A refuse shredder of the reversible over-running down-running type which combines in one machine the ability to handle oversize bulky and elongated waste material and garbage and residential discard waste. Such a combined shredder is obtained by opening the shredder housing to the material receiving hopper so that reversing the shredder rotor will be possible to handle both types of waste material and at the same time even the wear on the hammers. In the subject machine the hopper is extended above the feed conveyor for confining and controlling the return of the hard to reduce components, and adjustable breaker blocks provided at each side of the rotor can be set for the most efficient action of the rotor hammers.

6 Claims, 4 Drawing Figures
REVERSIBLE OVER-RUNNING DOWN-RUNNING SHREDDER MACHINE

BRIEF BACKGROUND OF THE INVENTION

This invention relates to improvements in shredder machines of over-running down-running character for reducing both oversize bulky and general industrial waste, and garbage and materials normally discarded in residential areas.

In the disposal of waste material, ecology regulations restrict open burning of waste material and therein lies a problem of proper handling of oversize, bulky waste, and packer truck material. The first type of material includes discarded furniture, pallets, and general industrial waste. The second type is composed of garbage, trash and related material normally classified as residential area waste. Each type of material has heretofore needed its particular shredder machine. For example, the packer truck material, such as garbage is best shredded in an over-running shredder machine, while the oversize bulky waste and industrial waste material is best handled in a down-running shredder machine, as jamming is overcome most easily. A combination shredder has not heretofore been available due to the differences in the shredding action of each and the prevailing design of each type of machine.

The advantages of combining the individual characteristics of over-running and down-running shredders reside in the economy of having in one machine, the reduction of all types of waste material to a condition where it may be used for incineration disposal, fuel for power generation or land fill. A down-running shredder requires a suitable breaker block or blocks on the feed side of the rotor and a partially closed rotor housing on the opposite side. This normal construction is needed to keep the waste material within the orbit of the rotor hammers which pull the material down, including elongated materials which cannot easily bridge over and prevent proper feeding into the rotor. On the other hand, an over-running shredder normally is constructed so that the feed material enters with a more open feed from the hopper to the rotor housing so that the rotor hammers and more vertically positioned breaker block or blocks, are capable of rapidly shredding the packer truck waste which does not contain elongated material to bridge over the rotor.

Since the normal characteristics of down-running and over-running shredder machines are so different it has not been thought possible to combine in one machine the special abilities of either machine. The present shredder machine has overcome the differences in a simple and efficient manner as will be hereinafter set forth.

The objects of the presently preferred shredder machine are to provide the characteristics of over-running and down-running shredders in one machine, to provide a reversible rotor with symmetrical swinging hammers so that the shredding action for each direction of rotation will be effective, to realize the economies of both types of shredder machines, to avoid the cost of installing two separate shredder machines, to provide one shredder machine for disposing of all types of waste material, and to incorporate a material feed hopper that is enclosed for ballistic control of the material to assure reduction thereof by returning the waste material toward the rotor to increase the mixing action.

In a preferred shredder machine the rotor housing is opened up across its top, the breaker block for the down-running rotor direction is set at a suitable angle while the breaker block for the over-running rotor direction is set in a substantially vertical position, and the hopper is enclosed and extended above the hopper feed opening for controlling the ballistic action of the material and to assure the material return toward the rotor for complete reduction to a size capable of passing out through the grate below the rotor. The respective breaker blocks may be adjustably mounted to permit efficient settings for material reduction.

BRIEF DESCRIPTION OF THE DRAWINGS

The presently preferred shredder machine is shown in the drawings which include:

FIG. 1 which is a fragmentary sectional view of a prior art down-running shredder;
FIG. 2 is a fragmentary sectional view of a prior art over-running shredder;
FIG. 3 which is a longitudinal sectional view of a preferred shredder machine which combines the overrunning and down-running characteristics of the prior art shredders; and
FIG. 4 which is a fragmentary sectional view of the rotor and grate seen along line 4−4 in FIG. 3.

DESCRIPTION OF THE SHREDDER MACHINE

In FIG. 1 there is shown a well known shredder mill of down-running character in which the counter clockwise rotation of the hammer rotor 5 draws the material down into the hammers past the breaker block 6 which is sloped downwardly toward the grate assembly 7. The opposite side of the mill from the breaker block 6 is formed with a scrap metal throwout pocket 8. The feed opening 9 for this mill is generally aligned over the breaker block 6 and to one side of the rotor 5 so that the material can be directed into the down-running hammers. In FIG. 2 there is seen a well known overrunning shredder mill in which the feed opening 9A is generally over the rotor shaft and the breaker block 6A is set generally vertically at the right of the rotor and opposite the scrap metal throwout pocket 8A.

In FIGS. 3 and 4 of the drawing the shredder machine S of this invention consists of a mill rotor housing 11 for a reversible rotor 12 equipped with pivotally mounted symmetrical hammers 13 rotated with suitable clearance across grate bars 14. The bottom 11A of the rotor housing 11 below the grate bars 14 is open to a material collecting conveyor 15 having a traveling top pass to transport the reduced material to the discharge end for collection in a suitable bin (not necessary to show).

The housing 11 has an open top 17 the area of which is greater than the area of the grate bars 14. Breaker blocks 18 and 19 are pivotally mounted on respective pivot shafts 20 and 21. The block 18 is provided with adjustment means 22 and similar adjustment means 23 is connected to the opposite breaker-block 19. As shown in FIG. 3 the breaker blocks 18 slant away from the rotor 12 while the breaker blocks 19 are generally vertically erect, and the result is that the top opening 17 is eccentric to the location of the rotor 12.

A closed hopper structure 24 surmounted by a closed top 25 is mounted over the eccentrically located feed opening 17 to the rotor housing 11, and a waste material feed conveyor 26 has its upper end wheel 27 mounted by shaft 28 in an opening 29 in the side of the
hopper 24. The opening 29 is provided with a shroud 30 and flexible curtain 30A to deflect material that may be thrown back by the action of the rotor hammers 13. Since some material may be directed or thrown back at the belt 26 a guard wall 31 is located, as shown, below the return pass of the conveyor 26.

In operation when handling industrial and oversize bulky waste, the rotor 12 is rotated in a counter clockwise direction for down-running action to pull the waste in a direction to strike the slanted breaker block 18 where it is caused to enter the orbit of the hammers 13. Certain components of this type of waste may pass around the grate and be flung upwardly in the hopper 24 in a ballistic path to strike the hopper cover 25. Such material is returned by gravity to the rotor housing to undergo further reduction to suitable sizes for discharge through the grate bars 14.

When packer truck material such as garbage is to be reduced the rotor 12 is reversed and runs clockwise. In this direction of rotation the waste will be maneuvered by the action of the hammers 13 to prevent bridging over the opening 17 by being crushed against the breaker block 19. Certain waste may be ballistically flung upwardly in hopper 24 only to be returned in a different orientation which will permit its reduction by the rotor hammers 13. The constant agitation and varied orientation effect of the elongated material will eventually result in its being reduced to a size that can pass the grate bars 14.

The foregoing manner of operation of the shredder machine is achieved by opening the rotor housing at its feed opening 17 to a width greater than the rotor diameter and by positioning breaker block 18 at an angle for the down-running action and the breaker block 19 in a substantially vertical position for over-running action. In this improved dual operating function of the rotor 12 with a wide feed opening, the closed hopper 24 is important to control the ballistic throw-out action of the hammers on the waste material, and to achieve return and reorientation of the material which at first is not reduced. Another important advantage is that the rotor 12 can be reversed so the machine can handle various materials and so that the wear on the hammers 13 will be substantially even, thereby resulting in lower maintenance costs by delaying the need to replace hammers. Furthermore, as hammer wear takes place the breaker blocks 18 and 19 can be adjusted to compensate and to maintain the desired close running tolerances.

It is, of course understood that the various types of material to be reduced is not fed to the hopper 24 in an indiscriminant manner, but must be chosen by the operator to suit the direction of rotation of the rotor 12 to obtain the most efficient reduction. On the other hand, the machine 10 is capable of reducing either character of waste material by reversing the rotor 12 into either its down-running or over-running mode of operation.

What is claimed is:

1. In an over-running down-running shredder machine selectively reducing bulky waste and packer truck materials, a housing having a material feed opening for the gravity receipt of material to be shredded, breaker block means adjacent opposed sides of said housing feed opening, a reversable rotor operably mounted in said housing adjacent and between said breaker block means, pivotally mounted hammers carried by said rotor, grate means adjacent said rotor operatively to said housing feed opening, said breaker block means having pivots fixed in said housing above the level of said rotor and adjusting means below said fixed pivots, said fixed pivot for the breaker block means at one side of said rotor being spaced farther away from said rotor than said fixed pivot for the breaker block means at the opposite side of said rotor such that the positions of said breaker block means is eccentric to said rotor, and said feed opening is also eccentric to said rotor, and material receiving hopper means enclosing said eccentric feed opening and extending outwardly from said feed opening, said hopper means confining material ejected from said housing feed opening by said rotor in either direction of its rotation.

2. The improvement in a down-running over-running shredder machine of a housing, breaker blocks and rotor combination for receiving and reducing substantially all types of waste material from oversize bulky and industrial waste material to standard packer truck waste material, said housing having a material discharge opening controlled by a grate and an enlarged waste material feed opening above said grate, said material shredding rotor being operably mounted in said housing between said openings for rotation in either direction, and said breaker blocks being disposed in said housing on opposite sides of said rotor and extending widthwise generally parallel to the axis of rotation of said rotor, the breaker blocks on one side of said rotor being slanted outwardly and upwardly at the down-running side and said breaker blocks on the opposite side being generally vertically erect on the over-running side, whereby said feed opening is aligned eccentrically to said rotor.

3. A reversible over-running down-running shredder machine consisting in a mill housing having a material feed opening and an opposed outlet for material that is shredded, material sizing grate means in said outlet, said feed opening having an area greater than said grate means, a hammer rotor operable in said mill housing between said feed opening and said outlet, first breaker block means carried in said mill housing at the over-running side of said hammer rotor in a generally vertical position, means to adjust the position of said first breaker block means toward or away from said hammer rotor, second breaker block means carried in said mill housing at the down-running side of said hammer rotor in a position slanted upwardly and away from said hammer rotor, the spacing of the upper portions of said first and second breaker block means from said hammer rotor being unequal to provide a bigger space at the down-running side of said hammer rotor, and the space between the upper portions of said first and second breaker block means forming a top opening to said hammer rotor that is eccentric, means to adjust the slanted position of said second breaker block means, both of said breaker block adjustment means being adjacent said grate means to effect clearance adjustments relative to said hammer rotor, and hopper means connected to said mill housing over said feed opening in position to direct material to be shredded into said hammer rotor.

4. In an over-running down-running shredder machine selectively directionally operable for reducing over-size bulky waste and packer truck material, the improvement which comprises: a reversible rotor assembly having pivotally mounted hammers thereon describing a circular path of a predetermined diameter
for either direction of rotation of said rotor; breaker blocks operatively mounted on opposite sides of the circular path of said hammers, the breaker blocks on one side being generally vertically erect and extending to an elevation about level with the uppermost reach of said hammer circular path, and the breaker blocks on the opposite side being angularly slanted upwardly and away from said hammer circular path and extending to an elevation about level with the uppermost reach of said hammer circular path; means connected with said breaker blocks and operable to adjust the positions thereof relative to the circular path of said hammers; grate means extending circularly below said hammer circular path and reaching to adjacent said breaker blocks at each side of said hammer circular path; and material feeding hopper means above said rotor assembly and forming an opening extending across the distance between the uppermost extent of said breaker blocks such that for shredding bulky waste said rotor assembly is free to rotate with said hammers passing downwardly over said angularly slanted breaker blocks and for shredding packer truck material said rotor assembly is free to rotate in the reverse direction.

5. The shredder machine of claim 4 wherein said upper elevations of said breaker blocks are separated a distance greater than the diameter of said hammer circular path and the space between said hammer circular path and said slanted breaker blocks is larger than the space between said hammer circular path and said generally erect breaker blocks; and said feeding hopper directs the oversize bulky waste into the larger space where more space is available for the oversize waste to arrange itself for effective action by said hammers.

6. The shredder machine of claim 5 wherein said material feeding hopper is close above said rotor and breaker blocks to catch the material thrown out by the rotor hammers, and said spaces between the hammer circular path and said breaker blocks are open to said hopper to accommodate the gravity return of material in orientation varied from its initial orientation.

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