United States Patent

Wood

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[54] IMPACT CRUSHER

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[52] **U.S. Cl.** **241/275**, 241/191

[51] **Int. Cl.** **B02c 13/09**

[58] **Field of Search** ..... 241/186 R, 188 R, 191–194, 241/195, 197, 257 R, 275, 291, 299, 189 A

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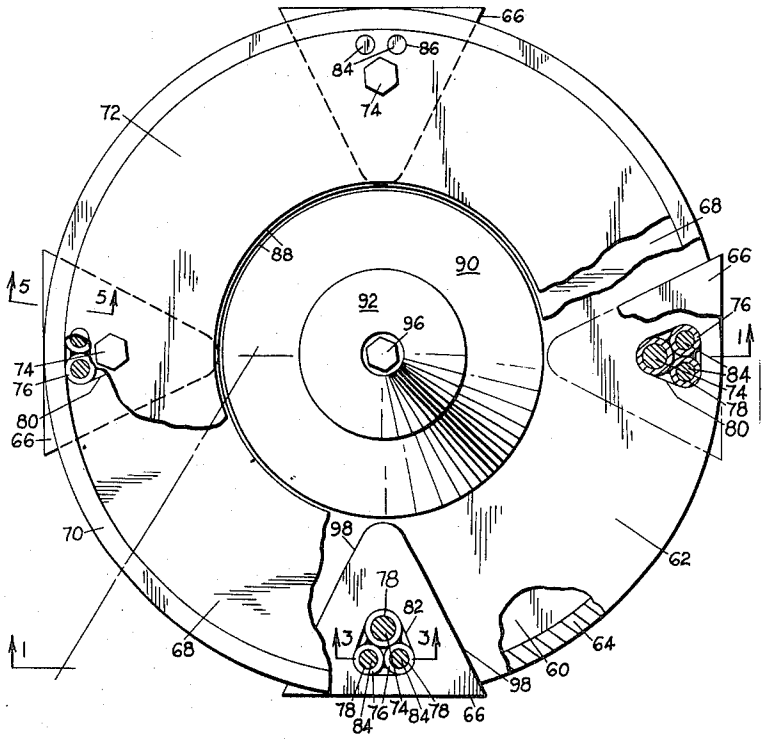
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[57] **ABSTRACT**

An impact crusher having impeller shoes which are triangular in shape for operation in either forward or reverse directions of rotation without shifting their positions. The shoes are maintained in place by attaching structure which holds the impeller shoes without applying a compressive clamping force thereon. The impeller shoes have dished impelling surfaces for improved efficiency. The crusher includes a central feeding disc having a replaceable ring portion to renew the disc without replacing the entire feeding assembly.

9 Claims, 5 Drawing Figures



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SHEET 1 OF 2

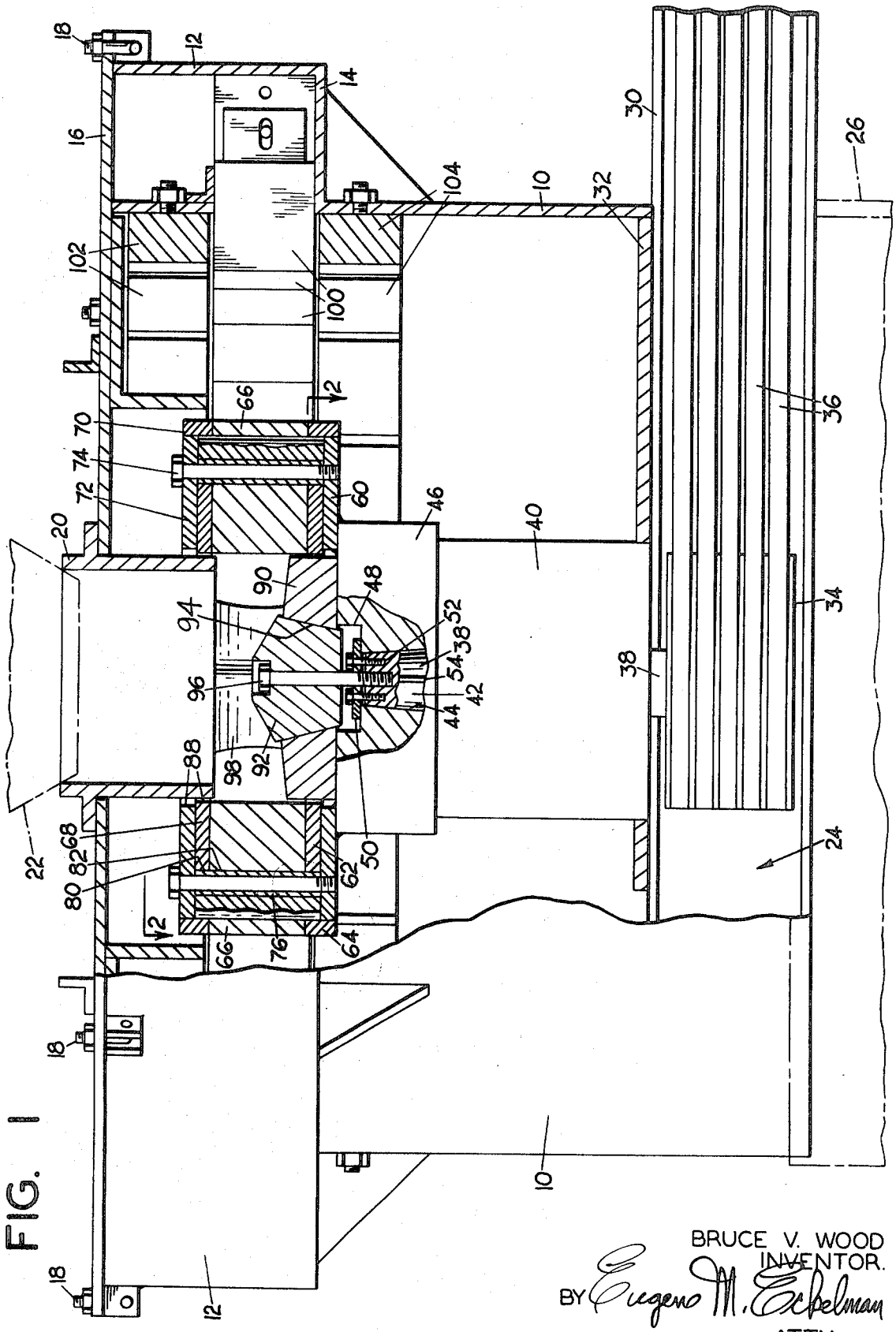
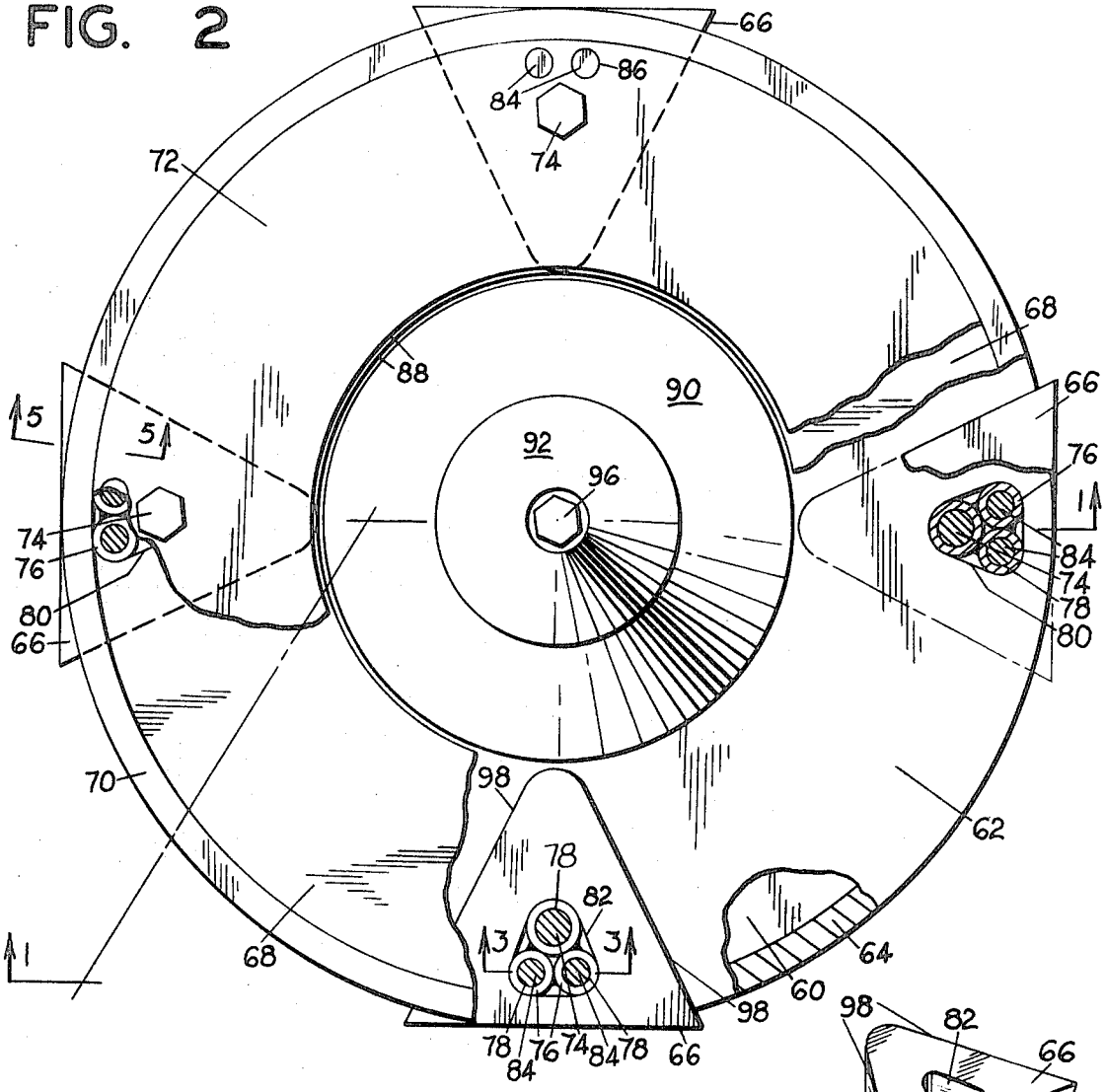


FIG. 1

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FIG. 2



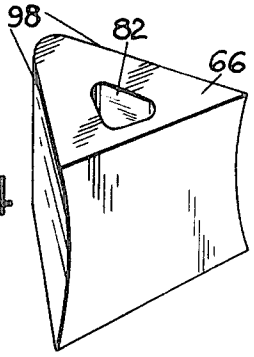


FIG. 4

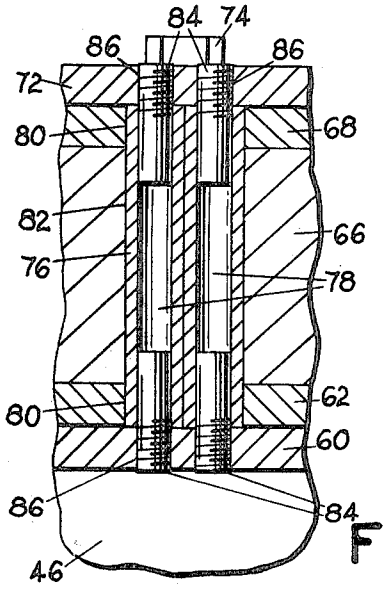


FIG. 3

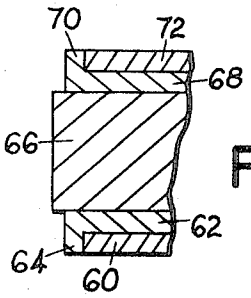


FIG. 5

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IMPACT CRUSHER

BACKGROUND OF THE INVENTION

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

In the construction of impact crushers wherein the rocks are impelled against anvils or breaker elements by rotating impeller means, the impeller means in the form of shoes must be securely anchored on the rotative drive disc. It is customary to clamp the shoes between upper and lower plates for firm attachment, but it has been found that such shoes are apt to fracture from the compressive forces of the clamping means, particularly since heavy strains are already applied thereto by the impelling action they impart to the rock load.

The rock load is in most cases extremely abrasive and hard to crush and this causes fast wear of the impeller means and anvils. The impeller shoes of prior crushers require frequent replacement, and although such prior structures have provided replaceable shoes they do not accomplish maximum wear as well as easy attachment and detachment.

SUMMARY OF THE INVENTION

Accordingly, a feature of the present invention is to provide an impact crusher having a novel structure which includes an impeller shoe structure designed to have maximum wear and also designed for fast replacement.

Another object of the present invention is to provide an impeller shoe structure which is substantially triangular in shape for operation in either forward or reverse directions to obtain maximum wear.

Another object is to provide in an impeller assembly upper and lower support plates and vertical connecting means having a spacer member with a vertical dimension greater than the vertical dimension of the shoes whereby upon clamping of the upper and lower plates together, the clamping pressure is applied to the spacer members and not to the impeller shoes.

Another object is to provide a support assembly for impeller shoes including a single clamp stud assembly wherein upon removal of such stud upper and lower support plates can be detached for easy removal of the impeller shoes.

Still another object is to provide an impeller assembly including a central feeding disc having an outer ring which can be replaced when worn so that the entire feeding disc does not have to be replaced. These rings may be provided in varying thicknesses to selectively fix the height of feed of the rock into the shoes.

The invention will be better understood and additional objects and advantages will become apparent from the following description taken in connection with the accompanying drawings which illustrate a preferred form of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical sectional view of the present impact crusher structure, such view being taken on the offset line 1—1 of FIG. 2;

FIG. 2 is an offset fragmentary plan view of an impeller assembly of the crusher with certain parts thereof broken away, this view being taken on the line 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view taken on the line 3—3 of FIG. 2;

FIG. 4 is a 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

With particular reference to the drawings, and first to FIGS. 1 and 2, the present crusher comprises a circular housing 10. Housing 10 has an enlarged peripheral extension 12 at the top provided with a bottom wall 14. A cover plate 16 is detachably connected to the housing by stud connections 18. Cover plate 16 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 is open for discharge of crushed rock. This housing is seated on a raised support 26, shown in phantom, for discharge of the crushed material out the bottom.

Disposed in the housing 10 is a pulley enclosure 30 having a top protective wall 32. Enclosure 30 projects outwardly beyond one side of the housing 10 and encloses pulleys 34 engaged by V-belts 36 having a driving engagement with motor driven pulleys not shown. Crushed rock discharges freely through the opening 24 around the pulley enclosure.

Pulleys 34 are keyed or otherwise secured to a vertical shaft 38 projecting upwardly through the pulley enclosure and journaled in an upstanding bearing block 40 supported integrally on the pulley enclosure. The upper end of the shaft 38 is tapered at 42 and projects beyond the end of bearing block 40 for reception in a tapered recess 44 of a base member 46 having a rotatable seating support on the block 40. The upper surface of the base member 46 has a central, top opening recess 48 for receiving a clamp washer 50. Clamp washer 50 seats on the bottom of recess 48, and studs 52 which pass through the washer have threaded engagement with the upper end of the shaft 38 for holding the base member on its bearing support. A key connection 54 is provided between the shaft and the base member 46 for unitary rotation.

Secured to the upper surface of the base member 46, as by welding, is an annular impeller disc or plate 60, also seen in FIG. 5, on which is seated an annular wear plate 62 having a peripheral downturned peripheral flange 64. The impeller disc 60 is disposed interiorly of the flanged portion 64 of the wear plate 62.

Plate 62 supports a plurality of impeller shoes 66 on which is supported an annular wear plate 68 having a peripheral upturned flange 70. Seated on the plate 68 is an annular impeller disc or plate 72. Impeller disc 72 is disposed interiorly of the flanged portion 70 of the plate 68.

The plates and shoes just described are held in assembled relation by upright studs 74, also seen in FIG. 3, which pass freely through the plates 62, 68 and 72 and have threaded engagement in the plate 60. Importantly, studs 74 are associated with spacer members 76 which, as best seen in FIG. 2, have three parallel bores or openings 78 therethrough, one of such bores receiving the studs 74. These spacer members may be formed of three tubes secured together in a manner such that their outer configuration forms a triangular shape. The plates 62 and 68 have triangular shaped apertures 80, also seen in FIG. 3, and the shoes 66 have similarly shaped bores 82 arranged to receive the spacer members 76. In assembled relation, the respective opposite ends of the spacer members abut against the upper surface of impeller disc 60 and the lower surface of impeller disc 72 and prevent pressure clamping of the plate assembly on the shoes. The shoes are thus not subjected to any clamping stress in their mounting assembly. The shoes are held against rotative movement on the impeller assembly by the triangular shape of the spacer members fitted in the correspondingly shaped openings 80 and 82 in the plates and shoes, respectively.

With particular reference to FIGS. 2 and 3, the two opening portions 78 of the spacer members 76 which are not associated with the studs 74 have upper and lower studs 84 fitted tightly therein. These studs engage in apertures 86 in both impeller discs 60 and 72 for reinforced nonrotative connection of the spacer members 76 in the impeller assembly.

As stated, the plates 60, 62, 68 and 72 are annular in shape, having a central opening 88. The two upper plates 68 and 72 thus allow rock from the feed tube 20 to be admitted down between the impeller shoes, it being preferred as shown that feed tube 20 extend down at least to a point below the plate 68. By this arrangement, a minimum of incoming rock will engage these plates and there will not be much wear. The wear plates 62 and 68, and their outer flanges, provide protection of the impeller discs from flying rock. The bottom plates 60 and

62 are disposed around a feed or deflecting disc assembly having an outer ring 90 and a clamping core member 92 therefor. Ring 90 and core member 92 have a tapered interfitting engagement 94 and are secured to the base member 46 by means of a central stud 96 passing down through the core member 92 and threadedly engaged in the top of shaft 38. The feed disc assembly 90, 92 rotates with the impeller assembly. The upper surfaces of the core member 92 and the ring 90 generally tapered down toward the outer side of the crusher whereby rock admitted through the feed tube 20 will be directed outwardly into the impeller shoes 66. The greatest wear occurs on the outer portion of the feed disc assembly and thus, since the outer ring 90 and its mounting core member 92 are separate pieces, the ring 90 may be replaced without the necessity of replacing the whole assembly. In addition, it may be desired that different thicknesses of the outer ring 90 be provided, as determined by the height it is desired that the rock be directed into the impeller shoes.

As best seen in FIGS. 2 and 4, the impeller shoes are substantially triangular as viewed in plan. Furthermore, they are substantially an isosceles triangle with two equally angled sides 98 thereof forming rock impelling surfaces. The shoes are mounted such that the angle or corner between the impelling surfaces 98 is directed toward the axis of the impeller unit whereby the two surfaces 98 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 36. Such reverse drive of the impeller unit provides for maximum wear of the shoes in that when one side of the shoes has become worn it is merely necessary to reverse the direction of rotation of the drive motor to subject the other side to wear. Although four impeller shoes are illustrated in the drawings, it is to be understood that more or less may be used.

In a preferred arrangement, the two impelling surfaces 98 of the shoes 66 are dished. It has been found that such dished construction contributes to better impelling movement of the rock and better wear for the shoes, as compared to a straight or flush surface.

The impeller shoes 66 are arranged to throw rock outwardly against anvil or breaker members 100 secured in the side extension 12 of the housing. In a preferred arrangement, the breaker plates are disposed in a main circumferential row 100 aligned laterally with the shoes and upper and lower auxiliary rows 102 and 104, respectively.

According to the invention an impact crusher is provided which obtains maximum wear from the impeller shoes 66 in that the latter operate in either forward or reverse direction of rotation of the impeller unit. Maximum wear can be obtained therefrom 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 to prolong the life thereof. The wear life of the impeller shoes is also prolonged because, due to the spacer members 76, no clamping pressure is applied to the shoes.

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.

Having thus described my invention, I claim:

1. An impact crusher comprising
   a. a housing,
   b. a feed inlet in said housing,
   c. an impeller unit mounted for rotation about a vertical axis in said housing,
   d. drive means connected to said impeller unit for rotating the same,
   e. at least one impeller shoe on said impeller unit for impelling material fed parallel to said axis of rotation through said inlet away from the impeller unit,
   f. means securing said impeller shoe to said impeller unit,
   g. said impeller shoe being substantially triangular in cross section and having a pair of rock engaging surfaces leading in different angular directions and arranged such that one surface impels rocks outwardly in the forward direction of rotation of said impeller unit and the other surface impels rocks outwardly in the reverse direction of rotation of said impeller unit.

2. The impact crusher of claim 1 wherein said impeller shoe is disposed such that the corner thereof between said two angled faces is directed substantially toward the axis of rotation.

3. The impact crusher of claim 1 wherein said means attaching said impeller shoe to said impeller unit is detachable and is arranged to be turned over.

4. An impact crusher comprising
   a. a housing,
   b. an impeller unit rotatably mounted in said housing,
   c. said impeller unit including at least one impeller shoe and a pair of plates one of which lies under the impeller shoe and the other of which overlies the impeller shoe,
   d. a stud extending through said shoe and having a head connection with one of said plates and a threaded connection with the other plate for attaching said shoe to said impeller unit between said plates whereby upon rotation of the impeller unit said shoe is arranged to impel rock outwardly,
   e. said impeller shoe being substantially triangular in cross section, having two vertically disposed angled faces forming a pair of rock engaging surfaces,
   f. and a spacer member extending between said plates and having a length greater than the vertical dimension of said impeller shoe to take the clamping pressure of the stud and prevent it from being applied to the shoe.

5. The impact crusher of claim 4 wherein said spacer member is nonround and fits in correspondingly shaped apertures in said pair of plates and said impeller shoe whereby to hold said shoe in a fixed nonrotative position between the plates.

6. The impact crusher of claim 4 wherein said spacer member has at least two openings extending vertically therethrough, one of said openings receiving said stud, and upper and lower projections in the other opening for engaging said upper and lower plates to stabilize the shoe on the impeller unit.

7. The impact crusher of claim 4 wherein said plates are annular to receive rock centrally thereof, and an impelling disc under the central opening arranged to direct rock into said impeller shoes.

8. The impact crusher of claim 1 wherein said angled faces of the impeller shoe are concaved.

9. The impact crusher of claim 4 wherein said plates are annular to receive rock centrally thereof, and a feed disc under the central opening arranged to direct rock into said impeller shoes, said disc having an outer replaceable ring and an inner mounting block secured to said impelling unit.

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