

Oct. 28, 1969

B. V. WOOD

3,474,974

IMPACT TYPE CRUSHER

Filed Feb. 27, 1967

4 Sheets-Sheet 1

FIG. 1

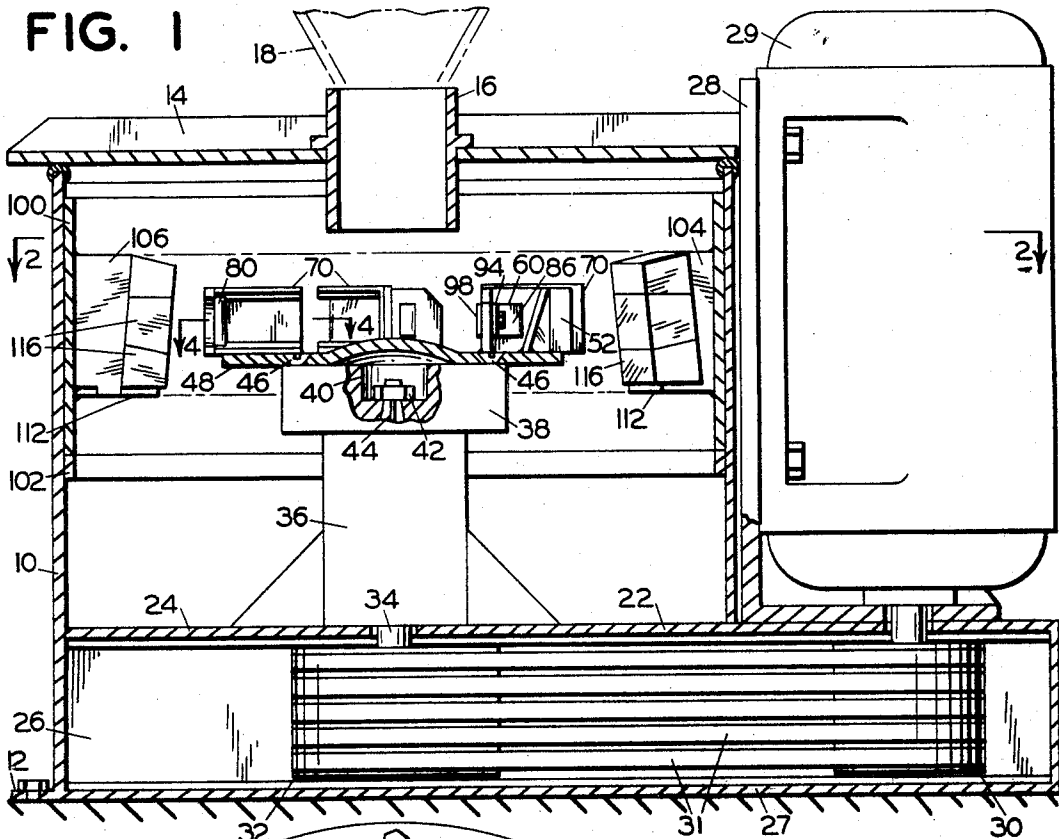
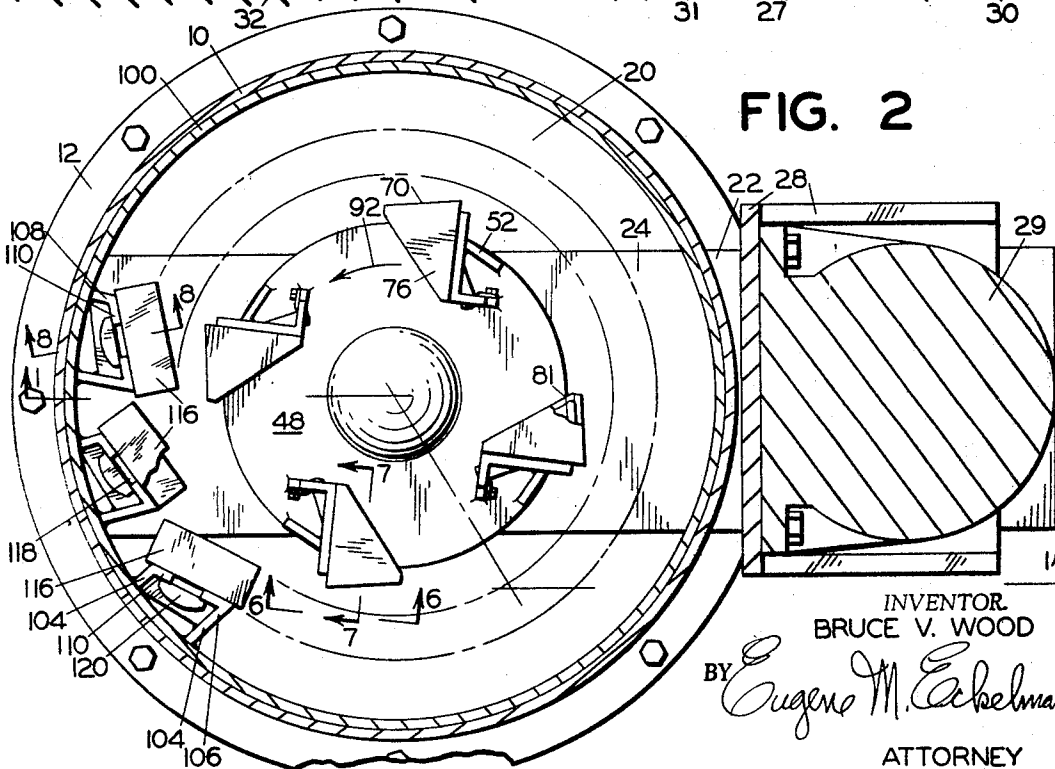


FIG. 2



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FIG. 4

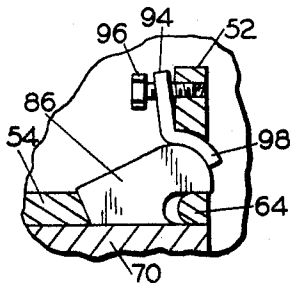
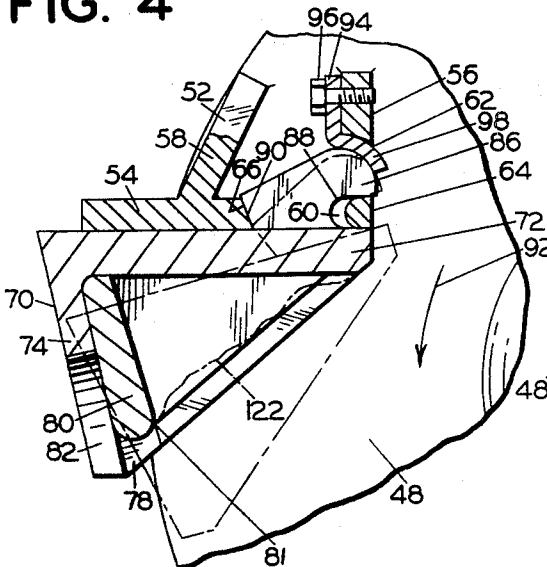


FIG. 5

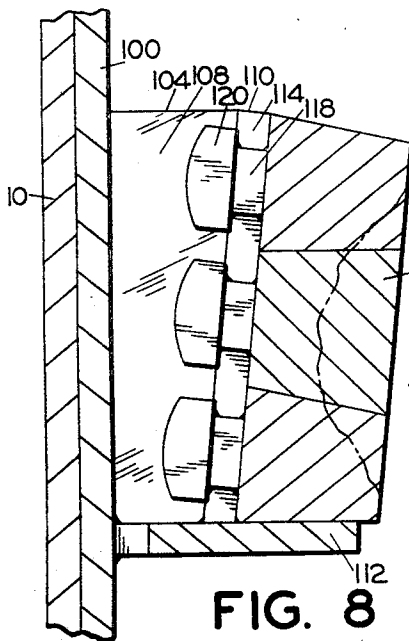


FIG. 8

FIG. 6

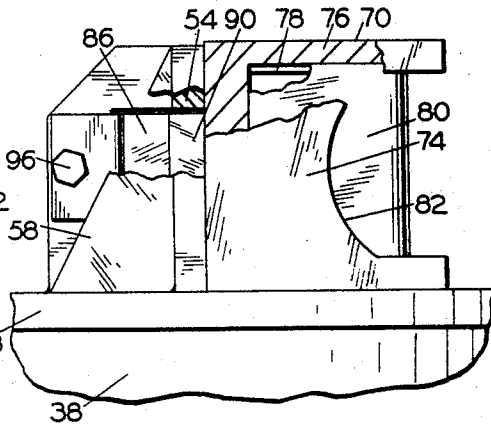
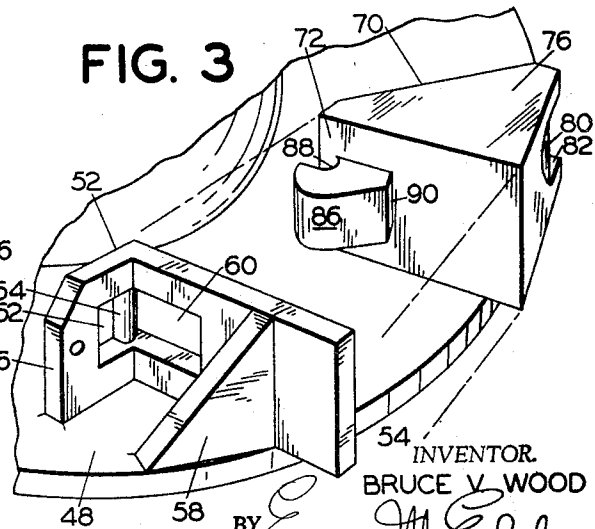


FIG. 7

FIG. 3



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FIG. 9

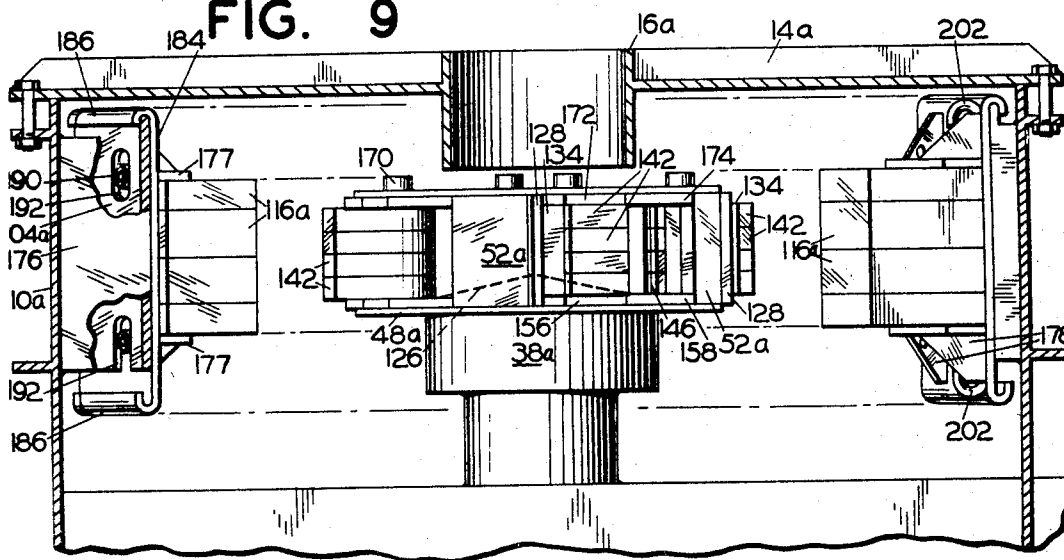


FIG. 14

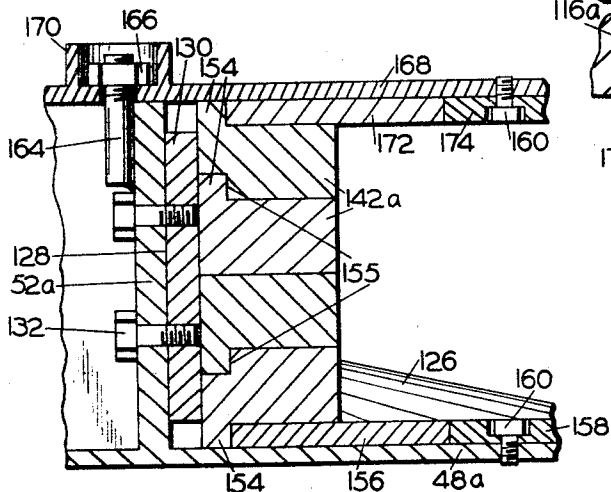
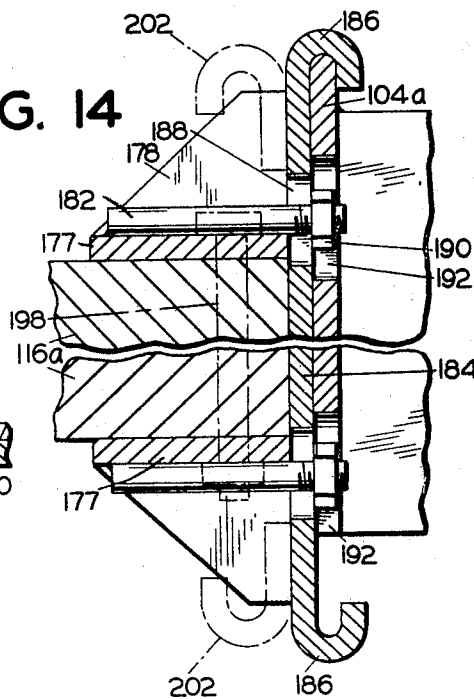


FIG. 11

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FIG. 13

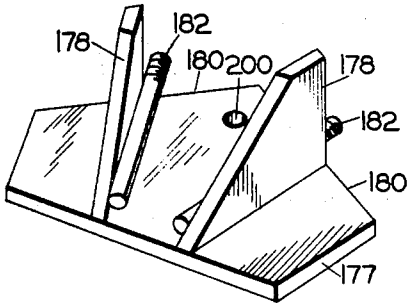


FIG. 12

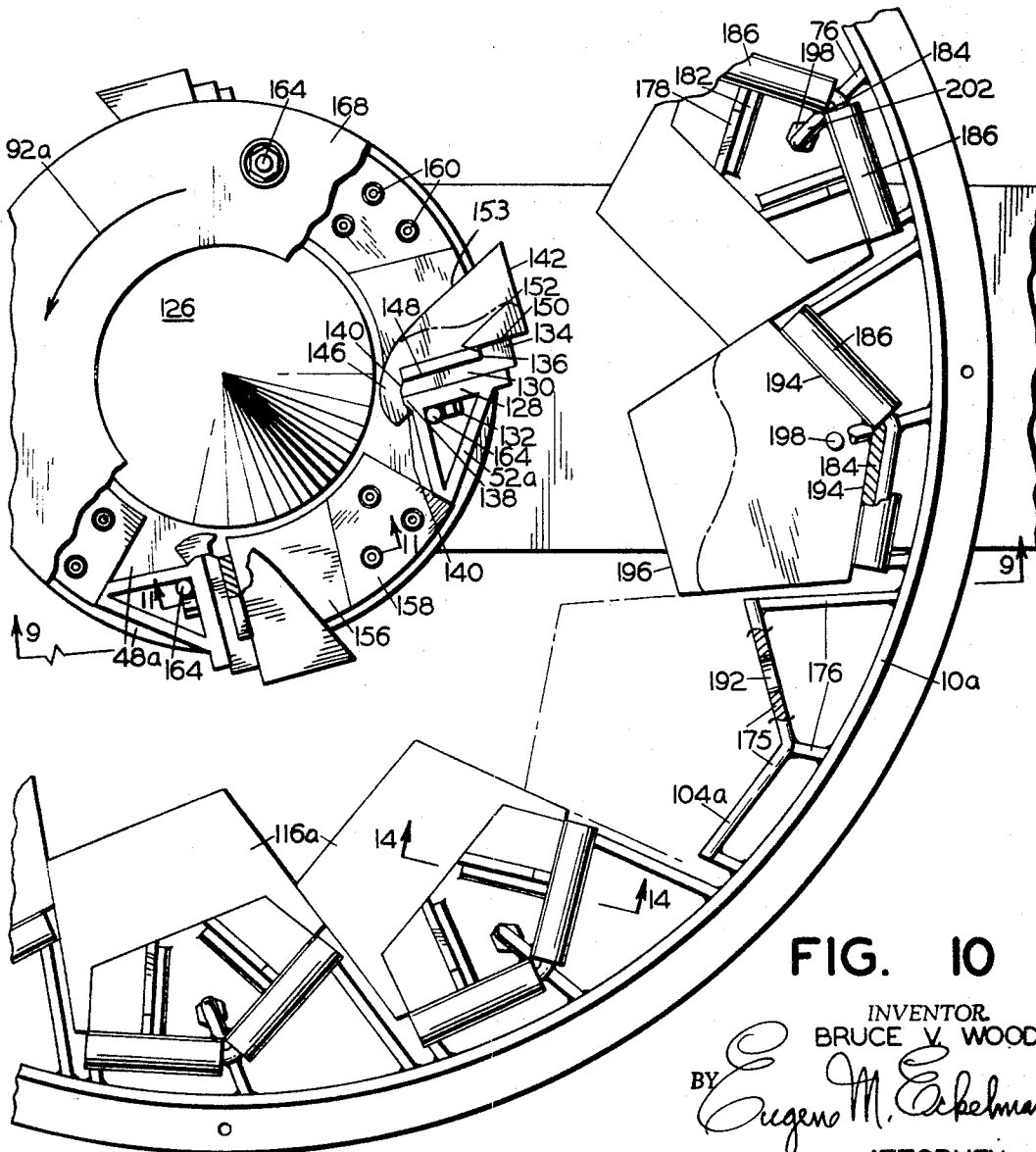
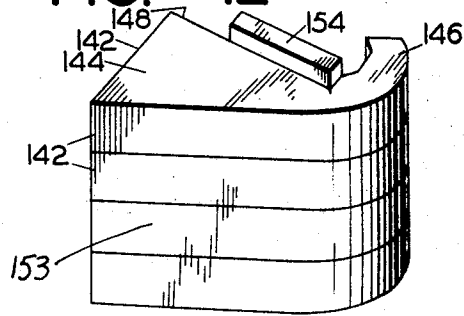


FIG. 10

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3,474,974

IMPACT TYPE CRUSHER

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Continuation-in-part of application Ser. No. 424,261,

Feb. 12, 1965. This application Feb. 27, 1967, Ser.

No. 618,919

Int. Cl. B02c 7/12, 13/28, 13/286

U.S. Cl. 241—275

11 Claims

ABSTRACT OF THE DISCLOSURE

An impact type crusher having impeller shoes and breaker plates capable of easy replacement and further more capable of re-positioning in the crusher to shift unworn parts to areas receiving the greatest wear. To accomplish the advantage just mentioned the impeller shoes and breaker plates are formed of multiple parts such that if one part receives more wear than another, such parts can be changed in position to prolong the overall life of the unit. In addition, holding means are provided to permit rapid and easy mounting and shifting of the impeller shoes and breaker plates.

Cross reference to related application

This invention is a continuation-in-part of application Ser. No. 424,261, filed Feb. 12, 1965 for Impact Type Crusher, now abandoned.

Background of the invention

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

In the crushing of rocks by an impact type crusher wherein the rocks are impelled against 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 unit as well as the breaker elements, and crushers of this type heretofore used require frequent replacement of operating parts, especially the impeller shoes and breaker plates. It is accordingly a primary objective of the present invention to provide an impact type crusher having an impeller unit and breaker elements of a novel construction and arrangement to provide for longer life of the parts than similar apparatuses.

More particular objects of the present invention are to provide impeller shoes and breaker plates for an impact type crusher which are formed of two or more parts whereby individual parts may be replaced when worn, or said individual parts may be repositioned such that when one part is worn another less worn part can be shifted into its place; to provide an impeller unit for a rock crusher of the type described wherein rotating impeller shoes are shaped and arranged to trap rocks therein and to utilize the rock as the principal impelling surface rather than metal parts of the shoes; to provide impeller shoes arranged to receive wear plates which are removable and thus replaceable when necessary; to provide impeller shoes which have a novel construction for attaching them to mounting brackets on the impeller unit wherein said shoes may be rapidly attached or detached; and to provide breaker elements having a novel construction and arrangement providing long life thereof and efficient breakage of the rock, to deflect rock which is impelled thereagainst in a downward direction; and furthermore to provide means facilitating easy attachment and detachment of the breaker elements from supporting structure.

Brief description of the drawings

FIGURE 1 is a vertical, central, sectional view of a crusher embodying principles of a first form of the present invention;

FIGURE 2 is a horizontal, sectional view taken on the line 2—2 of FIGURE 1;

FIGURE 3 is an enlarged, exploded view showing in particular a first form of impeller unit and means for attaching impeller shoes to the impeller unit;

FIGURE 4 is an enlarged, fragmentary, sectional view taken on the line 4—4 of FIGURE 1, showing an impeller shoe attached to a mounting bracket for the shoe;

FIGURE 5 is a view similar to FIGURE 4 except that it shows locking means in release position, whereas FIGURE 4 shows the locking means in lock position;

FIGURE 6 is a fragmentary, side elevational view, partly broken away, of the impeller shoe of FIGURE 1 and its mounting bracket, taken on the line 6—6 of FIGURE 2;

FIGURE 7 is a fragmentary, sectional view also partly broken away and showing the impeller shoe and its mounting bracket, taken on the line 7—7 of FIGURE 2;

FIGURE 8 is an enlarged, fragmentary, sectional view of the breaker plate assembly of FIGURE 1, taken on the line 8—8 of FIGURE 2;

FIGURE 9 is a vertical, central sectional view of a second form of the invention, taken on the line 9—9 of FIGURE 10;

FIGURE 10 is a top plan view, partly broken away, of the embodiment of FIGURE 9;

FIGURE 11 is an enlarged, sectional view taken on the line 11—11 of FIGURE 10 and showing a second form of an impeller shoe and mounting means therefor;

FIGURE 12 is a perspective view of impeller shoes shown apart from other structure;

FIGURE 13 is a perspective view of a mounting bracket for the breaker plates of the embodiment of FIGURE 9; and

FIGURE 14 is an enlarged, fragmentary and foreshortened sectional view of a breaker plate assembly of the embodiment of FIGURE 9, taken on the line 14—14 of FIGURE 10.

Referring now in particular to the drawings and first to FIGURES 1 through 8, a first embodiment of the present impact type crusher is shown. Such structure comprises a housing or casing 10 which is circular in configuration and which has a bottom, outwardly directed flange 12 for anchoring said housing firmly to a support. The upper end of the casing is closed by a suitable cover 14 which may be detachably connected to the casing by any suitable means, not shown. The top cover 14 has a feed tube 16 mounted centrally therein for receiving rock to be crushed from a hopper 18 or other means such as a conveyor and for directing the rock into the crusher. The bottom of housing 10 is open to form a discharge opening 20.

Projecting into the housing 10 is a pulley housing 22 having a top wall 24, side walls 26, and a bottom wall 27. This pulley housing projects outwardly beyond one side of the housing 10 and supports a motor bracket 28 to which is bolted a vertically disposed electric motor 29. The output shaft of motor 29 projects into the pulley housing 22 and has one or more pulleys 30 keyed or otherwise secured thereon. Pulleys 30 are engaged by belts 31 having a driving engagement with a corresponding number of pulleys 32 keyed or otherwise secured to a vertical shaft 34 projecting upwardly through the pulley housing.

Shaft 34 is journaled in an upstanding bearing block 36 supported integrally on the pulley housing 22. The upper

end of shaft 34 projects beyond the end of block 36 and is connected to a base member 38 having a rotatable seating support on the said block 36. The upper surface of the base member 38 has a central, top opening recess 40 for receiving a projecting end of the shaft 34 as well as a fastening member 42 secured on the end of the shaft. Base member 38 is rotatable with the shaft 34, and for this purpose suitable key means 44 serve to connect these parts for unitary rotation.

Secured to the upper surface of the base member 38, as by means of screws 46 is an impeller unit comprising a shoe support plate 48. Secured to the upper surface of the plate 48 are a plurality of impeller shoe assemblies including brackets 52, each of the said brackets being of identical structure and being shown in greater detail in FIGURES 3-7. Specifically, each of these brackets comprises a vertically projecting base wall 54, and a pair of end walls 56 and 58 extending at right angles to the base wall. Brackets 52 are secured on the upper surface of the supporting plate 48 by suitable means, such as by welding. Base wall 54 may be directed substantially radially on the plate 48 or as shown in FIGURE 3 may be angled rearwardly somewhat. A rearward angled position of 15° with relation to the diameter of the plate 48 has been found satisfactory.

As viewed in FIGURE 3, each of the base walls 54 of the brackets 52 has a rectangular opening 60, and similarly, each of the end walls 56 has a rectangular opening 62, these two openings terminating short of the corner between the base wall 54 and the end wall 56 to form a locking post or segment 64 also seen in FIGURES 4 and 5. Also, as seen in FIGURES 4 and 5, it will be apparent that the outer vertical defining wall 66 of the opening 60 is angled relative to the plane of wall 54 for a purpose to be described.

The brackets serve to releasably hold impeller shoe holders 70 on the rotating support plate. Each impeller holder 70 has a vertical side wall 72, an end wall 74, and triangular-shaped top and bottom walls 76, all these walls cooperating to form an open front, hollow impeller shoe holder. With particular reference to FIGURE 4, which comprises a horizontal sectional view through a holder 70 and its mounting bracket, the end walls 74 of the holders 70 are angled inwardly relative to the side wall 72, at an acute angle. An angle of 85° between the walls 72 and 74 has been found to be extremely efficient to accomplish the intended purpose.

With reference now to FIGURE 7, which comprises a vertical sectional view through a forward portion of a holder 70, the top and bottom walls 76 have opposed inwardly projecting recesses or grooves 78 extending substantially parallel to the inner surface of the walls 74. As seen in FIGURE 4 the recesses are narrowed toward their inner ends. Adapted to be received in the recesses 78 are shoes or slugs 80. End wall 74 is notched at 82 at its outer end in order that a grip can be obtained on the shoe in placing it in the impeller shoe holder and for removing it. As best apparent in FIGURE 2, the holders 70 are supported on the plate 48 by the brackets 52 such that the outer edge 81 of each shoe is disposed at the peripheral edge of the plate 48. Edge 81 comprises a discharge edge.

Integral with the outer surface of side wall 72 is a mounting and locking lug 86 having an end locking notch 88 extending parallel to the longitudinal plane of wall 72. The lug 86 is constructed and arranged to be received in the opening 60 of mounting bracket wall 54. In the fully inserted or mounted position of the impeller shoe holder 70 on the bracket 52, as viewed in FIGURE 4, the lug 86 projects through opening 60 and the outer end of the locking lug 86 projects through opening 62, the notch 88 receiving the post. One surface of the wall 72 of the holder abuts against one surface of bracket wall 54. Lug 86 has an angled rear edge 90 which in the mounted position of the impeller shoe on the bracket engages the angled wall 66 of opening 60.

To mount an impeller shoe holder on its bracket, said holder must initially be angularly directed toward the bracket, such angular position thereof being shown in phantom lines in FIGURE 4, the post 64 being engaged in notch 88. Thereupon, the impeller shoe can be rotated to a position of surface abutment with the bracket and then moved radially outwardly relative to the bracket to engage edge 90 of the lug against edge 66 of the wall 54. This comprises an operative mounted position thereof. The arms 56 of the brackets have a locking member or key 94 attached thereto by a screw 96 threadedly engaged in said arm. The locking member 94 has an offset or angularly disposed curved portion 98 adapted to project through the opening 62 in the wall 56 and extend partly over the end of the lug 86. The offset portion 98 is specifically angled with relation to the body portion of the locking member such that upon tightening the screw 96 the offset portion is pivoted around the adjacent edge of wall 62 in a clockwise direction, FIGURE 4, to urge the lug and the holder 70 radially outwardly. Thus, when it is desired to mount an impeller shoe holder 70 on a mounting bracket 52 the screw 96 is first loosened as shown in FIGURE 5. This permits pivotal movement of the locking member 94 around the corner edge of the opening 62 sufficiently to allow the locking lug 86 to project freely through the opening 62. Upon tightening the screw 96, the offset portion 98 of the locking plate bears against the inner end of the lug 86 and forces the holder 70 radially outwardly whereby the angled rear edge 90 of lug 86 engages the angled edge 66 of the opening 60. Since the impeller shoe holders are locked in place there is no possibility that they can be accidentally detached from their supporting brackets. Assuming that the support plate 48 is rotated in the direction of arrow 92, FIGURE 2, it is apparent that the impeller shoe holders are held firmly against their supporting brackets and the lugs 86 are locked in the openings 60 by the forward motion of the plate 48 and by centrifugal force. The keys 94, however, insure a positive securing of the holders to their mounting brackets. Impeller shoes 80 are also held in place in the holders by forward motion of the impeller unit.

With particular reference now to FIGURES 1, 2, and 8 there is disposed interiorly of the casing 10 a breaker plate support casing 100. This casing is seated freely on a support ring 102, FIGURE 1, secured integrally to the casing 10 as by welding.

Secured to the inner surface of the casing 100 in the horizontal plane of the impeller assembly are a plurality of brackets 104, which as best seen in FIGURE 2, comprise a pair of opposed vertical angled portions 106 and 108. Also, as apparent in FIGURE 2, the portions 106, which comprise the portions on the forward ends of the brackets 104, are wider than the rearward portions 108 whereby inturned front or inner walls 110 of these portions are angularly disposed with relation to the casing 100 so as to be faced somewhat rearwardly relative to the rotation of the plate 48. As apparent in FIGURES 1 and 8, the bracket portions 106 and 108 are vertically tapered, being narrower at the bottom and thus providing a vertically angled disposition of the walls 110 with relation to the supporting casing 110. The brackets 104 have integral bottom walls 112 which project inwardly of the housing beyond the wall 110.

Walls 110 of the bracket portions 106 and 108 terminate short of each other to form upright top opening slots 114 therebetween. Breaker plates 116 are arranged to be mounted on the brackets, and for this purpose said plates have neck portions 118 on the outer or back sides thereof which terminate in enlargements or knobs 120. The neck portions 118 are dimensioned for reception in the slots 114 but the enlargements 120 have a greater lateral dimension than the slots 114 for holding the breaker plates on the brackets. These breaker plates are mounted on the brackets by inserting them downwardly through the top open end of the slots 114.

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The breaker plates 116 are supported vertically on the bottom walls 112 of the brackets and are of a cross sectional shape shown in FIGURE 8. That is, in cross section these members are tapered from front to rear, and in a preferred arrangement a central one of the breaker plates is widened at its front end, and top and bottom breaker plates are narrowed at their front ends. These plates taper selectively to interfit at the adjoining surfaces.

As viewed in FIGURE 2, breaker plate assemblies are located close together to provide a continuous breaker surface around the casing 100. In fact, there is a circumferential overlapping of these plates.

Operation

In the operation of the present crusher, the motor 26 is energized to rotate the shaft 34 and the impeller support plate 48, such motor being of a type to rotate the plate 48 at high speed. Rocks to be crushed are admitted through feed tube 16 and fall by gravity onto the support plate 48. The rocks are impelled by the impeller shoe holders 70 and shoes 80 outwardly at a great force and impinge against the breaker plates 116 whereby to be broken or shattered. Since the impacting surfaces of the breaker plates 116 are angled downwardly, the rocks are deflected downwardly toward the discharge opening 20. The greater portion of rocks crushed will thus not be directed back toward the impeller unit and maximum efficiency is achieved.

The present apparatus was designed to provide a minimum of wear and replacement of the parts. In this regard, it will be first noted that the shoes 80 eliminate the engagement of rock against the end walls 74 of the impeller shoe holders. Since these shoes are removable, they may be replaced when worn. However, it is a feature of the present invention that even the shoes 80 are protected against appreciable wear, this feature resulting from the particular angular disposition of the holder walls 70 and 72 as illustrated in FIGURE 4. That is, as was set out hereinbefore, the angle between the walls 70 and 72 is an acute angle, and upon initial rotation of the support plate 48 the interior of the holders fill with rocks and remain full throughout the crushing operation. Thus, the impelling surfaces of the holders and shoes comprise rocks, and there is very little wear on the impeller shoes or holders with the exception that possibly the outer ends of the shoes 80 will experience some wear. The phantom line 122 in FIGURE 4 designates generally the outer surface of the rock charge which is trapped in the holders, to illustrate the protection which is given.

Since the shoes 80 are inserted in the recesses 78 through the leading end of the impeller shoe holders, these shoes are held firmly in place by the forward motion of the impeller unit. In addition, these shoes are held in place by the charge of rock trapped in the holders.

Another feature of the present invention is the particular structure and mounting arrangement of the breaker plates 116. As stated before these plates are horizontally mounted with the central breaker plate having a widened front end. The breaker plate assemblies are in substantially the same plane as the impeller shoe assemblies and the principal impacting load of the rock will engage the breaker plate assemblies at their vertical center, as illustrated by the phantom line 124, FIGURE 8. Thus, the widened central breaker plates comprise a reinforced structure to bear the impacting load. Furthermore, since the center breaker plates receive most of the wear, said central plates can be replaced and most of the time the upper and lower breaker plates need not be replaced; or at most the upper and lower plates can merely be turned over or manipulated to place unworn front surfaces toward the center. Since the breaker plates are horizontally disposed, the central plate will receive most of the wear and can be replaced if necessary, but such structure comprises a substantial improvement over those types of structures where the breaker plates are vertically dis-

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posed. In this latter instance all the latter plates receive approximately the same wear and all must be replaced at once.

Reference is now made to FIGURES 9 through 14 which show a somewhat different impeller shoe assembly construction as well as the breaker plate assembly. Such modified structure includes the same features as the structure shown in FIGURE 1 in that the parts have minimum wear and when necessary such parts are easily replaced. Similar to FIGURE 1, the crusher comprises a housing or casing 10a closed by a suitable cover or lid 14a having a feed tube 16a. This embodiment similarly has a rotatably driven base member 38a supporting integrally on its upper surface an impeller shoe support plate 48a. A central portion of the support plate 48a has an upward projection or deflector 126, FIGURES 9 and 10, in the shape of a flattened cone serving to deflect rocks which fall thereon from the feed tube in an outward direction.

Integrated with the upper surface of the plate 48a are a plurality of impeller shoe assemblies including brackets 52a, FIGURES 9-11, which are somewhat triangular in shape as viewed in plan, having a leading wall portion 128 extending transversely across the said plate and in general facing the direction of rotation of the impeller unit, the direction of rotation being designated by the arrow 92a in FIGURE 10. Removably secured to each of the walls 128 of the brackets 52a in an impeller shoe holding plate 130. These plates are removably secured to the brackets 52a by means of screws 132, FIGURES 10 and 11, and have an end, forwardly directed projection 134 at their outward ends forming a square shoulder 136 facing inwardly. With particular reference to FIGURE 10, the inner ends of the bracket walls 128 have a projecting portion 138 extending beyond the adjoining side brackets, and the inner ends of plates 130 terminate flush with the inner ends of said projecting portions, such inner ends preferably having opposed bevels or rounded portions 140 for a purpose to be described.

Supported against the forward faces of the shoe holding plates 130 are impeller shoes 142, and with particular reference to FIGURES 11 and 12, the shoes comprise several parts or layers 142a, such as four, stacked vertically and each having a body portion 144 and an end hook portion 146. The shape of the hooks 146 corresponds to the end contours of the shoeholding plates 130 and bracket projection 138 whereby to be snugly hooked therearound as shown in FIGURE 10. In addition, the shoe parts are provided with a notch 150 on that face which is directed toward the holding plates 130. Such notches are arranged to receive the projections 134 and form a shoulder 152 in the shoes which abuts against the shoulders 136 in the holding plates 130. Thus, the impeller shoes are held in place in the forward motion of the impeller unit by the hook ends 146 as well as by the abutment of shoulders 136 and 152. Since the shoulders 152 form an extension of the shoes at the body portion thereof, the shoes will take rugged use with little possibility of fracture. In the operative position of the shoes the forward edges thereof, designated by the numeral 153 in FIGURE 12, form a rock impelling surface. Such surface is angled relative to the diameter of the impeller plate 48a whereby rocks are engaged and effectively impelled outwardly.

Each of the shoe parts 142a has a projection or tongue 154 leading from a side face at their inside edge. As best seen in FIGURE 11, the tongues 154 on the two top shoe parts 148 project upwardly and the tongues on the two bottom shoe parts project downwardly. The uppermost and lowermost shoe parts have grooves 155 on their bottom and top edges, respectively, to receive the projections 154 of the adjacent center shoe parts. Thus, the two upper shoe parts are interlocked together, and the two bottom shoe parts are interlocked together.

Seated on the support plate 48a forward of each shoe assembly, FIGURES 10 and 11, are two wear plates 156 and 158, the wear plates 156 abutting against the projections 154 of the lowermost shoe part, FIGURE 11. Wear plate 158 has edge abutting engagement with wear plate 156 and is secured to the support plate 48a by screws 160. The wear plates 156 and 158 cover a critical wear portion of the support plate 48a, namely the area outwardly from the deflector 126 and immediately forward of the impeller shoes. Since the plates 156 bear against the projections 154 of the lowermost shoe parts, and since the plates 158 are anchored by screws 160, the two lower shoe parts are securely held in place against the holding plates 130. The abutting edges between the pairs of plates 156 and 158 are angled such that the plates 156 are prevented against outward radial movement by a wedging relation between the two plates. The plates 156 are maintained in their outermost position by centrifugal force and in addition cannot be displaced because of the deflector 126.

Welded to each of the brackets 52a in a vertical direction is a stud 164, FIGURES 10 and 11. The upper threaded ends of these studs project above the brackets an amount to secure, by nuts 166, a top plate 168 on the impeller unit. The projecting portion of the studs 164 and the nuts 166 are protected by tubular projections or bosses 170 secured to the upper surface of top plate 168.

Secured to the undersurface of top plate 168 are wear plates 172 and 174. These wear plates are identical in position and shape to the wear plates 156 and 158, respectively, the plates 174 being secured to the plate 168 by screws 160 and the plates 172 extending between the uppermost shoe part 142a and abutting against the projection 154 of the latter shoe part. Since the two uppermost shoe parts are interlocked together, the plates 172 hold such shoe parts against the holding plates 130, and in order to remove the shoes the plates 172 and 174 must first be taken off.

The shoe construction as described, provides an arrangement whereby the shoe parts are firmly anchored in place but yet can be readily taken off for replacement or repair. The two uppermost shoe parts 142a, being of identical construction, can be switched in their positions in the event that one shoe part is wearing faster than the other. The same is true of the two lowermost shoe parts, and by means of such construction, uniform and maximum wear can be achieved from the shoe parts. For example, the two center shoe parts usually receive the most wear, and after they have been worn down more than the others, suitable shifting of the shoes can be accomplished to get maximum usage therefrom. As seen in FIGURE 10, the shoes project outwardly beyond the holding plates 130 to protect the latter, and in addition, said holding plates project out beyond the mounting brackets 52a. Thus, the brackets are well protected against any negligence in failing to timely replace the shoes. In fact, practically all of the shoe can be worn off and even a portion of the holding plates 130 before any damage is done to the brackets. In the usual case, the shoes are periodically checked and the shoe parts shifted around or the shoes completely replaced before any damage is done to the holding plates 130, but as stated above, in the event that the operator does not timely replace the shoes, it is unlikely that he will be so negligent as to allow enough wear to occur as to damage the brackets.

In the construction of FIGURES 9 through 14, a plurality of brackets 104a for holding breaker plates are disposed in a horizontal plane with relation to the impeller assembly and each comprises an inwardly facing, vertically disposed, angular bracket member 175 secured to the inner surface of the casing 10a by legs 176. Forming a part of each breaker plate assembly is a holder having top and bottom clamp brackets 177, FIGURES 13 and 14, of identical construction and having a pair of right angle reinforcing fins 179 thereon. Two adjoining sides

180, FIGURE 13, meet at an angle which corresponds to the angular shape of the bracket member 175. Fins 178 extend longitudinally on the plate at an angle substantially normal to respective sides 180, and welded to the brackets 177 and ribs 178 are studs 182 the ends of which project beyond the sides 180.

Upper and lower clamp brackets 177 are arranged to be secured to a rear support wall or backing plate 184, FIGURE 10, of the same angular shape as bracket member 175 so as to lie snugly against the inner face thereof in an assembled relation. Rear walls 184 have top and bottom outwardly turned hooks 186, and attachment of clamp brackets 177 to the said walls is accomplished by means of the studs 182, in that the studs project through vertical slots 188 in the walls 184 and receive nuts 190, the slots 188 freely receiving the studs but being of less width than the nuts in order that the said clamp brackets can be attached in selected vertical positions on said walls 184. The breaker plate assemblies hang on the brackets 104a by means of the hooks 186 on the support members 184, and since a hook is provided on both the top and bottom of the walls 184, the assembly can be supported with either end up. The brackets 104a are provided with vertical slots 192 for freely receiving the projecting end of the studs 182 as well as the nuts 190 to allow the breaker plate assemblies to be attached or removed, as well as to allow vertical adjustment of the studs 182 when the clamp brackets are adjusted relative to the support walls 184.

The breaker assemblies include a plurality of plates 116a. These plates are flat and are shaped as shown in plan in FIGURE 10. More particularly two adjacent sides 194 correspond in an angular relationship to the angle between the support walls 184. Also, these plates have an edge 196 arranged for engagement by rocks impelled by the impeller unit. The breaker plates 116a are clamped between the two clamp brackets 177 in an assembly by means of a vertical bolt 198, FIGURE 14, projecting through apertures 200, FIGURE 13, in the clamp brackets and suitable apertures in the breaker plates, not shown. Thus, a complete breaker plate assembly is secured together as an integral unit and can be suspended on the brackets 104a with either side up. The plates may be all of identical thickness, as shown in FIGURE 9, or if desired the center plates can be thicker than the top and bottom plates since the center plates take the most wear. Whether or not the plates are of the same or of different thickness, they can be shifted one for the other so that all of them can be caused to be worn down uniformly. With reference to FIGURES 10 and 14, hooks 202 are integrated with the clamp brackets to provide connection with a lifting line or the like if desired.

The embodiment of FIGURES 9-14, as in the first embodiment, provides a structure which is rugged in use and wherein the parts are easily replaceable. Furthermore, as in FIGURE 9, the impeller shoe parts and the breaker plates are arranged to be shifted in vertical position so that uniform wear occurs on the units.

It is to be understood that the forms of my invention herein shown and described are to be taken as preferred examples 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 type rock crusher comprising:

- (a) a housing,
- (b) a feed inlet in the upper end of said housing,
- (c) an impeller unit rotatably mounted in said housing,
- (d) means connected to said impeller unit for rotating the same,
- (e) at least one impeller shoe assembly on said impeller unit arranged to engage rock admitted through said feed inlet and further arranged to impel said rock laterally outwardly,

- (f) an impeller shoe holder arranged to be secured to said impeller unit,
- (g) said impeller shoe comprising at least two plate-like parts disposed flatwise in surface engagement with each other in a horizontal plane and having vertical edges arranged for impelling engagement with rock admitted through the feed inlet,
- (h) the impeller shoe parts being detachable from each other as well as from said holder for individual replacement and for shifting said shoe parts around one for another,
- (i) said breaker plates mounted in said housing around said impeller unit,
- (j) said breaker plates having a face portion direction toward said impeller unit against which rock from said impeller shoe assembly is impelled and broken.
2. The crusher construction of claim 1 including vertically extending locking means on said shoe parts engaged with said impeller unit for holding said parts against relative lateral movement.
3. The crusher construction of claim 2 wherein said locking means comprises a tongue and groove means.
4. The crusher construction of claim 1 wherein said shoe holder has a vertical shoulder facing inwardly of the impeller and also has inner and outer ends, said shoe having a vertical shoulder in abutment with said shoulder on said holder and also having a hook portion engaged around the inner end of said holder to prevent outward movement of said shoe relative to said holder upon rotation of said impeller unit.
5. The crusher construction of claim 1 wherein each of said breaker plates comprises at least two plate-like parts disposed flatwise in surface engagement with each other in a horizontal plane and having vertical edges arranged for impelling engagement with rock impelled by said shoe, a holder for mounting said breaker plates in said housing, the breaker plate parts being detachable from each other as well as from said holder for individual replacement and for shifting said parts around one for another.
6. The crusher construction of claim 5 wherein one of said breaker plate parts is disposed substantially centrally of the path of the impelled rock and has a widened face portion.
7. A breaker plate assembly for an impact type rock crusher comprising:
- (a) support means arranged to be secured interiorly of a crusher in substantially vertical position and having a top edge,

- (b) a holder,
- (c) a breaker plate supported on said holder having a breaker face against which rock to be crushed is impelled,
- (d) means on said holder for supporting it on said support means,
- (e) and adjustment means on said holder arranged to adjust said breaker plate vertically relative to said support means to reposition the face thereof relative to a path of impelled rock as said face wears.
8. The breaker plate assembly of claim 7 wherein:
- (a) said holder includes a backing plate for supporting it on said support means,
- (b) and an outwardly projecting bracket on said backing plate for supporting the breaker plates thereon,
- (c) said adjustment means comprising a vertically adjustable connection between said bracket and said backing plate.
9. The breaker plate assembly of claim 7 wherein the means on said holder for supporting it on said support means comprises a hook on said holder engageable with the top edge of said support means whereby said holder is supported on said support means by hanging engagement and is removable by upward lifting movement.
10. The breaker plate assembly of claim 9 comprising one of said hooks on each of the upper and lower portions of said holder whereby said holder can be supported on said support means in either upright or inverted position.
11. The breaker plate assembly of claim 7 including means on said holder for connection to a lifting line whereby said holder can be installed and removed by hoist apparatus.

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