

[54] ROTOR CONSTRUCTION FOR IMPACT CRUSHER

[72] Inventors: **Floyd E. Kimble**, R. D. No. 1, Dover, Ohio 44622; **Richard H. Buchsieb**, Cambridge, Ohio

[73] Assignee: **said Kimble**, by **said Buchsieb**, a part interest

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[58] Field of Search... **241/189 R, 191, 192, 195, 197, 241/32, 286**

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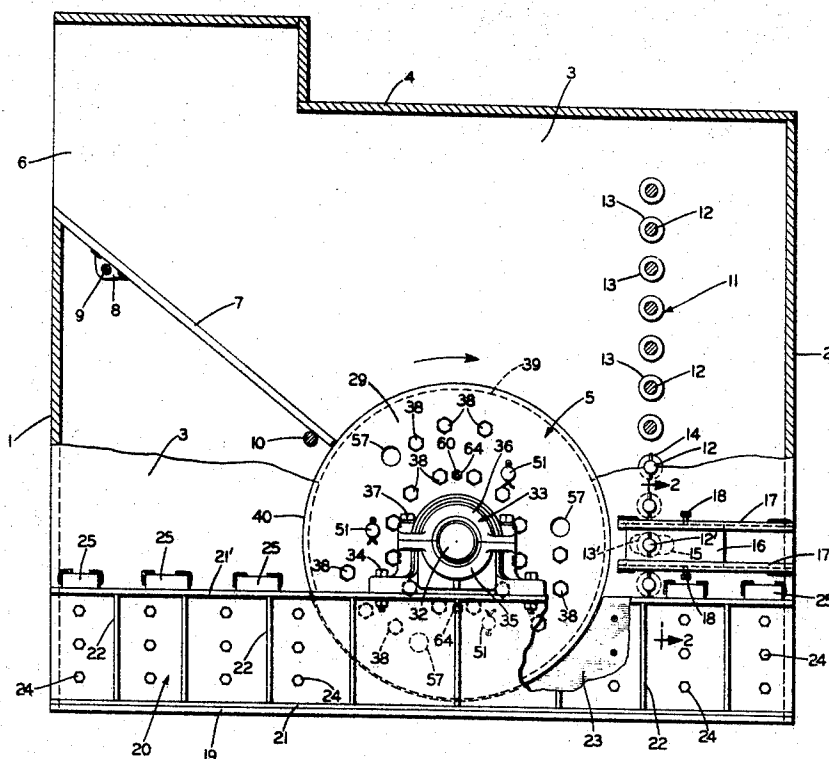
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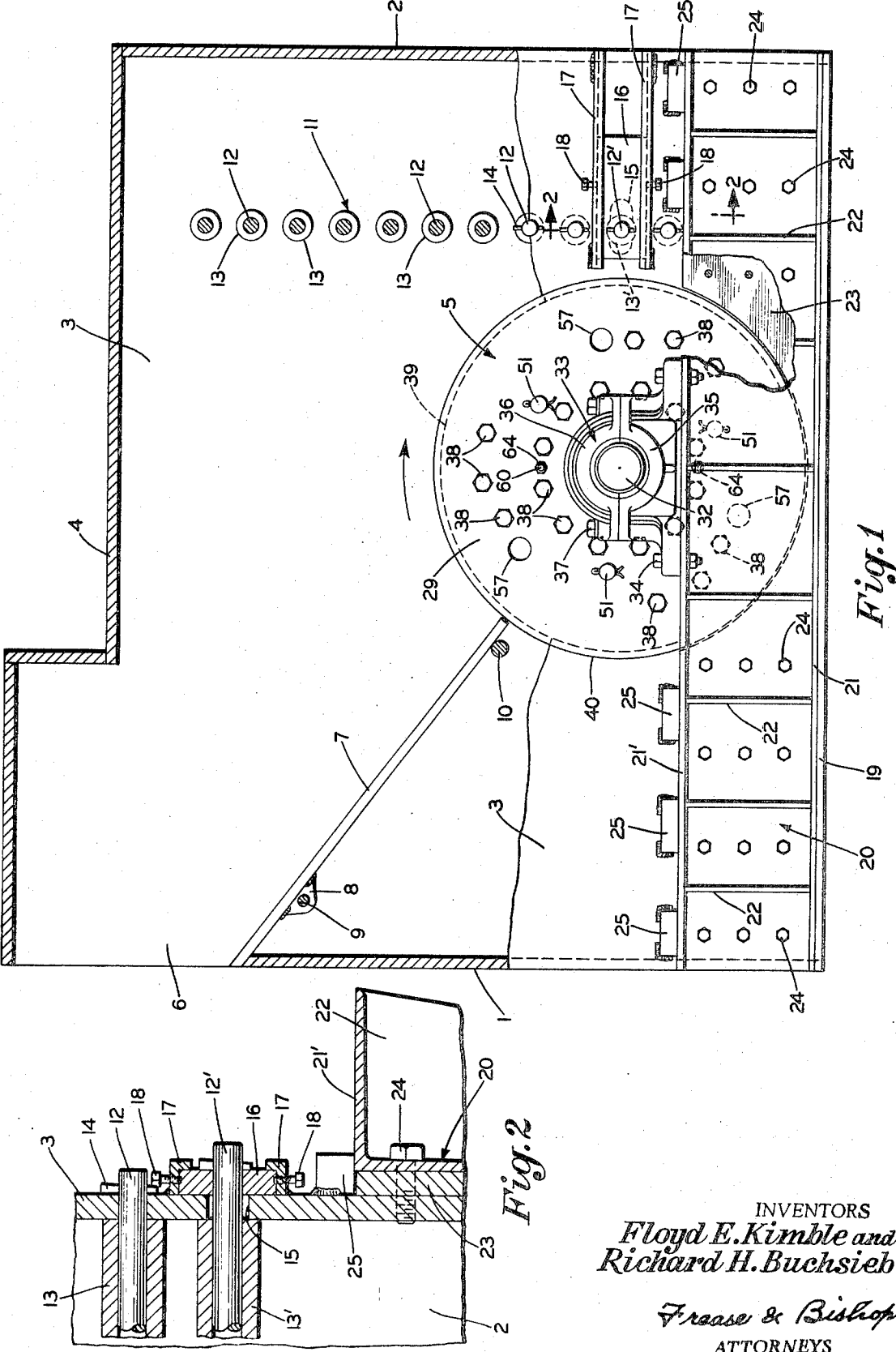
Primary Examiner—Robert L. Spruill
Attorney—John H. Bishop and Joseph Frease

[57] ABSTRACT

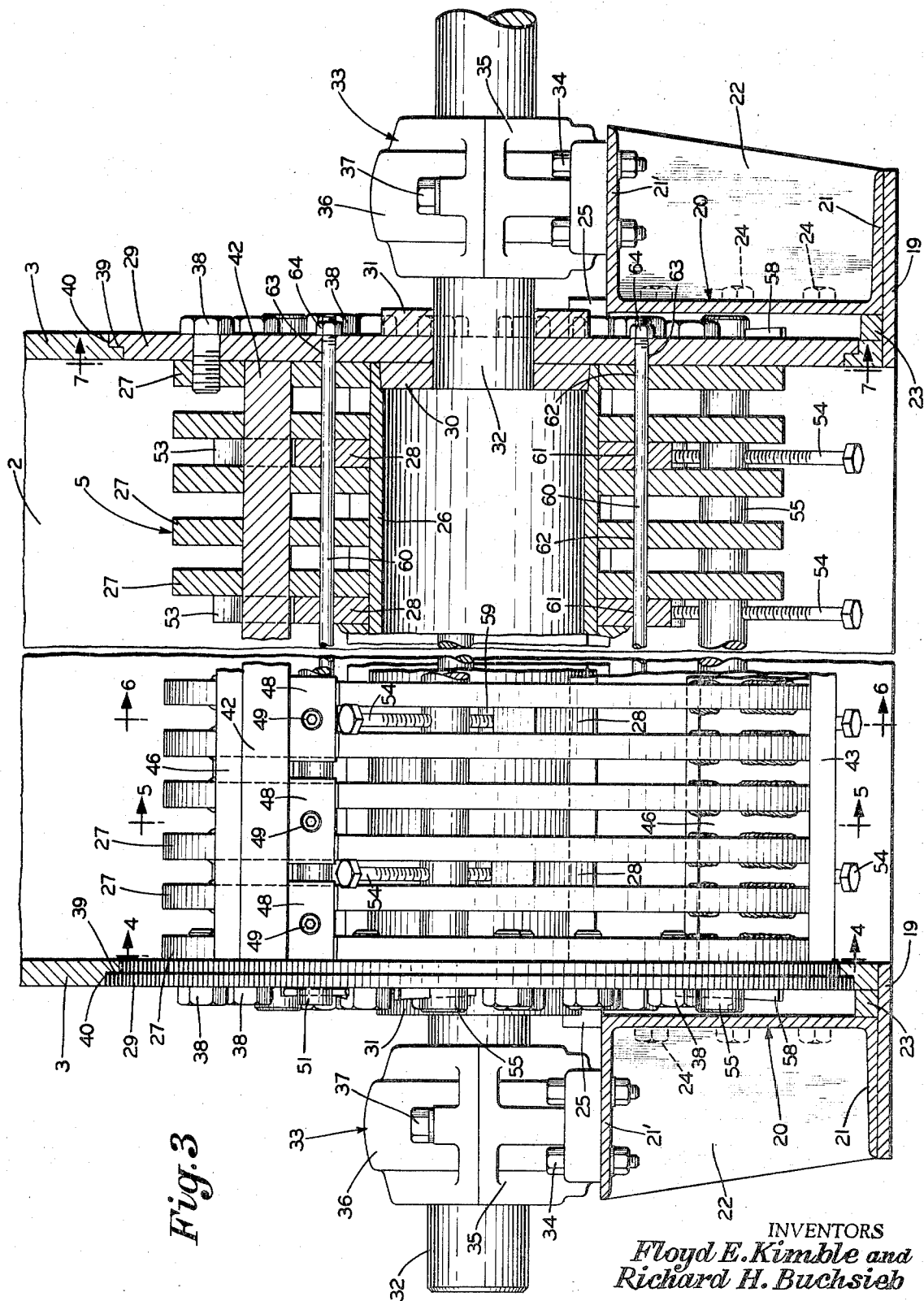
An impact crusher having a rotor with hammers in the form of elongated breaker bars extending longitudinally of the rotor. Adjusting means provides for extending the breaker bars out tangentially to compensate for wear. The rotor comprises an end drive assembly at each end, a tube or shaft rotatably connected at its ends to the end drive assemblies, a plurality of spaced breaker support rings fixed upon the tube or shaft, the endmost breaker support rings being fixed to the corresponding end drive assemblies. A plurality of open-ended tangential slots are formed in each breaker support ring. The breaker bars are located in said slots. Wedges, adjustably mounted in the inner enlargement of each slot, wedge the corresponding breaker bar against a breaker support bar located in the outer enlargement of each slot, firmly holding the breaker bar in adjusted position. Adjusting rings, rotatably mounted upon the tube, have peripheral lugs contacting the inner edges of the breaker bars. Adjusting screws threaded through rods located through the breaker bar support rings engage said lugs. Shear rods are located through registering apertures in the support rings and adjusting rings for holding the breaker bars in adjusted position.

16 Claims, 7 Drawing Figures



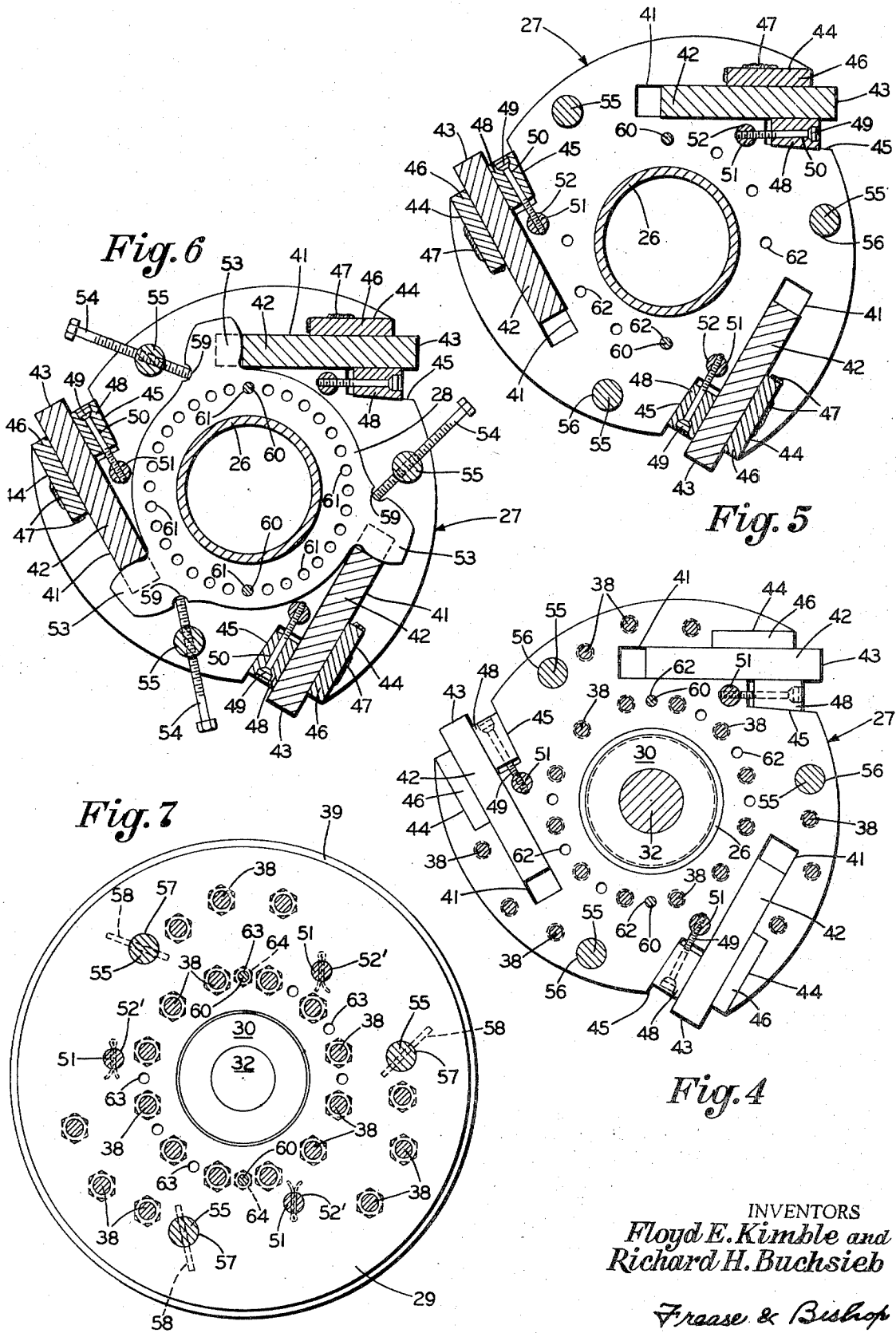


INVENTORS
*Floyd E. Kimble and
Richard H. Buchsieb*
Freese & Bishop
ATTORNEYS



INVENTORS
*Floyd E. Kimble and
 Richard H. Buchsieb*

Freese & Bishop
 ATTORNEYS



INVENTORS
*Floyd E. Kimble and
 Richard H. Buchsieb*

Freese & Bishop
 ATTORNEYS

ROTOR CONSTRUCTION FOR IMPACT CRUSHER**CROSS REFERENCE TO RELATED APPLICATION**

This application is a continuation of our copending allowed application, Ser. No. 764,675, filed Oct. 3, 1968, now abandoned.

BACKGROUND OF THE INVENTION**1. Field of the Invention**

The invention relates to impact crushers for crushing stone, coal and similar material, and more particularly to the construction of a rotor carrying the hammers or breaker bars.

2. Description of the Prior Art

In impact crushers such as are now in general use, the impact bars are disposed radially upon the rotor. In use, as the leading edge of the impact bar wears off, it presents a scuffing action to the material being crushed instead of striking it squarely. This results in squeeze breaking between the rotor and housing rather than direct impact breaking. The radial location of breaker bars currently in use provides lesser radius of gyration of the mass of the rotor, with relation to the longitudinal axis through the center of the rotor, than the tangential location.

SUMMARY OF THE INVENTION

In general terms, the invention may be briefly described as a rotor for an impact crusher comprising two spaced end drive assemblies, each assembly including a relatively large disc and a smaller disc concentrically located upon the inner side thereof, and a stub shaft concentrically fixed to said discs and extending outwardly therefrom to suitable bearings. Driving means may be connected to one of the stub shafts.

A tube has its outer end journaled upon the peripheries of the smaller discs. A plurality of spaced breaker support rings is concentrically fixed upon the periphery of the tube, each endmost support ring being connected to the larger disc of the adjacent end drive assembly as by cap screws.

Each of the support rings has a plurality of tangentially disposed slots therein open at one end. Elongated breaker bars are inserted laterally into the corresponding slots of the support rings. The open end of each slot is enlarged to receive a breaker support bar on one side and a wedge on the other side for backing up the breaker bar and wedging it tightly in the slots. Adjusting screws located through the wedges are threaded into rods located through the support rings.

Adjusting rings are rotatably mounted on the tube at spaced points throughout the length of the rotor, between certain pairs of support rings, and provided with radially disposed lugs engaging the inner edges of the breaker bars. Adjusting screws may be threaded through rods located through the several breaker support rings, the screws contacting the lugs upon the adjusting rings for moving the outer edges of the breaker bars outwardly to compensate for wear. The rotatable adjusting rings push the breaker bars out uniformly to retain dynamic balance of the rotor.

After the proper adjustment of the breaker bars is attained, shear rods may be located through registering apertures in the adjusting rings, breaker support rings, and discs of the end drive assemblies, for holding the

adjusting rings in adjusted position, wedges may be drawn into position to firmly hold the breaker bars, after which the adjusting screws and rods may be removed.

It is a primary object of the invention to provide a rotor for an impact crusher including breaker bars disposed tangentially adjacent to the outer periphery of the rotor.

Another object of the invention is to provide such a rotor having adjusting mechanism for moving the breaker bars out tangentially to compensate for wear and to adjust product size.

A further object of the invention is to provide a rotor of this character having safety release mechanism for the breaker bars when they strike uncrushable objects.

A still further object of the invention is to provide novel means for clamping the breaker bars in place in the rotor.

Another object of the invention is to provide a rotor of the type referred to comprising a plurality of spaced breaker support rings fixed upon a rotatable tube or shaft, breaker bars tangentially mounted in said support rings, adjusting rings rotatable upon the tube or shaft for adjusting the breaker bars, and wedge means for clamping the breaker bars in adjusted position.

Another object of this invention is to provide a rotor in which the undersized material may pass between breaker support rings to give increased output capacity.

A further object of the invention is to provide such a rotor in which the adjusting rings have shoulders contacting the inner edges of the breaker bars and in which the adjusting rings are rotated by adjusting screws contacting said adjusting rings.

A still further object of the invention is to provide a rotor of the character referred to in which shear rods are located through suitable apertures in the adjusting rings, the breaker support rings and the large discs of the end drive assemblies, for holding the adjusting rings in adjusted position, whereby the adjusting screws and rods may be removed.

Also, it is an object of the invention to provide breaker support and reinforcing bars for the tangentially arranged adjustable breaker bars.

These and other objects, apparent from the drawings and following description, may be attained, the above described difficulties overcome and the advantages and results obtained, by the apparatus, construction, arrangement and combinations, subcombinations and parts which comprise the present invention, a preferred embodiment of which, illustrative of the best mode in which applicants have contemplated applying the principle, being set forth in detail in the following description and illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional end elevation of an impact crusher provided with a rotor embodying the invention; FIG. 2 is an enlarged section on the line 2—2, FIG. 1;

FIG. 3 is an enlarged fragmentary longitudinal sectional view through the impact crusher shown in FIG. 1 showing the rotor partly in elevation and partly in section;

FIG. 4 is a smaller scale transverse section on the line 4—4, FIG. 3, showing one end breaker support ring;

FIG. 5 is a transverse section on the line 5—5, FIG. 3, showing one of the intermediate breaker support rings;

FIG. 6 is a transverse section on the line 6—6, FIG. 3, showing a breaker support ring, an adjusting ring and the adjusting screws and rods for the same; and

FIG. 7 is a transverse section on the line 7—7, FIG. 3, showing one end drive assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first more particularly to FIGS. 1, 2 and 3, in which similar numerals refer to similar parts throughout, the impact crusher is shown as having a housing comprising side walls 1 and 2, end walls 3, and a top 4 which may be removable if desired. The rotor, indicated generally at 5, is journaled through the end walls 3 as will be later described in detail.

The charging opening 6 is formed in the end wall 1, and an inclined chute 7 leads therefrom to one side of the rotor 5. This chute may be adjustably mounted. For this purpose, depending ears 8 on the underside of the chute pivotally mount the upper end portion of the chute 7 upon the pivot rod 9 supported in the side walls 3. The lower end portion of the chute is shown as supported upon a rod 10 which may be adjustably mounted upon the end walls 3 for adjusting the pitch of the chute.

Located within the housing, on the opposite side of the rotor 5 from the chute, is a vertical series of equally spaced breaker rods indicated generally at 11. Each breaker rod is shown as comprising a rod 12 with a tube 13 mounted thereon. The ends of the rods 12 are located through suitable openings in the end walls 3 of the housing, and pins 14 are located therethrough.

The breaker rod 12' with the tube 13' thereon located in substantially the same horizontal plane as the center of the rotor, may be adjustable toward and from the rotor as shown in FIGS. 1 and 2 in order to regulate the maximum size to which material may be crushed. For this purpose the rod 12' is located through an elongated horizontal slot 15 and received within a slide plate 16 slidably mounted between horizontal guides 17 fixed to the outer surface of the adjacent end plate 3.

The guides 17 are preferably of angular cross-section, as best shown in FIG. 2. The slide plate 16 may be held in adjusted position by set screws 18 or other flexible or shearable means which will permit the slide plate 16 to slide outward or to the right as viewed in FIG. 1 when steel or other uncrushable material is received between the rotor and the tube 13'.

The end plates 3 are mounted upon base plates 19. Spaced outwardly from the end plates, upon the base plates, are the channel-shaped brackets 20 having the outwardly disposed bottom horizontal flanges 21 resting upon the base plates 19, the outwardly extending top horizontal flanges 21' and the spaced vertical flanges 22 located between the flanges 21 and 21'.

Spacing bars 23, located between the lower ends of the end walls 3 and the brackets 20, space the brackets outwardly the desired distance from the end walls. Bolts 24 connect the brackets 20 to the end walls 3 of the housing.

Shear blocks 25 (FIG. 1 and 2) are welded or otherwise attached to the outer surfaces of the end walls 3 of the housing and rest upon the top flanges 22 of the brackets 20.

The rotor, indicated generally at 5, includes a tube 26 upon which are fixedly mounted as by welding, a plurality of equally spaced breaker support rings 27. Adjusting rings 28 are rotatably mounted upon the tube 26 between certain pairs of the breaker support means 27.

An end drive assembly is located at each end of the rotor and includes a disc plate 29 of larger diameter than the breaker support rings, inner and outer hub rings 30 and 31, respectively, and a stub shaft 32, all of which are welded or otherwise rigidly connected together.

The stub shafts 32 are journaled in bearings indicated generally at 33 which are mounted upon the top flanges 22 of the brackets 20 and connected thereto as by bolts 34. Each bearing 33 may include a pillow block 35 and a cap 36 connected thereto as by a cap screw 37. Each of the endmost breaker support rings 27 is connected to the adjacent disc plate 29 as by screws 38. The periphery of each disc plate 29 is shouldered, as indicated at 39, and has a running fit within a similarly shaped opening 40 in the adjacent end wall 3 of the housing. This provides a dust seal.

Referring now more particularly to FIGS. 4 to 7 inclusive, each of the breaker support rings 27 has three chordal slots 41 therein tangent to a common circle opening out through the periphery thereof. An elongated, flat breaker bar 42, formed of hardened steel or the like, is slidably located in each slot 41 with the outer edge 43 thereof projecting beyond the periphery of the breaker support ring for impact with the material to be crushed.

The open end of each slot 41 is enlarged on the outer side as indicated at 44 and on the inner side, as indicated at 45. A breaker support bar 46 is located in the enlargement 44 of each slot 41 and welded at two faces to the support ring as indicated at 47. The bars 46 reinforce the breaker bars and distribute the force of the impact along the entire length of the rotor.

A wedge 48 is adjustably mounted in the enlargement 45 of each slot 41, for wedging the corresponding breaker bar 42 against the breaker support bar 44. For this purpose, a screw 49 is provided located through a suitable bore 50 in the wedge and threaded into a rod 51 rotatably mounted through suitable apertures 52 in the breaker support rings 27 and apertures 52' in the disc plates 29. As the adjusting screws 49 are tightened, the rods 51 may oscillate slightly within the apertures 52 as the wedge changes position.

Each of the adjusting rings has a plurality of shoulders, shown in the form of lugs 53 corresponding in number and position to the breaker bars 42 and adapted to contact the inner edges thereof as best shown in FIG. 6.

For the purpose of rotating the adjusting rings to move the breaker bars 42 outwardly in the slots 41 in order to compensate for wear upon the impact ends 43 thereof, adjusting screws 54 are provided.

These screws are threaded through rods 55 located through apertures 56 in the breaker support rings and apertures 57 in the disc plates 29. Wedge pins 58 are

located through suitable apertures in the end portions of the rods 57 on the outer sides of the disc plates 29. The inner ends of the adjusting screws 54 are shown as engaged in notches 59 in the adjusting ring 28 at the base of the lugs 53.

When the breaker bars 42 have been properly adjusted, the adjusting screws 54 and rods 55 may be removed and the adjusting rings 28 may be held in adjusted position by means of shear rods 60 located through the proper openings 61 in the adjusting rings 28, openings 62 in the breaker support rings 27, and openings 63 in the disc plates 29, and nuts 64 are placed upon the threaded ends thereof.

OPERATION

In the operation of the impact crusher, one of the stub shafts 32 is connected to a suitable source of power for rotating the rotor in the direction of the arrow in FIG. 1. Material to be crushed is charged into the inlet opening 6 of the housing onto the chute 7 and, by rotation of the rotor, the material is moved toward the vertical series of spaced breaker rods 12-13.

All material small enough may pass between the tubes 13, while larger material is carried downward and crushed between the breaker bars 42 of the rotor and the adjustable breaker rod and tube 12'-13' and thus the material is crushed to small enough size to pass downward between the same. Adjustment of product size is accomplished by a combination of adjustment of breaker bars 42 and adjustment of breaker rods 12-13.

In the event that a piece of steel or other uncrushable object is charged into the crusher, when it comes into contact with the adjustable breaker rod 12' and tube 13', it will cause the sliding plate 16 to slide backward or to the right, between the set screws 18, or other flexible or shear release means, thus preventing damage to the mechanism of the crusher. The shear rods 60 also provide safety release means permitting the breaker bars 42 to move backward in their slots in the event uncrushable objects are encountered thereby.

Although for the purpose of illustration the rods 55 and adjusting screws 54 are shown in FIG. 3, it should be understood that in the operation of the crusher, both the adjusting screws 54 and rods 55 are removed after the adjusting rings are properly adjusted. Means are provided for removal of entire rotor, if necessary, through the side of the housing by removal of screws 24, and loosening one pillow block cap 36, permitting removal of one bearing support bracket 20. Means for removal of all of rotor except end drives is accomplished by removal of screws 38 at ends of rotor, and loosening of caps 36 of pillow blocks. The disc plates of the end drives may be moved back to clear tube 26, after which the rotor, less end drives, may be lowered through bottom of crusher housing.

The rods 55 may be positioned through proper apertures, and the adjusting screws 54 located therein may be turned to rotate the adjusting rings 28 in order to extend the impact edges of the breaker bar outward to compensate for wear. When properly adjusted, the shear rods are inserted, the wedges 48 are tightened against the breaker bar by turning the adjusting screws 49, and the rods 55 and adjusting screws 54 are removed, after which the crusher is in condition for operation.

In the foregoing description certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such words are used for descriptive purposes herein and are intended to be broadly construed.

Moreover, the embodiments of the improved construction illustrated and described herein are by way of example, and the scope of the present invention is not limited to the exact details of construction.

Having now described the invention or discovery, the construction, the operation, and use of preferred embodiments thereof, and the advantageous, new and useful results obtained thereby; the new and useful construction, and reasonable mechanical equivalents thereof obvious to those skilled in the art, are set forth in the appended claims.

We claim:

1. An impact crusher having a rotor including axially arranged breaker support rings having chordal slots therein tangent to a common circle open at one end, breaker bars located in said slots and each having one edge extending through the open end of the corresponding slot, a tube or shaft upon which the support rings are fixed, and adjusting rings rotatable upon said tube or shaft for adjusting the breaker bars in said slots to compensate for wear and to control size of product.

2. An impact crusher having a rotor as defined in claim 1 in which the adjusting rings are located between and rotatable relative to certain of the support rings, shoulders upon the adjusting rings engaging the inner edges of the breaker bars and means for rotating the adjusting rings relative to the support rings.

3. An impact crusher having a rotor as defined in claim 2 in which the means for rotating the adjusting rings comprises removable adjusting screws, and in which shear rods are provided for holding the adjusting rings in adjusted position.

4. An impact crusher having a rotor as defined in claim 1, in which the open end of each slot is enlarged at each side of the breaker bar, a breaker support bar is in the enlargement on one side of the breaker bar and a wedge is in the enlargement on the other side of the breaker bar.

5. An impact crusher having a rotor as defined in claim 2 in which an end drive assembly is detachably connected to each endmost breaker support ring, each end drive assembly including a disc of larger diameter than the breaker support rings.

6. An impact crusher having a rotor as defined in claim 5 in which the discs are peripherally shouldered and have a running fit in similarly shouldered openings in the end walls of the impact crusher.

7. An impact crusher having a rotor as defined in claim 6, in which a removable bearing support bracket with a horizontal top flange is outwardly spaced from the lower portion of each end wall and shear blocks fixed to the outer surface of the end wall rest upon said horizontal flange, this design permitting removal of the rotor through the side of the crusher.

8. An impact crusher having a rotor as defined in claim 7 in which safety release means is provided for holding the adjustable breaker bar in adjusted position.

9. An impact crusher having a rotor as defined in claim 5 in which the end drive assemblies include small diameter discs which receive the ends of the tube.

10. An impact crusher having a rotor as defined in claim 9 in which said larger diameter discs are detachably connected through screws to the endmost breaker support rings, enabling reinforcement of the endmost breaker support ring.

11. An impact crusher, as described in claim 2, in which the breaker support rings are axially spaced apart such that the distance therebetween enables passage of undersize material and thereby controls products size and volume of material passing through the crusher.

12. An impact crusher having a rotor as described in claim 2, in which the breaker support rings are constructed so that material may pass therethrough so as to aid productive output of the crusher.

13. An impact crusher for crushing coal and stone having a rotor, elongated breaker bars extending longitudinally of the rotor, each breaker bar having a blunt outer edge, said breaker bars being located tangent to a common circle, means upon the rotor for supporting the breaker bars in such location and means for adjust-

ing the breaker bars tangentially to said common circle to compensate for wear and to control size of product.

14. An impact crusher for crushing coal and stone having a rotor as defined in claim 13 in which the breaker bars are located near the periphery of the rotor.

15. An impact crusher for crushing coal and stone having a rotor as defined in claim 13 in which the outer edge of each breaker bar is located adjacent the plane in which the next forward breaker bar is located.

16. An impact crusher for crushing coal and stone having a rotor, a center tube or shaft in said rotor, elongated breaker bars in the rotor parallel with the center tube or shaft, each breaker bar having a blunt outer edge, said breaker bars being located tangent to a common circle so that the adjustable length of the breaker bars is not limited by said center tube or shaft, means upon the rotor for adjusting the breaker bars tangentially to said common circle and means upon the rotor for supporting the breaker bars in adjusted position.

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