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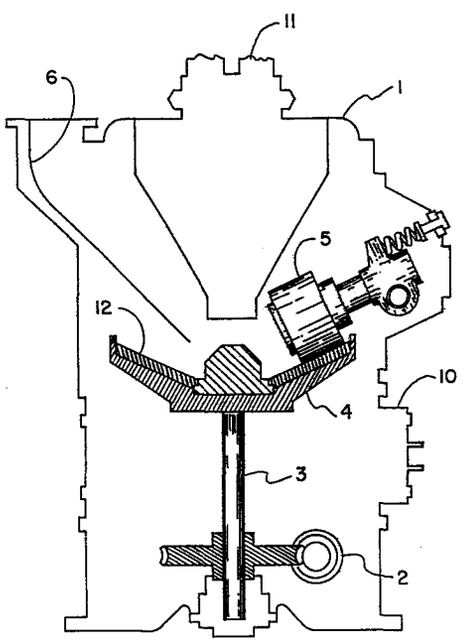
(54) Bull ring for a coal pulverizer.

(57) A coal-pulverizing bowl mill (1) has a bull ring (12) fastened to the table, or bowl (4), as a single body with a surface alloy (17) of high chromium content.



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BULL RING FOR A COAL PULVERIZER

TECHNICAL FIELD

The present invention relates to the formation of a bull ring having a ductile base and a surface layer with high abrasion resistance. More particularly, the invention relates to a bull ring having a unitary body of high ductility overlayed with an alloy of chromium and carbide forming a contact surface which is highly abrasive resistant.

BACKGROUND ART

U. S. Patents 2,848,170 and 3,138,337 are selected as representing the terminology and technology of the art of the present invention. Both disclosures illustrate the housing for a bowl mill in which a rotating table is powered by a vertical shaft. Grinding elements in the form of rolls are forced down upon the upper surface of the rotating table by springs, or hydraulic pressure, and coal is fed between the rolls and table surfaces for reducing the size of the coal. Air under pressure is introduced to the housing to remove the coal pulverized to a predetermined size. Routing is provided to regrind that coal not reduced to the desired size.

In further detail, the table, or bowl, has its upper surface provided with a working area by a so-called "bull ring". The bull ring structure provides a track which interfaces directly with the surface of the rolls forced downward to bring the surfaces into engagement. As a separate body connected, attached, or fastened to the table, the bull ring is exposed to the severe wear of abrasion resulting from crushing or pulverizing coal particles against the roll surface. The art has a long history of concern with the problems and their solutions relating to these bull ring bodies and the surfaces they provide.

At some point in the early development of the bull ring, it was forged as a unitary body from steel. The strength and ductility of the forged steel bull ring was satisfactory, but its resistance to the wear of abrasion was not. The art moved toward the use of Ni-hard for the single-piece bull ring to improve the resistance to abrasion. Ni-hard is a material well-known to the art as an alloy characterized by its high nickel content. The single-piece Ni-hard bull ring was satisfactorily resistant to the wear of abrasion, but, unfortunately, proved to be unsatisfactorily brittle and, therefore, subject to breakage from fit-up problems. The breakage problems of Ni-hard were then attacked by sectionalizing the ring and progress was made in the problem of breakage with this material. However, the bull ring, in sections, unfortunately imprinted on the ductile material of its table, multiplying the problem of fit-up during replacement.

The search continues for a balance of materials in the form of a continuous, unitary bull ring body. A degree of ductility is required which can apparently be met only by steel. The basic body of steel must be sheathed, or overlayed, with an alloy satisfactorily resistant to abrasion and which will not impair the performance of the steel body as a ductile material which can be readily fitted to the bowl or table.

DISCLOSURE OF THE INVENTION

The present invention contemplates a unitary body of ductile cast steel in the form of a bull ring which is overlayed with an abrasion-resistant alloy.

The invention further contemplates the alloy for the abrasion-resistant surface of the bull ring containing 27.5% chromium, 4.8% carbon, 6.3% manganese and 1.6% silica.

The invention further contemplates the surface alloy bonded to the upper surface of the cast steel bull ring by deposit thereon as welding strip material, or being powdered and sintered.

Other objects, advantages, and features of the invention will become apparent to one skilled in the art upon consideration of the written specification, appended claims and accompanying drawings.

BRIEF DESIGNATION OF THE DRAWINGS

Fig. 1 is a sectioned elevation of the major parts of a coal pulverizing mill with a bowl, or table, having a grinding ring embodying the present invention; and

Fig. 2 is a section of the grinding ring of Fig. 1.

BEST MODE FOR CARRYING OUT THE INVENTION

Terms and Technology

The rotated bowl, or table, of a coal pulverizing mill is provided with a surface to come into direct contact with the balls, or rolls, which can stand up to the severe service of directly reducing solid coal to the desired size. The surface is provided by a separate grinding ring colloquially referred to as a bull ring. In dimensional perspective, this grinding, or bull ring is in the order of 100" in outside diameter, and provided with a track in the order of 20" wide for direct contact with the rolls. The ground coal, pulverized to the desired size, is air-lifted out of the mill. The systems for feeding, recirculating, and air-lifting this solid fuel will not be described in detail. The invention is disclosed as embodied in the construction of the bull ring which is clamped to the rotating table. It is not necessary to disclose the structure with which the bull ring is clamped to the upper surface of the rotating table.

Overall Organization Of The Mill

The mill has a housing 1 with internal frame members on which is mounted a motor connected to a pinion gear 2 engaging the gears of a vertical shaft 3 on the upper end of which is mounted a bowl, or table 4. Although there may be more than one, a roll 5 is here disclosed as mounted on a trunnion so that the roll may be forced down upon the surface provided by the table 4.

A shoot 6 connects with an outside source of coal to direct the coal from the source to the center of table 4. This solid fuel to be pulverized is centrifugally thrown between the surface of the roll and the surface provided by the invention on the table 4. When ground to the desired size, air entering port 10 is directed upward to lift the particles of coal into exit duct 11.

The invention is embodied in the bull ring 12 which is clamped to the upper surface of the rotating table 4. The mating surfaces of the ring and table are fitted with great precision in order that the tremendous pressure of the roll 5 will not overflex the body of the ring and cause its fracture. The basic body of the ring 12 is formed of cast steel in order to provide ductility required of this body, while the upper surface of the ring is provided with an abrasive-resistant material which can withstand the severe service of grinding coal between it and the roll surface.

Fig. 2

Fig. 2 is simply the bull ring 12 sectioned to disclose a precise relationship between the base of the ring and the overlay material on its upper surface. Base 15 is the cast steel body whose undersurface 16 mates with the upper surface of table 4. On the upper surface of this base 15 there is deposited the abrasion-resistant material which, together with the base, form the unique combination of the invention.

The present invention is in the structure of the ring 12 and not the process with which it is formed. The cast steel base 15 has its upper surface covered with an alloy 17 which is preferably 27.5% chromium, 4.8% carbon, 6.3% manganese, and 1.5% silica. This material 17 may be deposited by welding it to the upper surface of the base 15, or it may be sintered thereon in powdered form. However deposited, the material is formed as illustrated in Fig. 2 with a surface 18 angled to mate with the surface of the roll.

From the foregoing, it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth, together with other advantages which are obvious and inherent to the apparatus.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the invention.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompany-

ing drawing is to be interpreted in an illustrative and not in a limiting sense.

CLAIMS

1. Bull ring for the rotating table of a coal pulverizer characterized in that a body of cast steel is fastened to the upper portion of the rotating table and a chromium carbide alloy is bonded to the upper surface of the cast steel body to form the contact surface with the pulverizing elements of the coal pulverizer.

2. The bull ring of Claim 1, wherein, the chromium carbide alloy comprises 27.5% chromium, 4.8% carbon, 6.3% manganese, and 1.5% silica.

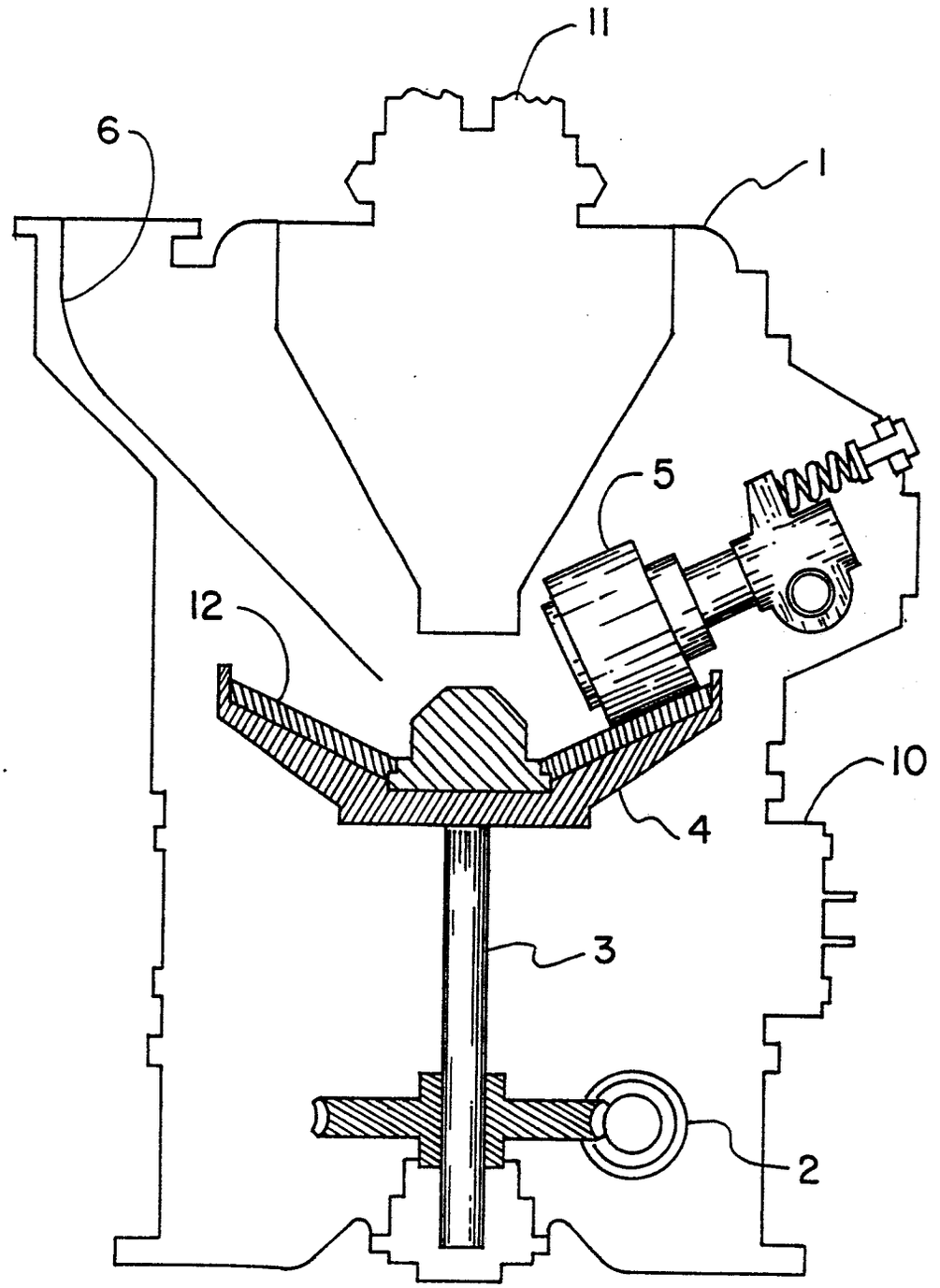

Fig. 1

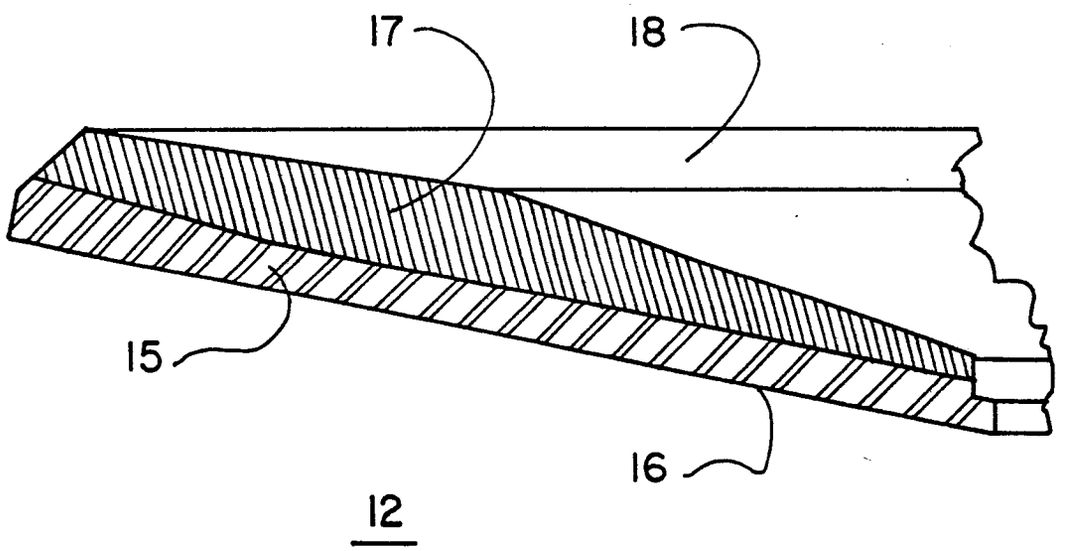

Fig. 2