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MILLS FOR THE COMMINUTION OF RAW MATERIAL

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Fig 1.

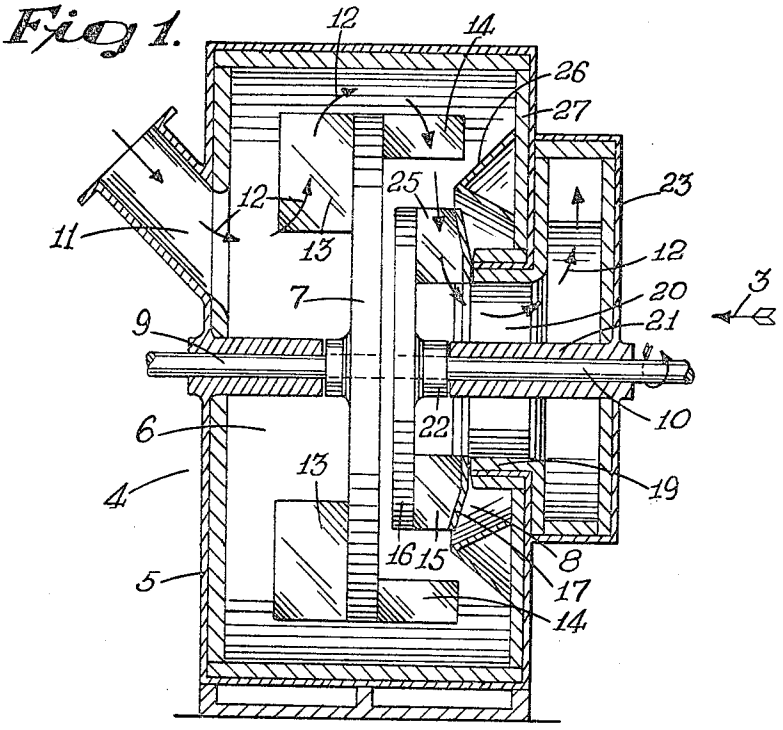
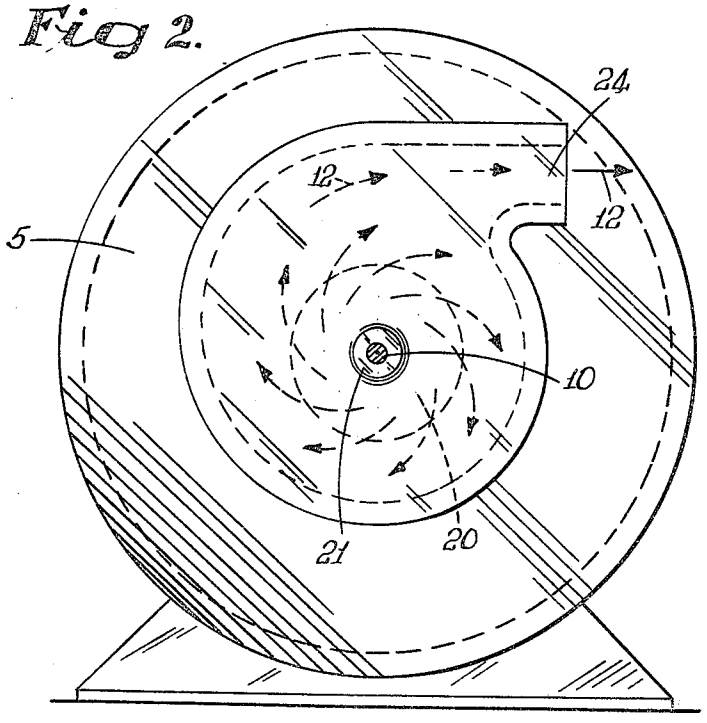


Fig 2.



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MILLS FOR THE COMMINUTION OF RAW MATERIAL

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U.S. Cl. 241—154 4 Claims

ABSTRACT OF THE DISCLOSURE

A comminuting and classifying apparatus includes a casing providing a chamber housing two axially disposed coaxial rotors mounted therein on separate drive shafts to be adjustably driven to vary the grade of fines obtained. One of the rotors is in a path for admitting material and is a comminuting rotor while the second rotor is a classifying rotor which classifies the comminuted material by centrifugal rejection of oversize material.

This invention relates to mills for the comminution of raw materials and the invention is principally concerned with the comminution of ores, rocks and the like.

It is known to provide mills of the kind in which a series of beaters is mounted around the periphery of a rotor adapted for rotation within a chamber. The raw material is fed into the chamber at some convenient point and on engagement with the rotating beaters it is pulverised. Elaborate variations from the general principle set out above are known but all operate on the basis of the material colliding with rotating beaters. It is also known to provide machines for the classification of broken up material into predetermined fractions. In this regard mention may be made of one machine which is characterised in a rotor whose vanes are partially or wholly enclosed in spaced shrouds. At the periphery of the vanes the raw material is broken up and by a centripetal action the fines are urged progressively between the shrouds in a radially inward direction towards a substantially axially disposed exhaust duct.

An object of the present invention is to provide a combined milling and classifying device which the applicant believes will have several useful advantages.

According to the invention a milling device includes a casing defining a chamber, at least two axially disposed co-axial rotors located in the chamber for rotation therein on separate drive shafts, means for admitting material to the chamber for movement into the path of beater blades fast with the leading rotor which constitutes a pulveriser, a passage defined in the chamber for axial movement of the material along the peripheral extremity of the pulveriser towards the second or trailing rotor, the second rotor being adapted to classify the oncoming material by centrifugal rejection of oversize material and providing a substantially closed path for the radially inward movement of fines, and a port for the removal of fines from the second rotor the rotor speeds being adjustable to thereby vary the grade of fines obtained.

Preferably the leading rotor is characterised in beater blades fast with the periphery, and to either side, thereof. In the preferred forms of the invention the trailing rotor is concentric with the beater blades extending rearwardly from the leading rotor.

The closed path associated with the second rotor is defined by shrouds between which is located a series of vanes in radially and axially extending relationship. The vanes may be given a rear or forward rake if desired.

Also according to the invention the circumferential area between vanes remains substantially constant at all radii.

Further according to the invention the trailing shroud seals against the casing to define an outlet for fines from the mill.

The invention also provides suction means for drawing a stream of air through the exhaust port.

A further feature of the invention is means to vary the rotational speeds of the two rotors thereby to vary the quality of the output fines.

In order to illustrate the invention an example is described hereunder with reference to the accompanying drawings in which:

FIGURE 1 is a vertical sectional elevation through a mill in accordance with the invention, the mill being shown diagrammatically, and

FIGURE 2 is a side elevation in the direction of arrow 3.

Referring to the figures, the mill **4** includes a casing **5** which defines a chamber **6** for a first or leading rotor **7** and a second or trailing rotor **8**. The leading rotor **7** is mounted for rotation on drive shaft **9** while the trailing rotor **8** is mounted on drive shaft **10**. A port **11** serves to allow material to be treated to pass into the chamber **6** and generally to move in the direction of arrows **12**.

The leading rotor **7** is constituted by a solid disc of suitable material to the peripheral zone of which metallic beater blades **13** are fast. The disc also supports rearwardly projecting attrition blades **14**.

It will be observed that the trailing rotor **8** is concentric with the blades **14** and this rotor is characterised in several vanes **15** extending radially and axially between side shrouds **16** and **17**. Shroud **17** seals against a mating zone **19** of the casing to inhibit the escape of un-classified material from the chamber directly into escape zone **20**.

Shroud **16** constitutes a hub arrangement which secures the rotor **8** to its drive shaft **10**. The sleeve **21** and the boss **22** act to protect the shaft **10** against the wearing action of passing fines. Sleeve **21** constitutes part of a housing **23** defining a whirl chamber through which material is drawn by suction means associated with the delivery line **24**. The action of the suction means is to maintain a stream of air flowing through the mill in the same direction generally as the material, a direction which is shown roughly by the arrows **12**.

In operation, the material is subjected to a primary pulverising action by the blades **13** and thus the material passing over the leading rotor **7** is reduced before it reaches the attrition blades **14**. These latter blades serve to break up the material yet further so that the material passing into the entry **25** to the trailing rotor is already of comparatively fine quality. In the space bounded by the shrouds **16** and **17** the trapped material is subjected to a classifying action on the basis of radially inward movement of the fines with consequent radially outward rejection of the coarser material. Coarse material entirely rejected by the second rotor will once again come under the attention of the blades **14** from whence it will return to the second rotor. Material in the second rotor which has been ground to the desired fineness will ultimately pass into the whirl chamber.

It will be seen therefore that the arrangement of the invention provides a milling device which is capable of carrying out the dual function of pulverising and classifying milled material. And variation of the quality of the output fines may be achieved by varying the speeds of the two rotors.

To facilitate the movement of material from the attrition blades **14** to the second rotor a suitable baffle **26** is secured to the inside wall **27** of the chamber.

Preferably the circumferential area between adjacent vanes **15** is maintained constant at all radial dimensions and this is achieved by having the shrouds **16** and **17** converge inwardly.

What is claimed is:

1. A milling device including a casing defining a chamber, two axially disposed co-axial rotors located in the chamber for rotation therein on separate drive shafts, means for admitting material to the chamber for movement into the path of beater blades fast with the periphery of the leading rotor and to either side thereof which constitutes a pulveriser, a passage defined in the chamber for axial movement of the material along the peripheral extremity of the pulveriser towards the second rotor, the second rotor being concentric with the beater blades extending rearwardly from the leading rotor and being adapted to classify the oncoming material by centrifugal rejection of oversize material and providing a substantially closed path for the radially inward movement of the fines, and a port for the removal of fines from the second rotor, the rotor speed being adjustable thereby to vary the grade of fines obtained.

2. A milling device as claimed in claim **1** wherein the path is defined by shrouds between which is located a series of vanes in radially and axially extending relationship.

3. The device as claimed in claim **2** wherein the circumferential area between the vanes remains substantially constant at all radii.

4. The device claimed in claim **3** wherein the vanes are raked.

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