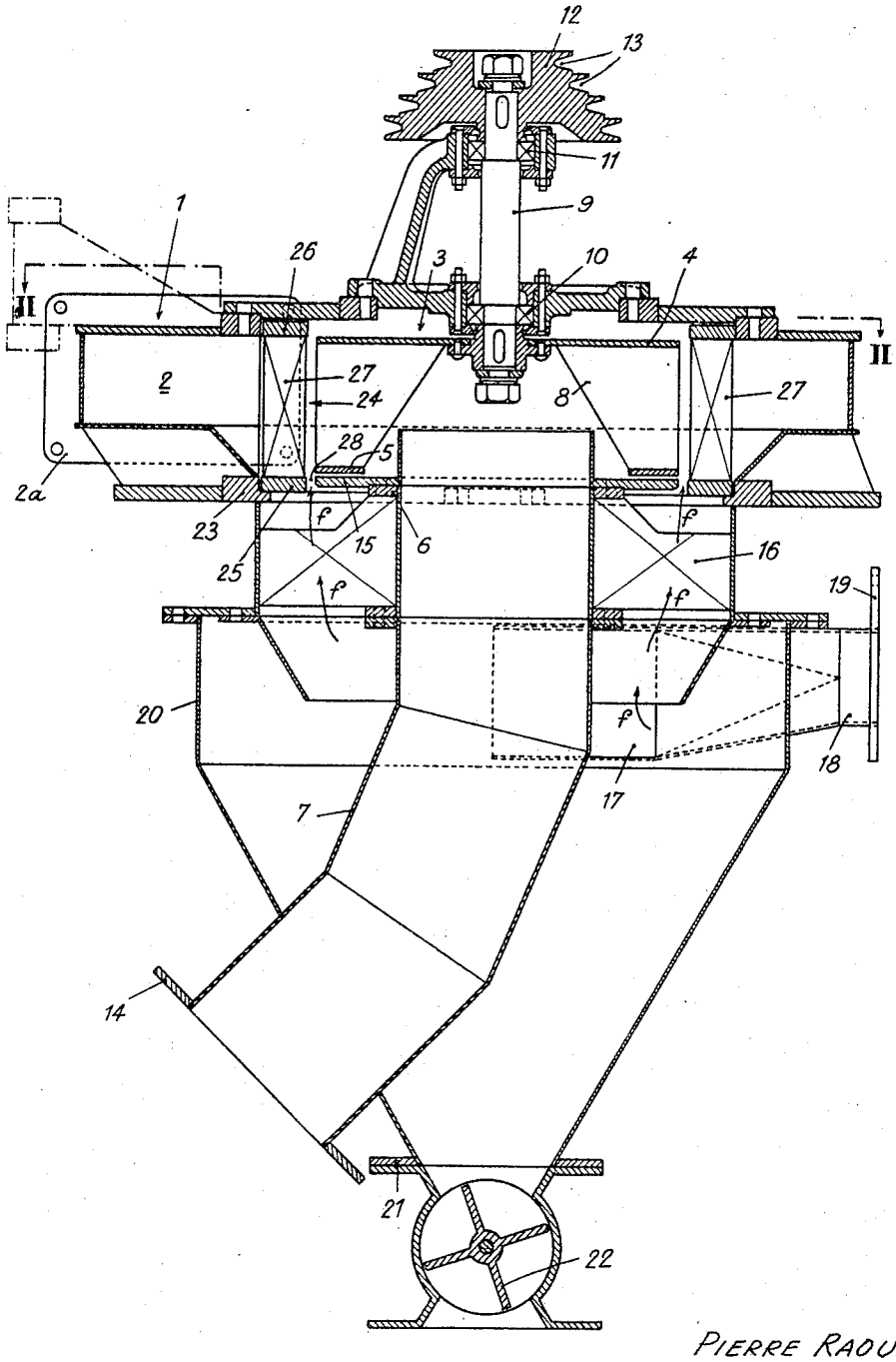
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DYNAMICAL SELECTOR DEVICE FOR CRUSHERS

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FIG. 1



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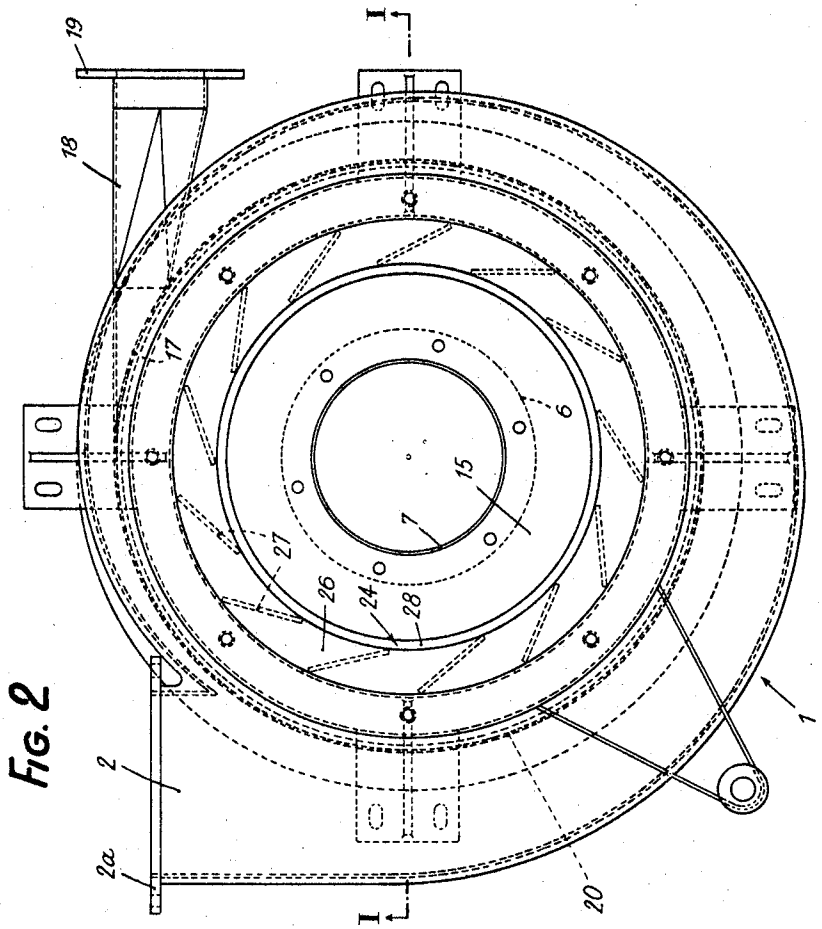


FIG. 2

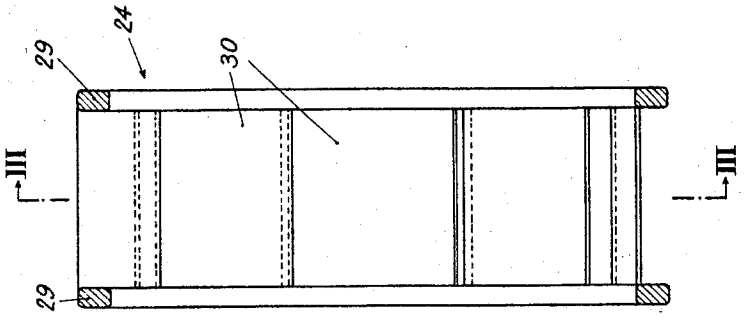


FIG. 4

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FIG. 5

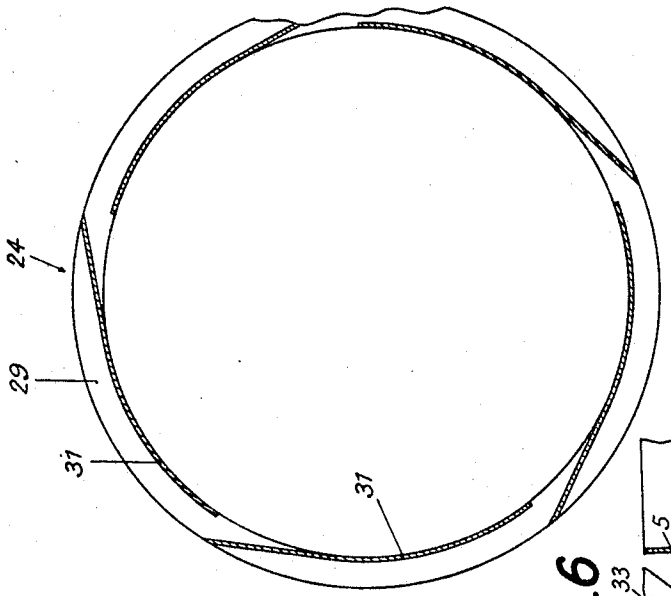


FIG. 6

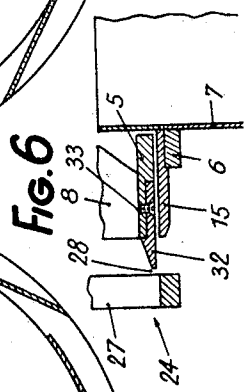
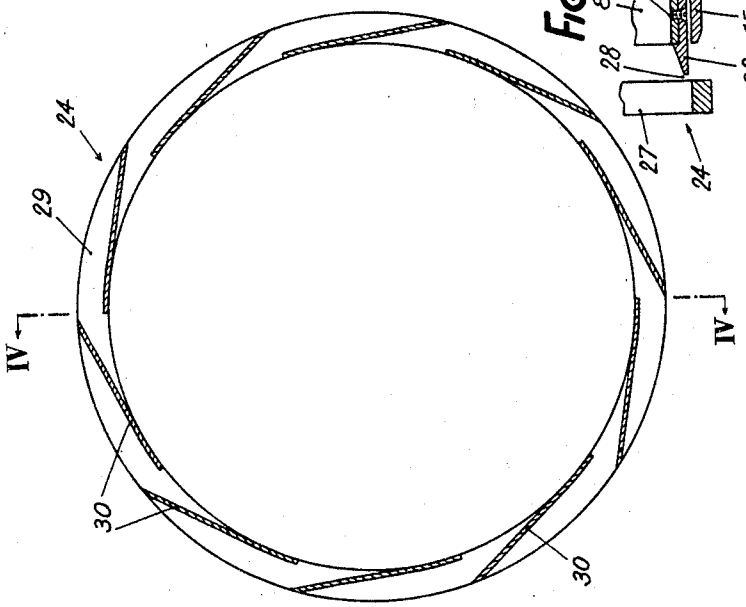


FIG. 3



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United States Patent Office 3,423,034 Patented Jan. 21, 1969

3,423,034

DYNAMICAL SELECTOR DEVICE FOR CRUSHERS

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Claims priority, application France, May 22, 1964, 975,424
U.S. Cl. 241—51 5 Claims
Int. Cl. B07b 3/00, 9/00, 11/00

ABSTRACT OF THE DISCLOSURE

A dynamic selector comprises a casing into which the material to be classified is tangentially introduced in suspension in air. Before being subjected to the action of a rotor having wide blades that turn about an upright axis, this current of material in suspension is braked and divided by a stationary crown. A central outlet duct is connected to a suction source for the discharge of the fine particles. A horizontal disc forming a stationary diaphragm is arranged under the rotor. This disc provides along its periphery together with the braking crown a horizontal refuse-discharging gap connected with a chamber into which a secondary air inlet opens. A rising current of secondary air engages the discharged refuse material passing through said gap, thus further classifying the material.

The present invention relates generally to the technique of grinding materials to a very high degree of fineness.

It is known in particular to provide crushers with a selector capable of evacuating the finer particles and to return the coarser particles to the crushing stage. It is also known to construct centrifugal selectors in which a mass of air laden with the particles to be classified is subjected to such a centrifugal action as to keep the coarser particles adjacent the periphery while the finer particles are directed toward the center. It is further known to combine the centrifugal action with a centripetal action due to a suction exerted by a fan, said action exercising itself continuously from the periphery toward the center or alternatively being limited to one or several fractions of the path followed by the particles, the unduly coarse particles being discharged by suitable devices, the discharge taking place for example through an annular aperture extending to the vicinity of the periphery and into which air is admitted by a countercurrent flow.

It is an object of the invention to provide a selector apparatus having a higher efficiency and lending itself to a more accurate adjustment while being of relatively simple construction.

Another object of the invention is to provide a dynamical selecting device adapted to be associated either with a crusher or with any device permitting the material to be classified that has been preliminarily brought into suspension in the air to be introduced into said selector and comprising a casing having at least one tangential inlet pipe for the materials to be selected that have been brought into suspension in the air, a central rotor fitted in said casing and driven from a suitable source of energy, a pipe connected to the suction side of a fan driven by a suitable source of energy and having its mouth adjacent the rotor center for discharging the particles having the required degree of fineness, a stationary diaphragm arranged under the rotor so as to separate the operating zone of said rotor from a refuse-discharging chamber which, where the selector is associated with a crusher,

permits said refuse to flow back to the crusher, and a stationary crown arranged around the rotor between the same and the tangential inlet zone of the material, said crown being made up of bars adapted to exert a braking and disintegrating action upon the material which is fed tangentially and a pair of cheek plates defining with the diaphragm mounted under the rotor a gap for the flow of the refuse toward the refuse-discharging chamber.

According to a feature of the invention, the bars of the crown operate to impart turbulence to the stream of material fed tangentially into the selector casing as a suspension in an air stream and to disintegrate said stream by thus submitting those particles in suspension therein to the action of the centrifugal force of the rotor. Due to the effect of the central suction, the finer particles for which the effect of the centrifugal force is less intense are directed toward the center of the selector while the coarser particles remain adjacent the rotor periphery between the latter and the crown, and are then evacuated from the selector through the aforesaid gap before reaching the refuse-collecting chamber which communicates with a hopper whose base is provided with a revoluble obturator or more generally with any tight discharging system counteracting any uncontrolled air inflow through the base of said hopper. By adjusting the degree of suction and the speed of the rotor, the size of the particles forming the refuse and fed back to the crusher can be varied.

According to another feature of the invention, an air inlet pipe has its mouth in the refuse-discharging chamber. Experiments have shown that by allowing the arrival of air into said discharging chamber so as to enable it to flow in countercurrent through the gap with respect to the particles forming the refuse, in the direction of the rotor and central suction pipe, a better efficiency is obtained, the control of the fineness of the materials being handled remaining practically independent of the quantity of air fed in countercurrent.

According to a further feature of the invention, the stationary crown which surrounds the rotor may have any suitable number of bars. The width and the outline of said bars may be also modified for achieving in each case a suitable adaptation of the braking stress and of the disintegration of the stream of material subjected to the selection process for matching the particular working conditions that are being encountered and particularly the nature of the material.

According to a conceivable modification, the aforesaid rotor may be provided with an additional ring or annulus of a larger diameter or with rings or annuli which are advantageously interchangeable and have different diameters so as to offset to a varying extent toward the periphery the gap through which the refuse flows and which is defined between the lower cheek plate of the bar crown and the diaphragm. This arrangement may be utilized in combination with a crown made up of bars having a reduced width.

With these and such other objects in view as will incidentally appear hereafter, the invention comprises the novel construction and combination of parts that will now be described with reference to the accompanying diagrammatic drawings exemplifying the same and forming a part of the present disclosure.

In the drawings:

FIGURE 1 is an axial sectional view on the line I—I in FIG. 2 of a dynamical selector device capable of being associated with a crusher and made according to the invention.

FIGURE 2 is a sectional view on the line II—II of FIG. 1, assuming the rotor and the driving member therefor to be omitted.

FIGURE 3 is a sectional view along the line III—III in FIG. 4 showing a constructional modification of the stationary crown.

FIGURE 4 is a sectional view on the line IV—IV of FIG. 3 corresponding to this constructional modification.

FIGURE 5 is a sectional view showing a further constructional modification.

FIGURE 6 is a detail view showing the circular diaphragm and its interchangeable ring.

The selector device represented in FIGS. 1 and 2 which may be associated with a crusher or which may alternatively operate independently comprises a casing **1** provided with a pipe **2** fitted with an attachment flange **2***a* and adapted tangentially to feed to the casing **1** the material to be classified which is in suspension in the air.

Inside the casing **1** is accommodated a central rotor **3** which may be advantageously constituted by a turbine similar to that of a fan and including a solid upper disc **4**, a lower disc **5** having an inner bore having a diameter larger than that of the collar **6** of a suction pipe **7** and fins **8** provided in any suitable number and having an appropriate shape, secured to the discs **4** and **5**. The central rotor **3** is carried by a shaft **9** mounted in ball bearings **10**, **11** and provided with a pulley **12** having several stepped grooves **13** driven from a suitable source of power (not shown) and permitting the speed of the rotor **3** to be so modified as to suit requirements.

The suction pipe **7** for the discharge of those particles having the required degree of fineness has its mouth adjacent the center of the rotor **3**. This pipe is provided at its lower end with an attachment flange **14** permitting the same to be connected to a piping fitted with a fan driven by a suitable source of energy and of which the speed may be regulated at will. A circular diaphragm **15** arranged under the rotor **3** and secured to the collar **6** on the suction pipe **7** separates the operative zone of the rotor **3** from an annular chamber **16** for the discharge of refuse in which terminates at **17** the mouth of an air inlet pipe **18** having an attachment flange **19**. The chamber **16** for the discharge of the refuse which permits the same to be returned to the crusher or to be rejected outside the apparatus has its mouth adjacent the upper end of a hopper **20** provided at its lower end with a flange **21** permitting a revoluble obturator **22** or any other tight device to be secured, the purpose of said device being to allow the refuse to pass through it without any introduction of non-controlled air.

The chamber **16** for the discharge of refuse is connected to a disc **23** adapted to support a stationary crown **24** arranged around the rotor **3** between the latter and the zone of tangential inflow of the material to be selected. The crown **24** has a pair of cheek plates **25**, **26** between which are arranged bars **27** adapted to exert a braking and disintegrating action on the tangentially fed stream of material, the cheek plate **25** defining with the circular diaphragm **15** an annular gap **28** for the passing of the refuse (i.e., the unduly coarse particles) towards the discharge chamber **16** and then into the hopper **20** with a view to returning them to the crusher or to evacuating them outside.

In FIGS. 3 and 4 is represented a modification of the stationary crown **24** according to which this crown includes a pair of annular rings **29** between which are arranged bars **30** the outline and the width of which are different from those of the bars **27**.

In the constructional modification shown in FIG. 5 are shown five bars **31** having an outline different from that of the bars **29** and **30**. The number of such bars as well as their outline may, however, differ depending upon the nature of the material to be selected or classified.

These several constructional forms of the stationary crown **24** permit the braking action to be suitably adapted in each case to prevailing conditions and the disintegrating conditions of the stream of materials subjected to the selecting process to match the operating conditions that are encountered, particularly the nature of the materials.

In FIG. 6 is represented a constructional modification wherein an additional annulus or ring **32** is centered under the bored disc **5** and is secured thereto by screws **33** in parallelism and in the vicinity of the circular diaphragm **15**, said ring **32** projecting with respect to the outer diameter of the disc **5** as an extension of said disc and in the direction of the gap **28**. Additional interchangeable rings having different outer diameters may be used with a crown **24** of reduced width so as more or less outwardly to offset the free passage between the lower cheek plate **25** of the barred crown and the diaphragm **15**.

The bars **27**, **30** and **31** of the stationary crown **24** are operative to cause turbulence of the stream of material which is led tangentially through the pipe **2** into the casing **1** of the selector device in suspension in a mass of air and to disintegrate said stream, the particles of the material in suspension therein being subjected to the action of the centrifugal force of the rotor **3**. Due to the suction effect produced through the axial pipe **7**, the finer particles that is to say the particles on which the effect of the centrifugal force is less intense are directed toward the center of the selector device while the coarser particles which are held adjacent the periphery of the rotor **3** between the latter and the stationary crown **24** are discharged from the selector device through the gap **28** and thus reach the discharge chamber **16** and then the hopper **20** to be returned to the crusher or to be evacuated outside. By varying the suction degree through the axial pipe **7** and by modifying the speed of the rotor **3** with the stepped arrangement of the grooves **13** in the pulley **12**, the possibility is afforded to adjust the size of the particles forming the refuse which are either returned to the crusher or discharged.

The air flowing from the pipe **18** and admitted into the discharge chamber **16** flows (as indicated by the arrows *f* in FIG. 1) through the annular gap **28** in countercurrent with respect to the particles forming the refuse in the direction of the rotor **3** and axial suction pipe **7**, thereby permitting a better selecting efficiency, the control of the fineness remaining practically independent of the quantity of air that is introduced countercurrentwise.

It will be seen that the selector device as hereinbefore described and as illustrated in the drawings, while representing a relatively simple arrangement, ensures a better and more accurate selecting effect that known devices.

Minor constructional details may be varied without departing from the scope of the appended claims.

What is claimed is:

1. A dynamical selector device adapted to be associated either with a crusher or with any device permitting the material to be classified that has been preliminarily brought into suspension into the air to be introduced into said selector and comprising a casing having at least one supply inlet pipe means for the material to be selected, said pipe means ending tangentially into said casing, a central rotor fitted in said casing and selectively driven about an upright axis, suction pipe means terminating centrally of said rotor for the discharge of particles having the required fineness, diaphragm means arranged underneath said rotor, a refuse-discharging chamber separated from said rotor by said diaphragm means, said diaphragm means defining a gap for the downward passage of coarse material from adjacent the periphery of the rotor to said refuse-discharging chamber, air inlet means opening into said refuse-discharging chamber for forcing air upwardly through said opening, and a stationary crown arranged around the rotor between said rotor and the inlet pipe means for the material to be classified so as to exert a braking and disintegrating action on the stream of material penetrating into said casing.

2. A dynamical selector device according to claim **1**, wherein the crown is made up of bars for exerting a braking and disintegrating action upon the tangential stream

of material, and a pair of cheek plates defining in combination with the diaphragm means a gap for permitting the refuse to pass therethrough and communicating with the refuse-discharging chamber.

3. A dynamical selector device according to claim 1, said diaphragm having a horizontal circular outer edge, said gap being annular and concentric with said rotor.

4. A dynamical selector device comprising a casing, at least one inlet pipe means for the material to be selected, said pipe means terminating tangentially in said casing, a central rotor mounted in said casing and selectively revolved about an upright axes, suction pipe means terminating centrally of the rotor for the discharge of particles having adequate fineness, diaphragm means underneath the rotor, a refuse discharging chamber separated from said rotor by said diaphragm means, a stationary interchangeable crown arranged arround the rotor between said rotor and the inlet pipe means for the material to be classified, said crown including bars for exerting a braking and disintegrating action upon the tangentially fed stream of material and a pair of cheek plates arranged on the opposite sides of said bars, and an interchangeable ring on said diaphragm, one of said cheek plates defining with said ring a gap for the downward flow of the refuse, said

gap communicating with the refuse-discharging chamber, and air inlet means opening into said refuse-discharging chamber for forcing air upwardly through said gap.

5. A dynamical selector device according the claim 4, said diaphragm having a horizontal circular outer edge, said gap being annular and concentric with said rotor.

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