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FIG. 1.



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BOWL FOR CENTRIFUGAL PULVERIZER
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1 Claim. (Cl. 241—275)

This invention relates to centrifugal pulverizers for reducing the particle size of materials, such as ore, rock, pigment, clay and the like. The invention relates particularly to an improved bowl for such a centrifugal pulverizer.

The type of centrifugal pulverizer referred to above generally includes an impeller which is driven rotationally at high speed about a vertical axis. The impeller is generally supported at the bottom end and the material to be crushed is dropped down into the impeller through a stationary vertical feed tube located above the impeller on the center axis of rotation. The material enters the impeller near the center axis and is propelled outwardly by centrifugal force.

In the type of centrifugal pulverizer contemplated by the present invention, the impeller is mounted for rotation within a bowl which is also generally mounted for rotation, but at a much lower speed than the impeller and preferably in the opposite direction. The material propelled outwardly by the rapidly rotating impeller is projected against the walls of the bowl, and unless some form of protection is provided the walls are subjected to rapid wear and erosion.

In my earlier filed co-pending application, Serial No. 181,552, filed March 22, 1962, entitled "Centrifugal Pulverizer," the walls of the bowl are inclined outwardly upwardly. An annular recess is provided in the inner wall of the bowl at the level of the impeller and it is intended that this fill up with particles projected from the impeller to form a protective layer for receiving the impact of subsequent particles ejected from the impeller.

The object of my present invention is to provide an improved bowl construction, particularly with respect to the impact area of the bowl.

My invention will be clear from the following detailed description of a preferred form thereof, illustrated in the drawing in which:

FIG. 1 is an elevational view, partly in section, showing an improved bowl, according to my present invention, and

FIG. 2 is a top plan view of the bowl of FIG. 1 looking down along the line II—II of FIG. 1.

Referring now to the drawing, FIG. 1 shows a section of the housing 20 of a centrifugal impeller. Mounted on an interior floor 21 of the housing 20 is a bearing housing 25 which supports an impeller drive shaft 26 and a bowl drive spindle 27. Shaft 26 and spindle 27, which are mounted concentrically on the vertical axis of the housing 20, are adapted to be driven independently, preferably in opposite directions and at different speeds. In the drawing, it will be assumed that the impeller 40 is rotated in the counterclockwise direction, as viewed in FIG. 2 and the bowl 60 is rotated in the clockwise direction, as indicated by the arrows. The impeller shaft 26 may be driven by a motor (not shown) through drive belts (not shown) attached to the sheave 29, while the bowl spindle 27 may be driven by a motor (not shown) through a drive belt (not shown) attached to the sheave 31.

The bowl 60 is illustrated in FIG. 1 as comprised of two sections, a lower section 61, and an upper section 62. The upper section 62 is illustrated as having a horizontal portion 63 and a lip portion 64. The horizontal portion 63 is bolted to the wall 34 of the lower section. The

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lip portion 64 inclines outward at an angle preferably of 33° relative to the vertical, for a reason to be mentioned later.

Bowl 60 is supported on the spindle 27 and has a central axial opening in its floor through which the impeller drive shaft 26 passes. The circumferential wall 34 of the lower section 61 is vertical.

In the floor of the lower section 61, intermediate the main wall 34 and the bearing housing 25, is an annular depression or trough 36; and between the trough 36 and the bearing housing 25 are a plurality of radial vents 37.

The impeller 40 is mounted within the bowl 60 on the impeller drive shaft 26. So far as the present invention is concerned the impeller 40 may be a single-deck affair, but is illustrated in FIG. 1 as having two decks formed by the three impeller discs, the upper disc 41, the middle disc 42 and the lower disc 43. Vertically disposed between each set of discs are a plurality of radial webs or vanes 44, which may be secured to the discs as by bolts. These impeller vanes 44, as seen in FIG. 2, curve in the direction of rotation of the impeller, and when the impeller is rotated at high speed, the vanes 44 eject the particles outwardly by centrifugal force.

The ejected particles are thrown at high speed toward the wall 34 of the impeller bowl, and, unless intercepted, would strike the inner surface of the wall 34 with great forces tending to cause rapid wear of the wall.

In accordance with my present invention, the wall 34 of the bowl 60 is protected by an annular impactor ring 50. Impactor ring 50 is formed of a plurality of angle members 51, preferably steel, placed in abutting positions in a continuous annular recess 38 formed in the floor of the bowl 60 immediately in front of the wall 34.

As illustrated in the drawing, angle members 51 comprise a radial leg 52 and a circumferential leg 53, and are so positioned in the annular recess 38 that their radial legs 52 face in the direction of rotation of the bowl, clockwise as viewed in FIG. 1. The angle members are clamped in place by the horizontal portion 63 of the upper section 62 but are otherwise unsecured.

When the bowl 60 is rotated, forces are generated which tend to turn the angle members 51 in a clockwise direction pivotally about the junction of their two legs, but the angle members are prevented from so rotating by the circumferential leg 53 which abuts against the wall 34 of the bowl 60.

In operation, the particles of material, such as ore, rock, pigment, clay, etc., which are to be reduced in size, are fed, as from a hopper (not shown) into a vertically disposed stationary feed tube (not shown) and are dropped down, as indicated by the arrow 55, into the center region of the impeller 40. These particles fall into the lower deck of the impeller 40, and as the impeller is rotated at high speed, which may be of the order of 2200-3600 r.p.m., the particles are thrown by the impeller vanes 44 outwardly in the direction of the impactor ring 50 formed by the angle members 51. The first particles to be ejected strike the angle members 51, and tend to be retained within the pockets 54, formed by the angle members 51, due to the centrifugal force established by rotation of the bowl which, in a typical case, may be a speed of from 300 to 450 r.p.m. As subsequent particles are ejected from the impeller, the pockets 54 tend to fill up with the particles, thus forming a protective coating protecting the angle plates 51 from wear.

After the particles retained in the pockets 54 have built up to a thickness greater than the length of the radial legs 52 and sufficient to present a wall of tightly-packed particles inside the innermost point of upper lip 64, the particles ejected thereafter, which are sufficiently crushed and reduced in size by their own impact against the wall and

by the impact of other later-arriving particles, begin to climb up the inclined lip 64 of the impeller bowl and to form a thin layer on the inner surface thereof. I have found from experience that an angle of inclination of 35° relative to the vertical is the most steep angle that will permit the particles to climb up the wall, and that if the wall be steeper than 35° the particles of material will have to build up in the impact area and on the bowl lip until an angle of 35° is reached. Accordingly, I prefer to give the lip 64 an angle of inclination of 33°.

It will be understood that the angle members 51 are not bolted or otherwise fastened to the bowl or bowl wall. Angle members 51 are merely inserted in the recess 38 in abutting relationship in the position illustrated and described, forming the substantially continuous protecting ring 50. The useful life of the angle members 51 is considerably extended by the fact that they are fully protected by the layer of particles formed thereon by the early-arriving particles which, due to the rotational movement of the bowl, tend to be retained in the pockets 54, following which they become firmly packed due to the impact of the later arriving particles from the impeller. The particles are ordinarily so tightly packed in the pockets 54 that, when the impeller is shut down and the bowl 32 stops rotating, the majority of the particles remain in the pockets 54.

While in FIG. 1, I have illustrated the bowl 60 as having an upper inclined wall or lip 64, such upper lip 64 may, in certain instances, be omitted and the particles allowed to be thrown out from the rotating bowl immediately above the horizontal retaining portion 63, which is needed as a retaining means for the angle members 51.

While the preferred embodiment of this invention has been described in some detail, it will be obvious to one skilled in the art that various modifications may be made without departing from the invention as hereinafter claimed.

Having described my invention, I claim:

An impeller bowl for a centrifugal pulverizer in which an impeller is mounted for rotation within a bowl which is also mounted for rotation, and the impeller is adapted to project particles of material toward the wall of the bowl, said impeller and bowl having means for driving them rotationally at substantially different speeds, the impeller speed being much higher, said bowl having a circumferential vertical wall and means for forming a continuous circumferential bed of packed particles of material inside said wall against which the subsequently projected particles of material are directed, said last-named means comprising: an annular recess in the floor of said bowl immediately in front of said wall, a plurality of angle members positioned edgewise in said recess in abutting relation to each other to form a substantially continuous circumferential impactor ring of radial pockets, and means clamping said angle members in said abutting relation, said clamping means including an upwardly and outwardly inclined lip, each of said angle members being positioned and clamped to have one leg adjacent the circumferential wall of the bowl and the other leg extending radially inward toward the center axis of said bowl, said bowl speed being sufficient for retaining in place said circumferential bed of packed particles of material and for causing the particles projected thereagainst to climb up said circumferential bed to beyond the upper limit of said lip.

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