against the forces of the centrifugal field and the velocity of particles of a given size under the influence of the centrifugal field (or close enough velocity values) provided by the material selection of polydispersed particles of a predetermined size. Thus due to the fact that the fluid feed stream 7 is set, the number of fine particles discharged through the second outlet 3, is insignificant, there are a predetermined fraction of the material selection of the material is polydispersed in one cycle (one passageway classification zone).

[0063] This option can be used with understated quality requirements for separation and limited overall dimensions node separation.

[0064] In some cases, the device constructive second input can be rasplozhen almost immediately after the first entrance.

[0065] If such delivery is possible both in the separation zone classification honor of different diameter and uniform tech zone classification.

[0066] This option can be used in more understated quality requirements for separation and limited overall dimensions node classification.

[0067] Specific parameters of the classification zone, and e is the diameters of the input and output openings, the diameter of the classification channel, the ratio of the diameters of the narrow and wide parts, the speed of rotation of the labeling zone (the level of the centrifugal force) depend on many factors, including those on the desired performance of the separation process polydispersed material, of polydispersed material structural features of the device classification. Zone classification parameters can be calculated from the known mathematical dependences iterative method.

[0068] At Fig. 3 shown preferred embodiments of an apparatus for classifying polydispersed materials. Device shown at Fig. 1 comprises a hollow shaft 1 with the rotation axis 2, embodied in the form of a cylindrical vessel, means 3 to the rotor feeding polydispersed liquid material (slurry polydispersed material) directed means 4 to the rotor, without the fluid material (clear liquid), the liquid outlet means 5 with material particles of a given size (suspensions and the fraction of a given size), the means 6 for discharging the liquid material with the particles whose size is greater than a predetermined (slurry a coarse fraction). In the cavity of the rotor assembly 1 is mounted 7 classification as a body of revolution.

[0069] Outside walls 7 classifying node adjacent to the inner cylinder wall of the rotor 1, the inner cavity 8 is formed along the axis of rotation of the rotor combined with the rotor cavity. Classifying unit 7 comprises at least one channel classification 71, two perpendicular axes of rotation of the rotor 1. Channel 71 has a first direction of rotation of the rotor output axis 72, open into the cavity 8 of the rotor 1, and a second outlet 73, aligned with the hole in the rotor, and for example, cross member 6 connected to drain slurry from the rotor with a larger fraction located between them a first input 74 for supplying slurry materials polydispersed and a second input 75 for the supply of clean liquid (without material) downstream of the action of the centrifugal forces is not spaced from the first entrance 74, preferably about 73 second outlet channel 71. A second output channel 73 is provided with means 71 to provide a reduction of its diameter, e.g., nozzle set, for example, in the hole wall of the rotor.

[0070] In some cases, structural embodiment second input device 75 may be located almost immediately after the first input 74. For example, such an implementation may be advantageous for low requirements to the parameters of separation, and the limited dimensions of the node classification.

[0071] The diameter 72 of the first exit channel 71 is a value interrelated with a volumetric flow $Q_{вых}$, combined output flow with a suspension of 9 selected pictures (the first stream of slurry), which in turn is defined by a capacity of the device.

$$Q_{вых} = V_{част} \cdot S_{к}$$

where $V_{част}$ - particle velocity in the channel 71 classification under the influence of a centrifugal field of the rotor, m/s,

S_x - sectional area 72 of the first exit channel 71 classification.

$$S_к = \pi \frac{D^2}{4}$$

where,

D - diameter of the first output 72 channel 71 classification.

[0072] Thus, the speed of movement of particles under the influence of the centrifugal field of the rotor rotation can be determined by the formula:

$$V_{част} = \frac{d^2 \Delta \omega^2 R_{разд}}{18\mu}$$

wherein $V_{част}$ - particle velocity, m/s;
d - diameter of the particle, m;
Δ - the density difference of the particles and the liquid, kg / m^3;
μ - viscosity of the fluid in Pa .s;
ω - the angular velocity of rotation of the rotor s^{-1}

$R_{разд}$ - the distance from the axis of rotation of the rotor 2 to the first input 74 channel 71.

[0073] The hole diameter at the second output 73 is one of factors that determine the volumetric flow rate of the liquid medium $Q_{Ф}$ (a second stream 11 of the slurry with particles of larger size than the defined range) g flowing through the second outlet 73 (the nozzle). Bore holes 73 on the second output and the second volumetric flow rate $Q_{Ф}$ slurry through nozzle 11 can be calculated by the following relationship

$$Q_{\Phi} = \frac{1}{4}\mu_{\Phi}\pi d_{\Phi}^{2}\,\omega\sqrt{(R^{2} - r^{2})}$$

where

$Q_{Ф}$ - volumetric flow of the second slurry stream 11 through the second outlet 73 m^3 / s;
μψ - constriction ratio at the second outlet openings 73 (nozzle constriction);
d - diameter second outlet openings 73, m;
ω - angular velocity of rotation of the rotor, s^{-1}
R - the distance from the axis of rotation of the rotor 2 to the second outlet channel 71 classification 73 (outer radius of the liquid column in the rotor), m;
r - distance from the rotor rotation axis 72 to the first exit classification channel 71 (inner radius of the fluid column in the rotor), m;
Channel 7 classifying unit 71 is divided into two parts 711 and 712 of different diameters. The wider portion 711 is disposed between the first outlet 72 and the first input 74. For the first input 72 is narrowest part 712 of the channel 71. 713 transition between parts 711 and 712 are preferably tapered to perform.

[0074] The cone-shaped transition from the wide portion 711 to a narrow portion 712 prevents the deposition of coarser particles moving to the second outlet at the wall of the cone. The transition between the parts can be staged. At the same time on the interface will precipitate large particles of material that will form a streamlined surface. However, in this case, the possible separation of the large particle material which may close the nozzle.

[0075] The diameters of the wide and narrow portions 711 and 712 define a channel 71 from the condition that the flow rates in the wide and narrow portions 711 and 712 channel 71.

[0076] The length of the narrow part of the channel 712 is not less than 71 and preferably greater than its diameter to provide a laminar flow of fluid therein. The total length of the channel 71 classification should be minimal, as it allows the design to reduce the ratio of the centrifugal forces on the ground and second outputs.

[0077] Possible embodiment of the device with a channel classification same diameter over the entire length (not shown). Such a device may be used with low quality requirements separation and limited dimensions of the labeling unit. Maybe use tapered channel to compensate for changes in the centrifugal forces along the channel.

[0078] The first and second inlets 74 and 75 may have a circular shape as well as another example, in the form of slits. Wherein the first inlet 74 to be at the boundary of the narrow and wide portions 711 and 712 channels.

[0079] Furthermore, the labeling assembly 7 comprises a first inlet duct 76, formed in said unit 7 at an angle to the channel 71 (in a direction toward the second outlet) and connected to the first input channel 71 and 74 with the means 3 for supplying the feed slurry to the rotor polydispersed material, a second input channel 77 formed in said unit 7 at an angle to the channel 71 (in a direction toward the second outlet), and connected to a second input channel 71 and 75 with means 4 for supplying clean liquid to the rotor.

[0080] Any possible, within 90 °, tilt angle of the input channels, wherein said angle is selected from structural considerations.

[0081] Did not sloping execution unit input channels, for example, by performing the labeling of the cavities in the node connected to the channel classification. Especially, this is possible to enter the pure liquid, however, for slurry flow will require special measures to avoid stagnant zones along the flow path, in which material can accumulate and interfere with the flow.

[0082] As the means 3, 4 (shown in phantom) for supplying a suspension to the rotor 1 polydispersed materials and pure liquid may be used well-known structures, such as nozzles.

[0083] Means 5, 6 (shown in phantom) O suspensions are channels through which the slurry flows by gravity by centrifugal force.

[0084] The slurry accumulates in compendiums and pumped further known methods into the device for further processing.

[0085] Possible to perform the labeling assembly 7 with more than one channel 71 classification, e.g., 2 or more such channels with the input channels, means connected with the drain of output streams and means for supplying a clean liquid and slurry

[0086] Source fluid flow with a polydispersed material (initial suspension of polydispersed material) that you want to divide into factions, through the medium of the slurry supply 3 polydispersed material is supplied with a given volume flow $Q_{BX\,B}$ in first angle input channel 76. Due to the action of centrifugal force the slurry through the first source inlet (first orifice) 74 to passage 71 goes classification in the broad part 711.

[0087] Since the second exit orifice 73 (outlet nozzle diameter) is less than the diameter of the narrowest part of the channel 712, the second outlet 73 creates a resistance to the incoming flow of hydraulic fluid, clean fluid flow is split into two streams, one of which, the first fluid stream 10 flowing in a direction opposite to the centrifugal force, and the second - in the direction of action of these forces.

[0088] Established on the second output 73 and the first hydraulic resistance of a pure liquid stream 10, which flows through the narrow channel portion 71 in the 712 opposite direction to the centrifugal force, expands the original liquid stream fed to the polydispersed material through the first inlet 74 and is combined with them to form a combined output flow, the first outlet slurry stream 9 which carries a first output 72 of a given size of particles of matter.

[0089] Volumetric flow rates Q_{BX} and Qдоб are respectively supplied to the liquid channel 71 from the source material and polydispersed clean fluid and the rate of rotation of the rotor, depending on the structural characteristics of the device (the channel in the wide and narrow portions, the inner and outer post rotor fluid) is selected so that the current velocity in the direction against the forces of the centrifugal field of fluid flow in narrow and wide parts of the channel 711 and 712 are close to the velocity of the material particles of a given size under the influence of the centrifugal field.

[0090] As a result, particles of a given size, the speed of which is equal to or less than the flow rate of the current against the action of centrifugal forces, said output flow from the labeling zone.

[0091] Thus, liquid stream 10, which flows into the narrow portion 712 the channel 71 displaces the narrow part of said predetermined size of all the particles and smaller, which fall back from the widest part of the channel, for example by diffusion or sticking to the larger particles. In the construction of the device shown in FIG. 3, the flow of suspension with a selected fraction outlet 5 by means of the output device in the deposition of a special device where the separation is made from a liquid material, for example, in the known self discharged centrifuges, the choice of which depends on the type and size of the partial material precipitable fraction.

[0092] In the construction of the device shown in FIG. 4, the flow of the slurry and the fraction flagged located in the rotor hub on the classification, the deposition chamber 12, which is produced by a known method of material separation from the liquid. Further material is removed from a dedicated device. Particles larger than a predetermined diameter by centrifugal force pass through the first fluid flow and with the second liquid stream (second stream to form slurry) extend outwardly through the nozzle.

[0093] Thus, polydispersed material fed into the channel 71 as the slurry is completely divided into predetermined fractions in a single pass through the classifying node.

[0094] Following are examples of calculating the parameters of a polydispersed material separation

Example 1.

[0095] Dimensioning separating slurry into two portions along the edge 10 microns. ie at -10 micron fines fraction and a coarse fraction 10 microns.

Calculation of the conditions hold:

[0096] The diameter of the broad part of the channel is assumed equal to D = 0.01 m (10 mm)

[0097] The diameter of the narrow part of the channel is assumed equal d=0.003 m (3 mm)

[0098] Accept the volumetric flow rate of fluid flowing through the first and the resulting channel output and the wide part of the channel

$$Q_{вых} = 15 cm^3 / s$$

[0099] Distance from the axis of rotation of the rotor to the interface of wide and narrow parts take equal $R_{разд} = 0.035$ distance from the axis of rotation to the location of the nozzle, which implies the second slurry flow at a flow rate $Q_{ф}$, taken as equal to R = 0.05 m inner radius of the liquid column (the distance from the axis of rotation to the first output channel, which implies the first slurry flow at a flow rate Q_{BbIT} was taken to be r = 0.025 m Volumetric flow rate of the second slurry stream flowing through the outlet nozzle was assumed to equal Q = 12 cm^3 / s

[0100] Initial conditions taken on the basis of a priori data. Calculation method is iterative.

[0101] For proper operation of the classification channel requires that the rate of current flow opposite to the narrow channel effect of the centrifugal forces $(Q_{доб} - Q_{ф})$ is equal to the velocity of the combined stream into a wide channel $Q_{вх} + (Q_{доб} - Q_{ф}) = Q_{вых})$.

Calculated:

Rotor speed

[0102] The volumetric flow of clean liquid $Q_{доп}$ fed into the channel through the second inlet nozzle outlet diameter $d_{ф}$

[0103] Flow volume of the initial suspension Q_{BX}, fed in through the first inlet channel

[0104] The speed of rotor rotation is calculated from the condition that the velocity of air flow in the wide portion of the duct inwardly of the rotor speed is 10 micron particles outwardly of the rotor due to centrifugal forces in a wide part of the channel $(R_{разд})$.

$$V_{потока} = V_{част}$$

$$4\frac{Q_{вых}}{\pi D^2} = \frac{d_{част}^{2} \Delta \omega^2 R_{разд}}{18\mu}$$

where $V_{част}$ - -particle velocity, m/s;
d - diameter of the particle, m;
Δ - the density difference of the particles and the liquid, kg/m^3;
μ - viscosity of the fluid in Pa .s,
ω - angular velocity of rotation of the rotor, s-1

$Q_{вых}$ - volumetric flow rate (the first slurry stream) flowing wide part of the channel and flowing through the first outlet channel;

$R_{разд}$ - distance from the axis of rotation of the rotor to interface the wide and narrow parts

[0105] Rearrangement of this formula and substituting the values of the parameters we obtain:

$$\omega = 200 \text{ rad / s},$$

where

$$n_{\omega} = \cdot 60/2\ \pi = 1909 \text{ rev/min.}$$

$$Q_{\text{доп}} = Q_{\text{выт}} + Q_{\text{ф}}$$

$$Q_{\text{выт}} = Q_{\text{вых}} \cdot d^2 / D^2 = 15 \cdot 0.09 = 1.35 \ \text{см}^3/\text{s}$$

where

d - diameter of the narrowest part of the channel,
D-diameter of the widest part of the channel.

[0106] Calculate the output nozzle diameter (diameter of the second output) formula

$$Q_{\text{вых}} = Q_{\text{вх}} + Q\ _{\text{выт}} = V_{\text{част}} \cdot S_{\text{к}}$$

$$Q_{\text{доп}} = Q_{\text{выт}} + Q_{\text{ф}} = 1{,}35 + 12 = 13{,}35 \ \text{см}\ ^3/\text{s}$$

$$d_{\phi} = \sqrt{\frac{4Q_{\phi}}{\mu_{\phi}\pi\omega\sqrt{(R^2 - r^2)}}}$$

[0107] Where

d^{Φ} = 1, 48mm
Next, calculate the volumetric flow rate of the initial suspension:

$$QBX = Q_{\text{вх}}$$

$$= Q_{\text{вых}} - Q_{\text{выт}} = 15 - 1.35 = 13{,}65 \ \text{см}3/\text{s},$$

,

[0108] Thus, we obtain:

- n = 1 909 rev / min;
- d = 1,48 mm;
- Q_{BX}=13,65 CM^3/S;

Example 2.

[0109]

- Dimensioning polydispersed material separation into two portions of the border 5 microns. ie at -5 micron fines fraction and a large 5 microns fraction.

[0110] Calculation of the conditions hold:

- The diameter of the broad part of the channel is assumed equal to D = 0.01 m (10 mm)

- The diameter of the narrow part of the channel is assumed equal to d = 0.003 m (3 mm)

0. Accept the volumetric flow rate of fluid flowing through the first and the resulting channel output and the wide part of the channel Qвых= 15cm/s

1. Distance from the axis of rotation of the rotor to the interface of wide and narrow parts take equal Rразд=0.035 = 0.035 m

2. The distance from the axis of rotation to the location of the nozzle which implies that the second slurry stream to volumetric flow rate $Q^{ф}$ taken as equal to R = 0.05 m

[0111] Inner radius of the liquid column (the distance from the axis of rotation to the first output channel, which implies the first thread suspension at a flow rate Q_{BbIT}) was assumed to equal r = 0.025 m

[0112] Volumetric flow rate of the second slurry stream flowing through the outlet nozzle was assumed to equal Q=12 CM^3/S.

[0113] Initial conditions taken on the basis of a priori data.

Calculation method is iterative.

[0114] For proper operation of the classification channel is required, the flow rate flowing in the opposite narrow channel the action of centrifugal forces (Qдо б-Qф) was equal to the velocity of the combined stream into a wide channel (Qвх +(Qдоб-Qф)=Qвых)

Calculation:

Rotor speed

[0115] The volumetric flow of clean liquid Qдоп, fed into the channel through the second inlet nozzle outlet diameter $d^{ф}$

[0116] Flow volume of the initial suspension Q_{BX},, fed in through the first inlet channel

[0117] The speed of rotor rotation is calculated from the condition that the velocity of air flow in the wide portion of the duct inwardly of the rotor speed is

[0118] 5 micron particle movement outwardly of the rotor due to centrifugal forces in the wider part of the channel (Rразд).

$$V_{потока}=V_{част}$$

$$4\frac{Q_{вых}}{\pi D^2}=\frac{d_{част}{}^2\Delta\omega^2 R_{разд}}{18\mu}$$

wherein

Vчаст- particle velocity, m / s;

d - diameter of the particle, m;

Δ - the density difference of the particles and the liquid, kg / m;

[0215] μ - viscosity of the fluid in Pa "s;
ω - angular velocity of rotation of the rotor, s^{-1}

Qвых - volumetric flow rate (the first flow of the suspension), the current across the widest part of the channel and flowing through the first outlet channel;
Section - the distance from the axis of rotation of the rotor to the interface of wide and narrow parts

[0119] Rearrangement of this formula and substituting the values of the parameters we obtain:

$$\omega = 400 \text{ rad / s},$$

where

$$\eta = \omega * 60/2\pi = 3818 \text{ rev / min}$$

[0120] Next, calculate Qдоп

$$Q_{доп}=Q_{выт}+Q_{ф}$$

$$Q_{выт}=Q_{вых}\cdot d2 / D2=15\cdot 0.09=0,92 \text{ см}^3/s$$

where d - diameter of the narrowest part of the channel,
D-diameter of the widest part of the channel.

$$Q_{вых}=Q_{вх}+Q_{выт}=V_{част}\cdot S_{к}$$

$$Q_{доп}=Q_{выт}+Q_{ф}=1,35+12=13,35 \text{ см}^3/s$$

[0121] Calculate the diameter of the outlet nozzle (the diameter of the second output) from the formula

$$d_{ф}=1 \text{ mm}$$

[0122] Next expect the volume flow of the initial suspension:

$$Q_{вх}=Q_{вых}-Q_{выт}=15-1.35=13,65 \text{ cm}^3/s$$

[0123] Thus, we obtain: n=3818 об/минrev/min

$$Q_{доп}=13,35 \text{ cm}^3/s$$

$$d_{ф}=1 \text{ mm}$$

$$. Q_{вх}=13,65^3 \text{ cm/s}$$

EXAMPLE 3.

[0124] 203. Dimensioning polydispersed material separating into two portions at the border 1 micron. ie on the fine fraction -10 microns and coarse fraction 10 microns.

Calculation of the conditions hold:

[0125] The diameter of the broad part of the channel is assumed equal to D = 0.02 m (20 mm)
[0126] The diameter of the narrow part of the channel is assumed equal to d = 0.007 m (7 mm)
[0127] Accept the volumetric flow rate of fluid flowing through the first and the resulting channel output and the wide part of the channel $Q_{вых}=7.5\ cm^3/s$
[0128] Distance from the axis of rotation of the rotor to the interface of wide and narrow parts take equal

$R_{разд}=0.035m$

[0129] The distance from the axis of rotation to the location of the nozzle 30, from which it follows a second slurry stream to volumetric flow rate $Q^{ф}$ was taken to be R = 0.05 m
[0130] The inner radius of the fluid column (distance from the axis of rotation to the first outlet channel, which implies the first slurry flow at a flow rate $Q_{выт}$')) was taken to be r = 0.025 m

- The volumetric flow of the second slurry stream flowing through the outlet nozzle 5 becomes equal to $Q^{ф}$ =12 cm/s

[0131] Initial conditions taken on the basis of a priori data.
[0132] Calculation method is iterative.
[0133] For proper operation of the classification channel is required, the flow rate flowing in the opposite narrow channel the centrifugal forces $(Q_{доб}-Q_{ф})$)) is equal to the combined flow rate in a wide channel $((Q_{вх}+(Q_{доб}-Q_{ф})=Q_{вых})$.

Calculating

Speed rotor

[0134] Volumetric flow of clean liquid $Q_{доп}$ fed into the channel through the second input

Diameter of the outlet nozzle $d^{ф}$
[0135] Flow volume of the initial suspension QBX, fed in through the first inlet channel
[0136] The speed of rotor rotation is calculated from the condition that the velocity of air flow in the wide portion of the duct inwardly of the rotor speed is 10 micron particle movement outwardly of the rotor due to centrifugal forces in the widest part of the channel $(R_{разд})$.

$$V_{потока}=V_{част}$$

$$4\frac{Q_{вых}}{\pi D^2}=\frac{d_{част}{}^2\Delta\omega^2 R_{разд}}{18\mu}$$

wherein

Vчаст- particle velocity in m/s;
d - diameter of the particle, m;
Δ - the difference in particle and fluid density, kg/m3;
μ - viscosity Pa s;
ω - the angular velocity of rotation of the rotor, s^{-1}
Q_{BbIX} - volumetric flow rate (the first slurry stream) flowing wide part of the channel and flowing through the first outlet channel;

Rразд - distance from the axis of rotation of the rotor to interface the wide and narrow parts

[0137] Rearrangement of this formula and substituting the values of the parameters we obtain w = 700 rad/ s,where

[0272] n=ω.60/2π=6680 rev/min

[0138] Now Q доп is calculated

Qдоп=Qвыт+Q ф

Qвыт=Qвых·d 2/D2=15·0.09=0.92

where

d - diameter of the narrowest part of the channel,
D-diameter of the widest part of the channel.

Q_{BBIX}-Q_{BX} Q_{BBIT}-V_{freq} * S_K

Qдоп=Qвыт+Qф=0.92+12=12,92 cm³/s

[0139] Calculate the output nozzle diameter (diameter of the second output) formula

$$d_{\phi} = \sqrt{\frac{4Q_{\phi}}{\mu_{\phi}\pi\omega\sqrt{(R^2 - r^2)}}}$$

[0140] Whence

dф=0.8 = 0.8mm

the volume flow of the initial suspension:

Qвх=Qвых-Q выт=15-0.92=14.08 cm³/s

[0141] Thus, we obtain:

$$n = 6680 \text{ rev / min}$$

$$Q_{доп} = 12.92 cm^3 / s$$

$$Q_{вх} = 0.8mm$$

$$Q_{BX} = 14.08 \text{ cm3 / s}$$

Claims

1. Size classification method polydisperse materials in a liquid medium in a centrifugal force field generated in the labeling zone, defined along the direction of action of centrifugal force, wherein the method comprises feeding to the zone classification polydispersed material in a fluid stream with a predetermined volume flow rate, establishing a classification zone effluent, flowing in the direction against the action of the centrifugal field of forces at a speed close to the speed of movement of the material particles of a given size under the influence of the centrifugal field, and particles comprising a predetermined material size, the output of the band classifying said first output flow direction against the action of a centrifugal force field, the output of the classification zone of the material particles which are larger than a predetermined, in the direction of the centrifugal force field, **characterized in that** the labeling zone at a portion downstream rasplozhennaya centrifugal force at the entrance polydisperse material is fed with a given volumetric flow rate without material.

2. A method according to claim 1, **characterized in that** classification of area of liquid feed stream of material, without forming a first liquid flow flowing in a direction against the action of the centrifugal field of forces at a speed close to the speed of movement of the material particles of a given size under the influence of the centrifugal field and the incoming downstream of the output stream and a second liquid stream flowing in the direction of a centrifugal force field and comprising particulate material larger than a predetermined size.

3. A method according to claim 1, **characterized in that** the output material flow to the particles whose size is less than those specified, the suspension forms a first stream flowing through the first outlet, said second fluid flow with the particles of material which are larger than those specified, the suspension forms a second flow flowing through another exit.

4. A method according to claim 1, **characterized in that** the volumetric flow rates supplied to the classification zone with a liquid material and a liquid polydispersed material is determined without the conditions of:

$$Q_{вх} + (Q_{доб} - Q_{ф}) = Q_{вых},$$

, where:

$Q_{вх}$ - ' volumetric flow rate with polydispersed material supplied to the classification zone;

$Q_{доб}$ - approved - the volumetric flow rate of fluid without material fed into the classification zone;

$Q_{ф}$.- ' volumetric flow of the effluent through the second outlet;

$Q_{вых}$ - volumetric flow rate of effluent flowing through the first outlet

5. A method according to claim 1, **characterized in that** said first stream of clean liquid that flows in a direction against the forces of the centrifugal field, is formed of a smaller diameter than the diameter of said output current flowing in the same direction from the fluid inlet to the poly particulate material.

6. A method according to claim 1, **characterized in that** the classification zone in the rotor, creating a channel disposed

perpendicularly to the axis of rotor rotation and having arranged in series along the centrifugal force the first and second outputs and between the first inlet for supplying liquid material and a second multisize input feed liquid without material arranged proximate to the second exit.

7. A method according to claim 6, **characterized in that** the second outlet orifice creates a smaller diameter than the first.

8. A method according to claim 6, **characterized in that** the channel section from the second output to the first input configured smaller diameter than the first section of the channel from the inlet to the first outlet.

9. A method according to claim 6, **characterized in that** the length of the narrowest part of the channel is set to be the diameter for providing a laminar flow of fluid therein.

10. Device for the labeling of polydisperse materials in a liquid medium, comprising a hollow rotor axis of rotation and in the form of a cylindrical vessel, means for supplying to the rotor polydisperse materials in the fluid stream, the labeling unit mounted in the rotor with the formationeat a cavity in the rotor along its axis of rotation, comprising at least one channel classification perpendicular to the axis of rotation of the rotor, having in the direction of the axis of rotation of the first rotor outlet open into said cavity of the rotor, and a second outlet, wherein the orifice of the second outlet passage is less than a first output section for creating resistance to the flow of hydraulic fluid at the second output, a first input for supplying a polydisperse materials in the fluid stream, bred between said output and coupled to said means for supplying to the rotor polydisperse materials, **characterized in that** the classification channel is formed for supplying a second input it clean liquid disposed in the first inlet in a direction from the rotational axis of the rotor and connected with means for supplying said liquid to the rotor.

11. Device according to claim 10, **characterized in that** it comprises first means for withdrawing liquid from the particulate material of a given size, coupled with the rotor cavity, the second fluid outlet means with particles of larger size, coupled with the second output channel classification.

12. Device according to claim 10, **characterized in that** the second input is located near the second output channel classification.

13. Device according to claim 10, **characterized in that** the channel is divided into two parts with different diameters, wherein the wider part is located in the area from the first output to the first input.

14. Device according to claim 13, **characterized in that** the length of the narrow part of the channel is not less than the magnitude of its diameter.

15. Device according to claim 10, **characterized in that** the first input is coupled to said means for supplying material to the rotor polydisperse first inlet channel formed in the node classification, a second input coupled to the means for supplying the second liquid to the rotor inlet passage formed in the node classification.

16. Device according to claim 15, **characterized in that** the first and second input channels are inclined classification channel towards the second outlet, wherein the angle does not exceed 90 °

17. Device according to claim 10, **characterized in that** the second outlet channel is closed nozzle.

18. Device according to claim 10, **characterized in that** it comprises two or more classification channels.

19. Device according to claim 10, **characterized in that** over the rotor the deposition chamber is formed the node classification.

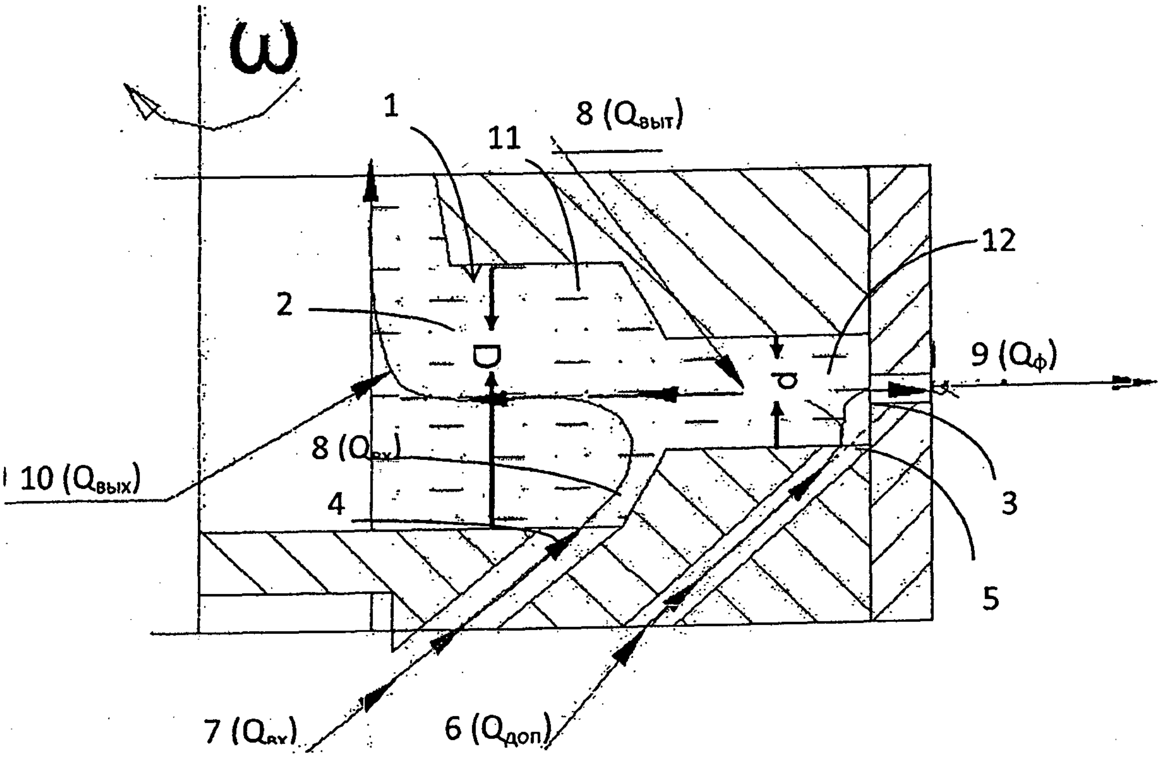

FIGURA 1

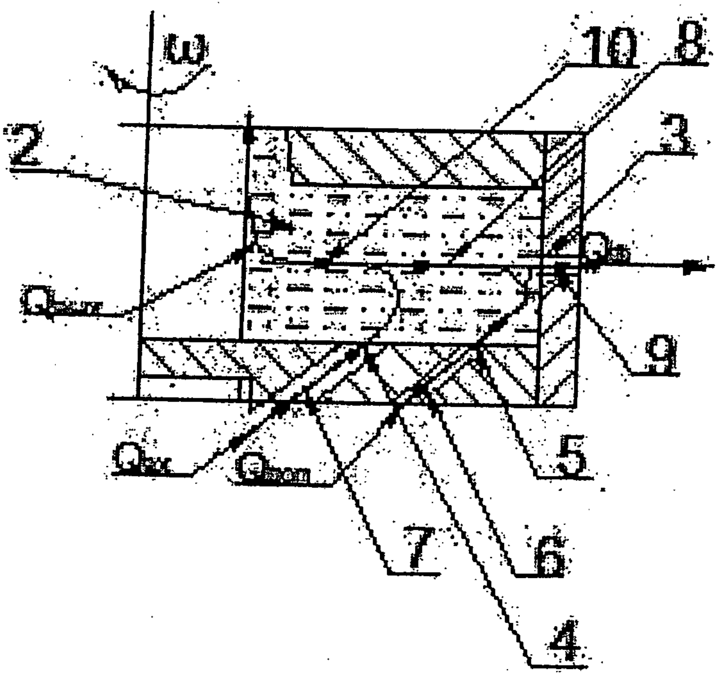

FIGURA2

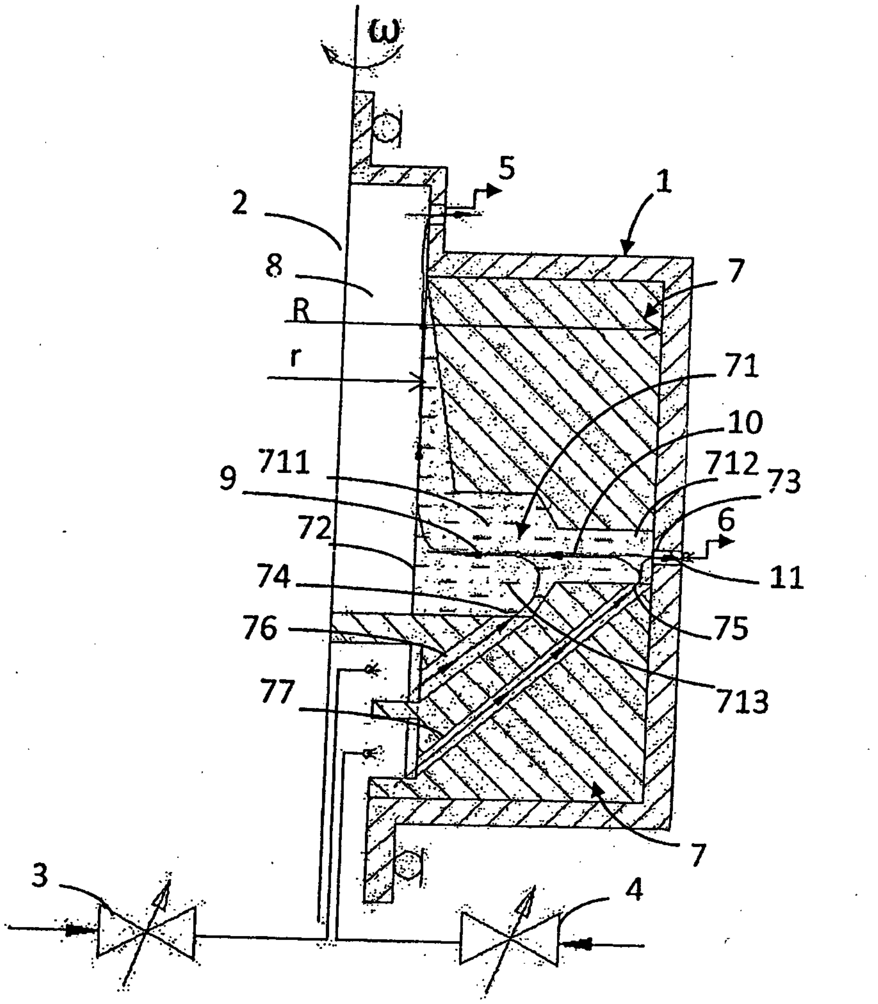

fIGURA 3

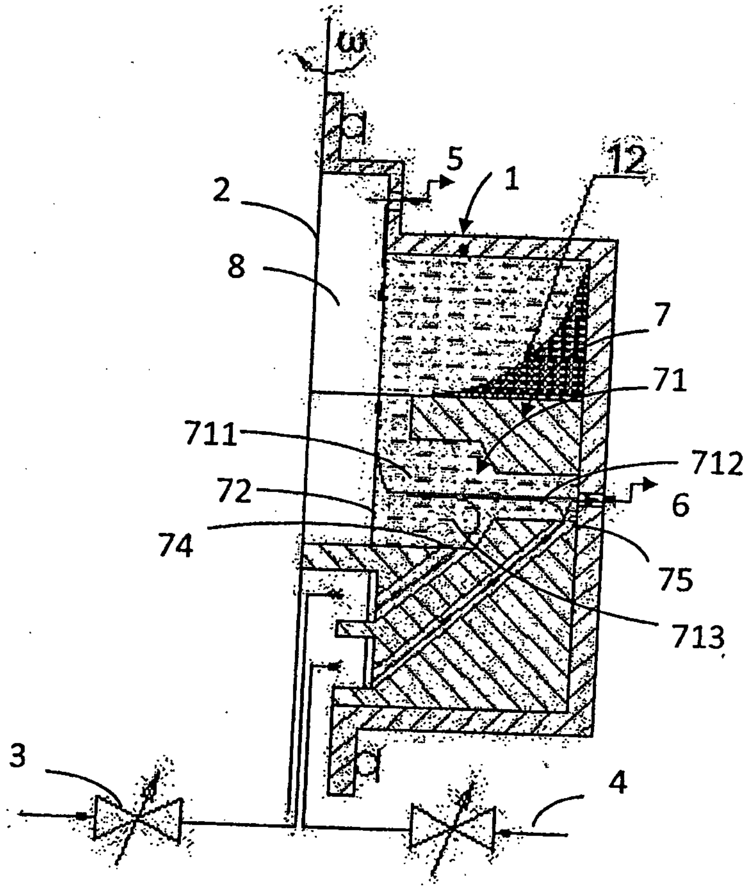

FIGURA 4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- RU 2130806 **[0006]**