March 31, 1970 H. W. ADAM 3,503,564

BOWL FOR CRUSHERS AND THE LIKE

Filed Aug. 24, 1967 2 Sheets-Sheet 1

Fig. 1.

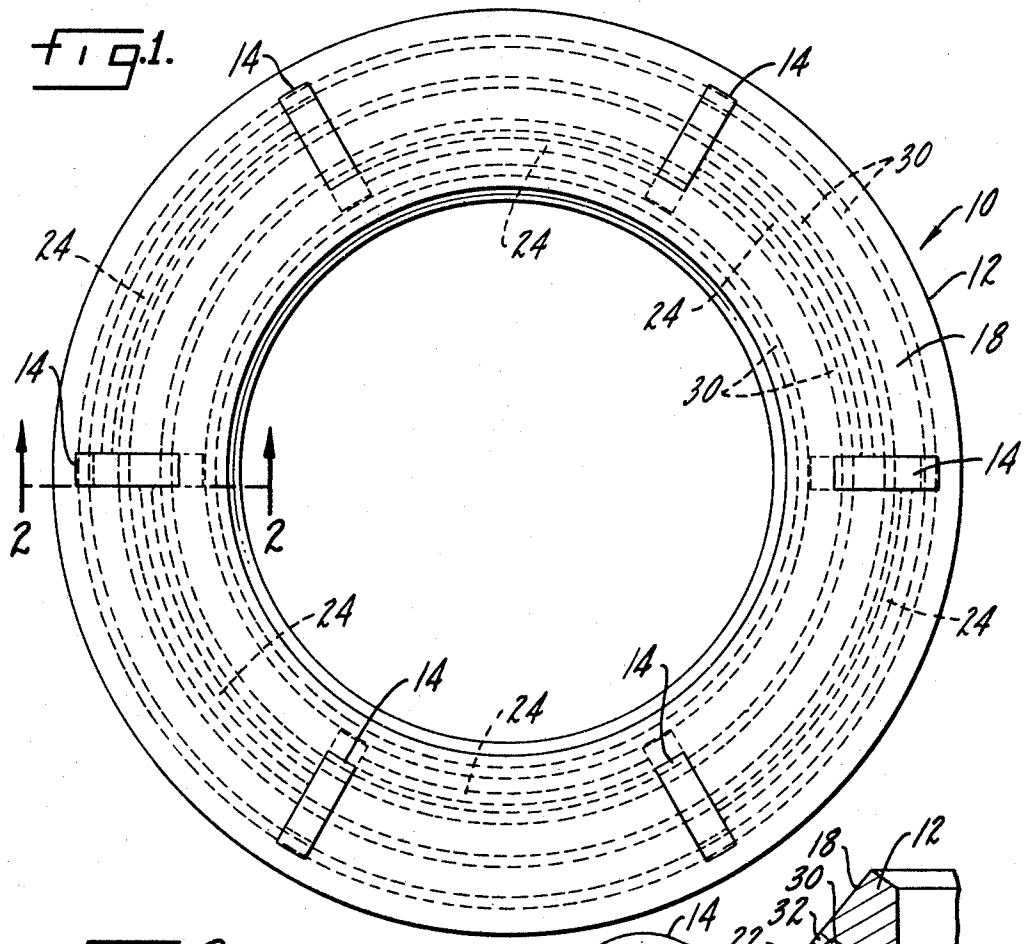
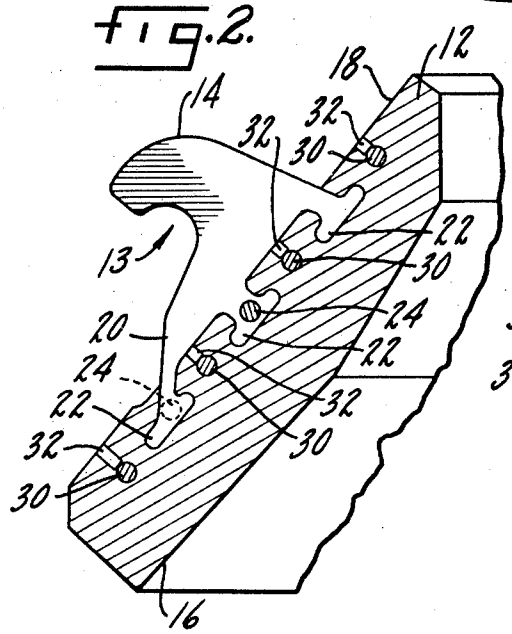


Fig. 2.



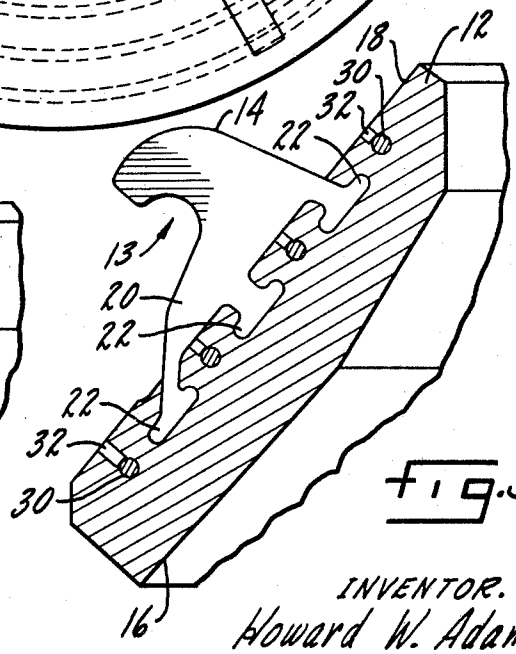


Fig. 3.

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Fig. 4.

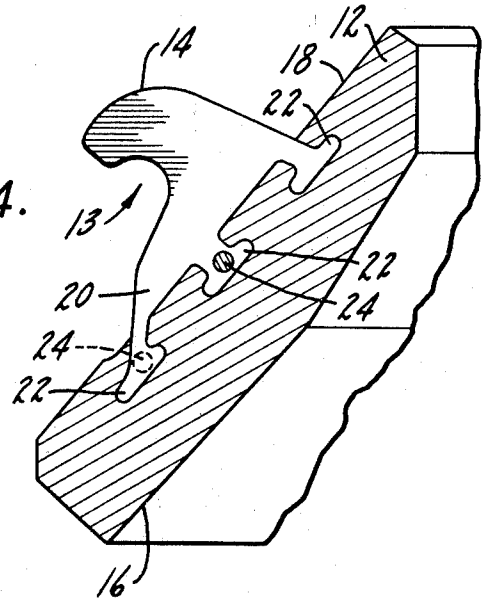
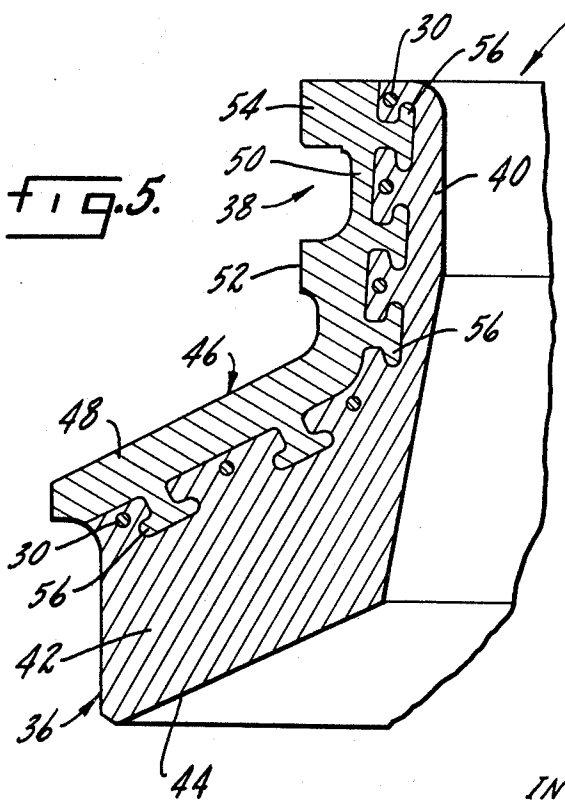


Fig. 5.



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3,503,564

BOWL FOR CRUSHERS AND THE LIKE

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Int. Cl. B02c 2/00
U.S. Cl. 241—299 11 Claims

ABSTRACT OF THE DISCLOSURE

A liner for use in a cone crusher and having an inner conical crushing surface and an outer conical supporting surface. The liner includes a cast crushing member made from a hard, wear-resistant metal; means for mounting the crushing member within the cone crusher are secured to the crushing member. The mounting means is made from a tough, fracture-resistant metal such as mild steel. The liner crushing member may have a plurality of retaining rings imbedded or in cavities therewithin.

SUMMARY OF THE INVENTION

This invention relates to liners for cone crushers and more particularly to a long-wearing liner of the type adapted to be mounted in a crusher bowl.

A primary object of this invention is to provide a liner having a hard, wear-resistant crushing surface and tough, fracture-resistant mounting means.

Another object is to provide an economical, long-wearing liner of the type adapted to be mounted by radially extending hooks.

Another object is to provide an economical, long wearing liner of the type adapted to be mounted by a radially extending flange.

Another object is to provide a liner structure which enables the use of a hard, wear-resistant material for the active crushing portion of the liner.

A further object is to provide a liner having a hard, wear-resistant annular liner crushing member and tough, fracture-resistant, mounting means securely anchored to the liner crushing member.

Other objects and advantages of the invention will become apparent upon reading the following description of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

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

FIGURE 1 is a plan view of one embodiment of the liner structure of this invention;

FIGURE 2 is a cross-sectional view taken along line 2—2 of FIGURE 1 to an enlarged scale;

FIGURE 3 is a cross-sectional view like that of FIGURE 2 showing a modified form of the embodiment of FIGURE 2;

FIGURE 4 is a cross-section like that of FIGURE 2 showing a further modification of the embodiment of FIGURE 2; and

FIGURE 5 is a cross-sectional view showing another embodiment of the liner structure of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGURES 1 and 2, one embodiment of the liner structure of this invention has been shown at **10** as comprising a truncated conical liner crushing member **12** and mounting means **13** for securing the crushing member **12** to a crusher bowl.

The liner crushing member **12** is formed with an inner conical crushing surface **16** and an outer conical backing

or support surface **18**. Although the crushing member **12** of FIGURE 2 has been shown as having a particular cross section, it will be understood that the crushing member cross-sectional shape may be widely varied. For example, the angle of inclination of the surfaces **16** and **18** may be increased or decreased, etc.

In the embodiment of FIGURE 2, the liner mounting means comprise a plurality of circumferentially spaced, radially extending mounting lugs or hooks **14** suitably secured or anchored to the liner crushing member **12** by a plurality of T-shaped feet **22** which are imbedded within the crushing member **12**. The T-shaped feet **22** extend from an elongated base portion **20** of the hook **14**.

Although each liner mounting hook **14** has been shown as having three generally equally spaced feet, it should be understood that more or less than three feet may be used and that the spacing may vary. Further, it should be understood that the T-shaped feet may be eliminated.

As shown in FIGURES 1 and 2, the liner mounting hooks **14** may be interconnected by arcuately formed tie-bars or rods **24** which are imbedded within the crushing member **12**. The tie-rods **24** have been shown welded or otherwise suitably secured at each end to the T-shaped feet of the mounting hooks **14**. Preferably, only one tie-rod **24** extends between any two successive liner mounting hooks **14**; and as shown in FIGURES 1 and 2, each tie-rod is preferably staggered so that it is axially offset from the preceding and succeeding tie-rod. It should be understood, however, that successive hook **14** may be connected by more than one tie-rod **24** and that successive tie-rods **24** may be axially aligned. Further, it should be understood that the T-shaped feet may be eliminated and the tie-rods **24** may be secured to the base portion **20** of the hooks **14**.

The liner crushing member **12** may have retaining rings **30** imbedded or in cavities therewithin which are spaced from each other and spaced relative to surface **18** by back spacers **32**.

The liner mounting hooks **14** and tie-rods **24** are preferably made using a mild steel, but it will be understood that any tough, fracture-resistant metal may be used.

As shown in FIGURE 3, the tie-rods **24** may be eliminated. A further modification is shown in FIGURE 4 wherein the retaining rings **30** and back spacers **32** have been eliminated.

Referring now to FIGURE 5, another embodiment of the liner structure of this invention has been shown at **34** as comprising an annular liner crushing member **36** and mounting means **38** for securing the crushing member **36** to a crusher bowl.

The crushing member **36** is formed with a cylindrical portion **40** and a conical portion **42** which forms a conical crushing surface **44**.

The mounting means **38** may include an annular jacket **46** having a conical portion **48** and a cylindrical portion **50**. The cylindrical portion **50** is formed with a guide flange **52** and a suitable upper mounting flange **54**. The jacket **46** has been shown secured to the crushing member **32** by a plurality of T-shaped feet **56** extending from the jacket **46** and imbedded within the crushing member **36**. The T-shaped feet may be peripherally continuous or they may be interrupted.

It should be understood that the jacket **46** may be formed as one continuous annular piece or may be formed by a plurality of arcuate segments. Further, the jacket may be formed to back or cover the entire axial outer surface of the crushing member **36** as shown in FIGURE 5, or it may cover just a portion of such surface.

The jacket **46** is preferably made using a mild steel, but it will be understood that any tough, fracture-resistant metal may be used.

The crushing member **36**, like the crushing member **12**, may have retaining rings **30** imbedded or in cavities therewithin.

The liner crushing member **12** or **32** is preferably a casting and is formed of a hard, wear-resistant material such as pearltic, carbidic, white cast iron; martensitic, carbidic, chrome-nickel alloyed cast iron, sometimes known as Nihard; or like materials having a Brinell hardness number at least as high as 400.

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

Generally, the liner **10** or **34** is positioned within a crusher bowl and mounted therein by suitable mounting means such as the hooks **14** or the mounting flange **54**. The bowl and liner surround a head adapted for gyratory motion. A mantle is mounted on the head and is formed with an outer conical crushing surface, which, together with the inner conical crushing surface of the liner, defines a crushing cavity in which material is discharged from above for reduction. During such use, the liner may be subjected to extreme stresses which tend to deform and/or cause the active crushing portion and the mounting means of the liner to fracture or crack while the crushing surface may be subjected to extreme abrasive forces.

Because of the extreme stresses which may be applied to the liner during crushing, the choice of materials from which the active crushing element and mounting means is made has been limited, in accepted practice, to metals which have relatively poor wear characteristics, but which have a toughness which enables them to stand the stresses without breaking or cracking. It has been the generally accepted practice to cast the entire liner, including the active crushing portion and the mounting means, out of manganese steel. Although manganese steel is tough and resistant to breaking and cracking, the crushing surface may wear away rapidly when crushing abrasive material. For example, in some crushing operations, the manganese steel liner may wear away at a rate of approximately one-eighth of an inch per three hour period.

Because of the great wear to which the crushing surface of the liner may be subjected, 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; or the like which have a Brinell hardness number at least as high as 400.

In the liner structure of this invention, the crushing member **12** or **36** is formed of a hard, wear-resistant material and the means for mounting the crushing member, such as the hooks **14** or the jacket **46**, are formed of a tough, fracture-resistant material.

The mounting means may be secured to the liner crushing member by T-shaped feet **22** or **56** which are imbedded within the crushing member, by a surface bond between the mounting means and the crushing member, or by other suitable means.

In the embodiment of FIGURE 1, the hooks **14** may be interconnected by tie-rods which are imbedded within the liner crushing member **12**, so that during use in the cone crusher, should the crushing member **12** fracture, the hooks **14** will remain in supporting engagement therewith. The tie-rods **24** additionally assist in maintaining the mounting hooks **14** properly spaced during casting and in maintaining any fractured segments of the liner crushing member **12** in working position.

Such fractured segments of the liner crushing member **12** or **36** may be further maintained in working position by rings **30** imbedded or in cavities within the cast liner crushing member as disclosed in U.S. Patent 3,473,746, issued Oct. 21, 1969. However, these rings may be omitted.

The T-shaped feet **22** or **56** of each liner mounting hook **14** or of the jacket **46** are such that the hooks or jacket may be firmly secured to the liner crushing member without having to be deeply imbedded. This enables optimum utilization of the material within the liner crushing member.

Although the metals described herein are particularly adapted for use in this invention, it should be understood that the crushing liner member may be made from a variety of hard, wear-resistant materials.

Further, although several embodiments and modifications of the invention have been depicted and described, such are intended to be exemplary only, and not definitive. It should also be understood that many further alterations and variations may be made without departing from the invention's fundamental theme. Accordingly, the scope of the invention should be limited only by the scope of the following appended claims.

I claim:

1. A liner for use in a cone crusher, said liner including,

a crushing member of truncated conical shape having an inner truncated conical crushing surface adapted to cooperate with a crusher mantle to form a crushing cavity and an outer truncated conical backing surface adapted to face an upper shell of a crusher, said crushing member being a hard, wear-resistant material, and

means for mounting said crushing member in said cone crusher, said mounting means being formed of tough, fracture-resistant material permanently secured to said crushing member and extending outwardly of said outer truncated conical backing surface.

2. The structure of claim **1** further characterized in that said mounting means comprise a plurality of circumferentially spaced, radially extending mounting hooks.

3. The structure of claim **1** further characterized in that said mounting means comprise a plurality of circumferentially spaced, radially extending mounting hooks, said hooks having base portions imbedded in said crushing member.

4. The structure of claim **3** further characterized in that said base portion of each hook is formed with at least one foot which is imbedded in said crushing member.

5. The structure of claim **4** further characterized in that said foot is generally T-shaped.

6. The structure of claim **5** further characterized in that at least one rod is fastened to and extends from each of said T-shaped feet in a direction generally circumferential of the crushing member.

7. The structure of claim **1** further characterized in that said mounting means includes an annular jacket having portions thereof imbedded in said crushing member.

8. The structure of claim **7** further characterized in that said jacket is formed with a mounting flange and an axially spaced guide flange.

9. The structure of claim **7** further characterized in that said portion of said annular jacket imbedded in said crushing member includes at least one foot.

10. The structure of claim **9** further characterized in that said foot is generally T-shaped.

11. The structure of claim **7** further characterized in that said jacket is segmented into a plurality of arcuate segments.

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U.S. Cl. X.R.

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