Aug. 4, 1942. H. E. KORUM 2,291,815

HAMMER MILL

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FIG-6

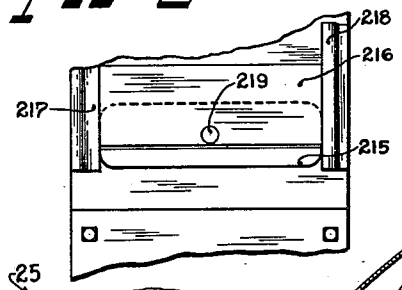


FIG-1

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HAMMER MILL

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FIG-3

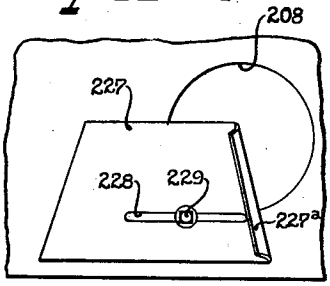


FIG-2

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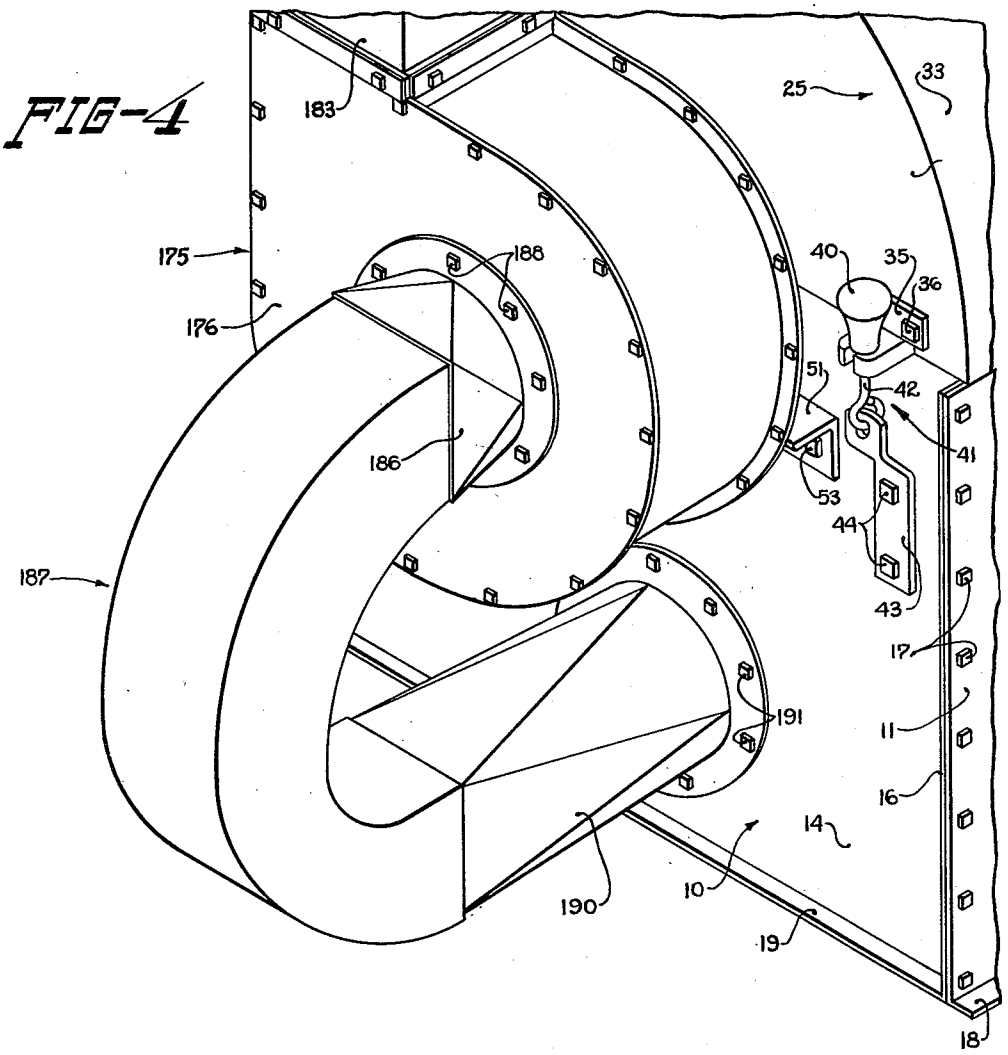
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HAMMER MILL

Filed Sept. 27, 1937 3 Sheets-Sheet 3

FIG-4



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Patented Aug. 4, 1942

2,291,815

UNITED STATES PATENT OFFICE

2,291,815

HAMMER MILL

Henry E. Korum, Moline, Ill., assignor to Deere & Company, Moline, Ill., a corporation of Illinois

Application September 27, 1937, Serial No. 165,857

5 Claims. (Cl. 83—11)

The present invention relates generally to grinding machinery and the like and is more particularly concerned with certain new and useful improvements in hammer mills.

Heretofore, mills of this type have required the expenditure of considerable power in order to secure as much as even a moderate capacity, and the principal object of the present invention is the provision of a hammer mill in which the capacity is materially increased and the power requirements materially reduced.

An additional object of the present invention is the provision of a hammer mill having rotatable hammers and a screen disposed about a portion of the rotor but in which the hammers are spaced far enough from the screen so that the only grinding action that takes place occurs by the hammers striking the material in mid-air and without rubbing or grinding the material between the hammers and the screen. As a result of this arrangement, there is no excessive wear on the screen nor is there any great amount of friction between the material being ground and the screen, so that there is no tendency for the screens to heat and power losses due to this cause are thereby avoided. A further object of the present invention is the provision of an improved breaker bar construction against which grain and other material is projected by the operation of the hammers. This feature of the invention particularly cooperates with the last mentioned feature, relating to the spacing of the hammers from the screen, and according to the present invention the grinding is done by the hammers striking and cutting the material in mid-air, throwing it against the breaker bars and back against the hammers until the material is broken down enough to pass through the screen. Thus, the provision of the breaker bars and the spacing of the screen provide an arrangement wherein the screen serves only the purpose for which it was intended, namely, to determine the fineness of grinding and not necessarily to enter into the operation of reducing the material.

Still further, another object of the present invention is the provision of improved means securing the screen in position below the rotor, and particularly it is an important object of the present invention to provide a combined screen lock and breaker bar which not only accommodates various kinds of screens but cooperates with screens of various sizes and holds each in proper position for the best operation. Another object of the present invention in this connection is the provision of a yielding breaker bar construction which reduces or prevents damage to the machine in the event some foreign object is inadvertently fed into the machine.

Still another object of the invention is the provision of new and improved baffle for the hood of the mill which not only protects the hood from wear but which can be adjusted to accommodate the feeding of different kinds of materials into the mill. Specifically, it is an object of the present invention to provide an adjustable baffle which can be shifted relative to the breaker bar to accommodate the feeding of small materials, such as grain and the like, or stalk and fibrous material, such as fodder, into the mill.

Still another object of the present invention is to provide a hammer mill which can be converted from a mill adapted particularly to grind small grains into a mill especially arranged to handle fodder or other stalk or other fibrous materials.

An additional object of the present invention is the provision of a hammer mill in which the chamber receiving the ground material is so constructed and arranged that there is no tendency for the screen underneath the rotor to become clogged and reduce the capacity of the mill. It is also an object of the invention to provide a suitable auxiliary or cross current of air within the material receiving chamber so as to sweep the under side of the screen clear of any material that might tend to cling thereto. This is of special importance when grinding fine. It is also an object of the present invention to provide an exhaust fan for drawing the ground material from the chamber and delivering it to a feed collector or other point, the exhaust fan being connected with the chamber by an intake duct that is so constructed that the flow of material from the chamber to the exhaust fan is distributed evenly, whereby any concentrated wear on the intake duct is eliminated.

These and other objects and advantages of the present invention will be apparent to those skilled in the art after a consideration of the following detailed description, taken in conjunction with the accompanying drawings illustrating the preferred form of the invention.

In the drawings:

Figure 1 is a longitudinal vertical section taken through a hammer mill constructed according to the principles of the present invention;

Figure 2 is a vertical section taken substantially along the line 2—2 of Figure 1;

Figure 3 is an enlarged fragmentary section taken on substantially the same plane as the

section in Figure 1, showing the second breaker bar means that cooperates with the rotor;

Figure 4 is a perspective view of the exhaust fan casing and the particular form of the intake duct connecting the exhaust fan casing with the casing of the hammer mill;

Figure 5 is a fragmentary view, taken along the line 5—5 of Figure 2 and illustrating the auxiliary air inlet for the lower portion of the ground material chamber; and

Figure 6 is a view taken along the line 6—6 of Figure 1 and illustrating the auxiliary air inlet that leads into the ground material chamber from a point above the rotor screen.

Referring now more particularly to Figures 1 and 2, the reference numeral 10 indicates the casing of the mill, the casing being formed of two end plates 11 and 12 and two side plates 13 and 14. The side plates and end plates of the mill are preferably formed of boiler plate and are securely welded and bolted together, thereby providing a rugged frame for supporting the rotor shaft, its bearings and other cooperating parts, and to this end, each of the side plates 13 and 14 is provided with end flanges 15 and 16 to receive bolts 17 but secure the end plates 11 and 12 to the flanged portions of the side plates 13 and 14. The end plates 11 and 12 are flanged, as at 18, at their lower portions, the bottom edges of the side plates 13 and 14 also being flanged, as indicated at 19, the flanges 18 and 19 thus serving as a base for the mill. Preferably the body or casing 10 of the mill is bolted to wood skids 21 to provide ample support for the mill and to facilitate its movement from one building to another. The upper end of the casing 10 is closed by a hood 25, which will be referred to in detail later, the hood having an open side or end 26 that is pivoted on bolts 27 which, in turn, are carried at the upper ends of a pair of strap members 28. The fixed supporting strap members 28 are bolted to the side plates 13 and 14 by any suitable means, such as bolts 30. The upper side of the hood 25 slopes downwardly from its open end 26 toward the opposite side thereof, the top of the hood being indicated at 33. The sides of the hood at its lower end have brackets 35 bolted thereto, as at 36 (Figure 4). Each bracket is adapted to receive the knob 40 of a hood lock indicated in its entirety by the reference numeral 41 and including an eye bolt 42 to which the knob 40 is attached and which is pivoted to a suitably formed bracket 43 that is bolted, as at 44, to the side of the mill casing 10. Preferably, the knob 40 is threaded onto the eye bolt 42 so as to provide for firmly clamping the hood in its closed position.

The side plates 13 and 14 of the body 10 carry suitable support angles 51 and 52 bolted, as at 53, to the casing sides, and the angles 51 and 52 support in any suitable manner a pair of main bearing housings 55 and 56. Bearings 57 support the shaft 58 of the rotor, indicated in its entirety by the reference numeral 60, of the hammer mill. The rotor shaft 58 has suitable shouldered sections 61 and 62 that receive the inner races of the bearings 57, and the central enlarged portion of the rotor shaft 58 is threaded, as at 64, to receive right and left hand lock nuts 67 and 68. The rotor proper is disclosed in a co-pending application, Serial No. 355,977, filed September 9, 1940. Briefly, it consists of a plurality of triangular plates 70, a plurality of spacers 71, which are generally circular castings of a diameter such that the spacers 71 are flush with the edges of the triangular plates 70, and three banks or rows of hammers 72 carried by the rotor. The plates 70 and spacers are slidable on the rotor shaft 58, and lock nuts 67 and 68 are disposed on the outside of the assembled triangular plates and castings 70 and 71 so that when the nuts 67 and 68 are tightened the castings and plates are fixed firmly and rigidly to the rotor shaft 58 to rotate therewith.

Each hammer 72 in a row or bank is pivotally mounted on a single through pin 76 extended through registering holes formed in the aligned corners of the triangular plates 70. The hammers 72 are each thinner than the associated circular or cylindrical spacer casting 71, and adjacent each hammer the pin 76 carries suitable spacing washers 77. The thickness of each washer 77 is substantially equal to the thickness of a hammer, and in the preferred form of construction, each spacer casting 71 is equal in thickness to a hammer and two of the associated spacing washers 77. Any suitable means, such as cotter keys 80, may be employed for maintaining the hammer supporting pins 76 in position. A drive pulley 82 is fixed to one end of the rotor shaft 58 while to the other end of the rotor shaft is fixed an exhaust fan which will be described later. Normally, the hammers are not clamped rigidly between the washers 77 but are free to swing on the rods 76, the amount of swinging action being determined by the amount of clearance between the butts 84 of the hammers 72 and the spacer castings 71, as best shown in Figure 1. The slight swing of the hammers which the spacing between the latter and the spacing collars 71 provides is sufficient to accommodate the passage of foreign materials, such as bolts, etc., through the mill without serious damage thereto.

As mentioned above, the hammers 72 are arranged in three rows or banks, and to facilitate this arrangement the plates 70 are in the form of equilateral triangles, with the hammer supporting pins 76 disposed at the apices of the triangular plates. This construction is of material importance in increasing the capacity of the mill, for as clearly shown in Figure 1 there is a relatively large space between each two adjacent banks of hammers to receive the grain or other material to be ground and to permit the hammers to have a full contact with the material and affording all of the cutting edges a full opportunity to act upon the material. The cylindrical spacing collars 71 are flush with the sides of the triangular plates 70 so that there are no projecting parts within the space between adjacent banks of hammers to interfere with or otherwise disturb the action of the latter in striking and reducing the material to be ground.

A generally semi-circular screen 100 is disposed just below the rotor 60, and the screen 100 is spaced from the ends of the hammers 72 to a sufficient distance (preferably in the order of 5/8") radially so that no grinding takes place between the radially outer ends of the hammers and the screen itself. The grinding is done by the hammers striking and cutting the material in mid-air, and not by rubbing or forcing the material against or through the screen. The screen 100 consists of a generally semi-circular metal plate having perforations 101 punched or otherwise formed therein, and to receive the screen and to make it possible to remove one screen and substitute another screen having different sized openings the sides 13 and 14 of the mill casing 10 are equipped with pairs of inner and outer

ring members 103 and 104 riveted or otherwise fixed to the mill casing in spaced apart relation, thereby providing a screen receiving groove 105 at each side of the hammer mill housing. A plate 110 is disposed horizontally at the upper portion of the hammer mill case 10 adjacent the pivots 27 for the hood 25, the horizontal plate 110 being fastened in position by any suitable means, such as a pair of angles 111 and 112. The inner edge of the horizontal plate 110 is extended into substantial contact with the inner screen ring 103, as best shown in Figures 1 and 3, the latter being an enlarged view of this portion of the hammer mill. The trailing edge of the screen 100 is adapted to be disposed against the under side of the adjacent edge of the horizontal plate 110 when the screen 100 is disposed in position underneath the rotor and in the grooves 105. This edge of plate 110, indicated by the reference numeral 110a in Figure 3, serves as a ledger plate or breaker bar when screens of certain sizes are to be used, as will be referred to later.

The screen 100 is locked in place by a combination screen lock and breaker bar that is best shown in Figure 1. At the ends of the screen receiving rings 103 and 104 opposite the horizontal plate 110 is a breaker bar 115 which is arranged to be removably supported in a position overlying and engaging the adjacent edge of a screen 100. The breaker bar 115 consists of a member that is provided with two grooves 116 and 117 of different depths, one of which receives the adjacent edge of the screen 100 when the breaker bar 115 is inserted with its ends resting on the adjacent ends of the outer ring 104. A pair of shiftable blocks 120, each mounted on a side wall of the hammer mill housing by bolts 121 disposed in slots 122 in the block, serves to hold the breaker bar 115 in such a position in the casing that the breaker bar itself holds the screen 110 in position between the rings 103 and 104 and with its opposite edge up against the horizontal plate 110 which thus serves as a screen stop and support.

Material is fed to the rotor by suitable means preferably carried on the pivoted hood 25. Adjacent the pivots 27 the hood carries a circular baffle plate 125 that is held in place and clamped between the side walls 26 of the hood by a pair of tie-bolts 126 and 127, the latter extending through brackets 128 that are fixed in any suitable manner to the baffle plate 125. A feed chute 133 is fixed in any suitable manner to the hood, preferably by suitable braces 134, and the inner end of the feed chute is bolted to a feed chute adapter 136 which is fixed, as by bolts 137, to the side walls 26 of the rotor hood 25. The inner end of the feed chute adapter is disposed at the upper edge of the rear baffle plate 125 and delivers the material directly into the relatively wide spaces between the banks of hammers. The feed opening 140 that is defined by the hood 25 and the feed chute unit 133, 136 is controlled by a gate 141 which includes a sheet metal member 142 that is secured in any manner to a U-shaped bracket or clip 143 that is pivoted, as at 144, to the side walls of the rotor hood 25. A small feed control gate or slide 147 is adjustably fixed, as by a set screw and nut 150, so as to cooperate with the main gate member 142 in securing the desired rate of flow of material toward the rotor 60. A safety flap or inner baffle 154 is pivoted, at 155, to the hood 25 and acts as a shield to prevent material from being thrown backwardly out of the feed opening 140. A front baffle 157 is fixed by bolts 158 at its upper edge to the top wall 33 of the rotor hood 25 and curves downwardly toward the breaker bar 115, being held in place in the hood 25 by a pair of tie rods 159. As best shown in Figure 1, the lower edge of the baffle plate 157 engages the upper groove in the breaker bar 115 when the hood is closed, so that when the hood is locked in place by the locking members 41 (Figure 4) the lower edge of the front baffle 157 engages the breaker bar 115 so as to cause the latter to hold the screen 100 in place with its rear edge up against the screen stop plate 110. The lower edge of the rear baffle 125 engages the upper surface of the plate 110 so as to prevent the screen from forcing the plate 110 out of position, thereby cooperating with the angle bars 111 and 112. A tie rod 162 is disposed above the plate 110 at about the point where the rear baffle 125 engages the same when the rotor hood 25 is closed and locked. The front baffle 157 protects the rotor hood and, in addition, forms a plenum chamber which will be referred to later.

The material that is fed into the mill and reduced by the hammers is drawn through the screen 100 and out of the mill casing by an exhaust fan unit indicated in its entirety by the reference numeral 175 in Figures 2 and 4. The exhaust fan unit 175 includes a fan casing 176, the inner wall 177 of which carries an angle member 178 that is bolted or otherwise fastened in any suitable manner to the angle 51 that supports the bearing housing 55 for the end of the rotor shaft 58 opposite the pulley 82. This end of the shaft carries a blower fan 180 which has a hub 181 fixed to the fan end of the rotor shaft 58 in any suitable manner, the blower fan being disposed within the fan casing 176. The fan casing 176 has a blower conduit 183, and the side wall 184 opposite the wall 177 of the fan casing is provided with an intake opening 185 over which the discharge end member 186 of a curved intake conduit pipe 187 is bolted, as at 188. The opposite end of the curved intake conduit 187 includes an elongated section 190 that is bolted at 191 over an opening 192 formed in the lower portion of the wall 14 of the hammer mill casing 10. As best indicated in Figure 4, the curved section of the intake conduit 187 is square in cross-section but the intake and discharge ends of the members 190 and 186, respectively, are circular, the members 186 and 190 being particularly formed to take care of the transition from the square cross-section of the curved member to the circular cross-section of the intake and discharge ends where the conduit unit 187 is connected to the hammer mill casing and the fan casing. One particular advantage in having the member 187 of square cross-section is that wear on the member 187 is appreciably reduced.

The operation of the fan 180 serves to draw air down through the feed opening 140 and the mill casing, thereby drawing the ground material through the openings 101 in the screen 100 below the rotor 60. According to the present invention, the hammer mill is so constructed that there is no tendency for the ground material to clog adjacent the screen 100. The ground material that is drawn through the screen is collected in a trough or chamber that is indicated in its entirety by the reference numeral 200 in Figures 1 and 2. The ground material receiving chamber 200 consists of a pair of downwardly inclined plate sections 201 and 202 which are bolted, as at 203 and 204, respectively, to the side

plates 13 and 14 of the hammer mill casing below the screen 100. The lower converging edges of the plates 201 and 202 engage and support a bottom trough 207, the ends of which are disposed in the discharge opening 192 and an oppositely disposed opening 208 formed in the side wall 13. The lower edges 201a and 202a of the chamber plates 201 and 202 cooperate at the upper edges 207a of the trough 207 in forming a support for the latter.

As best indicated in Figure 1, the center line of the bottom trough 207 is offset to the right with respect to a vertical line passing through the axis of the rotor shaft 58, the extent of offset being indicated at *a* in Figure 1. Both of the downwardly converging sheets 201 and 202 are spaced a considerable distance at the upper portions from the screen 100, the distance *b* between the left hand sheet 201 and the screen 100 being somewhat smaller than the distance *c* between the right hand sheet 202 and the screen 100. Both distances *b* and *c* are, however, sufficient to prevent any tendency for the ground material to clog between the screen and the plates 201 and 202. The plate or sheet 202, by virtue of the above mentioned offset, is disposed more nearly vertical than the opposite sheet 201. The reason for this construction is that by having a steep slope to the wall 202 adjacent the side of the screen where the hammers are moving upwardly, that is, in a direction opposite to the direction in which the air is drawn downwardly through the mill, a somewhat greater opportunity is provided for the material above the rotor to pass through the screen and slide down into the bottom trough 207 than at the other side where the hammers move downwardly, in the same direction that the air is drawn through the screen, and the passage of the ground material through the screen at this side is facilitated by the downward pressure of the rotating hammers. Hence the spacing *b* need not be quite as much as the spacing *c* for the opposite plate 201. However, the spacing of the wall 201 from the screen at the left side of the mill (Figure 1) is great enough to prevent any tendency for the material to clog at this point.

The prevention of clogging below the rotor screen is further aided by the provision of a plenum chamber P between the baffle plate 157 and the adjacent portions of the hood 25, such chamber communicating with the ground material chamber at the space between the left end of the screen 100 and the left or front end wall 11 of the hammer mill case. Provision is made for the admission of limited amounts of air into the chamber P and from there into the ground material chamber along the lower surface of the left portion of the screen. The front wall of the rotor hood 25 is provided with an opening 215 which is controlled by a slide gate 216, the ends of which are guided by suitable strips 217 and 218 fixed to the top or front wall of the hood 25. The gate 216 is provided with a handle 219 by which the gate 216 may be moved to various positions to govern the amount of auxiliary air admitted into the plenum chamber P. As will be clear from Figure 1, during the operation of the mill, the auxiliary air that is drawn in through the opening 215 sweeps across the under surface of the screen 100 and effectively keeps this portion of the ground material chamber clean and prevents clogging at this point.

A similar auxiliary air opening is provided for the ground material chamber 200. Referring now to Figures 2 and 5, the side wall plate 13 and the hammer mill casing has the circular opening 208, mentioned above, disposed in alinement with the opening 192 in the opposite side wall of the casing. A shield 224 is fixed by bolts 225 to the side wall plate 13 and serves to deflect material coming from the screen away from the opening 208. An adjustable damper 227 is disposed on the outside of the plate 13 and is provided with a slot 228 to receive an adjusting bolt 229 that is threaded into the plate 13 below the trough 207. The damper 227 is provided with a rolled edge 227a that facilitates manipulation of the damper to exactly the right position over the opening 208. In fine grinding the air intake 208 may be closed or partially closed, insuring a greater volume of air through the feed opening 140 and the screen 100, and for coarse grinding it is usually desired to introduce more air at the opening 208 so as to facilitate the carrying away of the relatively heavier material by the draft of air that moves across the lower portion of the ground material chamber and into the intake duct 187.

The operation of the hammer mill described above is substantially as follows:

The material to be ground is placed in the feed chute unit 133, 136 and the gate 141 adjusted to deliver the same uniformly to the rotor. Any suitable source of power is connected with the drive pulley 82 to drive the rotor 60 and the fan 180 that is carried directly on the end of the rotor shaft, as indicated in Figure 2. The relatively wide spaces between the adjacent rows or banks of hammers make it possible to introduce the material into the rotor in such a manner that the hammers strike the material while it is still in mid-air, reducing the same while at the same time projecting the material against the baffle 157 or the breaker bar sections 110a and 115, from which the material rebounds back into the path of the rotating hammers. The spacing between the radially outer ends of the hammers and the screen 100 is great enough to prevent any tendency for the hammers themselves to rub or force material along through the screen. Instead, practically all of the grinding or reducing action takes place by the hammers striking the material in mid-air, some of the grinding taking place due to the material being projected against the ledger plates or breaker bars 110a and 115.

At all times during the rotation of the rotor 60 the fan 180 is driven and draws a blast of air into the feed opening 140, down through the screen 100, materially assisting the passage of the ground material therethrough, and into and through the ground material chamber 200, and lastly into the intake duct 187. When grain and similar small materials are to be ground, the adjustable gate 216 is opened to the desired amount so as to let in a flow of air which sweeps across the lower surface of the screen and keeps the latter clean and also prevents clogging at this point. At this time the auxiliary air inlet 208 is closed or partially closed since it is not necessary to have a very strong blast of air move across the ground material chamber since the ground material is relatively light.

The mill can be adjusted to grind feed to practically any fineness desired. Each mill is usually equipped with two or more screens which are interchangeable by simply loosening the fastening units 41, swinging the rotor hood back, which makes it possible to lift out the breaker bar 115 and then slide the screen out and insert another

one in its place having a desired size of openings therein. The hood 25 is then swung back into closed position after replacing the breaker bar 115, and the lower edge of the baffle plate 157 engages the breaker bar and acts through the latter to hold the newly inserted screen in position for operation. In this connection it will be observed from Figure 9 that the groove 105, that is formed by the screen receiving rings 103 and 104 is wide enough to accommodate screens of various thicknesses. Usually, the screens are perforated while in the form of flat plates, the plates while flat all being of the same length. Screens having smaller openings are necessarily thinner than those having large openings, since it is not practical to punch very small perforations in thick screens. All sizes of screens, however, are cut in the same lengths while flat, and then are shaped into cylindrical form. Therefore, when a thin screen is installed in a mill, it lies against the outer ring 41 and the end of the screen adjacent the breaker bar 115 does not extend upwardly as far as when a thick screen is installed in the mill, since the median line between the two surfaces of a thin screen is thus disposed at a greater radius than is the median line of the thick screen. Hence, the longer notch or groove 117 is placed downwardly against the screen when a thick screen is used, as is illustrated in Figure 1, but when a thin screen is used, the bar 115 is reversed and the opposite notch or groove 116 is placed against the edge of the screen. Thus, in each case, the screen is locked in place and forced out against the outer rings 104 and with its trailing edge up against the stop plate 110 when the rotor hood 25 is locked in closed position.

The breaker bars 110a (Figure 3) and 115 are of especial advantage in reducing fine materials but are not necessary in grinding the larger sized material, and especially when using the mill as a roughage mill. According to the present invention, the breaker bars are so disposed that when thin screens are used, a considerable extent of the rear breaker bar is exposed to the action of the upwardly moving hammers in projecting the material against the cutting edge of the part 110a. However, when thicker screens are used, less of the section 110a is exposed, so that when only a small, if any, breaker bar action is desired, only a small portion of the breaker bar section is exposed. When operating as a roughage mill, such as for grinding fodder and similar fibrous or stalk-like material, the gate 141 may be thrown back out of position to facilitate feeding the material to the rotor. At the same time, the tie bolts 159 may be loosened and the baffle plate 157 shifted inwardly past the upper edge of the bar 115, thus making it easy to shove stalks and the like into the feed opening 140 of the mill without getting the stalk ends caught on the upper edge of the breaker bar 115. Also, it will be noted that this adjustment of the baffle 157 reduces the action of the screen lock bar 115 as a breaker bar.

When using the mill as a roughage mill, it is usually desired to adjust the plate 227 (Figure 5) so that there is a considerable sweep of air across the ground material chamber 200 to facilitate lifting the heavier and larger particles and moving them into the intake duct 187 by the blast of air drawn through the mill casing by the exhaust fan 180. However, when mill is used to grind grain, it is desirable to at least partially close the air opening 208 so that more air will be drawn down through the feed opening 140 and along with the incoming grain to prevent the finely ground material from clogging the perforations in the screen. Furthermore, the fine material which drops into the ground material chamber 200 does not require as strong a blast or current of air through the opening 208 to carry it into the fan. On the other hand, the coarse screens used when grinding roughage do not have any appreciable tendency to clog and, therefore, do not require a strong current of air along the under surface of the screen to keep the latter clear.

As mentioned above, the breaker bar retaining blocks 120 at each end of the breaker bar 115 are fastened to the side walls of the hammer mill housing 10 by bolts disposed in slots, and by virtue of this construction, in the event that a foreign object, such as a stone or bolt, gets into the mill and is caught between a hammer and a breaker bar 115, the latter will be pushed back away from the hammer until the lower edge of the breaker bar clears the upper end of the screen retaining ring 104, thus allowing the breaker bar 115 to drop downwardly and release the foreign object over the top of the breaker bar. The bolts holding the blocks 120 are preferably formed of relatively soft material, such as brass or aluminum, so that in case a large object gets into the mill, the bolts will shear off and drop the breaker bar downwardly, thereby providing more room for the object to drop into the ground material chamber 200. Thus, about the only part of the mill that could be damaged, other than the bolts 121, would be the screen 100.

While I have shown and described above the proposed embodiment of my invention, it is to be understood that the invention is not to be limited to the specific details shown and described but that, in fact, widely different means may be employed in the practice of the broader aspects of my invention.

What I claim, therefore, and desire to secure by Letters Patent is:

1. In a hammer mill having a rotor and screen receiving grooves dimensioned to receive any one of a set of screens of different thicknesses, the combination of a breaker bar, means on the hammer mill receiving said breaker bar in a position to hold a screen in position in said grooves, said breaker bar having recesses of different depths for receiving screens extending different distances in said grooves, respectively.

2. In a hammer mill comprising a casing, and a rotor journaled therein, the combination of screen supporting means in said casing, a fixed screen stop at one end of said supporting means, a removable screen slidably supported by said supporting means with one end against said stop, and a breaker bar removably supported in said casing at the opposite end of said screen and having recesses in opposite edges of said bar adapted to receive said opposite end of said screen, said breaker bar being reversible and said recesses being of different depths for receiving screens extending different distances from said fixed stop in said screen supporting means, respectively.

3. A hammer mill comprising a casing, a rotor journaled therein, a rotor hood pivoted to said casing and adapted to close the upper end thereof about said rotor, grooved screen receiving means on said casing, a fixed screen stop at one end of said groove means, a removable generally semi-circular screen slidably supported by said

screen receiving means and against said stop, a baffle wall carried by said hood and extending to a point adjacent the edge of the screen opposite said screen stop when the hood is closed, and a breaker bar carried by said casing and having a grooved portion receiving said one edge of said screen, the breaker bar having another grooved portion receiving the lower edge of said hood baffle when the hood is closed, whereby the hood acts through the breaker bar to hold the screen in position, said grooves being of different depths and said breaker bar being reversible end for end, whereby screens extending different distances in said groove screen receiving means are accommodated.

4. In a hammer mill comprising a casing and a rotor therein, means on each side of the casing forming screen receiving grooves that are generally arcuate about the axis of rotation of said rotor, a screen adapted to be inserted in place by sliding the same along the grooves into position adjacent said rotor, a generally horizontal plate secured to and forming a part of the hammer mill case, said horizontal plate overlying the grooves at one side of the rotor serving as a stop for the trailing end of said screen and terminating in an edge substantially in alignment with the inner sides of said grooves, so that said edge of the horizontal plate projects inwardly over the end of a relatively thin screen thereby serving as a breaker bar for fine grinding, but lying substantially flush with the inside surface of a screen of maximum thickness, thereby shielding the breaker edge for coarse grinding, a breaker bar at the other side of the rotor and adapted to overlie the other end of the screen when the latter is disposed in position about the lower portion of the rotor and in said grooves, and means on the sides of the casing for removably receiving said breaker bar.

5. A hammer mill comprising a casing including upper and lower portions hingedly connected together, a rotor journaled therein, means forming grooves on opposite side walls of the lower portion of said casing, said grooves being adapted to receive any one of a number of screens of different thicknesses, means for holding a screen in said grooves in contact with the radially outer portions thereof, and a breaker bar disposed at the trailing edge of a screen disposed in said grooves, said breaker bar comprising a generally horizontal plate fixed to said lower portion of the casing, serving as a top wall thereof, upon which a baffle of said upper portion abuts when said casing portions are closed together, said plate extending from an end wall to said grooves in said side walls and terminating in an inner edge substantially in alignment with the inner sides of said grooves, so that the edge of the breaker bar projects generally radially inwardly toward the rotor over the edge of a relatively thin screen but lies substantially flush with the inside surface of a screen of maximum thickness, whereby the effect of said breaker bar is substantially eliminated.

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