United States Patent

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[54] **IMPACT CRUSHER**
5 Claims, 5 Drawing Figs.

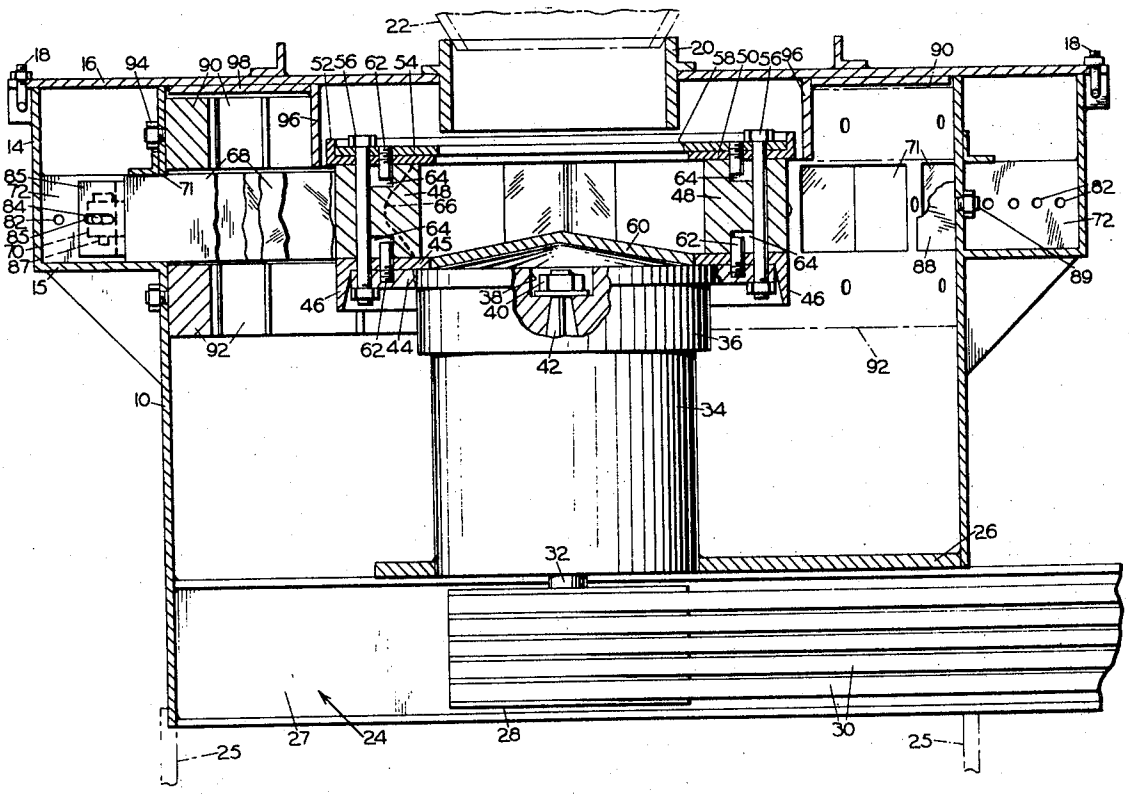
[52] **U.S. Cl.** **241/275,** 241/286
[51] **Int. Cl.** **B02c 19/00**
[50] **Field of Search** 241/275, 291, 286, 299

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ABSTRACT: An impact crusher having impeller shoes and anvils capable of easy replacement and furthermore capable of repositioning individually in the crusher as wear occurs. The impeller shoes are triangular in shape for operation in forward or reverse directions of rotation without shifting their position. The anvils are supported on a crusher housing by means of brackets capable of adjustment radially in the housing for repositioning the anvils.



2 Sheets-Sheet 1

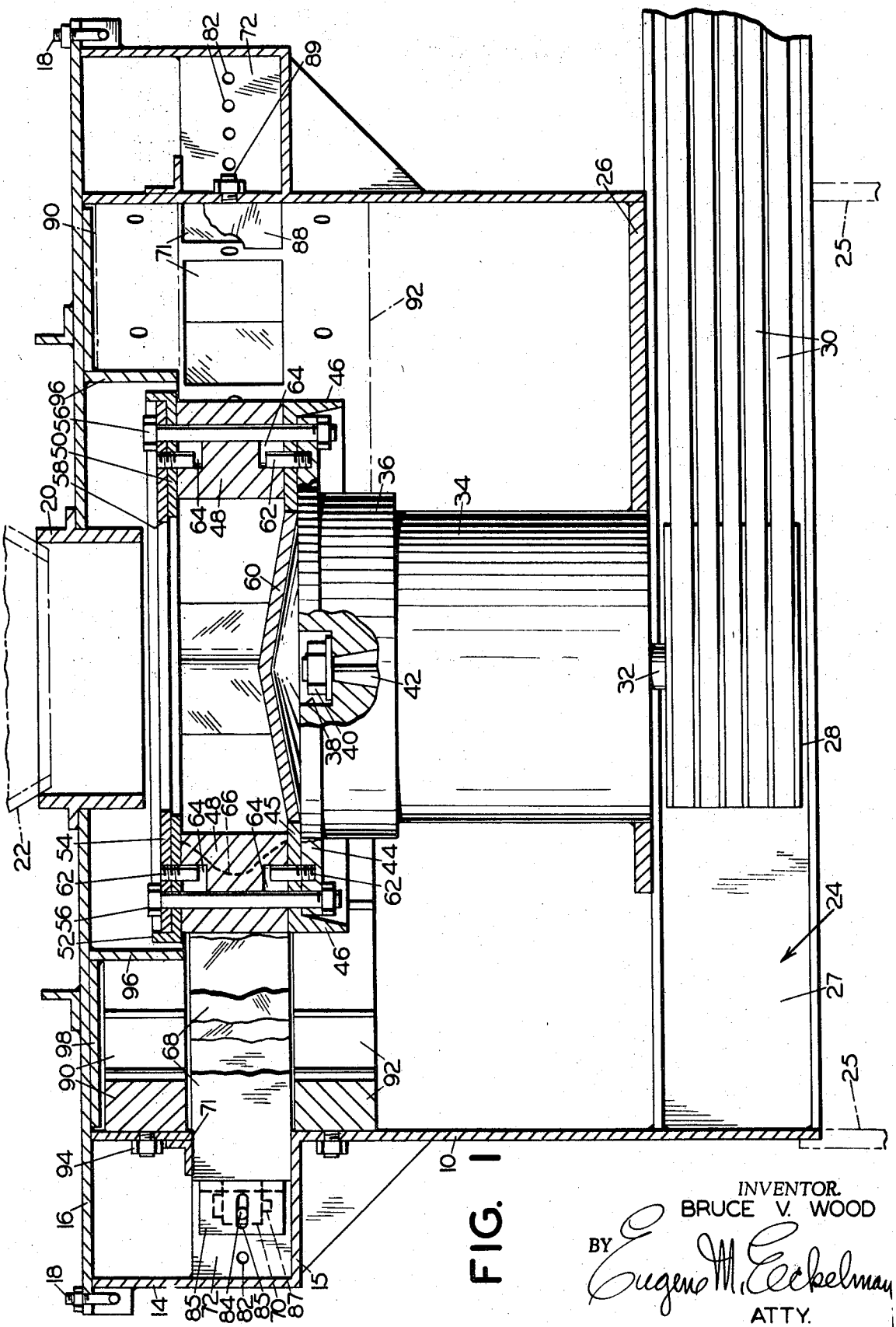


FIG. 1

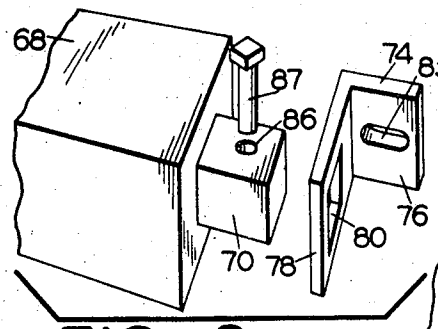


FIG. 3

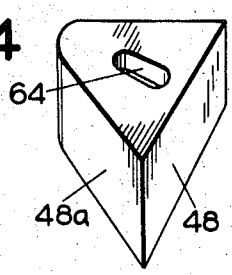


FIG. 4

FIG. 5

FIG. 2

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IMPACT CRUSHER

BACKGROUND OF THE INVENTION

This invention relates to new and useful improvements in impact crushers.

In the crushing of rocks by an impact crusher wherein the rocks are impelled against anvils or breaker elements by rotating impeller means, the rock load is in most cases extremely abrasive and hard to crush. This causes fast wear of the impeller means and anvils, and crushers of this type heretofore used require frequent replacement of operating parts, especially the impeller shoes and anvils. Prior structures heretofore employed have provided for replacement of the shoes and anvils but such structures do not provide for a positioning thereof which accomplishes maximum wear of both of the impeller shoes and anvils. Thus, replacement of said shoes and anvils is required long before full wear occurs.

Accordingly, a feature of the present invention is to provide an impact crusher having a novel structure and arrangement of impeller shoes and anvils which are capable of adjustment as wear occurs and which facilitate operation of the crusher in forward and reverse directions without repositioning the impeller shoes or anvils, all with the result that maximum wear can be obtained from these parts before replacement is necessary.

More particular objects of the present invention are to provide an impeller shoe structure which is substantially triangular in shape and capable of efficient operation in forward or reverse directions without repositioning for opposite directions of rotation; to provide impeller shoes which have a novel construction for attaching them to mounting plates wherein said shoes are readily attached or detached and are also capable of being inverted; and to provide anvil members having a novel mounting structure facilitating adjustment radially in the housing as wear occurs.

The invention will be better understood and additional objects and advantages will become apparent from the following description which illustrates a preferred form of the device.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical sectional view of an impact crusher structure embodying features of the present invention, this view being taken on the line 1–1 of FIG. 2;

FIG. 2 is a fragmentary plan view of the crusher with certain parts thereof being broken away for clarity;

FIG. 3 is a fragmentary perspective view of an anvil and of a mounting bracket for attaching anvil members to the housing;

FIG. 4 is an enlarged perspective view of an impeller shoe of the invention; and

FIG. 5 is an enlarged fragmentary sectional view taken on the line 5–5 of FIG. 2.

DETAILED DESCRIPTION of the Preferred Embodiment

Referring now in particular to the drawings, the present crusher comprises a housing or casing 10 circular in configuration. Housing 10 has an enlarged circular side extension 14 at the top provided with a bottom wall 15. A cover plate 16 is detachably connected on the housing by stud connections 18. This cover plate has a central feed tube 20 for receiving rock to be crushed from a hopper 22 or other means such as a conveyor. The bottom of the housing 10 is open to form a discharge opening 24. The housing is seated on a raised support 25 for discharge of the material out the bottom.

Disposed in the housing 10 is a pulley enclosure having a top wall 26 and sidewalls 27. This enclosure projects outwardly beyond one side of the housing 10 and encloses pulleys 28 engaged by belts 30 having a driving engagement with motor driven pulleys not shown. Top wall 26 of the pulley enclosure does not extend fully to the other side of the housing with relation to the side of the housing into which the pulley enclosure projects so that crushed rock can discharge freely through the opening 24. Pulleys 28 are keyed or otherwise secured to a vertical shaft 32 projecting upwardly through the top wall 26 of the pulley enclosure and journaled in an upstanding bearing block 34 supported integrally on the top wall of the pulley enclosure 26. The upper end of shaft 32 projects beyond the end of bearing block 34 and is connected to a base member 36 having a rotatable seating support on the block 34. The upper surface of the base member 36 has a central, top opening recess 38 for receiving a projecting end of the shaft 32 as well as a fastening member 40 secured on the shaft. Base member 36 is rotatable with the shaft 32, and for this purpose suitable key means 42 serve to connect these parts for unitary rotation.

Secured to the upper surface of the base member 36, as by welding, is an impeller unit comprising a lower round impeller disc or plate 44 having a diameter less than the diameter of the housing 10. The disc 44 supports an annular wear plate 45 having a protective depending circumferential flange 46. Plate 45 supports a plurality of impeller shoes 48 disposed adjacent the outer edge thereof. Seated on the shoes 48 is a top annular wear plate 50 having an upturned protective peripheral flange 52, and seated on the wear plate 50 is an upper impeller disc or plate 54, the assembly being held together by bolts 56 passing through shoes 48 and through the plates 44, 45, 50 and 54. Bolts 56 thus hold all the impeller shoe parts on the lower impeller disc 46 and such parts are readily detachable by removal of the bolts. The upper impeller disc 54 has a central opening 58 for receiving rock from the feed tube 20 whereby such rock is directed onto the impeller unit. A deflector plate 60 is supported on lower impeller disc 44 within the opening in the annular wear plate 50 and is in the shape of a flattened cone to deflect rocks outwardly which fall thereon from the feed tube.

As best seen in FIGS. 2 and 4, the impeller shoes are substantially triangular in configuration. Preferably, these shoes assume the shape of an isosceles triangle and two equally angled sides thereof form rock impelling surfaces 48*a* and 48*b*. The shoes are mounted such that the angle or corner between the impelling surfaces is directed toward the center of rotation and the two surfaces 48*a* and 48*b* thus allow forward and reverse rotation of the impeller unit without repositioning the shoes. Forward and reverse rotation of the impeller unit is accomplished by a reversible drive motor, not shown, which drives the belts 30. Such reverse drive of the impeller unit provides for maximum wear of the shoes 48 in that when one side of the shoes 48 has become worn it is merely necessary to reverse the direction of rotation of the drive motor to subject the other surface 48*a* or 48*b* to wear. Although four impeller shoes are illustrated in the drawings, it is to be understood that more or less may be used.

In order that the shoes will not rotate on the bolts 56, top and bottom anchor pins 62 are threadedly secured in impeller discs 44 and 54 and project into respective lower and upper recesses 64 in the top and bottom surfaces of the shoes 48. Recesses 64 are of extended length such that the bolts 56 also pass therethrough, although it is to be understood and as shown in the drawings that the anchor pins 62 are spaced slightly from the bolts 56 so that the shoes are held positively in a nonrotatable position. The bolts 56 are preferably located outwardly from the pins 62 so that a substantial amount of wear can occur in the inwardly directed portion of the shoe before any damage results to the bolts. The general pattern of wear is designated by the phantom line 66 in FIG. 1, whereby it is apparent that considerable wear can occur without touching the short anchor pins 62 of the bolts 56.

Anvil or breaker members 68 having a knob 70 on one of their ends are mounted in the enlarged housing portion 14 in horizontal alignment with the impeller shoes 48. These anvils project through windows 71 in the housing 10 and are supported on radially extending walls 72 integrated with the inner surface of housing portion 14. The anvil members 68 are seated on the wall 15 of housing portion 14 and are attached to the walls 72 by right-angle brackets 74 having legs 76 and 78, FIGS. 2 and 3. Leg 78 of the brackets has an eye or socket portion 80 on its end adapted to receive the knob 70 on the

anvil members **68**. The walls **72** have a plurality of horizontally aligned bolt holes **82**, FIG. **5**, for receiving bolts **84** which secure the brackets **74** in place. The brackets have horizontal slots **85** in their legs **76** for receiving the bolts **84**, and by means of the slots **85** and the plurality of bolt holes **82**, the anvil members can be held at selected radial positions in the housing. The anvils **68** rest on the bottom wall **15** of housing extension **14** and are held against the force of rock impelled against their faces by the brackets **74**. As the anvils wear, the brackets can be moved inward by resetting the bolts **84** in a different hole **82** or by adjustment of brackets **74** by means of slots **85**, or both. When the anvils are new, the brackets **74** may not be necessary since the knob **70** can abut against the wall of the housing. However, as the anvils wear, the brackets can be installed to hold the latter in newly adjusted positions. The mounting arrangement described allows the anvil members **68** to be adjusted inwardly to a point such that they can be worn almost entirely through their thickness before they need to be replaced. In a preferred arrangement the knobs **70** of the anvils have vertical bores **86** capable of receiving locking pins **87** for holding the anvils and brackets together. In FIG. **1**, the anvils **68** on the right side of the view have been ommitted for clarity.

In the arrangement shown, the walls **72** are provided peripherally around the housing portion **14** in selected spaced relation to confine a pair of the anvils **68** therebetween. The forward ends of the walls **72** have auxiliary anvils **88** secured thereto, as by means of bolts **89**, to protect the front end of the said walls from rock which is impelled thereagainst.

A row of anvils **90** is provided around the inner side of housing **10** above the main anvils **68**, and similarly a row of anvils **92** is provided below the main anvils **68**. These upper and lower anvils have integral projecting stud portions **94** for bolting them to the housing and serve to protect the housing from rock which may miss the main anvils or which glance off at peculiar angles. An annular wall **96** of less diameter than the housing **10** is integrated with the cover **16** and depends in the housing to prevent glancing rock from engaging inner parts such as the feed tube and bolts **56**. Cover **16** has a wear plate **98** on its under surface disposed between the housing **10** and the depending wall **96** to protect the cover from glancing rock.

According to the invention an impact crusher is provided which obtains maximum wear from impeller shoes **48** in that the latter operate in either forward or reverse direction of rotation of the impeller unit. Thus, maximum wear can be obtained from the shoes merely by reversing the direction of rotation of the impeller. No repositioning of the shoes or anvils is necessary in such reversal. The impeller shoes may be inverted if uneven wear occurs in a vertical direction. The anvils can be moved forwardly for maximum usage as wear occurs. The radial adjustable feature of the anvil members **68** also permits them to be adjusted a selected distance from the impeller shoes for accomplishing the best possible crushing action.

It is to be understood that the form of my invention herein shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of my invention or the scope of the subjoined claims.

I claim:

1. An impact crusher comprising:

a. a housing,

b. a feed inlet in said housing,

c. an impeller unit rotatably mounted in said housing,

d. drive means connected to said impeller unit for rotating the same whereby to impel material fed through said inlet away from the impeller unit,

e. a plurality of anvil members disposed in said housing around said impeller unit,

f. said anvil members having a face portion against which rock from said impeller unit is impelled and broken,

g. said face portions being disposed at substantially right angles to the radius of said impeller unit at respective anvil members,

h. and means mounting said anvil members in said housing for adjustable movement radially in said housing to maintain a selected spacing between the said face portion and said impeller unit as wear takes place on the said face portions.

2. The impact crusher of claim **1** wherein said anvil members are disposed in side-abutting pairs and said means mounting said anvil members in said housing provides individual radial adjustment of said anvil members.

3. The impact crusher of claim **1** wherein said means mounting said anvil members in said housing includes a bracket secured to said anvil members, and radial extension means on said housing receiving said bracket in different radial positions for accomplishing said radial adjustment of said anvil members.

4. The impact crusher of claim **1** wherein said anvil members are disposed in substantially side-by-side relation and said means mounting said anvil members in said housing provide individual adjustment of said anvil members relative to said impeller unit.

5. The impact crusher of claim **1** wherein said means mounting the anvil members in said housing comprise radially extending walls, bracket means secured to said anvil members, and fastening means arranged to secure said bracket means to said radially extending walls in different radial positions for accomplishing the said adjustable movement of the anvil members relative to said impeller unit.