

Feb. 23, 1965

G. W. BEHNKE ET AL
CRUSHER APPARATUS

3,170,645

Filed Dec. 26, 1961

2 Sheets-Sheet 1

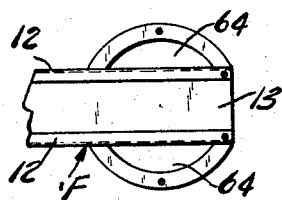
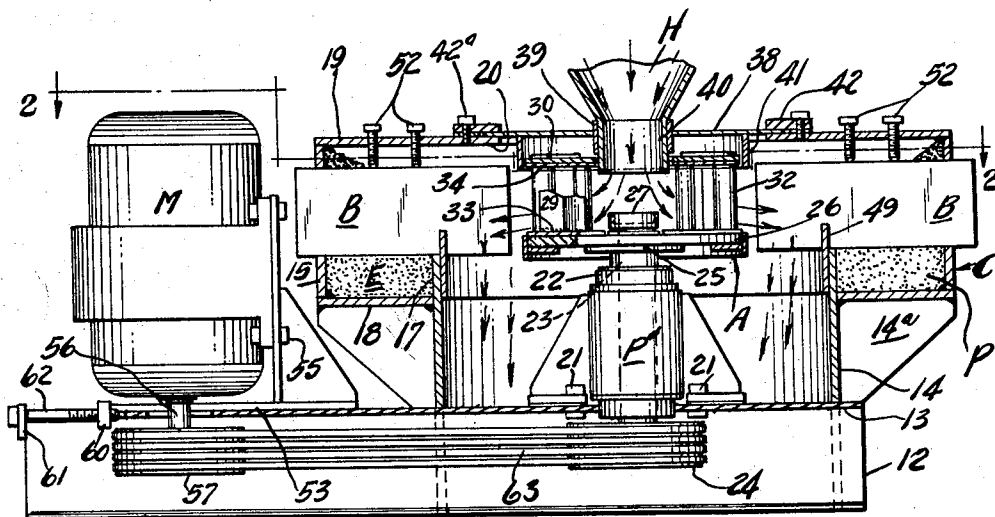
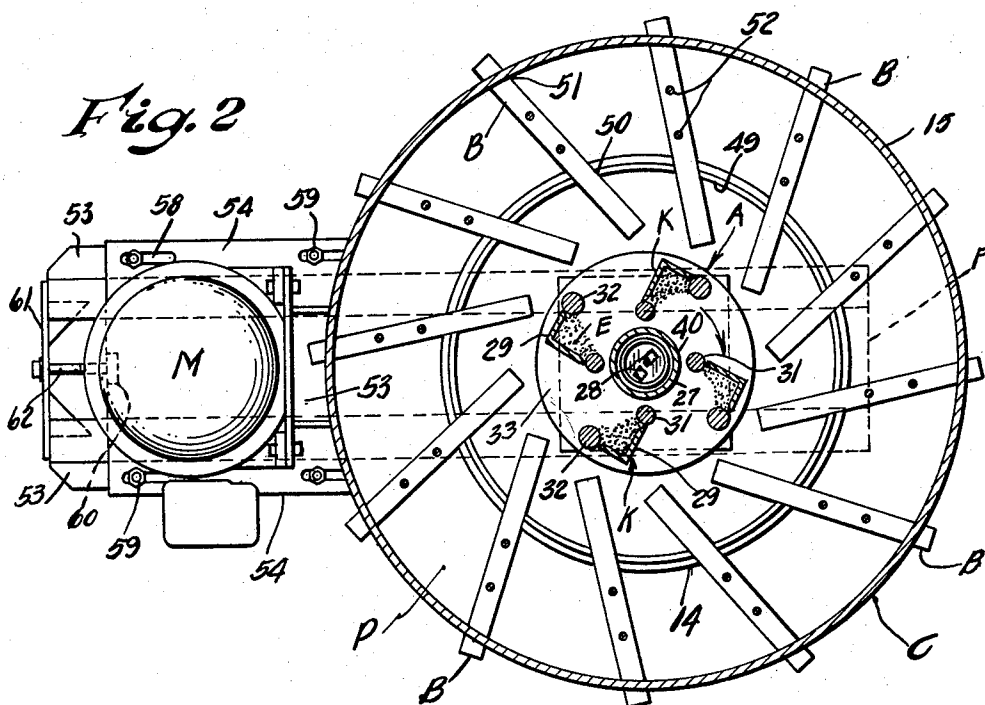


Fig. 6

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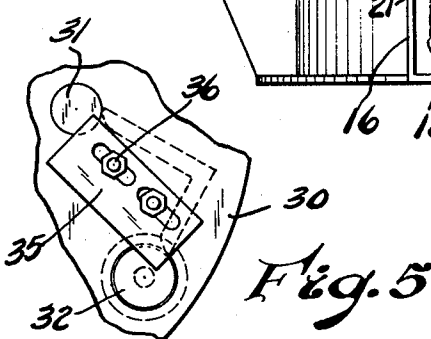
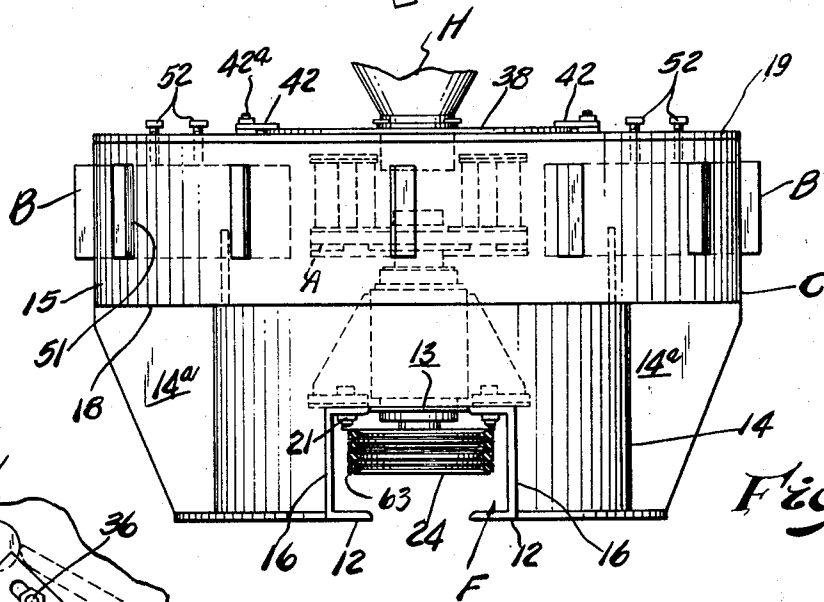
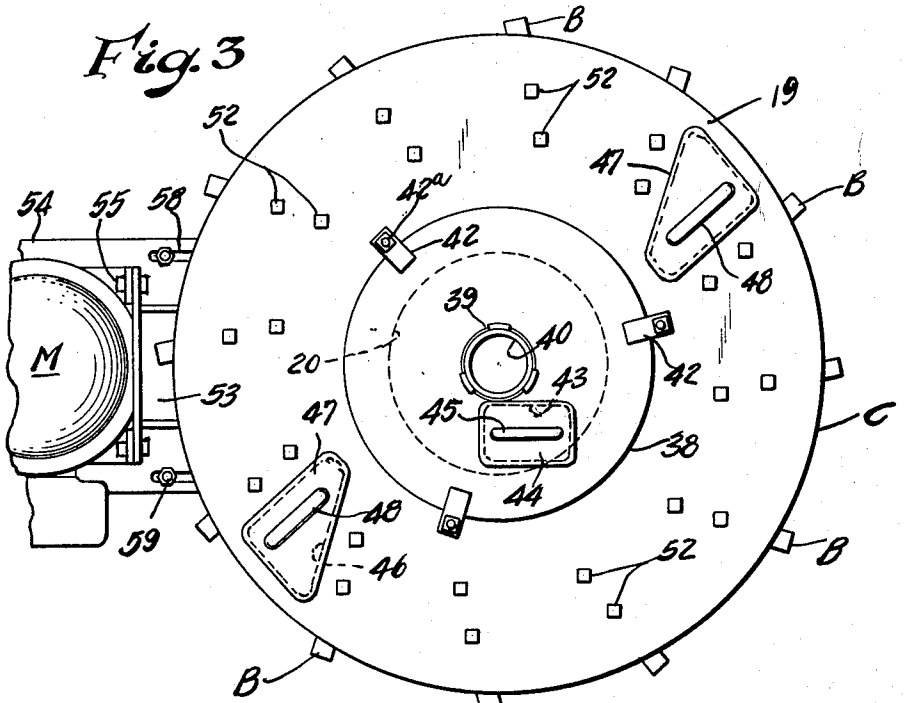
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CRUSHER APPARATUS

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Filed Dec. 26, 1961, Ser. No. 162,075
8 Claims. (Cl. 241—275)

This invention relates to crushers of the impact type for crushing lightweight aggregates, gravel, shale, asbestos, soft stone, coal, coke, limestone and other materials, either wet or dry, at a minimum cost, with high production and an optimum volume of finished product.

Due to the fact that the material to be processed is of a highly abrasive nature, it is essential that the wear parts of the mechanism be protected as much as possible; that they be adjustable to compensate for wear, and be also reversible to present fresh working surfaces to the end that the crusher will continue to operate at high capacity with the finished cubical product unchanged by this heavy wear.

One of the prime objects of the invention is to design a crusher mechanism including a crushing bowl and driven impeller with a plurality of impact bars adjustably mounted in said bowl and so disposed with relation to the impeller, that the material being processed is flung outwardly against the side walls of the impact bars to be uniformly shattered thereby, and in which the volume of "fines" can be accurately controlled by changing the speed of the driven impeller assembly.

Another object is to design a simple, practical and economical crushing mechanism in which the incoming material to be crushed, contacts and rides on the material packed in both the crusher bowl and impeller buckets, thus eliminating wear on the buckets and bowl respectively, insuring longer life and producing a more uniform product with a minimum of maintenance.

A further object of the invention is to provide an impeller assembly including vertically disposed, angularly shaped member, and a plurality of circumferentially spaced, easily removable wear pins associated with the angularly shaped members to form buckets to which the incoming material to be crushed is fed, and provide simple, practical, adjustable and relatively inexpensive means for driving said impeller assembly.

Still a further object is to provide a crusher mechanism, including a stepped bowl forming a shelf in which some of the crushed material is packed as it is thrown from the impeller, and driving means associated with the crusher for driving said impeller.

A further object is to provide a simple, practical, and economical and compact crusher mechanism composed of a minimum number of parts, all of simple and sturdy design and construction, which can be readily manufactured and economically assembled and installed.

With the above and other objects in view, the present invention consists in the combination and arrangement of parts, hereinafter more fully described, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims; it being understood that changes may be made in the form, size, proportion and modern details of construction, without departing from the spirit, or sacrificing any of the advantages of the invention.

In the drawings:

FIGURE 1 is a part sectional, side elevational view through the crusher.

FIGURE 2 is a top plan view taken on the line 2—2

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of FIGURE 1 with a removable cap on one of the impact bars.

FIGURE 3 is a top plan view of the crusher with the hopper omitted.

FIGURE 4 is a fragmentary, side elevational view showing the tunnel for the drive.

FIGURE 5 is an enlarged, fragmentary plan view showing the wear pin releasing means.

FIGURE 6 is a fragmentary plan view of the base showing processed material discharge openings.

Referring now more particularly to the drawings in which we have shown the preferred embodiment of our invention.

The letter F indicates the base or foundation of the crusher and comprises a pair of transversely spaced, elongate channels 12 having a plate 13 spanning and welded to said channels to form an inverted U-shaped tunnel section F on which a crushing bowl C is mounted, the lower end section 14 of the bowl being of less diameter than the main large section 15, and passages 16 are cut in the lower end of wall section 14 to accommodate the section F which extends therethrough as shown, gussets 14a being provided for reinforcing the bowl.

The crushing bowl C is formed as clearly shown in FIGURES 1 and 2 of the drawings, it is preferably cylindrical in shape; the upper end of the smaller section extending a predetermined distance into the upper section as at 17, and a horizontally disposed plate 18 is welded to the section 15, and to the section 14 at a point intermediate its height, to form a shelf and pocket P around the outer rim of the bowl. A horizontally disposed plate 19 is welded to the upper end of the bowl 15 and has a centrally disposed opening 20 therein and for a purpose to be presently described.

A bearing pedestal P' is mounted on the upper face of the base section F by means of bolts 21, and a vertically disposed bearing 22 is mounted therein, a drive shaft 23 being journaled in said bearing, with the lower end of the shaft projecting through said bearing and into the base section F with a sheave 24 mounted thereon as usual.

An impeller assembly A is mounted on the upper end section of the shaft 23 and includes a flange 25 to which an impeller plate 26 is welded or otherwise secured, and a cup shaped cap 27 is secured to the upper end of the shaft by means of set screws 28 or the like, this cap serving as a securing means and also as a shield to protect the end of the shaft from the incoming abrasive material.

A plurality of buckets K form a part of the impeller assembly, each bucket including a vertically disposed section 29, triangular in cross section, with the ends welded to the upper and lower plates 26 and 30 respectively of the impeller. Inner and outer sets of wear pins 31 and 32 are mounted in these plates, and are so located with relation to the section 29, as to form the tip and inner end of the buckets K.

A liner plate 33 forms an anti-abrasive surface for the face of the impeller plate 26, and an anti-abrasive wear plate 34 is secured to the lower face of the top plate 30 to minimize wear.

We direct attention to the fact that the radially spaced wear pins 31 and 32 are of different diameter and form, with the angular section 29, a bucket shaped structure in which the material E packs, so that a material on material operation results. Straps 35 are secured on the upper face of the disc 30, see FIG. 5 of the drawings, and overlie the ends of the wear pins, these straps being secured in position by means of studs 36, and loosening the bolts permits the straps to be shifted to uncover the pin ac-

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commodating openings so that the wear pins can be easily and quickly adjusted, removed, or replaced when desired.

A cover plate 38 forms a closure for the bowl opening 20 and is formed with a centrally disposed, cylindrical feed rim 39 adapted to telescopically accommodate the feed spout 40 of a feed hopper H through which the material to be processed flows to the impeller; this cover being formed with a depending wear rim 41 which is welded to the lower face thereof, the outer edge of said cover overlying the inner peripheral edge of the plate 19, and straps and bolts 42 and 42a respectively are provided for securing the cover in position. This arrangement permits quick and easy removal of the cover for access to the impeller for adjustment or removal of wear pins, repair, or for any other desired purpose.

An access opening 43 is provided in the cover 38, and a cover plate 44 forms a closure for said opening, a handle 45 being secured to said plate to facilitate the handling thereof.

Similar openings 46 are provided in the plate 19, and cover plates 47 normally close said openings and these are also provided with handles 48 as usual, these openings affording access to the impact bars B as will be hereinafter described.

The upper end 17 of the bowl section 14 which projects into the section 15 has a wear rim 49 welded thereto as shown, said rim being slotted as at 50 to accommodate the impact bars B which project through suitable openings 51 provided in the side wall of the bowl. Set screws 52 are mounted on the upper face of the bowl and engage the upper edges of the bars to secure them in set position, this arrangement permitting adjustment of the inner end of the bar with relation to the impeller and buckets, these bars can also be reversed end for end, or turned face for face to compensate for wear, or they can be quickly replaced when necessary.

Angles 53 are secured to the side walls of the base F to increase the width thereof, and a plate bracket 54 is mounted on said base, a drive motor M being secured on said bracket by means of bolts 55 with the end of the motor shaft 56 projecting into said base and having a drive sheave 57 thereon as usual. Slotted openings 58 are provided in the face of the bracket 54, and bolts 59 are provided in said base and project through said bracket for securing the bracket in set position.

An upstanding lug 60 is provided on the one end of the bracket 54 and a similar lug 61 is provided on the end of the base tunnel F in horizontal alignment therewith, a threaded bolt 62 being mounted in the lug 60 and has threaded engagement with lug 61 on the bracket, and it will be obvious that manipulation of the bolt 62 will adjust the motor bracket 54 accordingly.

A drive belt 63 drivingly connects the sheaves 24 and 57, and when the motor is energized, the impeller member will be driven accordingly. Adjustment of the drive belt is very simple, it is merely necessary to loosen the bolts 59 and then manipulate the bolt 62 as required. These drive sheaves and the driving belt are mounted in the base tunnel F formed by the channels and plate 12 and 13, and the base end of the bowl section 14 straddles the base tunnel and is open so that discharging processed material freely flows through openings 64 on either side of the base tunnel, to a conveyor or bin (not shown).

In practice, the material to be processed flows through hopper spout 40 onto the impeller liner plate 33, and moves by centrifugal force into the path of rotation of the buckets K, this material is caught by said buckets and flung outwardly against the one face of the impact bars as the impeller is driven, the crushed material discharging downwardly at either side of the drive tunnel into a conveyor or bin, etc. (not shown). Initially a portion of this material lodges and packs in the pocket P, and after the material is built up in this pocket, it then discharges through the discharge openings, this construction

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insures a material to material contact in both the buckets and the pocket, insuring longer life of all parts which would normally be subjected to excessive wear. When the wear pins 31 and 32 are sufficiently worn, they are turned end for end to present a new wearing area, and are, of course, replaced when they are no longer usable.

From the foregoing description, it will be clearly obvious that we have perfected a very simple, practical and economical crushing apparatus of high capacity with a minimum number of moving parts which requires very little maintenance and which can be used for crushing material of all kinds to required size and consistency.

What we claim is:

1. A centrifugal crusher comprising: a bowl; an impeller rotatably mounted in said bowl and comprising vertically spaced apart upper and lower members; means for driving said impeller in a direction of rotation; circumferentially spaced buckets opening in the direction of rotation of said impeller interposed between said members; each bucket comprising generally angularly disposed portions, the upper and lower edges of which are secured to said members; replaceable wear pins mounted between said upper and lower members adjacent the end edges of said buckets; means feeding the material to be processed to said impeller; and subdividing means in said bowl around said impeller and against which the material being processed is flung.

2. A centrifugal crusher comprising: a bowl; shaft means therein; means for driving said shaft means in a direction of rotation; an impeller rotatably mounted in said bowl by said shaft means; circumferentially spaced buckets opening in the direction of rotation of said shaft means mounted on said impeller; each bucket comprising generally angularly disposed portions; replaceable wear pins mounted on said impeller adjacent the end edges of said buckets; means feeding the material to be processed to said impeller; and subdividing means in said bowl around said impeller and against which the material being processed is flung.

3. A centrifugal crusher comprising: a bowl; impeller means rotatably mounted in said bowl; means for driving said impeller means; generally radially extending, impact bar means in said bowl in circumferentially spaced relation around said impeller means; said bowl having openings through which said bar means extend and out which they may be withdrawn; and means for releasably securing said bar means in position.

4. A centrifugal crusher comprising: a bowl; rotatable impeller means within the bowl including vertically spaced upper and lower members; means for driving said impeller means; circumferentially spaced buckets opening in the direction of rotation of said impeller interposed between said members; subdividing means in said bowl around said impeller and against which the material being processed is flung; said buckets including replaceable wear members forming at least at one generally vertical end edge thereof, at least one of said upper and lower members having openings permitting removal of said wear member therethrough, and means releasably secured to block said openings and retain said wear members in position.

5. A centrifugal crusher comprising: a bowl; shaft means therein; means for driving said shaft means in a direction of rotation; rotatable impeller means within the bowl and driven by said shaft means; spaced apart buckets opening in the direction of rotation of said shaft means mounted on said impeller means; said buckets being formed with generally axially parallel replaceable wear members, a radially disposed member axially adjacent the buckets to close the sides thereof; said member having openings configured to permit removal of said wear members therethrough, and means releasably secured to block said openings and retain said wear members in position.

6. The combination defined in claim 5 in which said

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latter means comprises plates with slotted openings and means extending through said slots and into said radially disposed member to hold the plates in adjusted position over the openings in said radially disposed member.

7. The combination defined in claim 5 in which a cover is provided on said bowl with access openings in said cover in general peripheral alignment with said plates, and removable covers for said access openings.

8. A centrifugal crusher comprising: a bowl; impeller means rotatably mounted in said bowl; means for driving said impeller means; generally radially extending, impact plate means in said bowl in circumferentially spaced relation around said impeller means; said bowl having openings through which said plate means extend and out which they may be withdrawn; ring means provided within said bowl surrounding said impeller means having

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slots for receiving said impact plates; and means for releasably securing said bar means in position.

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