Sept. 9, 1969 R. M. WILLIAMS 3,465,973

REVERSIBLE CAGE BAR AND MOUNTING FOR HAMMER MILLS

Filed June 30, 1967 2 Sheets-Sheet 1

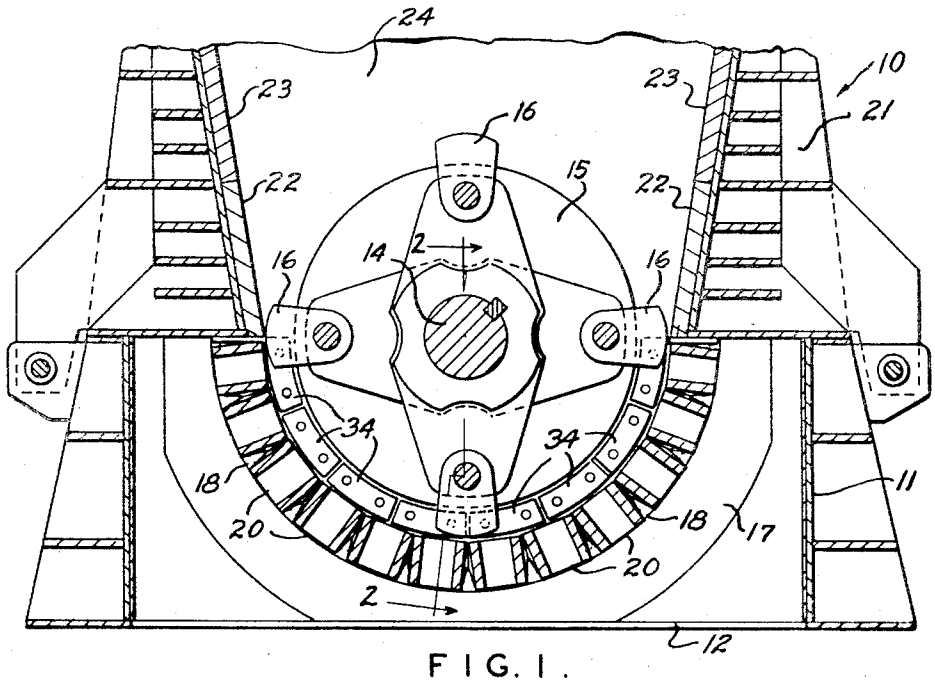

FIG. 1.

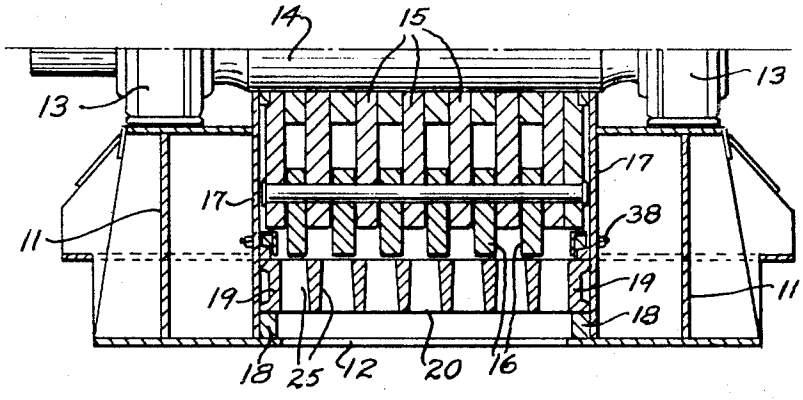

FIG. 2.

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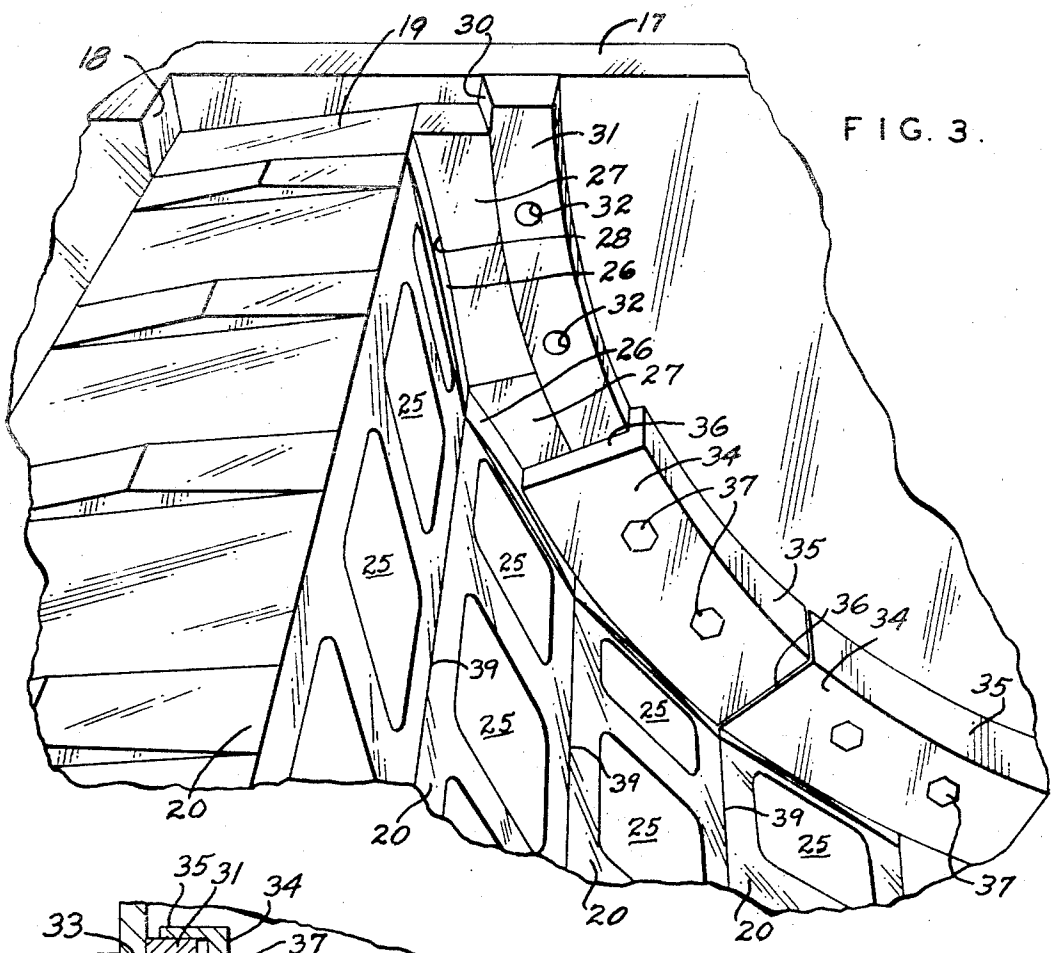

FIG. 3.

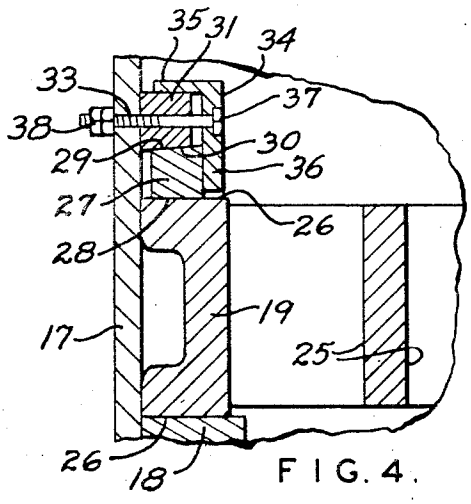

FIG. 4.

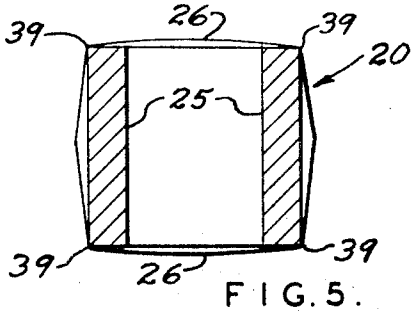

FIG. 5.

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REVERSIBLE CAGE BAR AND MOUNTING FOR HAMMER MILLS

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U.S. Cl. 241—86 5 Claims

ABSTRACT OF THE DISCLOSURE

A hammer mill apparatus in which the cage bars, mounted by wedge means including a protective keeper means therefor, are formed in a manner that allows reversal thereof on the mounting seats in the mill housing so that extended life is possible and efficient operation of the mill can be prolonged before cage bars have to be replaced.

This invention relates to improvements in hammer mills and particularly is concerned with providing reversible cage bars for such mills.

The problem in hammer mills is that trash, dirt, and foreign matter become so firmly jammed into the openings and crevices that it is an extremely difficult job to remove worn cage bars for replacement. Heretofore, cage bars for hammer mills have been discarded when wear thereon destroyed the desired running clearance in the hammer circle. As the cage bars wear and the hammer circle space increases the crushing and grinding effect of the mill rapidly decreases, either in longer time for reducing the material to a condition where it will pass through the grate bars or in failure to reduce the material to the desired fineness condition.

It is, therefore, an important object of the present invention to provide improved cage bars for hammer mills and to mount the cage bars for easy removability.

It is also an important object of the present invention to provide cage bars having a configuration that will readily allow for reversing the position of the bars so that longer life at substantially normal efficiency can be obtained therefrom.

It is also an object of the present invention to provide a hammer mill with improved mounting provisions for reversible cage bars.

Other objects and attendant advantages will be hereinafter disclosed in connection with a preferred embodiment of the present invention, particular attention being directed to the several views in the accompanying drawings, wherein:

FIG. 1 is a fragmentary sectional elevational view of a hammer mill embodying the improved reversible cage bars of this invention;

FIG. 2 is a fragmentary transverse sectional view of the cage bar assembly, the view being taken at line 2—2 in FIG. 1;

FIG. 3 is a greatly enlarged perspective view of a part of the mill showing the end mounting of the cage bars;

FIG. 4 is a fragmentary sectional view of the cage bar securing means shown in FIG. 3; and

FIG. 5 is an enlarged cross section of a typical cage bar to show its symmetrical form for reversibility.

In FIGS. 1 and 2 the hammer mill **10** has a base frame portion **11** formed with a bottom opening **12** for the discharge of the crushed material. The frame **11** carries suitable bearings **13** to support the shaft **14** on which the plurality of rotor discs **15** are assembled. The discs **15** carry a plurality of pivoted hammer elements **16** arranged in opposed pairs for purpose of balance. The rotor assembly is confined between opposite end walls **17** in which

continuous ring or semi-ring steps **18** (one being shown in FIG. 3) are provided to support the ends **19** of the several cage bars **20**. The steps **18** are sufficiently long to seat a group of cage bars in side by side relation.

The upper portion **21** of the mill casing carries breaker plates **22** adjacent the hammers **16**, and above these plates are the side walls **23** of the material feed chute **24**.

Each cage bar **20** is formed with through openings **25** spaced along its length, and the bar is substantially rectangular in cross section as can be seen in FIG. 5. However, the ends **19** of each such bar **20** are formed with arcuate surfaces **26** on the opposite sides. The arcuate surfaces **26** are determined by an arc whose center is at the center of the rotor shaft **14** and whose radial length reaches to or is measured out to the back side of the bar or that side of the bar remote from the hammers **16**. Each surface **26** has the same arcuate configuration so that when one side facing the hammers **16** becomes worn, the bar may be removed and turned over to present an unused side to the hammers **16** so that the hammer clearance space can be again brought into the desired condition.

As may be seen in FIGS. 3 and 4, the cage bars **20** are set by the ends **19** on the steps **18** in walls **17**. Each bar is provided with a wedge element **27** having an edge surface **28** curved to match the curved surface **26** on the bar, and the opposite edge surface **29** is tapered to provide an adjustable "draw-up" action when abutted on the tapered edge **30** of the arcuate cage ring member or abutment means **31**. In addition, the wedge elements are curved to match the curvature of the member **31**. Each abutment means **31** may be an elongated circular member which is shaped to match the circular arrangement of the assembled cage bars on the adjacent step **18**, and such means **31** is formed with a plurality of bolt receiving apertures **32** which match apertures **33** in the end wall **17**. A series of liner elements **34** are placed over the abutment means **31** such that their flanges **35** drop over the means **31** and the long leg **36** engages the wedge elements **27** as a keeper. Bolts **37** are passed through the liners **34**, the apertures **32** and the end wall **17** to the outside where nuts **38** are threaded up to draw the liners up tight against the wedge elements **27** and cause the tapered surfaces **29** and **30** to secure the cage bar ends **19** on the step **18**. The bolt heads are recessed in the liner elements **34** to avoid damage thereto during mill operation.

The assembly of the cage bars **20** in the manner shown has the advantage that the liner elements **34**, being short pieces as shown, but which can be a single circularly shaped element, makes it easy to dismantle the assembled cage bars. In this connection, it must be realized that the material fed into the hammer mill is pounded and thrown around with great force so that the cage bars are sprung out of shape and distorted, and the liner elements are pounded and disfigured to such an extent that the nuts **38** loosen and become tell-tale indicators to signal tightening is required. The liner also serves to protect the abutment means **31** which is normally welded in its initial assembly to the wall **17**. Without the liner in position the abutment means **31** would be pounded out of shape and rendered useless to cooperate with a fresh set of cage bars. Furthermore, the liner means is provided with the log legs **36** which protect the wedge elements **27** in a similar manner. Eventually, however, the pounding of the material in the mill chamber forces the liner legs **36** to drive the wedge elements **27** deeper into the space between the abutment member **31** and the adjacent end portion of the cage bars. This action, thereby, further tightens the cage assembly and prevents

movement that might otherwise destroy the cage ring seats **18**.

A still further advantage for the hammer mill assembly in the area of the cage bars is that when the wedge elements **27** are removed there is sufficient space in which to maneuver the cage bars **20** so that distortion, warping and misshaping of the bars can be accommodated during the process of the removal of the bars along the direction of the abutment means **31**. The bars can not be angled upwardly between the walls **17** but must be moved sideways along the seat steps **18** in order to achieve removal.

It is now apparent that the cage bar assembly achieves all of the objects desired, and provides a simple way of mounting the bars for easy removal and reversal so that the useful life of the bars can be extended to advantage. It is the aim herein to include all variations of the mounting assembly for reversible cage bars within the spirit and scope of the appended claims.

What is claimed is:

1. A hammer mill comprising a casing having a material discharge opening and opposed pairs of end and side walls adjacent such opening, one of said pair of opposed walls being formed with elongated seats, a plurality of cage bars located in working position over said discharge opening with the ends thereof on said seats, said cage bar ends having opposite side surfaces, each shaped to conform with said seats to allow positioning the cage bars selectively in one of two positions, wedge means engaged between said one pair of walls and said cage bar ends to retain the cage bars in working position, and protective keeper means engaged with and substantially covering said wedge means against direct impact by material in the hammer mill.

2. In a hammer mill the combination including a mill casing structure having a material discharge defined by at least two spaced opposed walls, each said wall having a circularly shaped elongated seat therein, a plurality of substantially identical cage bars located in assembled positions over said material discharge with the end portions thereof supported by said elongated seats, abutment means carried on each of said walls in spaced relation to said seat therein, each said abutment means having

a tapered edge directed toward the adjacent seat, holding elements for the ends of each cage bar, each element having a first edge shaped to conform to the cage bar end portion it engages and having an opposite tapered edge substantially matching the tapered edge of said abutment means, and liner means secured to said walls over said abutment means and holding elements to force said matching tapered edges on said holding elements and abutment means into wedging engagement.

3. The hammer mill combination set forth in claim **2** wherein the end portions of each cage bar are curved to match said seats, said curved end portions fitting said seats in at least two different positions of each of said cage bars.

4. The hammer mill combination set forth in claim **2** wherein each liner element has a flange portion engaged over said abutment means and a keeper portion engaged over said adjacent holding element.

5. The hammer mill combination set forth in claim **2** wherein said abutment means have circularly curved and tapered edges facing said seats, the end portions of said cage bars slide between said seats and abutment means selectively on assembly and disassembly, each cage bar end portion having at least two different surfaces circularly shaped to substantially match the circular shape of said seats and said holding elements and liner means being removable to allow selective seating of said cage bars on said seats in at least two different positions.

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