June 23, 1964 A. BOGOT ETAL 3,138,337

PULVERIZING BOWL MILL UTILIZING A SEGMENTED BULL RING

Filed March 26, 1963 2 Sheets-Sheet 1

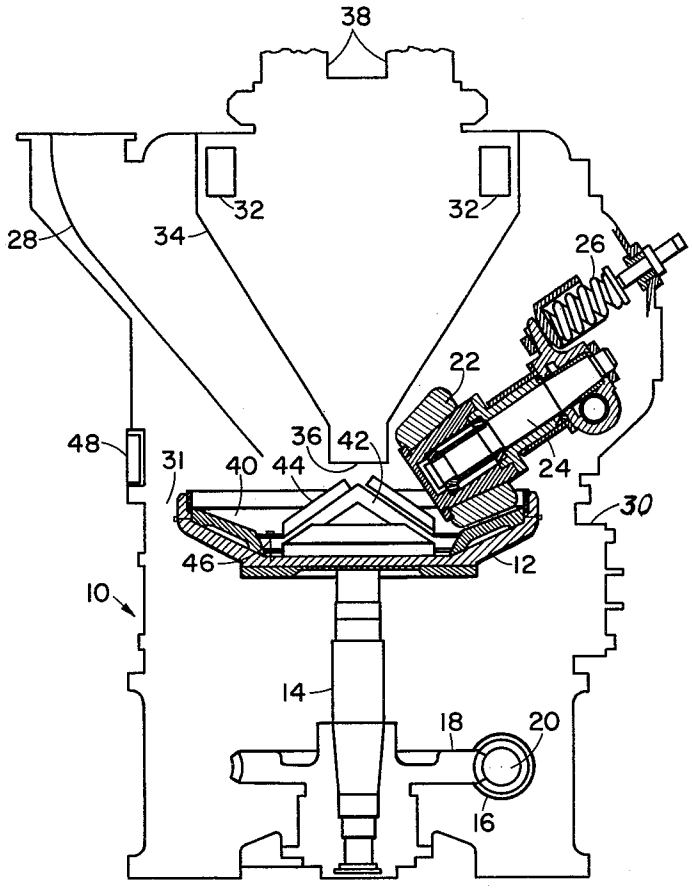


FIG. 1

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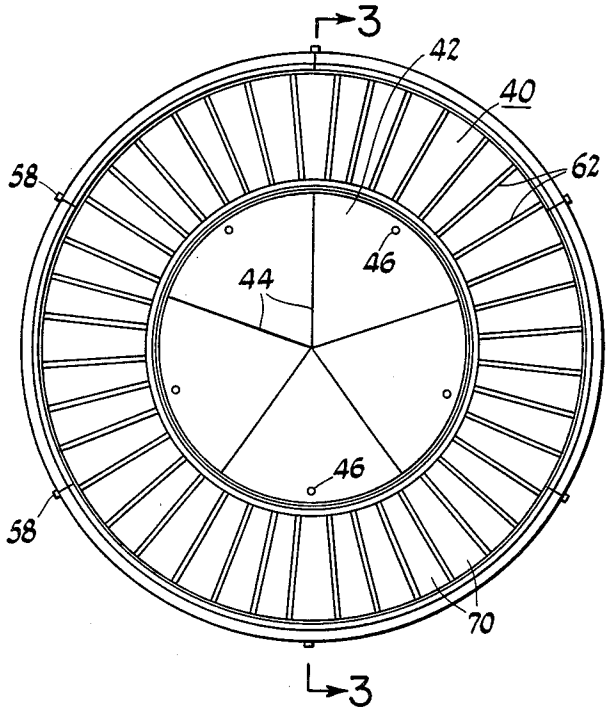


FIG. 2

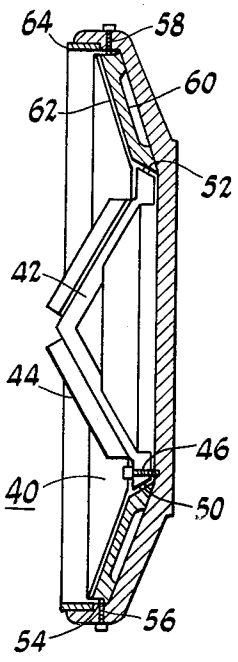


FIG. 3

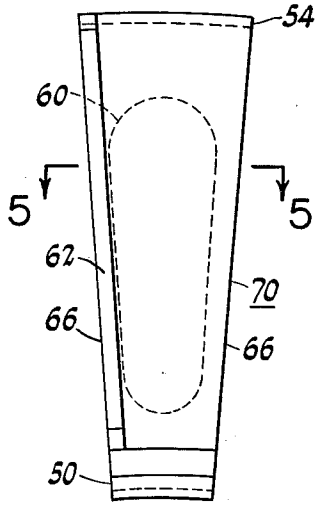


FIG. 4

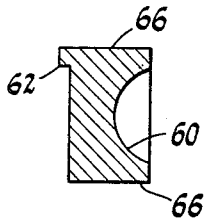


FIG. 5

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3,138,337

PULVERIZING BOWL MILL UTLIZING A SEGMENTED BULL RING

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1 Claim. (Cl. 241—103)

This invention relates to apparatus for pulverizing material, and in particular to an improved ring which coacts with the rollers or grinding elements to perform the grinding action.

Many pulverizing mills today utilize a rotating bowl or table having a race or grinding ring upon which a number of rollers or balls rotate, to thus pulverize coal or other material it is desired to grind to a given fineness. It has been found that considerable wear in these pulverizing mills occurs on the grinding ring or race, and these rings must be periodically replaced. Because of the size of these rings, which are of one-piece forged or cast construction, a substantial portion of the mill must be dismantled in order to permit the worn ring to be removed and replaced. This results in excessive maintenance costs, and periodic and lengthy shutdown periods.

It is an object of our invention to provide a grinding ring for a pulverizing mill constructed in such a manner that it will have a long life, and will be easily and quickly replaceable when it does become worn.

Other objects and advantages will become apparent from the following description of an illustrative embodiment of our invention when considered with the accompanying drawings, wherein:

FIG. 1 is a cross-sectional side view of a bowl mill embodying our invention;

FIG. 2 is an enlarged plan view of the segmented bull ring;

FIG. 3 is a cross-sectional side view of the bull ring taken on line 3—3 of FIG. 2;

FIG. 4 is an enlarged plan view of one of the segments or members that make up the bull ring; and

FIG. 5 is a cross-sectional view taken on line 5—5 of FIG. 4.

Looking now to FIG. 1, numeral **10** designates a bowl mill for grinding coal or other material therein. Inside the housing is positioned a rotatable bowl or table **12**, mounted on shaft **14**. Shaft **14** along with attached bowl **12** is rotated by means of worm wheel **18**, which engages worm **16** mounted on motor driven shaft **20**.

One or more grinding elements or rollers **22** are rotatably mounted on shafts **24**. Adjustable spring **26** urges roller **22** towards the inner surface of the grinding ring.

Coal to be pulverized is introduced into the mill through inlet **28**. Air enters through opening **30**, and flows through annular space **31** to convey the ground material passing over the lip upwardly through the mill interior and into the classifier **34**. The air and coal enter the classifier by way of inlets **32**. The larger particles of unground coal fall back onto the grinding surface through bottom opening **36** for further grinding, and the finer particles carried along by the air are discharged through outlets **38**.

Segmented bull ring **40** forms the grinding surface which coacts with the rollers **22** to perform the grinding action. The hub cone **42**, having radial vanes **44** thereon, continuously throws the coal discharged through opening **36** back onto the grinding surface for further grinding. Screws **46** secure cone **42** to the bowl **12**.

Covered opening **48** is provided in the bowl mill housing in order to permit access to the housing interior for maintenance and inspection purposes. Through this opening, for example, it is possible to replace the segments of bull or grinding ring **40** when they become unduly worn.

Looking now to FIGS. 2 and 3, the segmented bull or grinding ring is shown in more detail. A plurality of truncated wedge-shaped members **70** secured in side-by-side relationship make up the annular grinding ring which is rotatable with respect to the rollers. An inner retainer ring **52**, pressed downwardly against groove **50** in the inner peripheral surface of each segment, secures the inner surfaces of the members to the bowl **12**. The retainer ring **52**, which may be segmented, or made of three or more parts for ease of assembly, is pressed firmly against groove **50** by the bowl hub cone **42**, which is fastened to the bowl **12** by screws **46**.

The segments **70** are cast, and none of the surfaces thereon are thereafter machined. Thus there may be some slight irregularities on the surfaces thereof. It is for this reason that the retainer ring **52** is needed. Without the ring, if there were high spots on the inner peripheral surface of some of the segments, these segments would be the only ones contacted by the bowl hub cone. The retainer ring **52** is made of a soft iron, or other suitable material which will be crushed out of shape by the bowl hub cone when screws **46** are tightened. In this manner the inner edge of each of the segments will be securely fastened to the bowl.

The outer peripheral surfaces of the segments **70** are secured to the bowl **12** by outer retainer ring **56**, which is pressed down upon groove **54** by a plurality of screws **58**, threaded through the peripheral portion of bowl **12**. Again, retainer ring **56** is made of three parts for ease of assembly. Bowl extension ring **64** fits on the inner annular edge of bowl **12** and serves the purpose of retaining the coal to be pulverized within the grinding bowl.

As best seen in FIGS. 4 and 5, each segment **70** contains a recess **60** in the lower surface thereof and a rib **62** extending up out of the plane of the upper surface. The purpose of these features will be explained later.

Previous to this invention, the bull or grinding rings had been of one-piece forged or cast construction. The materials that could be used for making these rings were limited in number, due to the fact that these rings would necessarily have to be machined and worked prior to their installation in the bowl mill. The truncated wedge-shaped members **70** of the present invention are cast, and need not be machined or worked at all. Thus it is possible to make these members of a very hard material having extremely good abrasive resistant characteristics. The metal used can have a hardness on the order of Rockwell hardness No. 75. A typical material that can be used is "Nihard" or "Diamite."

The recess **60** covers an area substantially larger than the area which is not recessed in the bottom of each member **70**. This reduces the weight of each member, and is also a saving of material. The recess also permits only the outer peripheral edge of the bottom surface to rest against the bowl **12**. Thus if there are some slight irregularities in the surface, the element will fit better than would be the case if the recess were not present. Since these elements are made of a material not capable of low cost machining, this feature is significant.

The ribs **62**, which extend up out of the plane of the upper surface, and run along adjacent one of the side surfaces from the inner peripheral surface to the outer peripheral surface, serves a two-fold function. Without these ribs, the surface of the bowl ring tends to become shiny and polished, with the result that the material being pulverized and hence the rollers tend to slip somewhat thereon. These ribs prevent slippage of the material and rollers. The ribs, by being positioned adjacent to one of the flat side surfaces, also prevents the segments from becoming unduly worn along their adjoining edges, by

preventing the rollers from coming into direct contact with these joints.

While we have illustrated and described the preferred embodiment of our invention, it is to be understood that such is merely illustrative and not restrictive and that variations and modifications may be made therein without departing from the spirit and scope of the invention. We therefore do not wish to be limited to the precise details set forth but desire to avail ourselves of such changes as fall within the purview of our invention.

What we claim is:

In a grinding mill, a bowl, means for rotating said bowl, a segmented ring secured to the bowl, a grinding roll positioned in a manner to coact with the segmented ring to accomplish grinding, said segmented ring being made up of a plurality of one piece cast construction truncated wedge-shaped members which, when secured together in side-by-side relationship form an annular ring, each truncated wedge-shaped member having two flat side surfaces adapted to abut against the flat side surfaces of the next adjacent members, a lower surface which lies against the bowl, an upper surface which coacts with the grinding roll, an inner peripheral surface, an outer peripheral surface, a rib extending up out of the plane of the upper surface, said rib extending from the inner peripheral surface to the outer peripheral surface adjacent one of the flat side surfaces, the upper surface being flat with the exception of the rib, a groove formed in both the inner and outer peripheral surfaces extending from one side surface to the other side surface, retaining rings positioned within the grooves of both the inner and outer peripheral surfaces, each retaining ring being made up of several separable portions, each portion of each retaining ring encompassing a plurality of the wedge-shaped members, means for firmly clamping all of the wedge-shaped members between the retaining rings and the bowl, at least one of said retaining rings being made of a malleable metal so that it will conform to any irregularities on the surfaces of the grooves in the wedge-shaped members.

References Cited in the file of this patent

UNITED STATES PATENTS

1,110,222	Morat	Sept. 8, 1914
1,400,123	Wolff	Dec. 13, 1921
2,848,170	Crites	Aug. 19, 1958
3,065,920	Johnson et al.	Nov. 27, 1962