April 2, 1957 J. WOELLHAF 2,787,422

JET GRINDING APPARATUS

Filed July 28, 1953

FIG. 1

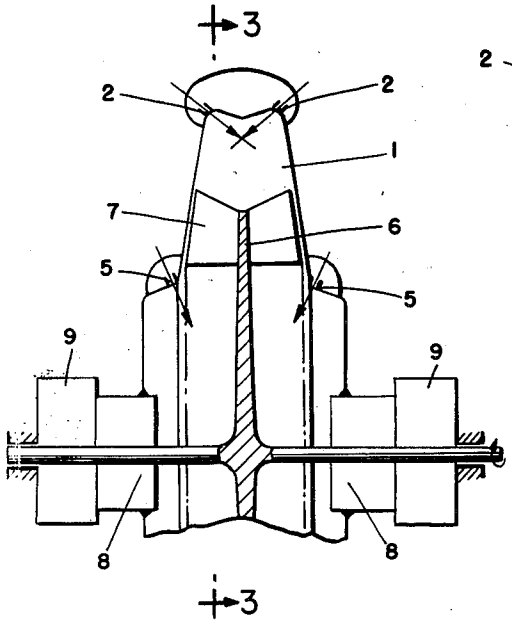


FIG. 2

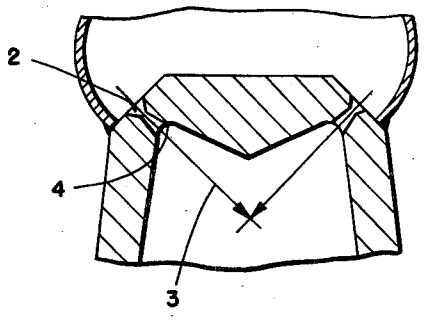
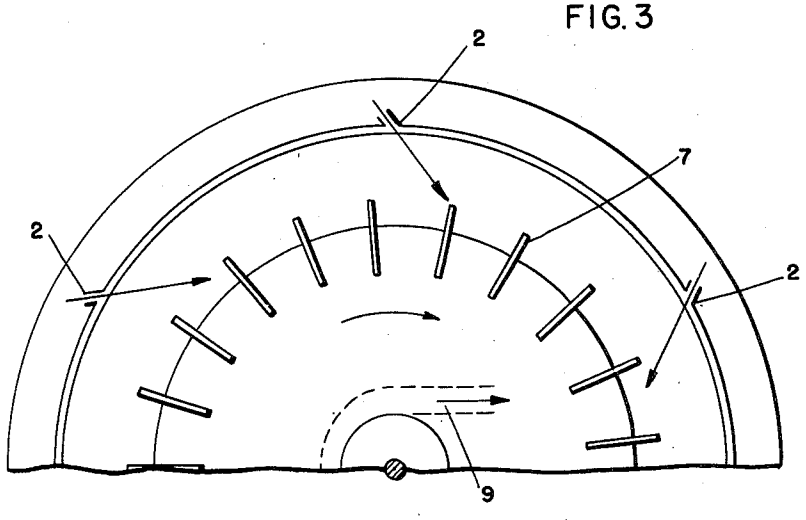


FIG. 3



INVENTOR:

JOSEF WOELLHAF

BY Marzall, Johnston, Cook & Root

ATT'YS

United States Patent Office 2,787,422 Patented Apr. 2, 1957

2,787,422

JET GRINDING APPARATUS

Josef Woellhaf, Ludwigshafen (Rhine), Germany, assignor to Badische Anilin- & Soda-Fabrik Aktiengesellschaft, Ludwigshafen (Rhine), State of Rheinland-Pfalz, Bundesrepublik Deutschland

Application July 28, 1953, Serial No. 370,787

Claims priority, application Germany August 16, 1952

5 Claims. (Cl. 241—39)

This invention relates to improvements and apparatus for grinding materials.

In the prior art practice high-grade pulverization of materials by grinding is achieved by the use of circular grinding chambers in which the material to be ground is kept in a circulatory movement by jets of propellants. By means of these propellant jets, which preferably enter the grinding chamber at a definite angle to the tangent, the comminution is effected by mutual collision of the particles and by friction. At the same time they produce a strong spiral flow by which the coarser particles are thrown against the outer wall of the grinding chamber, whereas only the finest particles will be discharged from the mill.

I have now found that the grinding effect achieved by the said process can be increased by introducing the propellant jets in groups at such an angle into the grinding chamber that they impinge upon each other therein. The speed at which the individual particles of the material to be comminuted impinge upon each other is thus substantially increased, and hence a higher comminution effect is achieved because the latter increases with the square of the speed of impingement.

The nozzles for the introduction of the propellant jets, which coact in groups, preferably in pairs, are arranged in a plurality of circles of equal or different diameter which are centrally arranged to the grinding chamber axis. It is especially advantageous to shape the wall bounding the grinding chamber in such a way, as for example by indenting the same, that annular depressions are formed, the nozzles for the propellant jets being provided therein. In this way the material to be ground collects in these depressions and is entrained with high efficiency by the propellant jets.

In order to increase the speed of rotation in the sifting zone still further, additional propellant jets may be allowed to enter into the sifting zone between the grinding zone and the point of exit as described in my copending application Ser. No. 337,597, filed February 18, 1953, now U. S. Patent No. 2,753,123, issued July 3, 1956, the said additional jets imparting to the circulating material to be ground an increased speed of rotation whereby the coarser particles are returned to the grinding zone to an increased extent. The propellant jets entering the sifting zone lie in one or more planes perpendicular to the axis of the grinding device, which planes are different from the planes in which lie the propellant nozzles opening into the grinding zone. They may also be directed obliquely to the said planes, perpendicular to the grinding chamber axis. The central part of the grinding device, which serves as the sifting zone, is preferably widened with respect to the grinding zone so that at the transition from the grinding zone to the sifting zone there are formed projecting edges at which the larger particles of the material to be ground, which are led directly along the wall inwardly, are seized by the strong rotational flow of the eddy produced in the sifting zone and returned to the grinding zone. The same purpose can be served by

so-called baffle rings provided on the inner wall of the sifting zone, which can be let into the wall concentrically to the axis of the grinding chamber.

A rotating insertion can preferably be arranged in the center of the grinding device so as to direct the stream of propellant to reduce the flow loss to a minimum. The grinding device may also be so constructed that the wall of the sifting zone and the insertion form a rotating part which is moved mechanically in the stationary grinding chamber housing. The relative speed between the propellant and the wall of the sifting chamber is thus kept low and the influence of wall friction reduced.

In order to increase the speed of rotation in the grinding chamber further, there may be provided therein a mechanically driven rotor wheel. This may be combined with the said rotating walls of the sifting chamber.

The invention will be further described with reference to the accompanying diagrammatic drawings in which Figure 1 is a sectional elevation of part of a grinding device according to the invention, Figure 2 is part of the upper portion of Figure 1 on a larger scale and Figure 3 is a section on the line 3—3 of Figure 1.

Referring to the drawings, propellant gas, as for example air, nitrogen, superheated steam or the like is introduced into a grinding chamber **1** by means of nozzles **2**. The jets **3** of this propellant (see Figure 2) impinge upon each other in the grinding chamber **1** by reason of the position of the nozzles **2**. They seize the particles of material to be ground which are concentrated in the depressions **4**, accelerate them and impart to them very high impingement speed, whereby a high comminution effect is obtained.

Propellant can also be introduced through nozzles **5** in order to increase the rotational speed in the sifting zone further. A mechanically driven rotor wheel **6** having blades **7** serves to increase the rotational speed in the grinding chamber. The fine ground material leaves the grinding chamber at **8** and is supplied to dust separators. It is preferable to provide guide spirals **9** at the outlets so as to convert the rotational flow into straight-line flow for the recovery of energy.

What I claim is:

1. A pulverizing apparatus comprising a generally circular casing defining a grinding zone, a sifting zone and an outlet opening, said sifting zone lying between said grinding zone and said opening and being transversely widened with respect to said grinding zone, means for the introduction of a propellant gas into said grinding zone, arranged so that pairs of propellant gas jets enter the grinding zone at such angles that they impinge on each other therein, and means for the introduction of a propellant gas into said sifting zone.

2. Apparatus as defined in claim 1 wherein said means for the introduction of a propellant gas into said grinding zone comprises a plurality of nozzles arranged in a plurality of circles concentric with the axis of the grinding chamber, at least some said nozzles being arranged in pairs in different circles so that the propellant gas jets enter the grinding zone at such angles that they impinge on each other therein.

3. Apparatus as defined in claim 1 wherein the wall bounding the grinding zone is shaped to form peripheral annular recesses therein, said propellant gas jets entering the grinding chamber at the recesses.

4. Apparatus as defined in claim 1 wherein a mechanically driven rotor wheel provided with blades is arranged within said casing for increasing the rotational movement of the propellant gas and the material to be ground.

5. A pulverizing apparatus comprising a generally circular casing enclosing a chamber having a grinding zone in the outer portion thereof, the peripheral wall of said casing being provided with annular recesses and means

for the introduction of propellant gas jets into said chamber in directions which will maintain a rapid circulatory motion of material to be comminuted, at least some of said introduction means being located at positions in the annular recesses substantially corresponding to the greatest radial distances from the axis of the casing and being arranged to introduce propellant gas jets into the grinding zone at such angles that pairs of jets impinge on each other therein.

References Cited in the file of this patent

UNITED STATES PATENTS

2,155,697	Young	Apr. 25, 1939
2,191,095	Hobbie	Feb. 20, 1940
2,237,091	Stephanoff	Apr. 1, 1941
2,325,080	Stephanoff	July 27, 1943
2,376,747	Andrews	May 22, 1945