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Giorgi

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[54] **ROTARY TUBULAR CRUSHER**

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[52] **U.S. Cl.** **241/176,** 241/184

[51] **Int. Cl.** **B02c 17/10**

[58] **Field of Search** 241/170, 171, 172, 176, 241/177, 178, 179, 184

[56] **References Cited**

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[57] **ABSTRACT**

A rotary crusher comprises a cylindrical crusher drum rotating about a horizontal axis and inwardly projecting spacers occupying only a small part of the interior wall surface of the drum and disposed in planes inclined in respect of the drum axis or along curves so as to support and space the freely moving crushing rods in the drum at least at two points at opposite sides of the center of gravity of the rods.

6 Claims, 4 Drawing Figures

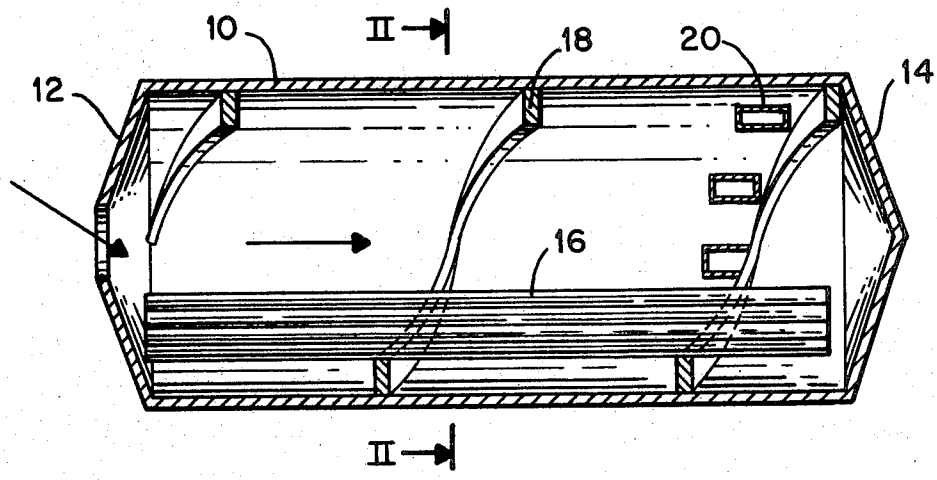


FIG. 1

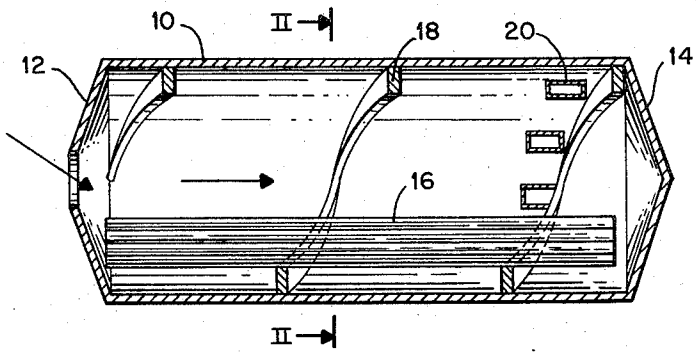


FIG. 2

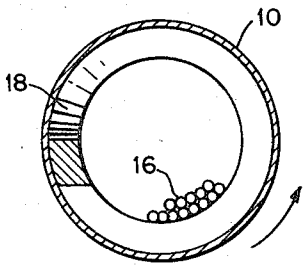


FIG. 3

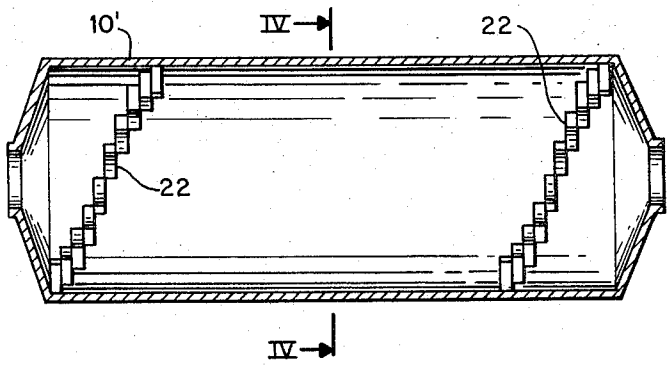
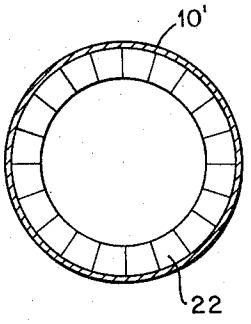


FIG. 4



ROTARY TUBULAR CRUSHER

The present invention relates to improvements in a rotary tubular crusher comprising a cylindrical drum having a horizontal axis and containing freely moving rods forming crushing elements.

In known apparatus of this type, crushing of the material charged into the drum is effected, on the one hand, between the rods and, on the other hand, between the wall of the crushing drum and the rods.

In such apparatus, it has been found that the attrition between the rods and the crushing drum wall produces a relatively large amount of "super" fines, i.e., particles whose dimensions are substantially smaller than the average size of the attrited material. To reduce wear of the drum wall, it has been proposed to provide two fixed spacing rings on the wall in the interior of the drum in planes perpendicular to the drum axis so as to remove the crushing rods from contact with the wall. This removes the above-indicated disadvantage but causes rapid wear of the crushing rods in the regions where they come into contact with the spacing rings.

It is the primary object of this invention to eliminate these disadvantages while maintaining the crushing rods spaced from the peripheral wall of the crushing drum by rod supports which are so disposed that the regions of support of the rods are displaced along the length of the rods when the drum is rotated so that the rods are worn uniformly along their length.

To accomplish the above and other objects, the invention provides a crusher drum with a peripheral wall whose interior surface has projecting portions occupying only a small part of the surface and disposed along curves extending in planes inclined in respect of the drum axis in such a manner that the rods are always supported on at least two points at respective sides of the center of gravity of the rods.

These projecting portions may form one or several continuous ribs, or they may be distinct from one another and inclined in respect of the direction of the curve in which they are disposed. If desired, the projecting portions may be provided only in the terminal parts of the crusher drum while the central drum part is free of such projecting portions.

If the peripheral wall of the crusher drum has screened ports for discharging the attrited material, these ports are preferably arranged upstream of the projecting portions in the direction of the advance of the material in the crusher drum.

The above and other objects, advantages and features of the present invention will become more apparent in the following detailed discription of certain preferred embodiments of a crusher or mill according to this invention, taken in conjunction with the accompanying schematic drawing wherein

FIG. 1 is a longitudinal section of a crusher drum with rods according to one embodiment.

FIG. 2 is a transverse section along line II—II of FIG. 1.

FIG. 3 is similar to FIG. 1, showing another embodiment; and

FIG. 4 is a transverse section along line IV—IV of FIG. 3.

Referring now to the drawing, and first to FIGS. 1 and 2, there is shown a cylindrical crusher drum **10** having a horizontal axis about which extends a peripheral wall the ends of which are closed off by end walls **12** and **14** one of which, i.e., wall **12** has a central opening through which material to be attrited is charged into the drum.

In a manner well known and, therefore, not shown, the drum may be supported for rotation about its horizontal axis on rollers or its end may have trunnions for rotation in bearings.

The crusher drum **10** contains crushing rods **16** whose length is substantially the same as that of the cylindrical drum. According to the invention, the crushing rods rest or are supported on a helically extending rib **18** projecting inwardly from the interior of the drum wall and maintaining the crushing rods spaced from the wall. This rib may be soldered to the interior surface of the wall or be constituted by armor plating fixed to, or integral with, the wall.

The pitch and the axial length of the helical rib **18** are so chosen that the rods **16** will always rest on the rib at least at two points situated on respective sides of the center of gravity of the rods during rotation of the drum. Thus, the crushing rods will always remain spaced from the crusher wall, and no attrition of the material charged into the drum will take place between the crushing rods and the drum wall whereby the production of "super" fines is avoided.

The drum wall has either along its entire length or, as illustrated, only at one end opposite to the end where the material is charged into the drum a series of peripheral ports **20** which have screens through which the attrited material may be discharged from the drum at the desired particle size. The discharge ports are arranged adjacent the spacing rib **18** and upstream in respect thereto relative to the direction of advance of the material in the drum, which is indicated by a horizontal arrow in FIG. I. Thus, the attrited material is discharged as it is produced.

The rib **18** forms an obstacle to the further advance of the attrited material which accordingly accumulates on the screens of the ports, which facilitates the screening of the material. However, the screens are not blocked because the attrited material is not compacted by the crushing rods which are maintained spaced from the drum wall by rib **18.** If desired, the screened material discharged through ports **20** may be gathered in a fixed casing surrounding the crusher drum.

The direction of the helical spacing rib **18** may be chosen in respect to the direction of rotation of the drum so as to accelerate the advance of the material in the drum, or to retard this advance.

Obviously, serveral helical ribs of the same pitch, or of different pitches, may be provided. Furthermore, the ribs may take different forms by disposing them along curves different from helices as long as these curves do not extend in a plane perpendicular to the axis of the drum **10.** In any event, however, only a very small fraction of the total surface of the interior of the drum wall must be covered by the spacing rib or ribs so that no substantial attrition of the material takes place between the rods and the spacing rib or ribs.

In the embodiment of FIGS. 3 and 4, the crushing rods (not shown in these figures) are supported by two series of ring segments **22,** each segment being disposed in a plane perpendicular to the axis of drum **10'** and the segments of each series forming a portion of a helix. In effect, the distinct ring segments form a helical spacing support for the crushing rods in their end regions. In this embodiment, the central part of the drum is free of spacing supports for the rods and, obviously,

the central part of the helical rib **18** of FIG. **1** may be analogously omitted. Conversely, the series of spacing segments **22** may be disposed along curves different from helices under the conditions described hereinabove in connection with the embodiment of FIG. **1**.

I claim:

1. A rotary tubular crusher comprising

1. a cylindrical crusher drum having
   a. a horizontal axis and
   b. a wall extending peripherally about the axis and having an interior surface;
2. spacing means projecting inwardly from the interior surface of the drum wall, the spacing means
   a. occupying only a small part of the surface and
   b. disposed along curves extending in planes inclined in respect of the drum axis; and
3. freely moving crushing rods contained in the drum,

   a. the spacing means being so disposed that the rods are always supported thereon, and spaced thereby from the interior wall surface, at least at two points at opposite sides of the center of gravity of the rods.

2. The rotary tubular crusher of claim **1**, wherein the spacing means is constituted by at least one continuous rib.

3. The rotary tubular crusher of claim **1**, wherein the spacing means comprises spacing portions distinct from one another, the spacing portions being disposed along a curve and each spacing portion being inclined in respect of the direction of the curve.

4. The rotary tubular crusher of claim **1**, wherein the spacing means are provided only in the end parts of the crusher drum.

5. The rotary tubular crusher of claim **1**, wherein the spacing means is disposed along at least one helix.

6. The rotary tubular crusher of claim **1**, wherein the peripheral wall of the crusher drum defines screened discharge ports for material charged into the drum to be attrited and advancing therein axially, the discharge ports being upstream from the spacing means in respect of the direction of advance of the material in the drum.

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