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T. E. BRIDGEWATER

3,032,169

IMPELLER STRUCTURE

Filed April 27, 1960

2 Sheets-Sheet 1

Fig. 1.

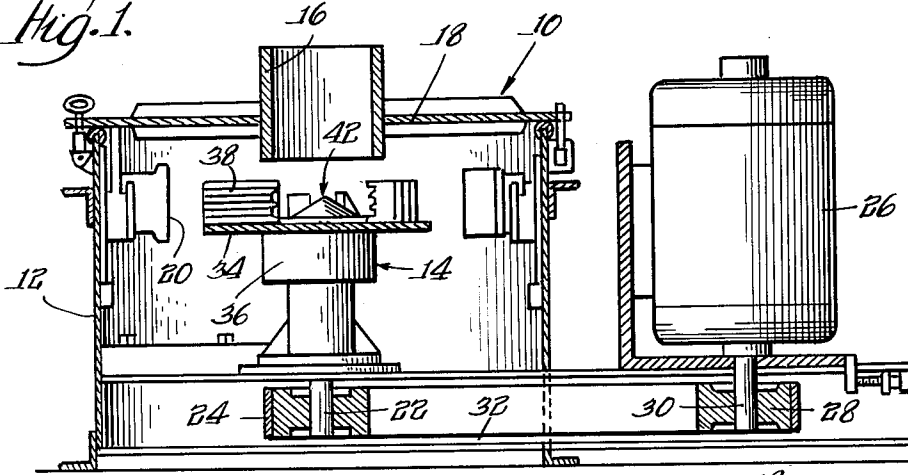


Fig. 2.

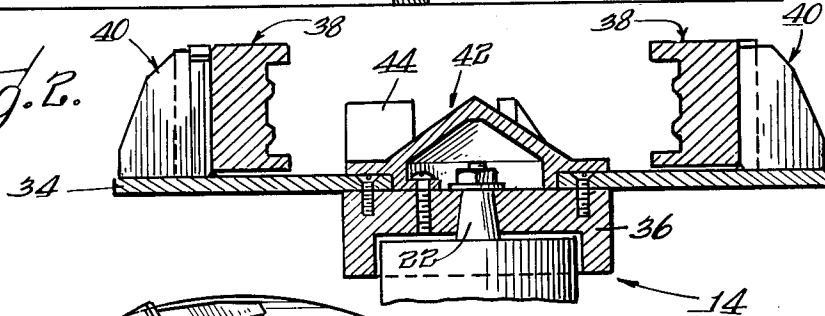
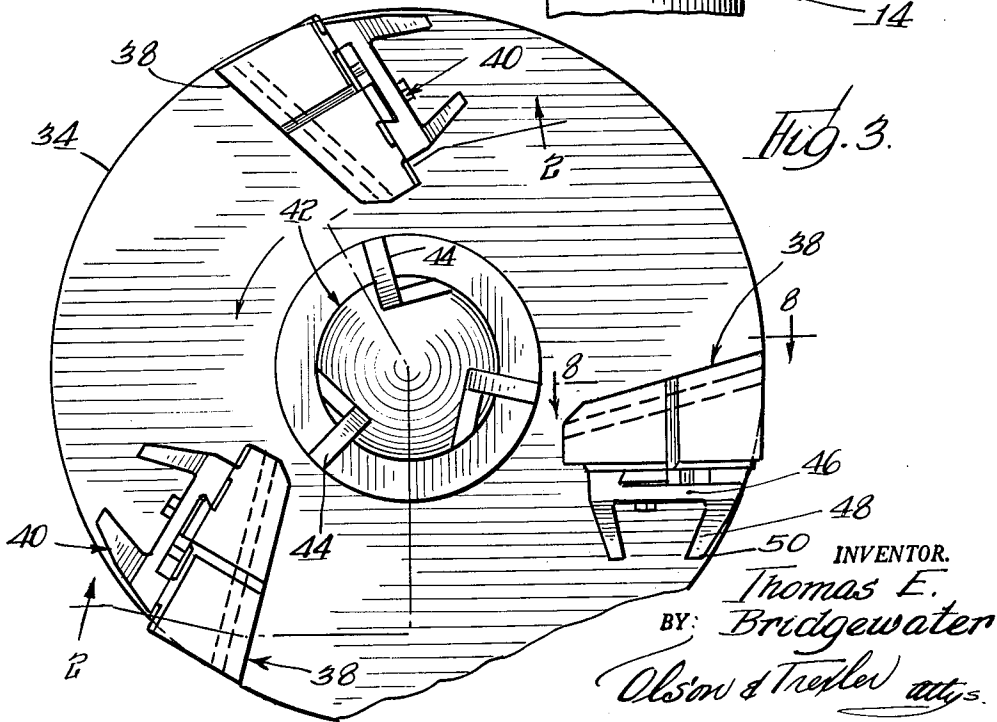


Fig. 3.



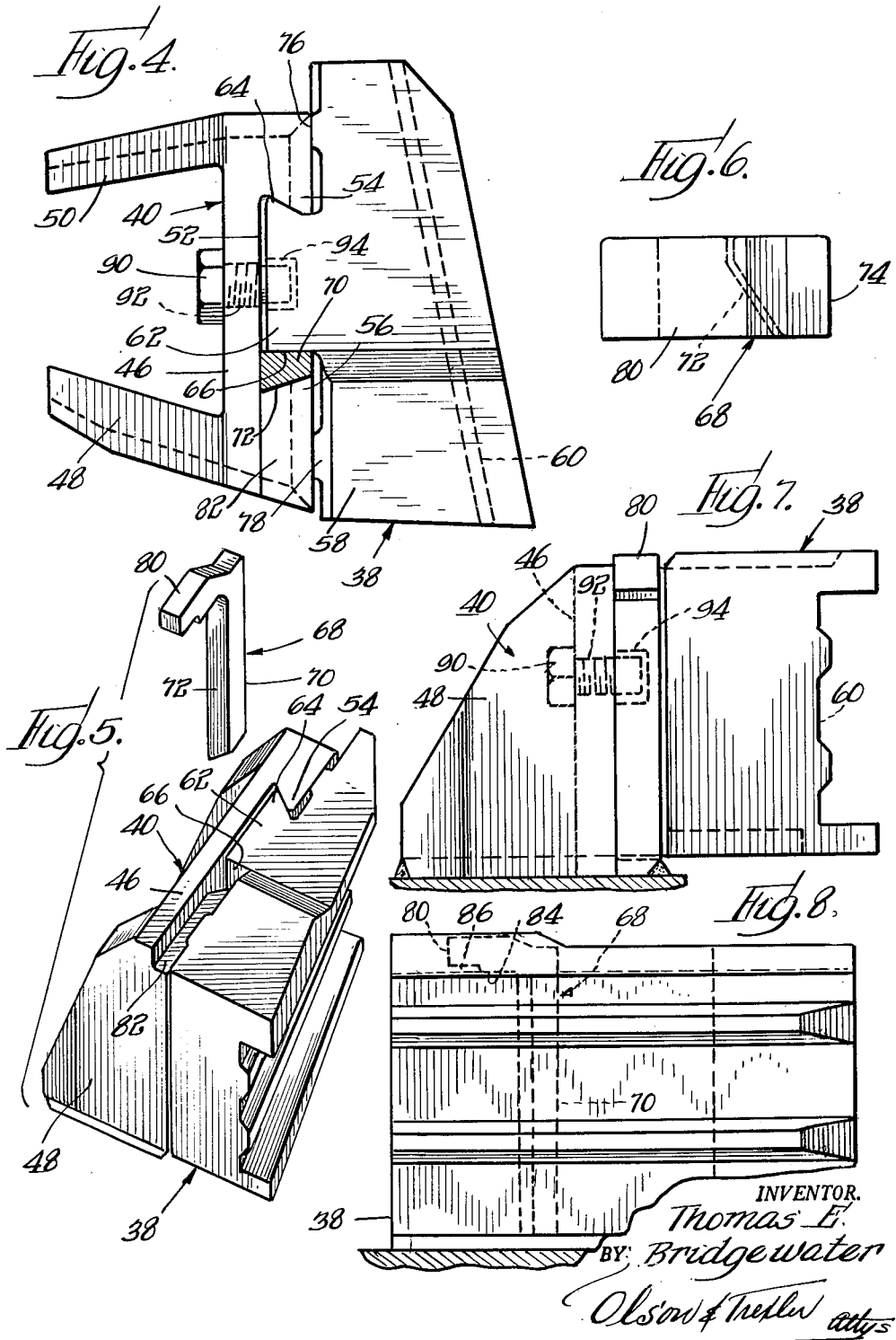
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IMPELLER STRUCTURE

Thomas E. Bridgewater, % Adams Engineering Co.

2151 E. 83rd St., Elmhurst, Ill.

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11 Claims. (Cl. 198-128)

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

Impact type crushers as contemplated herein generally comprise a rotary impeller onto which material to be processed is delivered, which impeller serves to accelerate the material and throw it against breaker plates and the like arranged around the periphery of the impeller. It has been proposed to provide such impellers with blade members or shoes, detachably connected with brackets and the like, which shoes come into direct contact with material being processed during a crushing operation and are therefore subjected to considerable abrasion and wear. While the shoes are formed from an abrasion resistant material, they will eventually wear out and require replacement.

In order to reduce maintenance cost, it has been proposed that means be provided whereby impeller shoes may be quickly and easily connected with mounting brackets. One problem which has been encountered which greatly increases the length of time required to change impeller shoes or blade members, is sticking of the shoes as a result of dust, which is formed and packed between the shoes and the mounting brackets during a crushing operation.

An important object of the present invention is to provide a novel impeller structure having a shoe or blade member which may not only be quickly and easily connected with a mounting bracket or the like, but which may also be relatively quickly and easily removed from the bracket.

A more specific object of the present invention is to provide a novel impeller structure of the above described type wherein the parts may be quickly and easily assembled by sliding complementary elements into interlocking association, which structure is also formed so that such interlocking elements may be relatively easily broken apart or disassembled, even though they may be stuck together as a result of packed dust and the like.

Still another object of the present invention is to provide a novel impeller structure of the above described type wherein the means interconnecting the shoe and mounting bracket is relatively strong and rugged whereby the impeller structure is particularly suitable for use in crushing apparatus of larger sizes.

A further important object of the present invention is to provide a novel impeller structure having complementary elements which may be slipped together for securing the shoe with the bracket, which elements are formed so that the shoe may be easily manipulated for assembly with the bracket without interfering with a cover or other part of the apparatus.

Still 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 a crushing apparatus incorporating features of the present invention;

FIG. 2 is an enlarged fragmentary sectional view of an impeller structure incorporating features of the present invention as seen generally along line 2-2 in FIG. 3;

FIG. 3 is a fragmentary plan view of an impeller structure incorporating features of the present invention;

FIG. 4 is a plan view showing an impeller shoe and mounting bracket incorporating features of the present

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invention, in which view a locking key is partially broken away for illustrative purposes;

FIG. 5 is a partially exploded perspective view showing a shoe, a mounting bracket and locking key structure incorporating features of the present invention;

FIG. 6 is a plan view showing a locking key utilized in the apparatus of the present invention;

FIG. 7 is an outer end elevational view of the assembly shown in FIG. 4; and

FIG. 8 is a sectional view on an enlarged scale taken along line 8-8 in FIG. 3.

Referring now more specifically to the drawings wherein like parts are designated by the same numerals throughout the various figures, a crushing apparatus 10 incorporating features of the present invention is shown in FIG. 1.

In the embodiment shown, the apparatus comprises a cylindrical housing or shell 12 in which an impeller structure 14 is mounted for rotation around a vertically disposed axis. The impeller structure which will be described more in detail below, is adapted to receive material to be crushed, delivered through a chute 16 mounted in a cover 18 on the housing and to accelerate such material and throw it outwardly against breaker plates 20, disposed around the periphery of the impeller.

The impeller structure includes a vertically disposed rotatable shaft 22 having a pulley 24 fixed to its lower end. In order to drive the impeller, any suitable prime mover such as an electric motor 26 is provided outside of the housing 12. A pulley 28 is fixed to the rotor shaft 30 of the motor, and a driving connection is provided between the pulley 28 and the pulley 24 by endless belt means 32.

As shown best in FIGS. 2 and 3, the impeller structure 14 comprises an annular support plate or disc 34 secured to and extending radially outwardly from a hub member 36. The hub member is in turn fixed on the upper end of the impeller shaft 22.

In order to engage and accelerate material to be crushed, impeller blades or shoes 38 are spaced around the plate member 34. These shoes are, in accordance with features of the present invention described fully below, detachably connected to mounting brackets 40 which are preferably welded or otherwise permanently secured to the plate member 34.

As shown in FIG. 1, the chute 16 is disposed so that material to be crushed passing therethrough will fall onto a central portion of the impeller. The impeller is provided with a centrally located conical distributor member 42, which serves to direct the material being processed radially outwardly to the shoes 38. In the embodiment shown, the distributor member is provided with a plurality of integral relatively small blade elements 44 which serve to direct material from the distributor cone to the forwardly facing surfaces of the shoes 38.

As shown best in FIGS. 3-5 and 7, each mounting bracket 40 comprises an upstanding web or body portion 46. Generally triangular support or brace elements 48 and 50 are integrally formed with opposite side vertically extending margins of the web portion 46 and extend rearwardly therefrom with respect to the direction of rotation of the impeller structure. As indicated above, the bracket 40 is preferably secured to the impeller plate 34 by welding.

In order to provide means for interconnection with an element of one of the shoes, the body portion 46 of each bracket is formed with a groove 52 which preferably extends generally vertically. As shown best in FIG. 4, the groove 52 has a generally dovetail configuration so that inwardly projecting flange portions 54 and 56 extend along opposite vertical sides of the groove.

Each of the shoes 38 comprises a main body portion 58, having a forwardly facing surface 60 for engagement

with the material being processed. It will be noted that surface 60 is inclined from the radial inner end of the shoe forwardly with respect to the direction of rotation of the impeller. Furthermore, the bracket 40 is disposed so that when a shoe is assembled therewith the surface 60 of the shoe will be inclined forwardly with respect to a radius of the impeller plate 34. As a result of this inclination, the impeller shoe tends to retard the radial outward movement of material being processed so that the velocity of such material will be substantially increased before the material is thrown from the periphery of the impeller.

Each shoe 38 comprises an integral projection 62 extending from a rear side thereof for entry into the slot 52 in a mounting bracket. As shown best in FIGS. 4 and 5 the projection 62 has a beveled marginal or flange portion 64 adapted to engage behind and mate with the beveled flange portion 54 of a bracket for resisting separation of the shoe from the bracket in the direction of rotation of the impeller.

A side surface 66 of the projection 62 opposite from the beveled flange portion 64 is, as shown in the drawings, disposed substantially perpendicularly with respect to the rear surface of the shoe. Furthermore, the distance between the surface 66 and the outer edge of the flange portion 64 is less than the width of the lateral mouth of the slot 52 or, in other words, is less than the distance between the edges of the flange portions 54 and 56 of the shoe. With this arrangement, the projection 62 may be readily inserted through the lateral mouth of the slot 52 in the manner described more in detail below or, if desired, the projection 62 may be slipped endwise through the upper end of the slot 52.

In order to releasably secure the shoes in association with the mounting brackets, a locking key member 68 is assembled with each associated shoe and bracket. As shown best in FIGS. 4-8, each key 68 comprises a shank portion 70 adapted to be inserted into the slot means 52 of the bracket between the surface 66 of a shoe and the flange 56 of the bracket. The shank is formed with a beveled surface 72 for mating with the beveled flange portion 56 of the bracket and a square surface 74 for mating with the surface 66 of the shoe. In many instances it is desirable to taper the surface 72 toward the lower end of the shank 70 and to form the surface of the flange portion 56 with a similar taper or inclination longitudinally of the slot. With this arrangement the shank portion of the locking key will serve to wedge the projection 62 tightly within the slot 52 and between the flange portions 54 and 56 of the slot. Furthermore, such wedging action and the interengagement between the beveled surfaces of the flange portion 54 of the bracket and the flange portion 64 of the projection 62 causes the shoe to be drawn toward the bracket until abutment portions 76 and 78 formed on the back of the shoe are firmly engaged against the forward surface of the bracket. In other words, the arrangement is such that the shoe is not only securely but also solidly retained in association with the mounting bracket.

As shown in FIGS. 5-8, each of the locking keys 68 also comprises a laterally projecting hook portion 80 extending from the upper end of the shank 70. An upper margin of each mounting bracket is recessed as at 82 for accommodating the hook portion 80 of each locking key whereby each hook portion will be disposed behind and protected by an associated shoe 38. The lower side of the hook portion 80 is formed with an abutment 84 engageable with the bottom of the recess 82 and a notch 86. The notch 86 is adapted to receive a suitable tool, not shown, which may be used to pry the locking key upwardly when it is desired to remove an associated shoe from a mounting bracket.

From the above description it is believed to be clear that a shoe 38 may be quickly and easily connected with a mounting bracket merely by inserting its projection

62 into the groove 52 of the bracket and then forcing the shank of a locking key between the projection 62 and the side of the groove. During subsequent crushing operations dust and the like is formed which becomes packed between the confronting surfaces of the shoe and the mounting bracket and also into any space remaining in the groove 52. Such dust in many instances effectively locks the parts together so that, in the absence of features of the present invention, it would be extremely difficult to disconnect the shoe from the mounting bracket for replacement or any other desired purpose. However, with the structure of the present invention, a prying tool may be easily inserted into the notch 86 in the lower side of the hook portion of a locking key and the key may be relatively easily pryed upwardly sufficiently to break it loose from the locking action of the dust. Once the key is freed, it may be readily withdrawn, after which the projection 62 of a shoe may be freely disengaged from the slot.

This means described above for interconnecting the shoes and the mounting brackets is usually sufficient since the major forces to which the shoes are subjected tend to shift the shoes radially outwardly and rearwardly against the brackets. It will be noted that such movement of the shoes is restrained not only by their projection 62 but also by direct engagement between the abutments 76 and 78 and the forwardly facing surfaces of the mounting brackets since the brackets are disposed so that such surfaces are inclined forwardly with respect to radii of the impeller plate. There is also a possibility that under certain circumstances the shoes may tend to rise. Therefore, screws 90 are threaded through tapped apertures 92 in the body portions 46 of the brackets for entering into enlarged bores 94 formed in the projections 62 of the shoes. Since there is usually little or no engagement between the screws and the shoes except when limited engagement is required to prevent the shoes from rising, the screws will not interfere with the procedure described above for assembling or disassembling the shoes with the brackets.

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. An impeller structure of the type described comprising means rotatable about a predetermined axis, a bracket mounted on said rotatable means and having slot means therein extending generally parallel to said axis, said bracket including first and second flange means respectively disposed along and overlying opposite longitudinal margins of the slot means, a shoe member disposed against said bracket for engagement with material to be processed upon rotation of the impeller structure, said shoe member including a projection extending rearwardly therefrom and into said slot means and behind one of said flange means, and a locking key removably disposed between said projection and the other of said flange means for removably securing said shoe member with respect to said bracket.

2. An impeller structure, as defined in claim 1, wherein said locking key is tapered longitudinally of said slot means for wedging between said projection and said other flange means.

3. An impeller structure, as defined in claim 1, wherein the locking key includes laterally projecting means at an outer end thereof for facilitating removal thereof from said slot means.

4. An impeller structure, as defined in claim 3, wherein said laterally projecting means of said key includes recess means adapted to receive a tool which may be used to pry the key loose from the slot means.

5. An impeller structure, as defined in claim 1, wherein said slot means has a laterally opening mouth having a predetermined width, said projection of said shoe

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having a maximum width less than said predetermined width for enabling the projection to pass laterally into and out of said slot means during assembly or disassembly of the shoe with respect to the bracket.

6. An impeller structure, as defined in claim 1, which includes an element fixed with respect to said bracket and projecting forwardly therefrom for engaging and retaining the shoe against movement relative to said bracket longitudinally of said groove means.

7. In an impeller structure of the type described, having means rotatable about a predetermined axis and having a portion provided with a dovetail slot, a shoe connectable with said portion for engaging material to be processed, said shoe including a rearwardly extending projection for entry into said slot, said projection including a flange portion along one margin thereof for engagement behind one side of the dovetail slot, said projection having a surface opposite from said flange portion disposed with respect to said flange portion for enabling said projection to be inserted laterally into or removed laterally from said slot.

8. In combination with a shoe, as defined in claim 7, a key element for engagement with said surface of said projection and also for engagement with a side of the dovetail slot opposite said flange portion for removably securing said projection within the slot.

9. An impeller structure of the type described, com-

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prising means rotatable about a predetermined axis and including a portion of predetermined height having a forwardly opening recess in a side thereof extending generally along said axis, said recess being partially defined by an abutment surface facing generally radially inwardly with respect to said axis, and a shoe member of predetermined height disposed against said portion for engagement with material to be processed upon rotation of the impeller structure, said shoe member including a portion extending into said recess and presenting an abutment surface in opposing relationship to said first mentioned surface, said surfaces extending for substantially the full height of said shoe member.

10. An impeller structure, as defined in claim 9, which includes a key element removably disposed in said recess and providing said first mentioned abutment surface.

11. An impeller structure, as defined in claim 9, which includes interengageable means on and extending between said rotatable means portion and said shoe member portion for limiting movement of the shoe member longitudinally of said recess.

References Cited in the file of this patent

UNITED STATES PATENTS

1,671,040	Meinecke	May 22, 1928
2,766,872	Pillsburg	Oct. 16, 1956