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3,536,268, dated Oct. 27, 1970.

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[54] **WEARING PARTS FOR CONE CRUSHERS**
3 Claims, 2 Drawing Figs.

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[50] Field of Search **241/293-**
—300, 207—216; 16/2; 52/224

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ABSTRACT: A wearing part for use in a crusher and including a crusher member having a supporting surface, an outer circumferential surface and a crushing surface. The crushing member is formed from a hard, wear-resistant material. The crushing member is prestressed in compression sufficiently to overcome the tension stresses normally produced therein by crushing blows against its crushing surface. This prestressing may be accomplished by an annular band or bands secured around and engaging the outer circumferential surface of the crushing member.

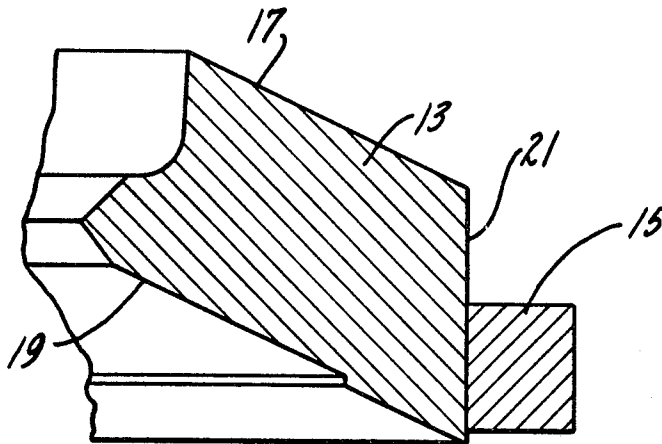


fig. 1.

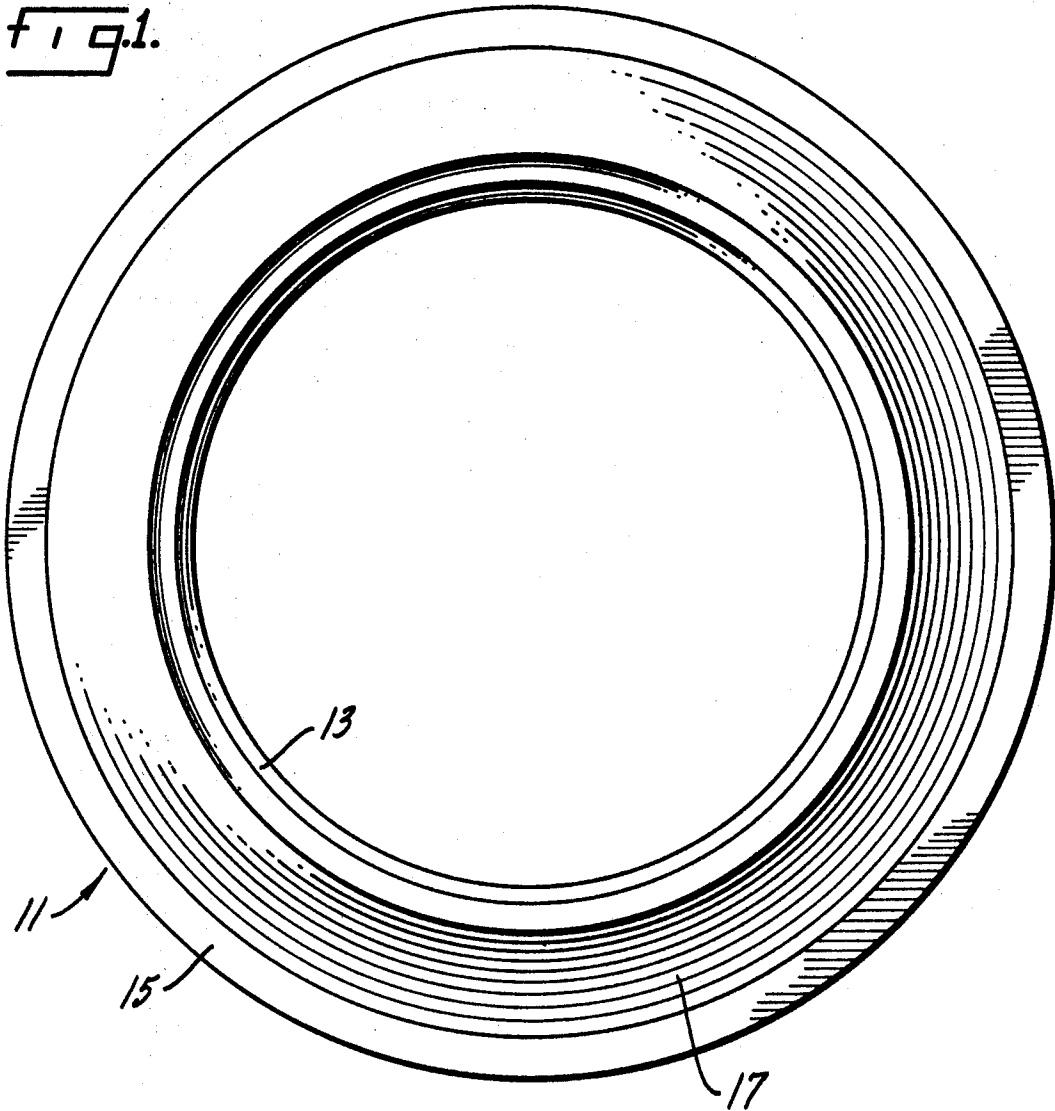
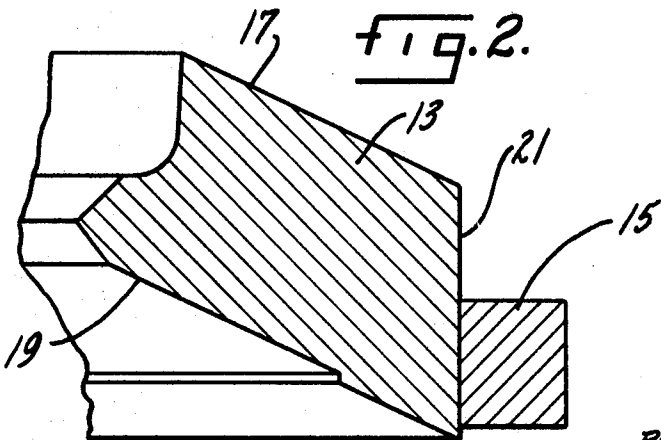


fig. 2.



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WEARING PARTS FOR CONE CRUSHERS

This is a continuation-in-part of our earlier filed application, Ser. No. 669,215, filed Sept. 20, 1967 now U.S. Pat. No. 3,536,268, issued Oct. 27, 1970.

SUMMARY OF THE INVENTION

This invention relates to wearing parts for crushers and more particularly, to a wearing part which is prestressed in compression sufficiently to overcome the tension stresses which would be produced therein under normal operating conditions by crushing blows applied to the crushing surface.

An object of this invention is a crusher wearing part made of a hard, wear-resistant material which will resist cracking under the crushing stresses normally encountered.

Another object is a crushing member which is prestressed in compression by one or more annular bands so as to more or less cancel the tension stresses normally produced therein by crushing forces acting against the crushing surface.

Another object is a crushing member that will not fall apart in the event that it cracks during crushing operations.

Other objects may be found in the following specification, claims and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated more or less diagrammatically in the accompanying drawings wherein:

FIG. 1 is a plan view of a crusher mantle or so-called lower liner embodying the features of this invention; and

FIG. 2 is a partial cross-sectional view of the mantle of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The drawings show the invention applied to a mantle of a gyratory crusher. The mantle 11 includes a truncated conical crushing member 13 and an annular prestressing band or ring 15.

The truncated conical crushing member 13 is formed with an outer conical crushing surface 17, an inner conical supporting surface 19 and an outer circumferential surface 21. Although the crushing member is shown herein as a truncated conical member, it should be understood that this is merely illustrative of the various shapes that the crushing member may take and should not be considered as a limitation of the application of the invention. For example, this invention may also be applied to the bowl of a crusher or the upper liner as it is sometimes called. This invention may also be applied to a flat crushing member which is annular or disc-shaped.

The mantle crushing member 13 may be made from a hard, wear-resistant material such as pearlitic, carbidic, white cast iron; martensitic carbidic chrome-nickel-alloyed cast iron, sometimes known as Nihard; and like materials having a Brinell hardness number at least as high as 400. Additionally, relatively abrasion resistant but brittle materials such as composite metals, ceramics and other metal materials may also be used for the crushing member.

The prestressing band or ring 15 may be shrink fitted around or otherwise suitably secured or engaged to the outer circumferential surface 21 of the crushing member 13. The ring 15 may be sufficiently prestressed that the compressive forces it applies to the crushing member are equal to or greater than the maximum tension stresses produced in the crushing member due to crushing blows exerted against the crushing surface 17. Although we speak about the prestressing provided by the band 15 being sufficient to overcome the maximum tension stresses normally produced in the crushing member due to crushing blows exerted against the crushing surface, it should be understood that it may not be possible to calculate, yet alone design, for the maximum stresses that may be created in the crushing member when a foreign object such as a piece of tramp metal passes through the crusher and engages the crushing member 13. If this happens, the crushing member may possibly crack, but the prestressing band will then function to hold the fragments of the crushing member

together and prevent them from falling into and damaging the crusher.

The band 15 may be made of any suitable metal having a tensile strength sufficiently high to bring about the required compression of the crushing member 13 without exceeding its working properties. Although the prestressing band has been shown and described as attached to and engaging the outer circumferential surface 21 by shrink fitting, it should be understood that other means of tightening this band, such as through the use of a turnbuckle, may be utilized. It should be also understood that although only a single prestressing band has been depicted and described, it may be desirable to use more than one prestressing band. The band or bands may engage only a relatively small portion of the outer circumferential surface 15 of the crusher member 13, say one-tenth to one-half of this surface, even though it prestresses the entire crusher member. A larger band may interfere with the passage of material through the crusher and, therefore, may be undesirable.

The use, operation and function of the invention are as follows:

The mantle 11 of this invention is adapted to be mounted on a crusher head with the supporting surface 19 of the mantle in contact with the crusher head. The crusher head cooperates with a bowl having a liner of material similar to the material of the mantle to form a crushing cavity. The crusher head and its attached mantle 11 are gyrated relative to the bowl and its liner. During crushing, the mantle and bowl liner are subjected to extreme stresses which tend to deform and/or cause the mantle and bowl liner to fracture, while the crushing surfaces of these members are subjected to extreme abrasive forces.

Because of the extreme stresses applied to the wearing portions of a crusher, such as the mantle and bowl liner, during crushing operations, the choice of materials from which these portions may be made has been limited to metals which may have relatively poor wearing characteristics in certain applications. However, these metals were chosen because they have a toughness which enables them to withstand the crushing stresses encountered without breaking or cracking. To prolong the useful life of such crusher parts, it is extremely desirable to use hard, wear-resistant cast materials, such as pearlitic, carbidic, white cast iron; martensitic, carbidic, chrome-nickel-alloyed cast iron, sometimes known as Nihard; and the like which have a Brinell hardness number at least as high as 400. Additionally, it may be desirable to use other relatively abrasion resistant, but brittle materials such as composite metals, ceramics and other metal materials.

Such materials, however, tend to fracture or crack when subjected to stresses of the magnitude applied to a mantle or bowl liner of a crusher. To enable these hard, yet brittle materials to be used as wearing parts of a crusher, the crusher member is prestressed in compression in an amount generally sufficient to overcome the tension forces which would normally be produced therein by crushing blows applied to the crushing surface. In other words, the compressive prestressing applied to the crushing member is sufficiently great that it will tend to cancel out the tension stresses produced in the crushing member during crushing action so that tension forces sufficiently great to crack the crushing member are not produced.

It should be understood that a blow to the crushing surface of the mantle or bowl liner of the magnitude applied by a foreign object such as a piece of tramp metal passing through the crusher may be sufficient to produce tension stresses in the crushing member greater than the compression forces produced by the prestressing. In such cases, although the crushing member may crack, the band 15 will hold the parts of the crushing member in operative position. An additional advantage obtained by the prestressing is that it reduces the chance of premature failure of the crushing member.

Although a preferred embodiment of the invention has been depicted and described, it should be understood that many alterations and variations may be made thereto without departing from the invention's fundamental theme. Accordingly, the

scope of the invention should be limited only by the following claims.

We claim:

1. For use in a cone crusher having a supporting surface therein for positioning and supporting a wearing part, the improvement comprising a somewhat conical crushing and wearing member having inner and outer annular surfaces, a generally conical crushing surface and a generally conical supporting surface to be positioned against the supporting surface of the crusher, said crushing member being made of a hard, wear-resistant material, and means prestressing said crushing member, including a circumferential band on the outer annular surface of the crushing member preshrunk thereon in compression sufficiently to overcome the tension stresses normally

produced in the area of the crushing member adjacent its supporting surface by crushing blows applied to the crushing surface thereby preventing cracking of the crushing member in normal use.

2. The structure of claim 1 further characterized in that the circumferential band engages less than a substantial portion of said outer circumferential surface.

3. The structure of claim 1 further characterized in that the crushing member is a lower liner element adapted to be mounted on the crushing head of a cone crusher with the generally conical supporting surface of the wearing member mounted on and engaging the surface of the crushing head of a cone crusher.

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