Sept. 19, 1961 T. E. BRIDGEWATER 3,000,579

IMPELLER SHOE

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Fig. 1.

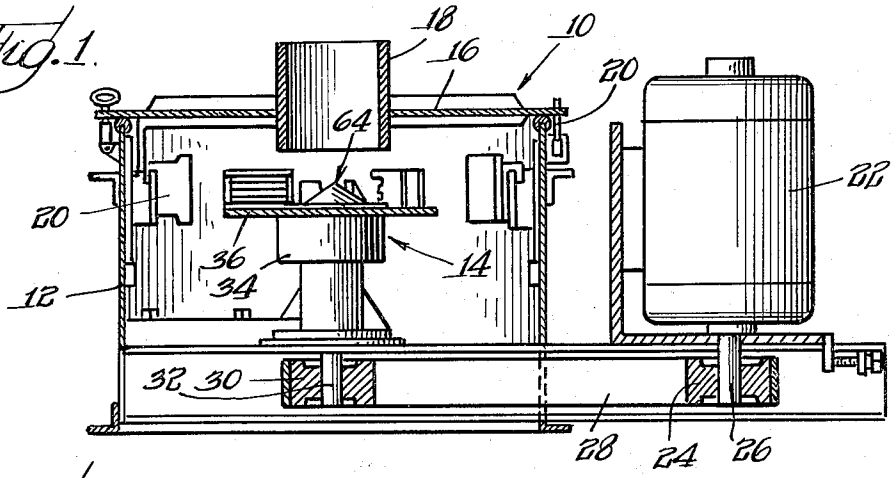

Fig. 2.

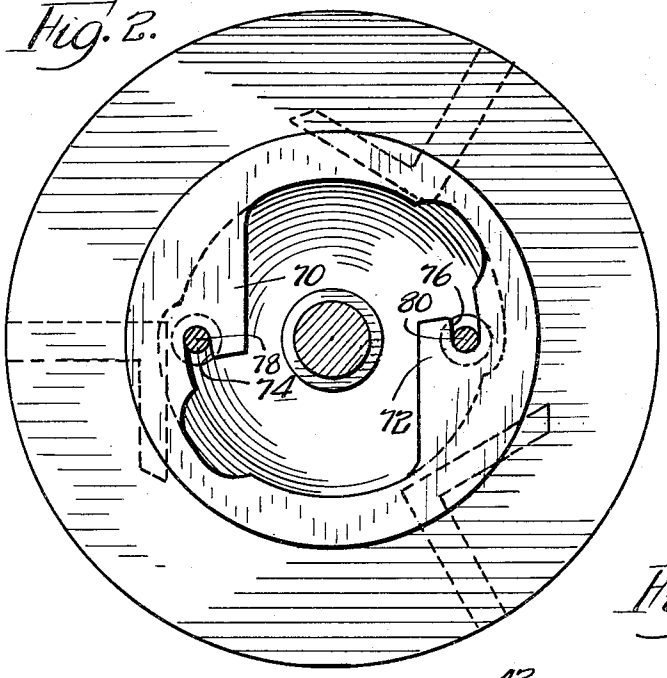

Fig. 4.

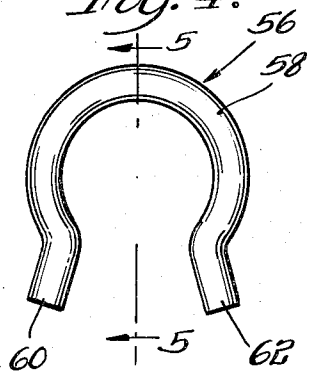

Fig. 5.

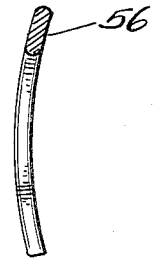

Fig. 3.

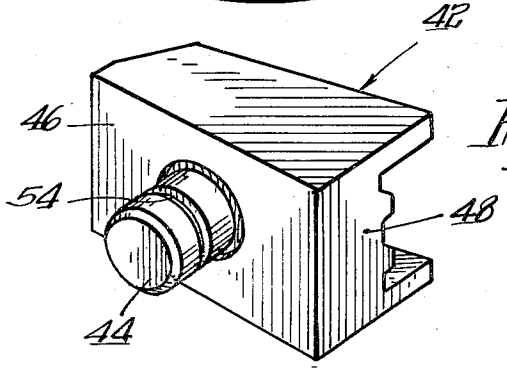

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Fig. 6.

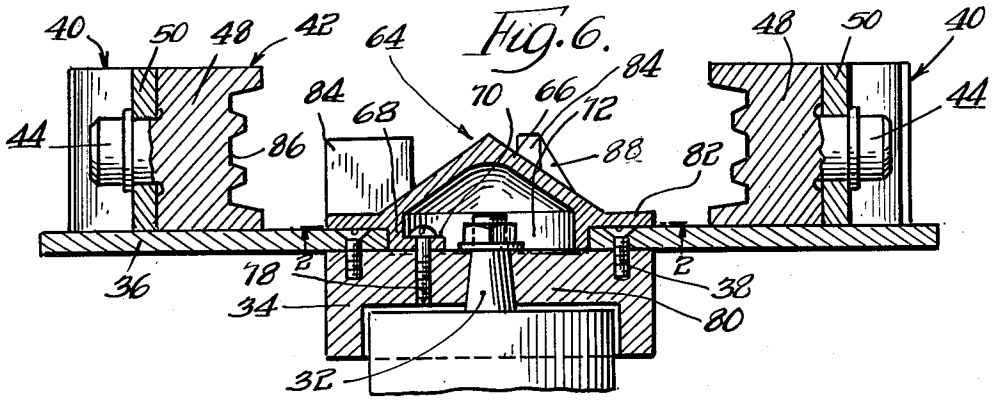
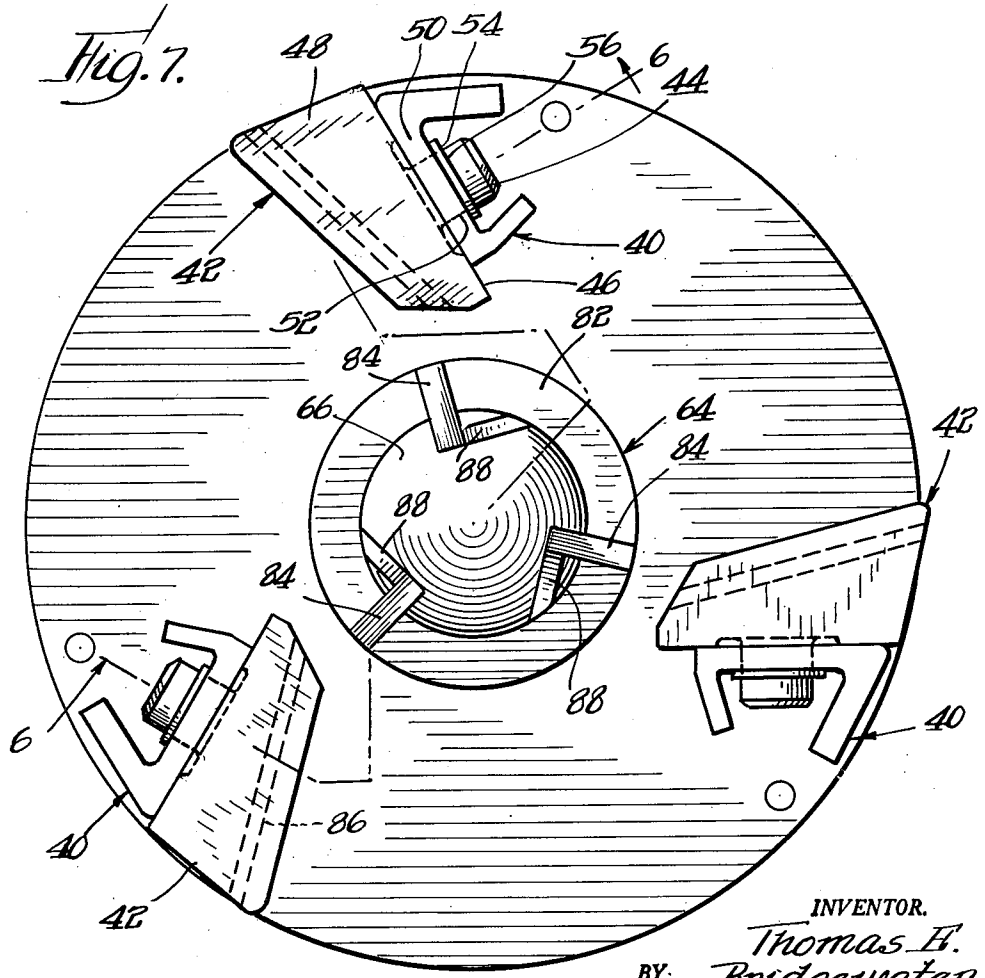


Fig. 7.



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IMPELLER SHOE

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The present invention relates to a novel apparatus for crushing various materials, and more particularly to a novel impact type crushing apparatus.

Impact crushers of the type contemplated herein generally include an impeller onto which material to be crushed is deposited, which impeller then accelerates and throws the material outwardly against breaker plate means or the like surrounding the impeller so that the impact of the material against the breaker plates causes the desired crushing. One factor which limits the crushing action which may be obtained is the amount of acceleration which may be imparted to the material by the impeller. Another problem which is encountered is that of abrasion and wear of parts of the impeller that are engaged by the material being crushed, which abrasion and wear require periodic replacement of such parts with resulting losses flowing from machine shutdown time and cost of parts.

An important object of the present invention is to provide a novel impeller for an impact crusher, which impeller is constructed so as to improve the acceleration of material being worked upon so as to obtain a greater crushing action.

A further object of the present invention is to provide a novel impeller of the above described type which is constructed so as to reduce the rate of wear of certain material engageable parts whereby substantial savings in maintenance and replacement costs may be effected.

A more specific object of the present invention is to provide a novel impeller of the above described type wherein various replaceable parts thereof are constructed so that they may be quickly and easily replaced so as further to reduce maintenance costs.

Other objects and advantages of the present invention will become apparent from the following description and the accompanying drawings, wherein—

FIG. 1 is a simplified partial sectional view showing an impact crusher incorporating features of the present invention;

FIG. 2 is an enlarged sectional view taken along line 2—2 in FIG. 6;

FIG. 3 is a perspective view showing a replaceable impeller blade member or shoe incorporating features of the present invention;

FIG. 4 shows a securing element for releasably connecting the blade member or shoe with a bracket of the impeller structure;

FIG. 5 is a sectional view taken along line 5—5 in FIG. 4;

FIG. 6 is a partial sectional view taken generally along line 6—6 in FIG. 7; and

FIG. 7 is a plan view showing an impeller structure incorporating features of the present invention.

Referring now more specifically to the drawings wherein like parts are designated by the same numerals throughout the various figures, an impact crushing apparatus 10 incorporating features of the present invention is shown in simplified form in FIG. 1. The apparatus comprises a cylindrical housing 12 having an upstanding impeller 14 centrally mounted therein. A cover plate 16 is releasably secured against the upper margin of the cylindrical housing 12 and is provided with a central tube or chute 18 through which material to be worked upon is directed to the impeller. As indicated hereinabove, the

impeller is adapted to throw the material laterally outwardly, and a plurality of breaker plates 20 is circumferentially mounted around the housing for receiving the material thrown from the impeller. It will be appreciated that the breaker plates should be arranged so as to provide substantially continuous annular breaker surface means around the impeller. In order to rotate the impeller at high speed, a suitable motor 22 is mounted exteriorly of the housing 12, which motor carries a pulley 24 on the lower end of its rotor shaft 26. The pulley 24 drives endless belt means 28 which in turn drives a pulley 30 secured to the lower end of the upstanding rotatable shaft 32 of the impeller 14.

As is shown in FIGS. 1 and 6, a hub member 34 is secured on the upper end of the impeller shaft 32. A substantially flat impeller disc or plate member 36 is fixed on the hub member by means of a plurality of screws 38 and carries a plurality of equally spaced upstanding brackets 40. The brackets are welded or otherwise suitably secured to the plate member 36. An impeller blade member or shoe 42 is detachably connected with each of the brackets in the manner described below.

In order to connect a shoe 42 with a bracket 40, the shoe is, in accordance with one feature of the present invention, provided with a short stud or projection 44 of circular transverse cross section extending perpendicularly from a back surface 46 of a main body portion 48 of the shoe. An upstanding central web portion 50 of the bracket has an aperture 52 therethrough with a diameter similar to but slightly greater than the diameter of the stud or projection 44 so that the stud may be easily inserted therethrough. The stud is formed with groove means 54 at a location spaced from the back surface 46 of the shoe body 48 a distance substantially equal to the thickness of the web portion 50 of the bracket, which groove means is adapted to accommodate a resilient locking element 56.

As shown best in FIGS. 4 and 5, the locking element 56 comprises a partially circular section 58 which is adapted to be snapped around the stud and into the annular groove 54. End portions 60 and 62 of the partially circular section flare away from each other for facilitating application of the locking element to the stud. As shown in FIG. 5, the locking element is normally arched in transverse cross section so that upon application to the annular groove it will aggressively resiliently engage opposite walls of the groove and thereby substantially eliminate any possibility of accidental disassembly. It will be appreciated that with this structure a shoe may be quickly and easily assembled with or removed from the mounting bracket.

The arrangement of the shank 44 which has a diameter approximately equal to its length substantially perpendicular to the back surface 46 of the shoe body facilitates more economical production of the shoe as well as improved ruggedness. It is also to be noted that the strength and ruggedness of the connection between the shoe and the bracket is enhanced by the arrangement of the bracket so that the web portion 50 thereof is disposed in a plane inclined forwardly with respect to the direction of rotation of the impeller which is counterclockwise as viewed in FIG. 7, so that a substantial portion of the thrust provided by centrifugal force on the shoe is transferred directly from the back surface 46 of the shoe body to the abutting face of the support bracket, rather than through the stud or shank 44.

In accordance with another important feature of the present invention the impeller 14 is provided with a central distributing member 64 which is formed, like the impeller shoes, from a suitable wear resistant steel alloy material. The member 64 is constructed in a manner described in detail below so that it serves to direct ma-

terial received from the chute 18 radially outwardly to the impeller shoes and so that it serves the additional important function of initially accelerating the material prior to engagement of the material with the shoes 42 whereby to reduce the wear on the shoes and also obtain a higher final velocity as the material leaves the impeller for impingement against the breaker plates.

The distributor member 64 which is shown best in FIGS. 2, 6 and 7, comprises a central conical body portion 66 which is preferably hollow so as to reduce the amount of stock material required. In order to enable the member 64 to be quickly, easily and detachably connected with the remainder of the impeller, an annular flange 68 depends from the conical body portion, which flange is provided with laterally inwardly extending portions 70 and 72 having slots 74 and 76 therein for accommodating upper end portions of screws 78 and 80 which extend above the hub member 34. Preferably the impeller plate 36 is formed with a central aperture for providing a recess adapted to accommodate the depending flange 68 of the distributing member.

The distributing member 64 also includes a peripheral radially outwardly extending flange 82 adapted to overlie the plate 36 and protect the heads of the screws 38. In accordance with an important feature of the present invention radially short upstanding blade elements 84 are formed integrally with the flange 82 and with the lower base portion of the conical body 66 in the manner shown. The blade elements 84 are equally spaced so that they are respectively associated with the shoes 42 in a manner which enables them to direct material to be crushed onto the outer or forwardly facing surfaces 86 of the shoes. In the embodiment illustrated, the blade elements 84 extend radially as distinguished from the forwardly inclined arrangement of the shoe surfaces 86. This arrangement of the blade elements 84 in combination with the short radial extent thereof limits engagement of the blade elements with the material to be crushed and acceleration of the material to a degree which prevents undue abrasion or wearing away of the blade elements 84 while still imparting a substantial beneficial amount of acceleration to the material. It will be noted that a generally triangular web 88 is formed integrally with and extends rearwardly with respect to the direction of rotation from inner ends of each of the blade elements 84. These webs serve to retard the outward movement of any material which attempts to pass directly behind one blade so that such material will be picked up and acted upon by a succeeding blade and, in addition, these webs serve to support the blade elements 84. While the specific arrangement of the blade elements 84 provides the advantages discussed above, it will be appreciated that in certain instances the blade elements may be inclined forwardly with respect to the direction of rotation, if further acceleration is desired.

While the preferred embodiment of the present invention has been shown and described herein, it is obvious that many structural details may be changed without departing from the spirit and scope of the appended claims.

The invention is claimed as follows:

1. In an impact crushing apparatus, an impeller rotatable about a predetermined axis and comprising radially extending support means, a plurality of blade means circumferentially spaced on said support means for accelerating material to be crushed and projecting such material laterally outwardly, each of said blade means comprising an upstanding bracket of predetermined thickness having an aperture therethrough and fixed to said support means, a wear resisting shoe including a body abutting said bracket and a stud having a length greater than said thickness and projecting substantially perpendicularly from said body through said aperture, recess means in said stud and spaced from said body a distance similar to said thickness, and a locking element removably disposed in said recess means and engageable with said bracket for releasably securing the shoe to the bracket, and said impeller including a centrally located distributing member releasably connected with said support means, said distributing member comprising a generally conical body portion and a plurality of radially short upstanding blade elements for initially directing the material radially outwardly and accelerating the material prior to engagement of said material with said blade means.

2. An impeller, as defined in claim 1, wherein said locking element has a resilient body portion of arcuate transverse cross section for aggressive resilient engagement in said recess means for resisting accidental disassembly from the recess means.

3. An impact crushing apparatus of the type described, comprising an impeller rotatable about a predetermined axis and including a plurality of circumferentially spaced blade means having front surfaces spaced radially outwardly from said axis and inclined forwardly with respect to the direction of rotation of the impeller for accelerating material to be crushed and projecting such material laterally outwardly, and a centrally located distributing member including a plurality of radially short circumferentially spaced blade elements located generally radially inwardly from said blade means for initially accelerating material and directing said material to the blade means for further acceleration, said blade elements including front surfaces extending substantially radially with respect to said axis for reducing wear of the blade elements as the material traverses the blade elements and passes toward the blade means.

4. In an impact crushing apparatus, an impeller rotatable about a predetermined axis and comprising a plurality of circumferentially spaced blade means for accelerating material to be crushed and projecting such material laterally outwardly, and a centrally located distributing member including a plurality of laterally outwardly extending blade elements for initially accelerating material and directing material to said blade means for further acceleration, said distributing member also including web sections extending rearwardly from said blade elements for preventing material from passing outwardly directly behind one blade element and retaining such material for engagement by a succeeding blade element.

5. A distributing member, as defined in claim 4, wherein said distributor member includes a substantially conical body for directing material disposed therein radially outwardly.

6. A distributor member for an impeller of the type described having a predetermined outside diameter comprising a generally radially extending body, a plurality of radially short upstanding blade elements circumferentially spaced on said body and having outer ends defining an imaginary circle having a diameter substantially less than said outside diameter, said body being substantially conical for directing material radially outwardly, and web sections respectively extending rearwardly from each of said blade elements and terminating substantially short of succeeding blade elements for inhibiting flow of a portion of the material from the conical body so as to promote engagement of such material with succeeding blade elements.

7. In an impact crushing apparatus, an impeller rotatable about an upstanding axis and comprising generally radially extending support means, and blade means on said support means for accelerating material to be crushed and projecting such material laterally outwardly for crushing impact against breaker means disposed around the impeller, said blade means comprising an upstanding bracket of predetermined thickness having an aperture therethrough and fixed to said support means, a wear resisting shoe including a body abutting said bracket and a stud having a length greater than said thickness and projecting substantially perpendicularly from said body through said aperture, recess means in

said stud and spaced from said body a distance similar to said thickness, and a locking element slidably removably disposed in said recess means and engageable with said bracket for releasably securing the shoe to the bracket.

8. An impeller, as defined in claim 7, wherein abutting surfaces of said bracket and said shoe body are inclined forwardly with respect to a direction of rotation of said impeller whereby outward thrust of the body as a result of centrifugal force is partially transferred directly between said surfaces to said bracket.

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