Sept. 22, 1964 T. E. BRIDGEWATER 3,149,793

IMPELLER SHOE

Filed July 30, 1962 2 Sheets-Sheet 1

Fig. 1.

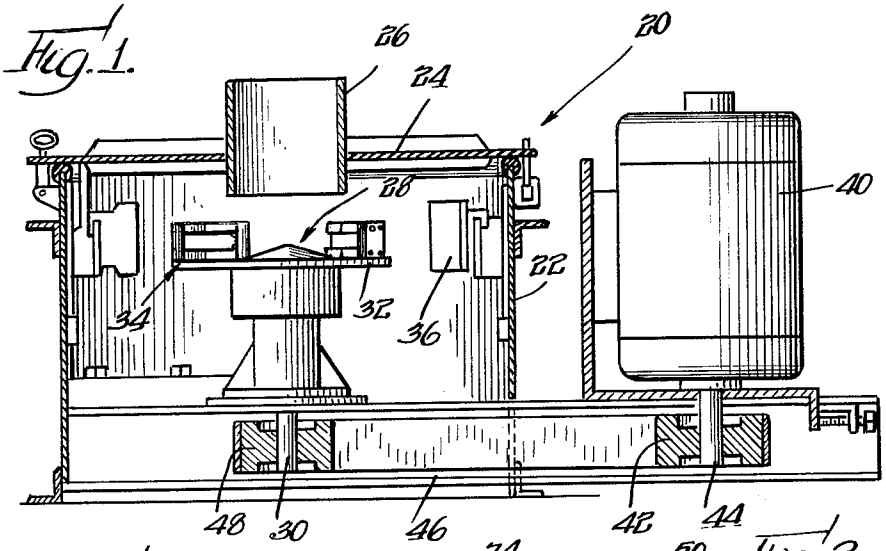

Fig. 3.

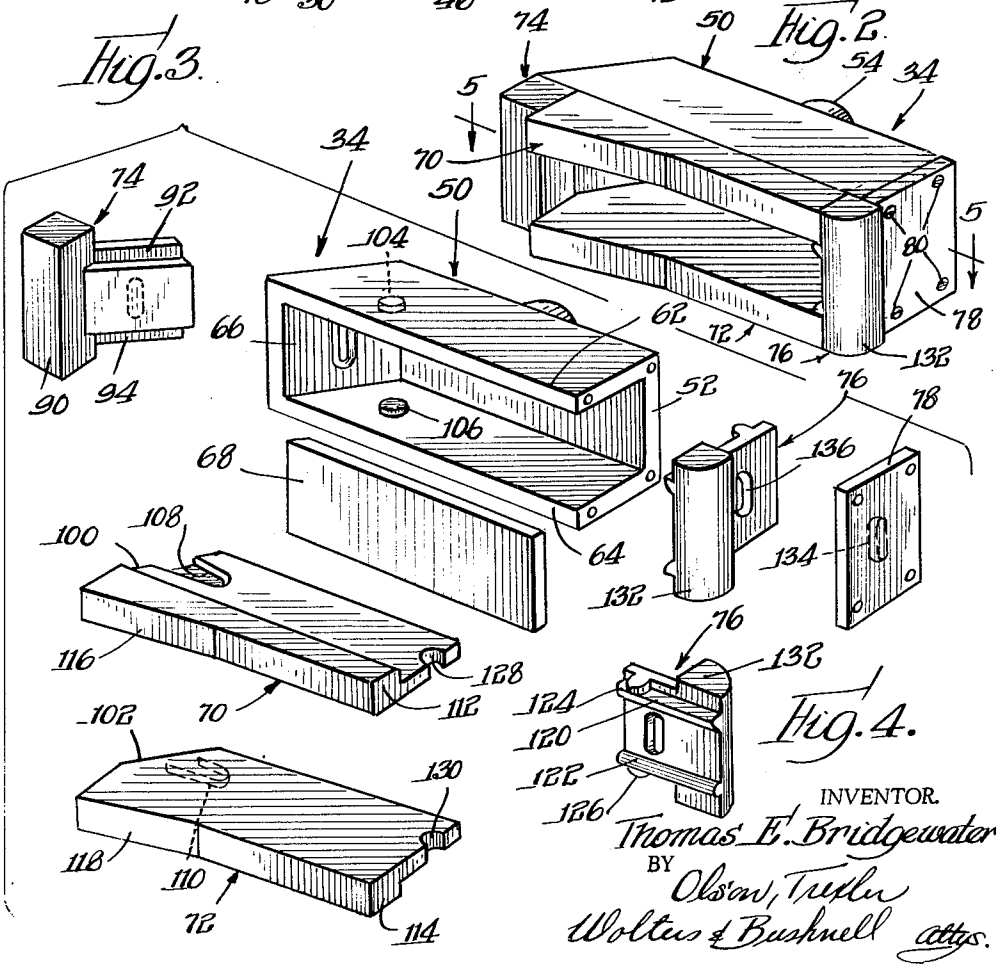

Fig. 2.

Fig. 4.

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Fig. 5.

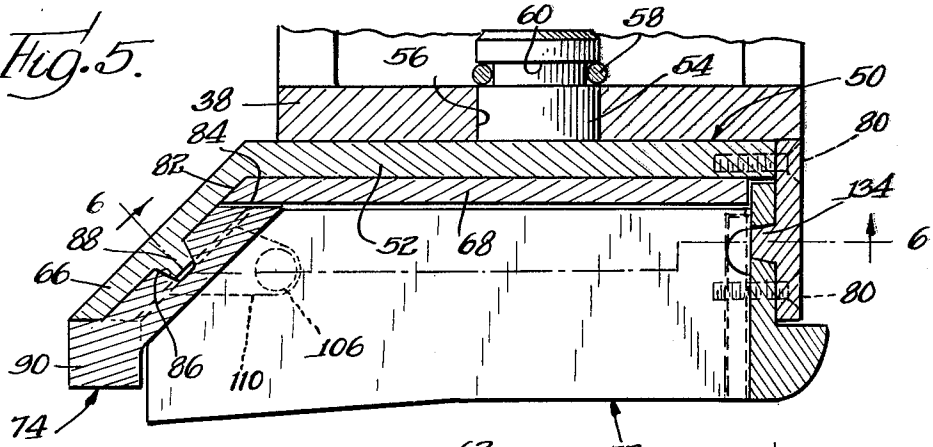


Fig. 6.

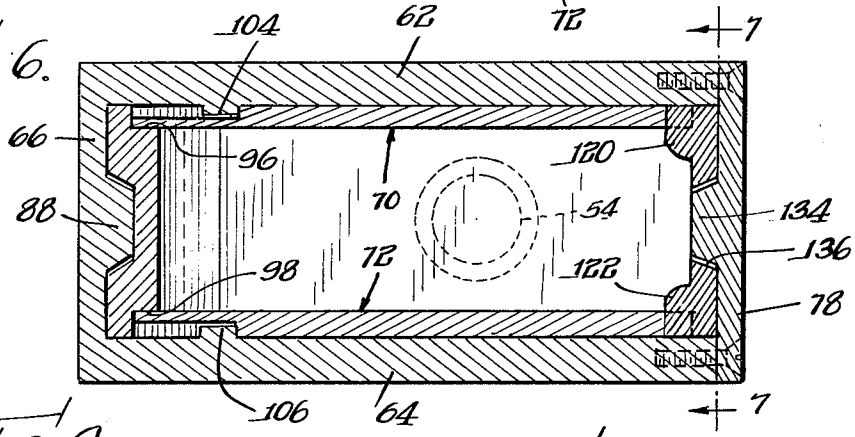


Fig. 9

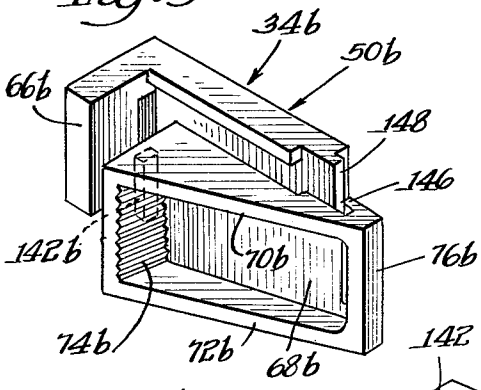


Fig. 7.

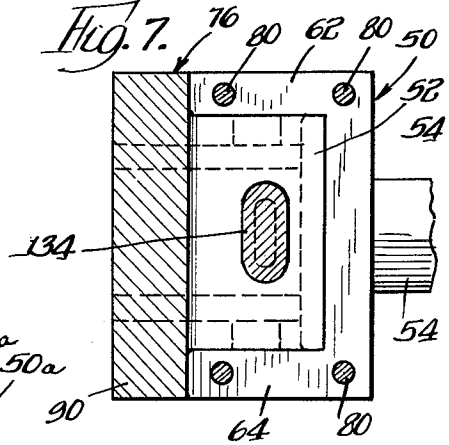
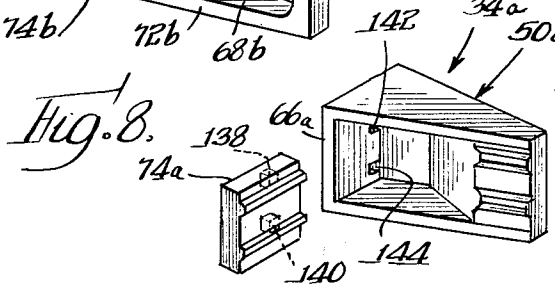


Fig. 8.



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IMPELLER SHOE

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8 Claims. (Cl. 241—275)

The present invention relates to a novel crushing apparatus and more particularly to a novel impact type crusher. This application is a continuation in part of my co-pending application Serial No. 857,365 filed December 4, 1959, now Patent No. 3,074,657.

In crushers of the type contemplated herein, a central upstanding impeller is provided for engaging and accelerating material to be crushed and throwing or projecting material radially outwardly against suitable breaker plates. The impeller is usually arranged for rotation about an upstanding axis and includes one or more upstanding and generally radially extending blade means adapted to engage and accelerate the material being processed. The elements of the apparatus subjected to the material being processed and particularly the impeller blade means suffer considerable abrasion and may wear out rapidly. As a result certain installations have been unduly expensive to operate and maintain since worn parts must be replaced frequently and certain of such heretofore suggested parts have been expensive and have required considerable time and labor to install.

An important object of the present invention is to provide a novel impact type crushing apparatus having parts of the impeller thereof constructed in a manner so as to facilitate economical replacement or repair thereof and thereby promote more economical operation of the apparatus.

It will be appreciated that parts of impeller structures in impact type crushers and particularly blade means of impellers are preferably formed from special and expensive materials having relatively high resistance to abrasion. It is further object of the present invention to provide a novel impeller blade construction whereby substantial savings in the amount of expensive stock material may be effected and an increase in useful working life may be obtained. A further specific object of the present invention is to provide a novel blade structure for an impeller of an impact type crushing apparatus, which blade structure is constructed so that various portions thereof may be separately and individually removed and replaced according to the wear they have received, the construction further being such as to enable the various portions to be quickly and easily removed and so as to enable the parts to be easily reassembled and securely interlocked with each other in a manner which substantially precludes accidental disassembly of the parts during a crushing operation.

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

FIG. 1 is a somewhat simplified partial sectional view showing a crushing apparatus incorporating features of the present invention;

FIG. 2 is a perspective view showing an impeller blade structure incorporating features of the present invention;

FIG. 3 is an exploded perspective view showing the impeller blade structure of FIG. 2;

FIG. 4 is a perspective view showing one part of the novel impeller blade structure;

FIG. 5 is an enlarged sectional view taken generally along line 5—5 in FIG. 2;

FIG. 6 is a sectional view taken along line 6—6 in FIG. 5;

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

FIG. 8 is an exploded perspective view showing a modified form of the present invention; and

FIG. 9 is an exploded perspective view showing another modified form of the present invention.

Referring now specifically to the drawings wherein like parts are designated by the same numerals throughout the various figures, an impact type crushing apparatus 20 incorporating features of the present invention is shown in FIG. 1. The apparatus 20 comprises an upstanding cylindrical housing 22 on which a cover structure 24 is removably secured. A tubular member 26 is mounted on and extends through a central portion of the cover for providing a guide for feeding material to be processed downwardly and centrally into the apparatus.

An impeller structure 28 is centrally mounted within the cylindrical housing 22 for rotation about an upstanding axis. The impeller structure includes a rotatable shaft 30 which carries a radially extending horizontally disposed disk 32 at its upper end. Upstanding and generally radially disposed impeller blade units 34 are spaced around the disk 32 for engaging material fed into the central portion of the impeller disk and accelerating and projecting such material outwardly and against breaker plates 36 mounted around the interior of the shell 22. The impeller blade units 34 are detachably connected with upstanding brackets 38 (see FIG. 5) which are welded or otherwise fixed to the impeller disk 32.

A motor 40 is mounted outside of the housing 22 for driving the impeller 28. The motor has a suitable drive pulley 42 connected with its shaft 44. An endless belt 46 extends around the pulley 42 and also around a pulley 48 fixed on the lower end of the impeller shaft 30.

As shown in FIGS. 2–7, each blade unit 34 includes a main body member 50 of generally box like construction. The body member 50 is preferably formed from a relatively inexpensive material having good strength and impact resistance characteristics. The body member 50 comprises a bottom wall 52 from which an integral stud 54 extends for insertion through an aperture 56 in an upstanding impeller bracket 38. A snap ring or the like 58 is adapted to be assembled in a groove 60 formed in the stud 54 for retaining the blade unit in assembled relationship with the bracket.

The body member 50 is provided with upper and lower side walls 62 and 64 extending from integral junctions with upper and lower margins of the bottom wall 50. An outer end wall 66 extends from the outer end of the bottom wall 52 and between the outer ends of the side walls 62 and 64. It will be observed that the box like body member 50 provides a cavity or pocket which is adapted to become at least partially filled with particles of the stone or other material being processed. Such material within the pocket serves to provide the blade unit with protection against a portion of the wear and abrasion to which it otherwise would be subjected as additional material is engaged by and flows across the blade unit during a processing operation. The outer end wall 66 is preferably inclined diagonally outwardly from the bottom wall 52 in the manner shown so as to facilitate the flow of the material being processed outwardly from the end of the impeller blade unit.

It has been found that more or less localized areas of the impeller blade unit 34 are usually subjected to a greater amount of abrasion and wear away faster than other areas during a material processing operation. The location of the area of greatest wear may vary vertically as well as radially of the blade unit in accordance with the particular material being processed, and more specifically in accordance with the characteristics of such material including particle size, abrasiveness, moisture content and the like.

In accordance with a feature of the present invention

the blade unit 34 is provided with a plurality of separate and individually replaceable parts or inserts adapted to be assembled with the main body member 50 for protecting the body member 50 from direct contact with an abrasion by material being processed. These parts or inserts are preferably formed from metal alloys having especially good abrasion resistance characteristics. While such alloys may be relatively expensive, the construction is such that the individually replaceable inserts or liner members are sufficiently small so that they may be economically replaced.

Referring particularly to FIG. 3, it is seen that the inserts or liner members include an elongated bottom liner member 68 adapted to be placed against the inner surface of the bottom wall 52. Upper and lower side liner members 70 and 72 are respectively adapted to be positioned against inner surfaces of the upper and lower side walls 62 and 64. An outer end insert or liner member 74 is provided for overlying the inner surface of the outer end wall 66. An inner end member 76 is constructed for fitting within the inner end of the body member 50 and against ends of the side liner members 70 and 72 in a manner described more in detail below, and an inner end cover plate 78 is constructed for overlying and retaining the inner end liner member 76. The plate 78 is adapted to be detachably secured to the inner end of the body member 50 by means of a plurality of screws 80 or other suitable fastening devices.

When assembling the inserts or liner members with the main body member 50, the bottom member 68 is first inserted and located against the bottom wall 52. As shown best in FIG. 5, the bottom liner member 68 is provided with a beveled forward edge 82 adapted to abut a lower margin of the front wall 66. The length of the bottom liner member 68 is slightly less than that of the bottom wall 52 so as to provide clearance for a lower margin of the inner end member 76 as shown in FIG. 5. After the bottom member 68 is in place, the outer end liner member 74 is positioned against the inner surface of the outer end wall 66. A lower end 84 of the member 74 is beveled as shown in FIG. 5 for substantially abutting and retaining the outer end of the bottom liner member 68. The end liner member 74 is provided with a recess 86 adapted to receive a lug 88 projecting from an integral junction with the end wall 66. The lug 88 serves to lock the outer member 74 against outward movement parallel to the inner surface of the end wall 66.

The outer end liner member 74 is provided with a thickened and transversely elongated outer end or marginal section 90 which is adapted to overlie and protect the free edge of the end wall 66. As shown in FIGS. 2, 3 and 7, the section 90 extends laterally at opposite sides of the remainder of the member 74 for completely overlying the junctions between the end wall 66 and the side walls of the main body member.

The side liner members 70 and 72 are positioned against the inner surfaces of the side wall 62 and 64 after the end liner member 74 has been assembled. It is to be noted that the outer end liner member 74 is provided with grooves 92 and 94 adapted to receive forward or outer end margins of the side members 70 and 72, which grooves present shoulders 96 and 98 for retaining the side liner members 70 and 72 against the side walls of the main body member. At the same time the beveled outer ends 100 and 102 of the side liner members serve to engage and retain the end member 74.

In order to prevent the side liner members 70 and 72 from slipping forwardly out of the main body member, lugs 104 and 108 are respectively formed integrally with the side walls 62 and 64 adjacent to but spaced from the radially outer ends thereof. In addition the side liner members 70 and 72 are respectively provided with grooves 108 and 110 adapted to receive the locking lugs 104 and 106. These grooves respectively extend from and intersect the beveled outer edges of their respective liner members so that the liner members are adapted to be engaged with or disassembled from the locking lugs 104 and 106 upon endwise movement of the liner members toward and away from the radially outer end of the blade unit. Preferably the grooves 108 and 110 are relatively wide at their open mouths or intersections with the beveled ends of their respective liner members for facilitating assembly with the locking lug.

The side liner members 70 and 72 serve to cover and protect the inner surfaces of the side walls 62 and 64. In addition these liner members overlie the bottom member 68 and aid in retaining the bottom member in the assembly. Outer marginal sections 112 and 114 of the liner member 70 and 72 respectively are thickened so that they provide flanges adapted to overlie and protect the free edges of the side walls 72 and 74. Preferably the transversely thickened sections 112 and 114 also are formed with radially outer end portions 116 and 118 of progressively increasing height for accommodating increased abrasive action to which the radially outer end portions of the blade unit are frequently subjected.

After the side liner members have been properly positioned, the inner end liner member 76 is inserted between the side walls 62 and 64 and positioned against the inner end margins of the bottom liner member 68 and the side liner members 70 and 72 as shown best in FIGS. 5 and 6. The member 76 is provided with elongated ribs or abutments 120 and 122 extending along its inner surface respectively for overlying and engaging end portions of the side liner members 70 and 72 and retaining the side liner members against the walls 62 and 64 as shown best in FIG. 6. The member 76 is also provided with lugs 124 and 126 projecting from opposite side margins thereof for interlocking engagement with complementary notches or recess means 128 and 130 formed in adjacent ends of the side liner members 70 and 72 respectively. Thus the lugs 124 and 126 co-operate with the previously described lugs 104 and 106 in preventing the side liner members from slipping forwardly out of the body member 50.

The inner end liner member 76 is formed with a thickened and transversely elongated marginal section 132 similar to the marginal section 90 of the outer end liner member 74. Preferably however the marginal section 132 is rounded in the manner shown for facilitating the passage of material being processed thereover.

The final step in assembling the blade unit 34 comprises positioning the inner end plate 78 against the liner member 76 and securing the end plate to the body member 50 by means of the previously described screws 80. The end plate 78 is formed with an inwardly projecting locking lug 134 which is adapted to project into a complementary opening 136 formed in the liner member 76 as shown best in FIGS. 5 and 6 Thus the end plate 78 serves to lock the liner member 76 in position, which liner member in turn effectively locks the side liner members 70 and 72 in the assembly. As previously described the side liner members lock the outer end liner member 74 in position the bottom liner member 68 is, of course, securely retained in position by the side and end liner members. With this interlocking structure, it is seen that all of the liner members are positively and securely retained in assembled relationship and, at the same time, assembly and disassembly of the unit may be accomplished easily and rapidly for permitting one or more of the liner members to be economically removed and replaced.

FIG. 8 shows an impeller blade or shoe unit 34*a* incorporating a modified form of the present invention. In this embodiment elements corresponding to those described above are designated by the same numeral with the suffix *a* added. It is seen that this impeller shoe structure comprises a main body member 50*a* which is preferably cast or otherwise formed from material having a high abrasion resisting characteristic. The body member 54 is provided with a laterally projecting finger or stud portion, not shown, similar to the stud 54 described above

for enabling the blade or shoe to be detachably connected with a bracket on an impeller. The body member **50***a* provides a large pocket which will become largely filled with material being processed during a crushing operation. In certain installations, the abrading action of the material being processed will be focused to a considerable extent at the outer end wall **66***a*. In such installations satisfactory results may be obtained by utilizing only a liner member **74***a* over the end wall **66***a*. In this embodiment the liner member **74***a* includes a pair of integral fingers **138** and **140** extending laterally from an inner end portion thereof for projecting into apertures **142** and **144** respectively in the end wall **66***a*. This arrangement enables the liner member to be quickly and easily removably secured with respect to the end wall.

FIG. 9 shows an impeller blade unit or shoe structure **34***b* which is similar to the above described structures as indicated by the application of identical reference numerals with the suffix *b* added to corresponding parts. In this embodiment the insert **74***b* is intgerally joined with opposite side insert portions **70***b* and **72***b* and an inner end insert portion **76***b* and also with a bottom insert portion **68***b*. It will be appreciated that the insert provides the entire portion of the shoe structure which is subjected to a considerable amount of abrasion from the material being processed whereby the body member **50***b* may be formed from a relatively inexpensive material which need not have high abrasion resisting characteristics. In addition to the finger or locking lug portion **142***b*, the insert is provided with a flange **146** at its inner end adapted to project beneath a lip **148** on the body member for detachably connecting the insert with the body member.

While the preferred embodiments of the present invention have 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. A blade unit for an impeller of an impact crusher of the type described comprising a body member adapted to be detachably secured in a generally radiating position on the impeller, means on said body member defining a pocket facing in the direction of rotation of the impeller for being at least partially filled with material to be crushed for protecting a portion of the blade unit from abrasion, said means including an insert detachably connected with said body member and defining a radially outer end of said pocket, additional inserts respectively defining upper and lower sides and an inner end of said pocket, and said inserts including means mechanically interlocked with each other and with said body member.

2. A blade unit, as defined in claim 1, wherein said body member includes a radially outer end wall traversing the radially outer end of said pocket, said wall having opening means therein, said first mentioned insert being disposed against said wall and including projection means extending into said opening means for detachably connecting the insert to said wall.

3. An impeller blade unit for an impact crusher of the type described comprising a main body member detachably connectable to an impeller, said body member including an outer end wall projecting forwardly with respect to the direction of rotation of the impeller, a first liner member disposed against an inwardly facing surface of said end wall, said members including interlocking lug and recess means extending between said end wall and said first liner member for detachably securing the first liner member with respect to the end wall, said body member including vertically spaced upper and lower side walls extending from junctions with said outer end wall, said unit including upper and lower side liners respectively disposed against inwardly facing surfaces of said upper and lower side walls, additional interlocking lug and recess means extending between said upper and lower side walls and their associated upper and lower side liner members for retaining said last mentioned liner members against forward separation from the body member, an inner end member detachably secured to an inner end of said body member, an inner end liner member disposed within said inner end member, and interlocking lug and recess means between said inner end member and said inner end liner member for locking said inner end liner member against forward separation from the body member.

4. A blade unit for an impact crusher of the type described comprising a main body member detachably connectable to an impeller, said body member including an outer end wall projecting forwardly with respect to the direction of rotation of the impeller and upper and lower side walls extending from junctions with said outer end wall, an inner end member detachably secured to an inner end of said body member, a first liner member disposed against an inwardly facing surface of said outer end wall, upper and lower side liner members respectively disposed against inwardly facing surfaces of said upper and lower side walls, an inner end liner member disposed within said inner end member, interlocking lug and recess means between said liner members and said body and inner end members for locking said liner members against forward separation from the body member, said first liner member and said upper and lower side liner members including interengageable abutment surfaces for retaining said first liner member against the end wall and for retaining said upper and lower side liner members respectively against the upper and lower side walls, and said inner end liner member and said upper and lower side liner members including interengageable abutment surfaces for retaining the inner end liner member against said inner end member and for retaining said upper and lower side liner members respectively against the upper and lower side walls.

5. A blade unit, as defined in claim 4, which includes additional interlocking lug and recess means between said inner end liner member and adjacent inner end margins of said upper and lower side liner members for further restraining said upper and lower side liner members against forward separation from the body member.

6. A blade unit, as defined in claim 5, wherein all of said liner members include relatively thin first portions extending within said body member and relatively thick outer marginal portions overlying forwardly facing free edges of said body member.

7. A blade unit for an impact crusher of the type described comprising a main body member detachably connectable to an impeller, said body member including an outer end wall projecting forwardly with respect to the direction of rotation of the impeller and upper and lower side walls extending from junctions with said outer end wall, a first liner member disposed against an inwardly facing surface of said outer end wall, upper and lower side liner members respectively disposed against inwardly facing surfaces of said upper and lower side walls, interlocking lug and recess means extending between said body member and said liner members for retaining said liner members against forward separation from the body member, and said first mentioned liner member including shoulder surfaces engaging said upper and lower side liner members and retaining the upper and lower side liner members against their associated upper and lower side walls of the body member.

8. A blade unit for an impact crusher of the type described comprising a main body member detachably connectable to an impeller, said body member including an outer end wall projecting forwardly with respect to the direction of rotation of the impeller and upper and lower side walls extending from junctions with said outer end wall, a first liner member disposed against an inwardly

facing surface of said outer end wall, upper and lower side liner members respectively disposed against inwardly facing surfaces of said upper and lower side walls, interlocking lug and recess means extending between said body member and said liner members for retaining said liner members against forward separation from the body member, said outer end wall extending generally diagonally outwardly, and said upper and lower side liner members

including outer end surfaces engageable with said first mentioned liner member for retaining said first mentioned liner member against said outer end wall.

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