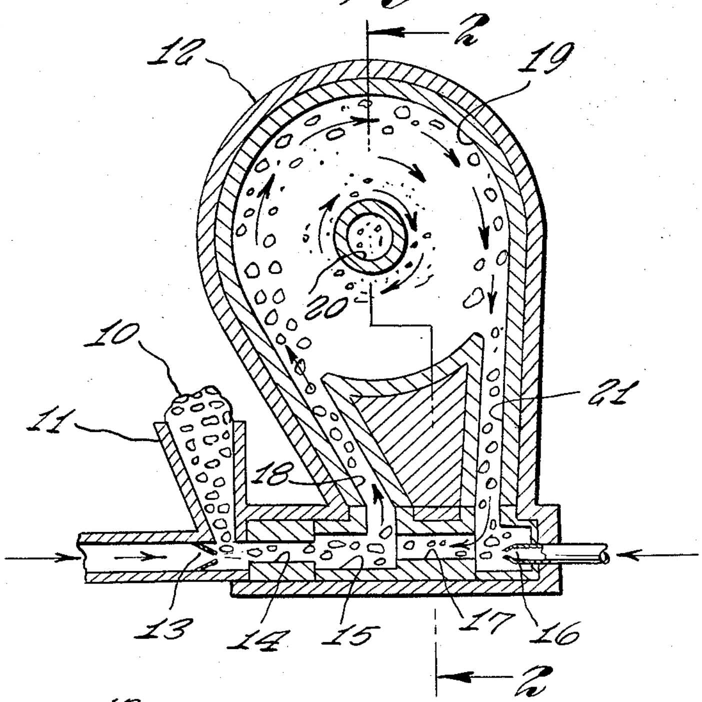
Nov. 24, 1964 W. M. WILSON ETAL 3,158,331

SLURRY COLLOIDAL ZIRCONIUM OXIDE GRINDING PROCESS

Filed May 27, 1963

Fig. 1



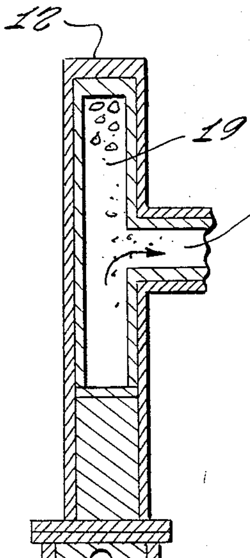




Fig. 2

United States Patent Office

3,158,331

Patented Nov. 24, 1964

1

3,158,331

SLURRY COLLOIDAL ZIRCONIUM OXIDE GRINDING PROCESS

Wilbert Moody Wilson, Morristown, and William B. Kinyon, Helmetta, N.J., assignors to George W. Helme Company, Helmetta, N.J.

Filed May 27, 1963, Ser. No. 283,493

1 Claim. (Cl. 241—5)

This invention relates to a method of producing colloidal particles. More particularly it relates to a method using fluid energy grinding in conjunction with a suitable slurry.

The Trost jet mill employs opposing streams of air to grind particles by head-on collision to particles of colloidal dimensions. Into one of these streams, the inlet stream, is introduced a dry powder. The other stream, the recycle stream, is used to recycle the larger particles from the mill.

This invention is described in conjunction with a conventional Trost mill shown in the accompanying drawing and in which;

FIG. 1 is a vertical section view of the mill showing the flow streams therein by means of arrows and,

FIG. 2 is a section view taken on line 2—2 of FIG. 1 and showing the outlet port from the classification chamber.

The Trost mill is used for what is known as the dry grinding method to produce colloidal particles.

According to applicants' improved process, a feed stream of suitable slurry is used in lieu of dry powder.

Thus this invention relates to a wet or semi-wet process of grinding particles using fluid energy as shown in the drawing.

The slurry employed by applicants may be of any suitable liquid such as water, kerosene or other liquid hydrocarbon, glycol or other organic liquid.

This invention is especially suited for grinding particles of metal oxides, minerals or metal to sizes in the colloidal range.

A particular example is in the grinding of zirconium oxide.

The normal dry grinding in the Trost mill of zirconium oxide is impossible since air and zirconium oxide form explosive mixtures.

According to this invention an aqueous slurry of zirconium oxide containing from about 12 percent zirconium oxide to about 20 percent zirconium oxide is useable in this process.

Where less than 12 percent zirconium oxide is used an explosive mixture is formed.

Similarly where over 20 percent zirconium oxide is used another explosive mixture is formed.

At from about 12 percent to about 20 percent solid content a suitable slurry **10** is prepared. This slurry **10** is poured into the mill at the inlet hopper **11** and is propelled into the housing **12** by means of an air stream from an inlet air stream jet nozzle **13**.

The slurry **10** and the air stream at suitable pressure, preferably 80 to 150 pounds per square inch, are mixed in conduit **14** and expand in chamber **15**.

The opposing or recycle stream is propelled by air at a similar suitable air pressure from jet nozzle **16** into a conduit **17** and thence into chamber **15**. In chamber **15** both streams are expanding streams and collide in head-on relationship thereby effecting a grinding action between the colliding particles.

The resulting collision stream is propelled into the housing chamber throat **18** and thence against the curved in-

2

side surface **19** of the housing as a peripheral stream.

The stream sweeps around the wall **19** with centrifugal force so that the larger and heavier particles are thrown against or adjacent to said wall **19**, with the finer and lighter particles being removed with the air at the exit orifice **20**.

These fine particles are in the colloidal range. The heavier particles are conducted down passageway **21** to engage the air stream from nozzle **16** and be recycled until they become so fine as to pass out of the exit orifice **20** as colloidal particles.

The slurry feed must be of such a liquid composition as to be fully vaporized in the classification chamber of the housing **12**. Thus the liquid of the slurry of this invention upon expansion from conduit **14** into the grinding chamber **15** is vaporized and in so doing cools the material to be ground. Where this material is very friable as for example, sulfur particles, the cooling effect makes it even more friable on impact collision in the grinding chamber. Moreover the vapors of the liquid in the chamber assist in absorbing and thereby removing the frictional heat of collision of the particles.

Accordingly by introducing the feed material as a liquid slurry of suitable concentration and suitable specie of liquid a vast improvement over the prior art dry grinding is accomplished.

As an example an aqueous slurry consisting of water and 15 percent zirconium oxide was introduced at a suitable rate into hopper **11** and was propelled by a 100 pound per square inch air jet stream at nozzle **13** into the grinding chamber **15**. The water was vaporized by the expansive or venturi effect on passing from small diameter conduit **14** into the large diameter chamber **15**. The vapors of the water and the ground zirconium particles of chambers **15** were passed into the large chamber of housing **12** by way of conduit **18**.

Again there is an expansive effect and the liquid vapors become fully dispersed in the large volume of air streams from nozzles **13** and **16**.

The colloidal zirconium oxide particles are discharged through exit orifice **20** in an air current containing a small amount of water vapor.

In lieu of water a similar percent of kerosene may be used in the formation of the slurry of this invention.

This invention was described by means of several embodiments showing its versatility of use, but it is not to be limited to these illustrations as it embraces the broad concept of grinding a slurry by use of opposing gaseous propellant carrier streams.

We claim:

The continuous re-cycle process of cold grinding zirconium oxide in a Trost jet mill comprising introducing said zirconium oxide as an aqueous slurry of from about 12 percent to about 20 percent oxide into the inlet air stream of said jet mill, cold grinding said zirconium oxide in the presence of vaporizing water to obtain particles within the colloidal range, separating centrifugally said colloidal oxide from said cold still expanding water vapors to produce substantially dry colloidal zirconium oxide and re-cycling the non-separated particles to further cold grinding.

**References Cited by the Examiner**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 2,735,626 | 2/56 | Trost | 241—39 |
| 2,846,150 | 8/58 | Work | 241—5 |

ANDREW R. JUHASZ, *Primary Examiner.*