United States Patent

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[54] STRIKING BAR FOR CAGE MILL

6 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **241/191,** 241/197
[51] **Int. Cl.** **B02c 13/28**
[50] **Field of Search** 241/197, 188.5, 91, 300

[56] **References Cited**

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ABSTRACT: A striking bar for a cage mill in which the striking bar comprises a steel-backing member channel shaped toward the rear so as to fit over the front face of an axial bar extending between the end rings of the cage of the cage mill. The steel backing for the striking bar has carbide facing on the radially outer and radially inner sides and on the side facing away from the axial bar on which the striking bar is mounted. The striking bar is connected to the axial bar of the cage mill by bolts located near the radially outer side of the axial bar so that the radially inner part of the steel-backing member of the striking bar is not interrupted by bolt holes.

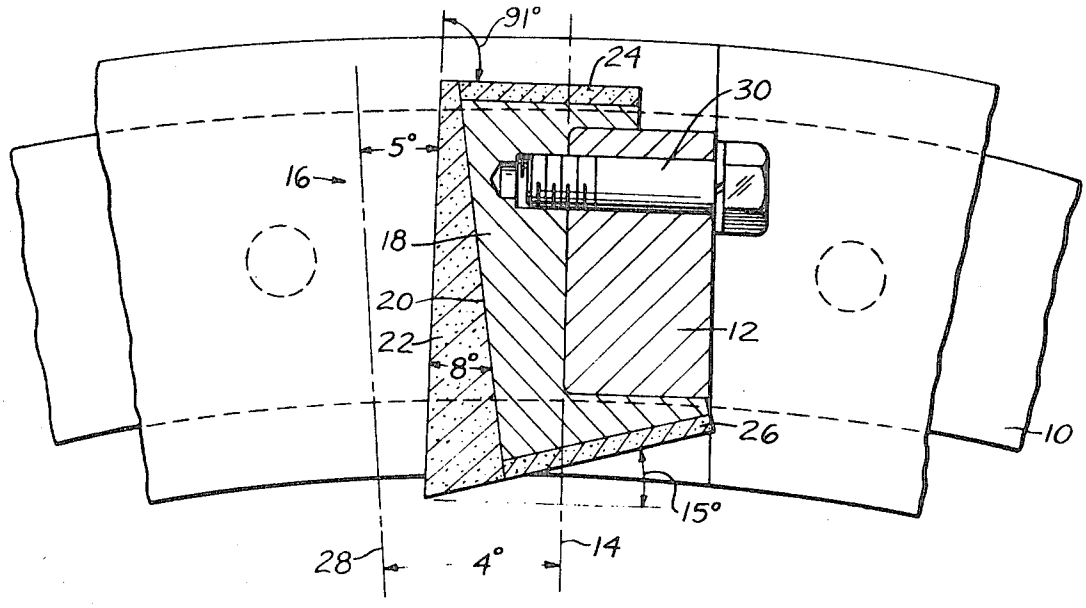


FIG-1

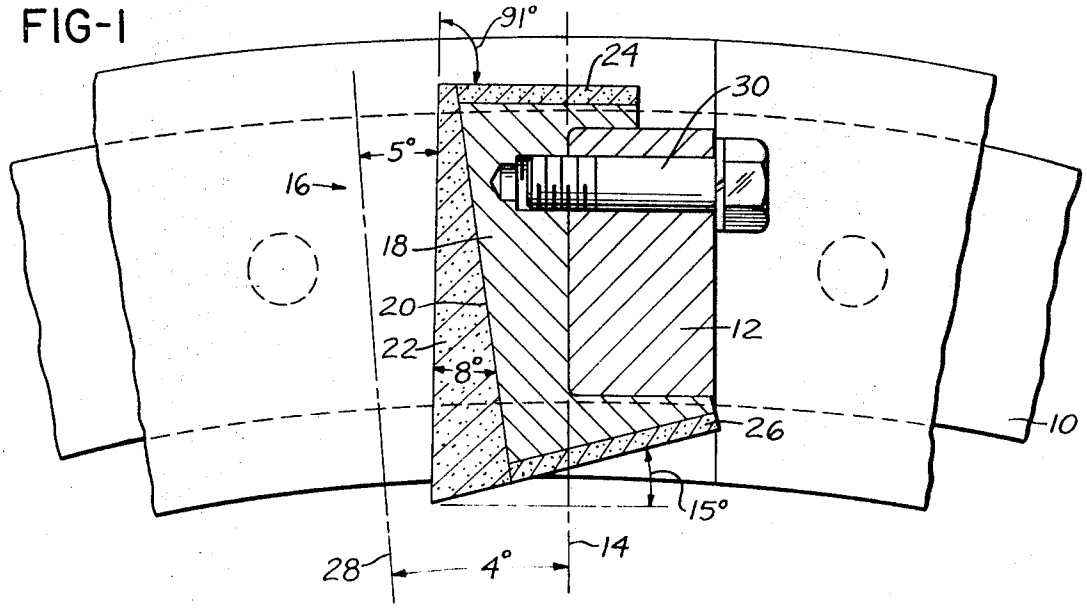


FIG-2

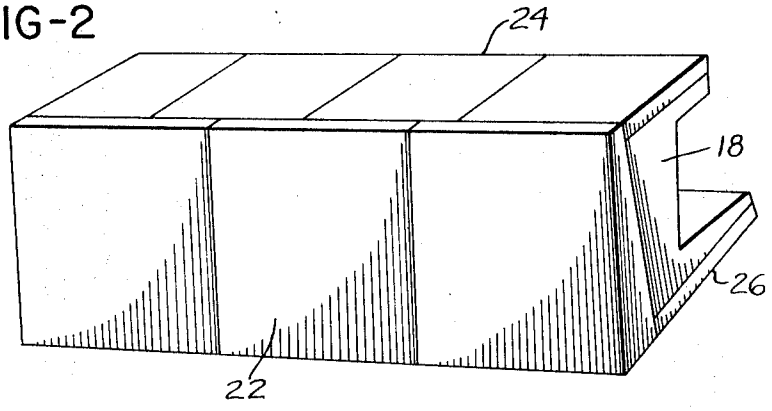


FIG-3

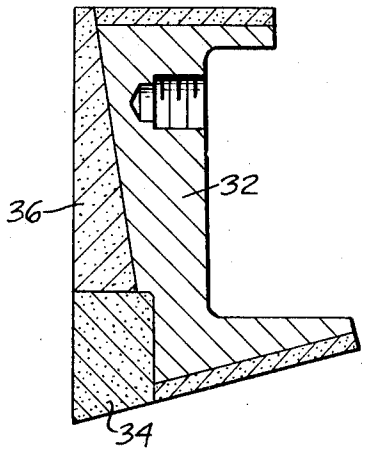
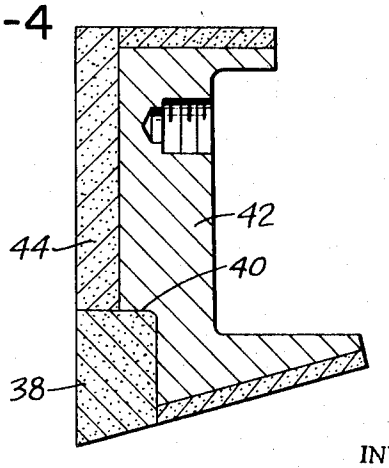


FIG-4



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STRIKING BAR FOR CAGE MILL

This invention relates to improvements in cage mills and is particularly concerned with an improved arrangement of the steel skeleton of the cage of the cage mill and the manner in which the striking bars are mounted thereon.

Cage mills are known and are employed for breaking up or pulverizing material which is introduced into the center of the cage mill and which moves radially outwardly through the cages of the mill while being impacted by the striking areas of the cages so that the material is progressively reduced in size as it moves radially outwardly through the mill.

Cage mills are known in which the striking surfaces of the cages of the mill are in the form of carbide-faced steel supports that are mounted on axial bars extending between the end rings of the cages. The present invention is particularly concerned with an improvement in the construction in the cages and an improvement in the construction of the striking bars carried by the cages.

In earlier cage mills, the cages consist of axially spaced end rings with axial support bars extending therebetween with the supporting bars being rectangular in cross section and inclined relative to a radius passing through the respective bars. This inclination of the axial bars is for the purpose of presenting the front face of the striking bars at the proper angle to the material passing through the cage mill. While such cage mills are eminently satisfactory in operation, the cages involve some little expense because of the angle at which the axial support bars are mounted between the end rings while, furthermore, the striking bars are somewhat expensive to manufacture and are difficult to face with carbide facing in such a manner as to obtain the longest life of the striking bars.

With the foregoing in mind, the primary objective of the present invention is the provision of a cage mill of the nature referred to which is economical to manufacture and in which the striking bars are easy to manufacture and exhibit long life.

Another object of the present invention is the provision of a cage mill structure and a striking bar therefor in which the striking bar is so shaped as to permit substantial modification of the carbide facing applied to the leading side thereof to accommodate the striking bar to the various conditions encountered in the use thereof.

These and other objects and advantages of the present invention will become more apparent upon reference to the following detailed description, taken in connection with the accompanying drawings, in which:

FIG. 1 is a partial transverse section through the cage of a cage mill showing a portion of an end ring and an axial support bar and a striking bar according to the present invention mounted thereon;

FIG. 2 is a view looking in from the left side of FIG. 1 showing a typical striking bar;

FIG. 3 is a vertical transverse section through a modified form of the striking bar; and

FIG. 4 is a view like FIG. 3 but shows still another form which the striking bar can take.

According to the present invention, the cage of the cage mill is constructed so that the circumferentially spaced axial bars extending between the spaced end rings of each cage are substantially radially disposed instead of being tilted to a radius as has been the practice heretofore.

The desired radial tilting of the face of the steel portion of the striking bar mounted on the axial support bar is formed into the steel portion of the striking bar. The aforementioned change of position of the axial support bar and the change in formation of the steel part of the striking bar results in substantial thickening of the steel support part of the striking bar in the radially outer region thereof so that it is this region of the striking bar which receives the support bolt to secure the striking bar to the axial support bar of the cage.

The outer surfaces of the steel support member of the striking bar are faced with hard wear resistant cemented carbide material and the thickness of the material on the forward face of the striking bar can be increased in thickness toward the radially inner side of the bar where the greatest wear takes place.

The cages are easier to manufacture and the striking bars are less costly and it becomes a simple matter to distribute the carbide facing thereon to produce he best wear characteristics.

Referring to the drawings somewhat more in detail, an end ring of a cage is shown at **10** in FIG. **1** and extending axially between the end rings in circumferentially spaced relation are supports bars **12** which are preferably welded to the end rings. As will be seen, the leading face of support bar **12** lies in the plane of a radius **14** of the cage so that the fabrication of the cage becomes a relatively simple matter.

Mounted on the leading face of bar **12** is a striking bar or hammer generally indicated at **16** and which includes a channel-shaped steel backing part **18** which fits over the leading face of bar **12** and along the radially inner side thereof and at least part way along the radially outer side thereof. The leading face of steel member **18**, indicated at **20**, inclines rearwardly from a radius from the outer edge to the inner edge. On the leading side **20** of steel member **18** is mounted the tapered carbide facing **22** secured in place as by epoxy cement or brazing.

The radially outer side of steel member **18** has carbide facing **24** thereon and the radially inner side has carbide facing **26** thereon. The carbide facing at **22**, **24** and **26** is generally made up of relatively small segments and the number of segments applied to a striking bar or hammer is determined by the length thereof. As will be seen in FIG. **2**, which shows a typical hammer, the facing at **22** is made up of three segments and the facing at **24** and **26** is made up of four segments.

The inclination of the outer side of carbide facing **22** is such that it makes an angle of 5° with a second radius to the cage, indicated at **28**, and making an angle of 4° with the above mentioned radius **14**. The inclination of the leading side **20** of steel support member **18** is such that the angle of taper of carbide facing **22** is about 8°, as marked on the drawing. The described arrangement produces the proper disposition of the working leading face of the hammer but does so without requiring a cage having other than radial support bars extending between the end rings.

The bolts **30** which extend through axial support bars **12** and are threaded into steel support members **18** of the striking bars are disposed close to the radially outer sides of bars **12** and support members **18** thus leaving the radially inner portions of members **18** free for modification if so desired.

The principal wear on the carbide facing **22** occurs at the radially inner side of the hammers and the tapered shape illustrated in FIG. **1** is thus of considerable merit.

It might be desired, however, to make the radially inner portion of the carbide facing of the hammer even heavier and this can be accomplished according to either of the modifications of FIGS. **3** or **4**.

In FIG. **3**, for example, the carbide facing on the support member **32** is in the form of a block like member **34** at the radially inner side of the leading face of the hammer while the radially outer portion thereof is made up of the tapered facing **36**.

As will be seen in FIG. **4**, a carbide block **38** of substantial dimensions is set into the notch **40** formed at the radially inner side of the leading face of steel support member **42**, and the carbide facing on the remainder of the leading face of the support member takes the form of the flat strip **44**.

In both of FIGS. **3** and **4** modifications, the carbide members **34**, **36**, **38** and **44** could be segmented if desired and could either be cemented to the steel-back member or brazed thereto.

The FIGS. **3** and **4** arrangements have the advantage that the portion of the carbide facing on the leading side of the hammers illustrated therein at the radially inner edge, and which is subjected to the greatest abuse, has a mechanical interlock with the steel support member and is thus firmly supported against severe radial impacts that might, in an extreme

condition, cause loosening of the carbide facing from the steel support.

It has been found that hammers and cages made according to the present invention offer the advantages of ease of manufacture of the cages and, therefore, lower costs while at the same time the hammers themselves are somewhat easier to fabricate and are lower in cost and offer the further advantage of greater freedom of modification due to the absence of bolt holes in the radially inner regions thereof.

What is claimed is:

1. In a cage mill; cage means having end ring means and support bar means attached to said end ring means and extending axially therefrom, and striking bar means mounted on the leading side of said support bar means, said striking bar means comprising a channel-shaped steel backing member extending over the leading side and the radially inner and radially outer sides of said support bar means, hard wear resistant facing elements mounted on the leading face of said backing member and on at least the radially inner face thereof, and means securing said backing member to said support bar means and located in the radially outer region of said support bar means.

2. A cage mill according to claim 1 in which the plane of the leading side of said support bar means is substantially radial with respect to said cage means.

3. A cage mill according to claim 1 in which the said facing elements mounted on the leading face of said backing member have a greater thickness in the circumferential direction at the radially inner side of said striking bar means than at the radially outer side thereof.

4. A cage mill according to claim 3 in which the facing elements on the leading side of said striking bar means taper outwardly in the radially inward direction.

5. A cage mill according to claim 3 in which the facing elements on the leading face of said striking bar means comprise a first circumferentially thicker element at the radially inner region of the leading face of said support member and a second circumferentially thinner element extending from the radially outer side of said first element outwardly.

6. A cage mill according to claim 5 in which said backing member has a notch in which said first element is mounted, the leading sides of said first and second elements being disposed in a common plane.