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(54) GRADER

(57) The invention can be used for production of grinding powders, ceramics, conductive pastes in microelectronics, etc.

Subject of the invention: a classifier comprises a housing 1, a rotor 2 with fixedly mounted disks 3, 4 and 5 located in the housing, a pipe 6 for supplying a material, pipes 7 and 8 for withdrawal of a large and a small fraction. Slots 9 are formed on the disk 3 at the side of the pipe 6 for forming vorteces, and blades 10 are located between the disks 4 and 5 for withdrawal of particles of the small fraction.

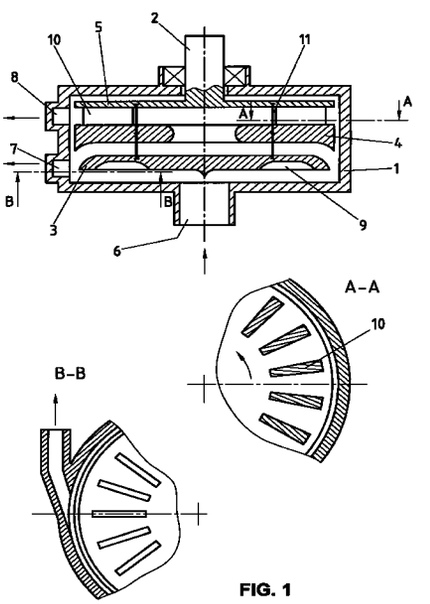

FIG. 1

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Description

FIELD OF THE INVENTION.

The present invention relates to a technique for separation of materials into fractions, and more particularly to centrifugal-air classifiers which have a separating device unitizing the principle of counter action of two forces, a centrifugal force and a force of entraining by a gas flow (Stox force).

PRIOR ART.

A classifier is known (U.S. patent no. 4,560,471) which has a housing with a rotor located inside the housing and carrying a row of disks for producing a twisted movement of a powder-gas mixture, from which during passage through the so-called ⟨⟨separation zone⟩⟩ formed by edges of the disks, a large fraction is ejected while a small fraction is entrained by a gas flow into a space between the disks and then is withdrawn through an outlet of a small fraction.

The disadvantage of this device is a limited size of the separation zone, which results in an increased content of particles of the small fraction in the large fraction.

A classifier is also known (Inventors Certificate of the USSR No. 154868) which has a housing and a rotor located in the housing and having disks which are fixedly mounted on it and arranged coaxially, a pipe for introduction of an air-dispersed mixture, pipes for withdrawal of large and small fractions, wherein a first disk in direction of movement is provided with beaters for crushing of aggregates.

The device when used for separation of mixture of powders with particle sizes less than 120 μm has the disadvantage that it possesses a low efficiency of separation of the small fraction, and a great quantity of the small fraction remains in the large fraction which needs several additional cleaning steps. This is caused both by a strong aggregation of small particles into their own aggregates as well as by sticking of them onto large particles in an initial material, while the insufficient efficiency of the dispersing beaters does not provide crushing of these aggregates as well as cleaning of the surface of large particles from small particles during the separation process. This leads to the presence of a great quantity of small particles in the large fraction, which makes necessary a repeated (4-5 times) cleaning of the large fraction and thereby reduces the total efficiency of the classification process.

A device which is the closest to the proposed invention (patent of Great Britain No. 2122514) has a housing with a pipe for a material supply and pipes for withdrawal of small and large fractions, disks located in the housing and coaxially mounted on a rotor arranged in supports of the housing, and blades located between the second and third disks in the movement direction.

The disadvantage of this technical solution is its low efficiency which is caused by the reason disclosed in the description of the previous technical solution and by inefficient shape of the blades.

SUMMARY OF THE INVENTION.

The technical problems to be solved by the proposed invention in an increase of efficiency of separation of the small fraction from the large fraction and increase of reliability of the classifier.

The above mentioned problem is solved in a classifier which has a housing with a pipe for a material supply and pipes for withdrawal of small and larger fractions, disks located in the housing and mounted in housing supports with blades mounted coaxially on the rotor and located between second and a third disk in direction of movement of material. An end of the first disk in the direction of movement, which faces a pipe for a material supply has slots, and the above mentioned blades in a cross-section which is parallel to the disks are formed trapezoidal. Moreover, the above mentioned slots can be formed as radial slots.

BRIEF DESCRIPTION OF THE DRAWINGS.

Fig. 1 shows a general view of the classifier is presented.

DESCRIPTION OF PREFERRED EMBODIMENT.

The proposed classifier includes a housing 1, a rotor 2 located inside the housing and having disks 3, 4, 5 fixedly mounted on it, a pipe 6 for introduction of a material to be separated and a carrying gas, pipes 7 and 8 for withdrawal of large and small fractions. The pipe 7 for withdrawal of the large fraction communicates with a space between the disks 3 and 4, and the pipe 8 for withdrawal of the small fraction communicates with a space between the disks 4 and 5. Slots 9 are formed on the outer end surface of the disk 3, and blades 10 are located between the disks 4 and 5. The disks are fixedly connected with one another by a brace 11.

The classifier operates in the following manner.

A rotation from a drive (not shown in Fig. 1) with a regulated rotary speed is transmitted to the rotor 2 with the disks 3, 4, 5 mounted on it. A dispersed material is supplied through the pipe 6 with a transporting gas and enters a gap between the wall of the housing 1 and the outer end surface of the disk 3. During rotation of the disk, formation of air vorteces which turbulize the gas flow in the above mentioned gap occurs in areas adjoining the slots 9. The rotating air medium in this gap twists the supplied air-dispersed mixture so as to simultaneously destroy the aggregates.

When the material passes this zone, it is dispersed to a maximum degree and enters a zone of separation formed by the radial edges of the disks 3 and 4, where it is separated into the large and small fractions. Large particles are thrown into the pipe 7, while small particles

are carried by the gas flow through the axial opening in the disk 4 into a space between the disks 4 and 5, from which they are carried out into the pipe 8. The blades 10 create a ventilation pressure in addition to a rarefaction formed outside of the pipe 8 for evacuation of the particles from the apparatus.

The formation of vorteces near the slots of the disk 3 in the rotating flow of air dispersed mixture leads to an intense destruction of aggregates of the particles and ⟨⟨peeling⟩⟩ of small particles from the surface of the large particles, or in other words a principle of vortex comminution is realized. The intensity of action of the vortex comminution in this devices depends on the rotary speed of the rotor. The intensity of action will increase with the increase of the rotary speed of the rotor and will reduce with its reduction. For example during separation of sufficiently large particles with the separation size 40-50 μm when the rotary speed of the rotor is small (1500-1000 rev/min) and the particles have sufficient mass and kinetic energy themselves which allows crushing of the aggregates, the influence of the vortex action is insignificant. This does not lead to an additional comminution of large particles. However, with the size of separation of the order of 2-5 μm when the rotary speed of the rotor is high (5000-4000 rev/min) the speed of the air-dispersed mixture in the flow reaches 10-20 m/sec, which is sufficient for formation of an intense vortex disturbance of the flow caused by the slots on the disk. With the above mentioned movement speeds, the particles repeatedly strike against one another, which leads to a more efficient destruction of aggregates than under the action of the beaters.

The presence of the zone of vortex dispersion of the aggregates provides for a possibility of increasing the efficiency of separation of the small fraction from the large fraction, and guarantees a higher quality separation into the fractions for the powders with initial sizes less than 10 μm.

The presence of blades between the disks creates an additional ventilation pressure directly in the space of evacuation of the small fractions, while the formation of the blades 10 with a trapezoidal shape of the cross-section allow maintaining of the radial speed of the air flow which carries the small fraction, so as to prevent accumulation of the particles between the blades, which enhances the increase of reliability of the classifier.

Therefore, the invention provides for a possibility of reduction of the number of cleaning steps of large fraction, as a result, wear of elements of classifier., which enhances the increase of its efficiency and reliability.

INDUSTRIAL APPLICABILITY.

From the above presented it goes that the suggested invention can be used on a standard industrial equipment with the use of known technologies and materials.

The invention can be used in various technologies which provide utilization of powder materials with a given granulometry. The most promising is its use in the manufacture of grinding powders, ceramics, special cements, conductive pastes in microelectronics, carriers for pigments, etc.

Claims

1. A classifier, comprising a housing with as pipe for supplying a material and pipes for withdrawal of small and large fractions, disks located in the housing and coaxially mounted on a rotor arranged in supports of the housing, blades located between a second and a third disk in direction of movement of the material, characterized in that an end of a first disk in direction of movement, which faces the pipe for supplying a material, has slots, and the above mentioned blades are formed trapezoidal in a cross-section extending parallel to the disks.

2. A classifier according to claim 1, characterized in that the slots are formed radial.

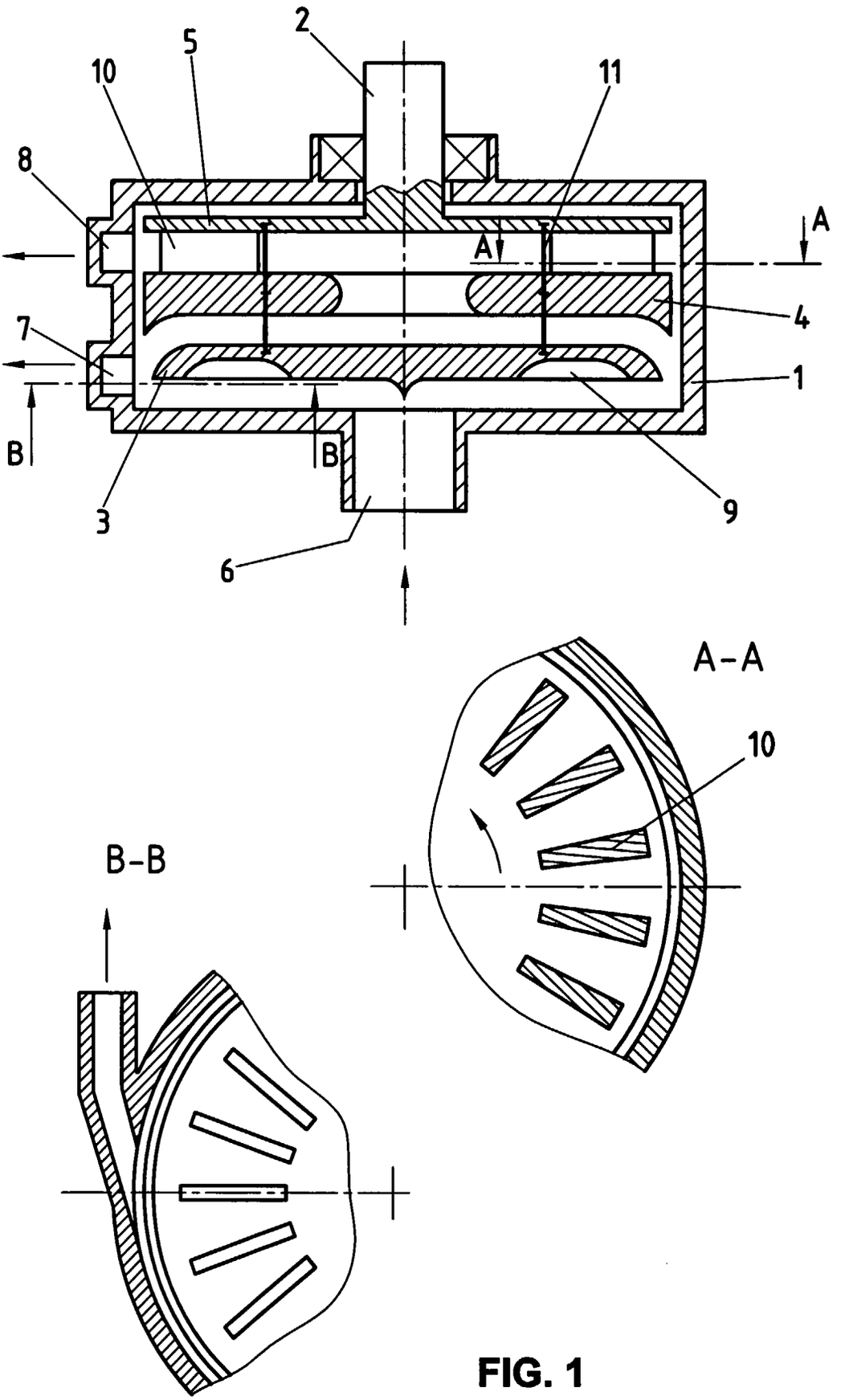

FIG. 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/RU 96/00212

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. 6 : B07B 7/083

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl. 6 : B07B 7/08 - 7/083

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SU, A2, 1620161 (INSTITUT KHIMII TVERDOGO TELA I PERERABOTKI MINERALNOGO SYRYA SO AN SSSR), 15 January 1991 (15.01.91)	1-2
A	SU, A1, 1316719 (IVANOVSKY KHIMIKO-TEKHNOLOGICHESKY INSTITUT), 15 June 1987 (15.06.87)	1-2
A	SU, A, 829211 (GOSUDARSTVENNY VSESOJUZNY NAUCHNO-ISSLEDOVATELSKY INSTITUT TSEMENTNOI PROMYSHLENNOSTI "NIITSEMENT" et al) 15 May 1981 (15.05.81)	1-2
A	DE, A1, 3712909 (INSTITUT CHIMII TVERDOGO TELA I PERERABOTKI MINERALNOGO SYRJA SIBIRSKOGO OTDELENIJA AKADEMII NAUK SSSR), 03 November 1988 (03.11.88), abstract	1-2
A	GB, A,2110962 (GREVILLE NICOLAS WHIDDETT), 29 June 1983 (29.06.83), abstract	1-2

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
03 September 1996 (03.09.96)	05 September 1996 (05.09.96)
Name and mailing address of the ISA/RU	Authorized officer
Facsimile No.	Telephone No.

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