

[54] **SHREDDER HAMMER**  
 [75] Inventor: Carl R. Graf, Whitehall, Pa.  
 [73] Assignee: Pennsylvania Crusher Corporation,  
 Broomall, Pa.  
 [22] Filed: Jan. 21, 1974  
 [21] Appl. No.: 435,063

3,123,312 3/1964 Palyi ..... 241/193 X  
 3,674,220 7/1972 Tupper et al. .... 241/101 M  
 3,688,479 9/1972 Martinson et al. .... 241/101.7

Primary Examiner—Roy Lake  
 Assistant Examiner—E. F. Desmond  
 Attorney, Agent, or Firm—Pollock, Philpitt & Vande Sande

[52] U.S. Cl. .... 241/194; 241/195  
 [51] Int. Cl.<sup>2</sup> .... B02C 13/04; B02C 13/28  
 [58] Field of Search ..... 241/191, 194, 195, 197,  
 241/101.7, 101 M

[57] **ABSTRACT**

A shredder hammer and material reduction machines suitable for reduction of municipal refuse of the type typically collected by packer trucks, in which the hammer includes a heavy, broad, mass portion from which project one or more narrow shredder tips which may be replaceable.

[56] **References Cited**  
**UNITED STATES PATENTS**  
 1,803,148 4/1931 Sheppard ..... 241/195 X  
 2,716,526 8/1955 Baker ..... 241/197

**12 Claims, 10 Drawing Figures**

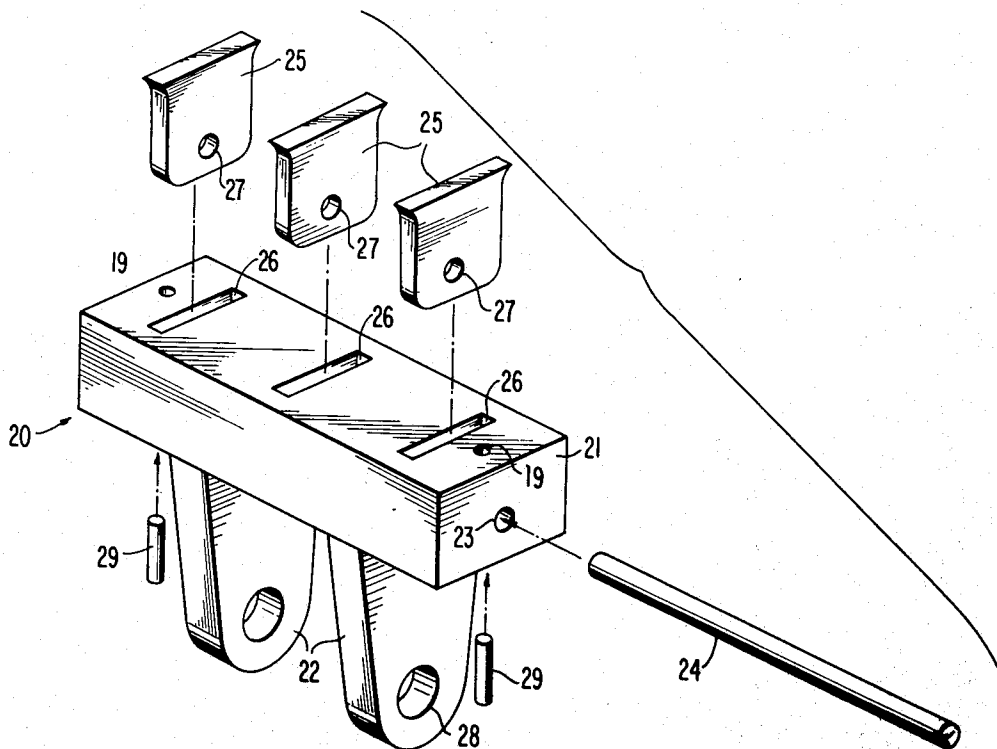


FIG. 1

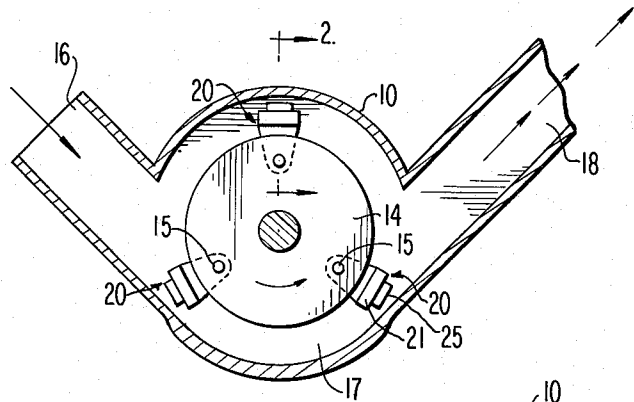


FIG. 2

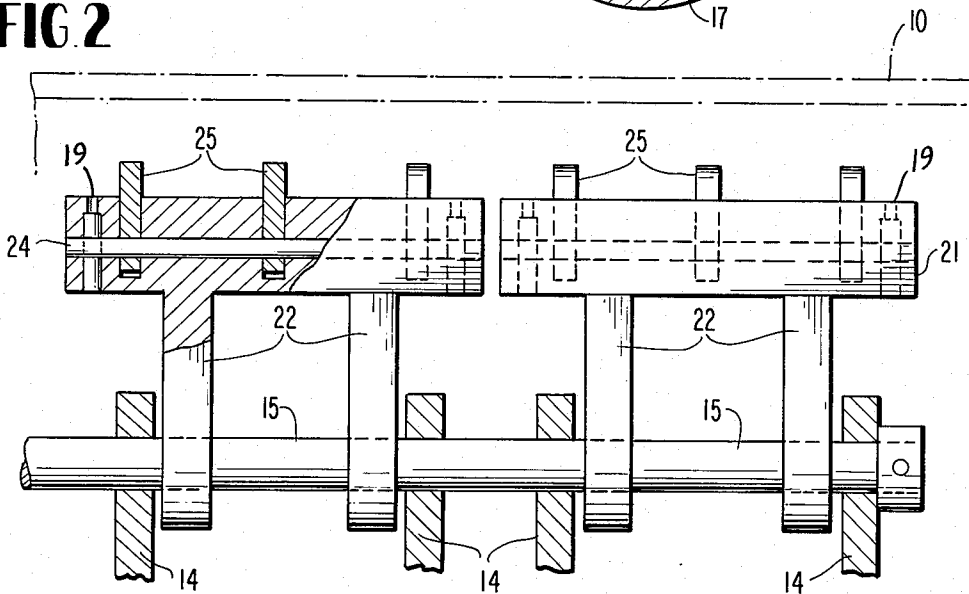
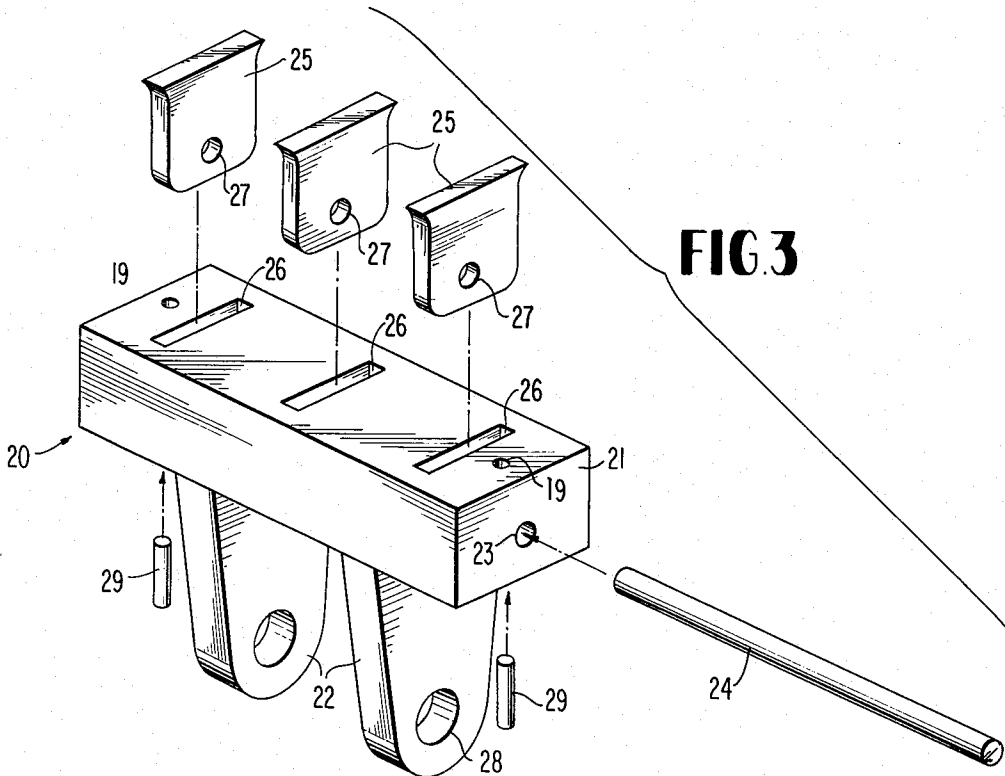
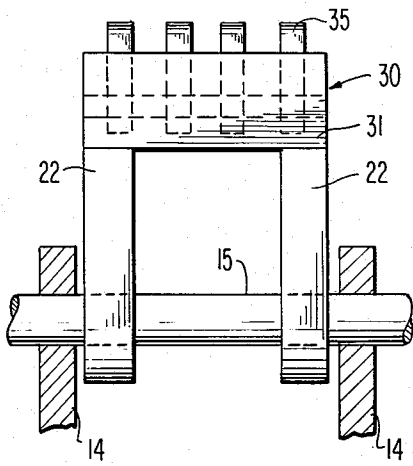
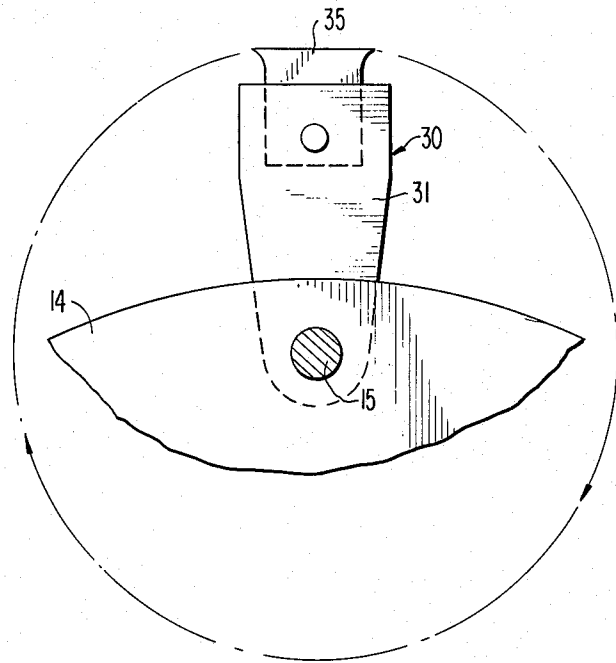


FIG. 3

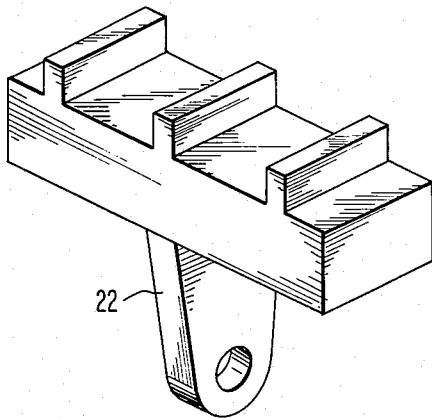




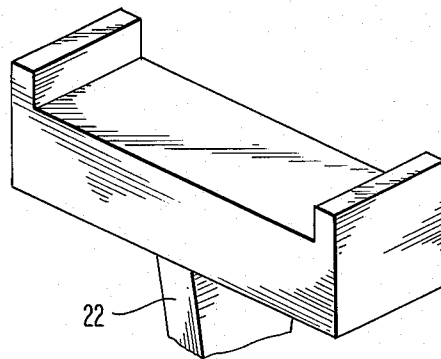
**FIG. 4**



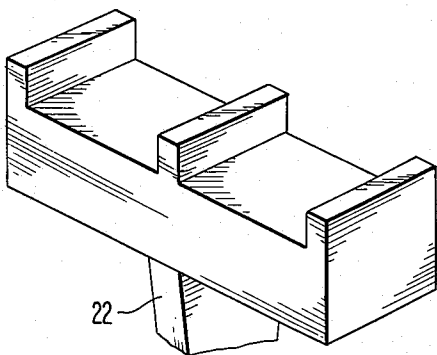
**FIG. 5**



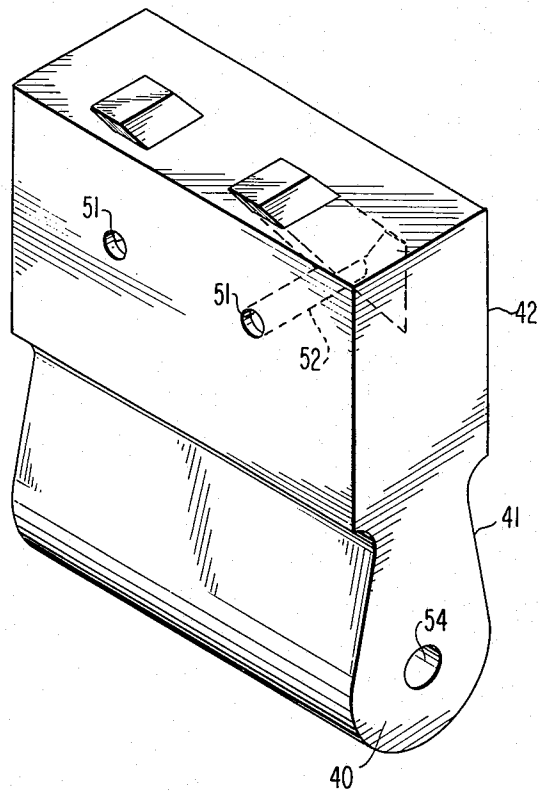
**FIG. 6**



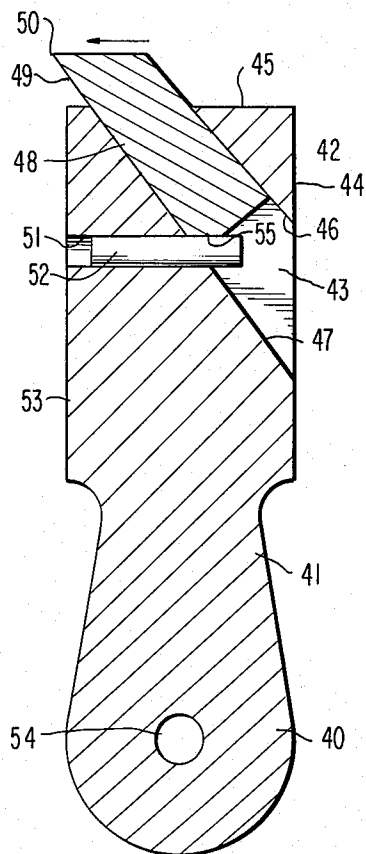
**FIG. 8**



**FIG. 7**



**FIG. 9**



**FIG. 10**

**SHREDDER HAMMER****CROSS REFERENCE TO  
RELATED APPLICATIONS**

This application claims and in part discloses, subject matter which is common to it and prior copending applications Ser. No. 185,760, filed Oct. 1, 1971, now abandoned.

**BACKGROUND OF THE INVENTION**

By volume, the largest part of municipal refuse collected by "packer" trucks is paper, cardboard, glass bottles, plastic containers, tin cans and the like. It was once thought that such material might be successfully reduced in a machine having a rotating shaft with rotor discs which carried suspension bars, which in turn carried shredder knives, taking the form of knife blades or very lightweight hammers having sharpened leading edges. The results were not satisfactory. The parts of refrigerators, washing machines and other appliances, automobile parts, furniture and other dense objects picked up by the packer trucks were not efficiently reduced and caused excessive wearing of the shredder knives and their suspension bars.

This problem was overcome by replacing the shredder knives with hammers which are large, heavy, broad masses. With this change, it became possible to successfully reduce the denser components of the refuse and to reduce the wear on the suspension bars. On the other hand, other problems emerged.

While wear on the massive hammers could be corrected somewhat by periodically building up their worn surfaces with welding, this could only be done a few times, after which it would become necessary or advisable to discard the entire large and expensive hammer. More significantly, however, the massive hammers were considerably less efficient in dealing with the paper and other lightweight materials constituting the largest volume components of the refuse. Despite a clear need for more efficient reduction of the lighter components, the recognizably inefficient use of the massive hammers continued. Clearly, no economical and practical solution to the problem was evident.

**SUMMARY OF THE INVENTION**

A principal object of the present invention is to provide, for a rotary hammer crusher and/or shredder machine, a hammer having the capability of reducing the heavier, harder and larger types of materials, as in municipal trash while at the same time having the capability of shredding the lighter materials which best reduce by shredding rather than by impacting.

Another object is to provide, for a rotary hammer shredder and/or crusher, a hammer having a relatively large heavy broad mass for reducing the heavier, harder materials to be reduced while at the same time having narrow lighter blades for shredding lighter materials, including fibrous materials.

Another object is to provide, for a rotary shredder machine, a shredder hammer having a heavy broad mass in which shredder tips are carried, thereby to reduce the layback of the shredder blades on the suspension bars.

Yet another object is to provide a hammer of the aforesaid type in which the shredder tips are removably carried by the heavy hammer mass for replacement purposes.

**BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a schematic elevational view of one form of rotary hammer crusher/shredder machine in which hammers according to the present invention may be employed.

FIG. 2 is an enlarged view looking along the line 2-2 of FIG. 1 showing a currently preferred form of hammer according to the present invention.

FIG. 3 is an exploded view of one of the hammers of FIG. 2.

FIG. 4 is a view of a modified form of hammer, according to the present invention.

FIG. 5 is a schematic illustration showing that the hammers of the modified form of FIG. 4 are fully rotatable on their suspension bar.

FIGS. 6, 7 and 8 show other forms of hammers embodying the present invention.

FIG. 9 is a perspective view of another form of hammer according to the present invention.

FIG. 10 is a sectional view of the hammer shown in FIG. 9, taken through a shredder tip receiving slot and in the plane of hammer rotation.

**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Referring now to FIGS. 1 and 2, there is shown a fragmentary portion of a rotary hammer crusher/shredder comprising a housing 10 having supported therein a rotor shaft 12 having keyed or otherwise secured thereto a plurality of rotor discs 14. Extending through the rotor discs 14, at 120° spacing, are three suspension bars 15 on which the hammers 20 are pivotally supported between the discs 14. It will, of course, be understood that the provision of three suspension bars 15 at 120° spacing is merely representative of one example, and that other arrangements, such as four bars at 90° spacing, or at unequal spacing, could be used so far as the present invention is concerned. The material to be reduced, which may be trash, or other material, is fed into the hammer circle 17 through an input feed conduit 16. The material is reduced by the rapidly rotating sets of hammers 20, shown to be rotating in the counterclockwise direction, and the reduced material is projected upwardly through a discharge conduit 18.

FIG. 2 is an enlarged view of two hammers 20 of a presently preferred type provided in accordance with the present invention. While two hammers 20 are shown in FIG. 2, it is to be understood that the full set, i.e., the number of hammers suspended from the same suspension bar 15, may consist of four, or five, or six, or any other suitable number of hammers. The hammers 20 are each shown as having two legs 22 spaced apart by a distance related to the spacing between rotor discs 14. Each leg 22 is provided with a hole 28 (FIG. 3) through which the suspension bar 15 extends. Suspension bar 15 is supported in the rotor discs 14 and extends through holes provided therein in a well known manner.

The hammers 20, according to the present invention, include a large heavy broad block 21, which is shown to be rectangular in FIGS. 2 and 3, but which could be of other suitable shape, for example, hexagonal in cross-section. The outer or peripheral surface of block 21 is provided with one or more slots 26 (in this case three) for receiving inserts 25 which function as shredder tips or blades that are each substantially narrower

when measured parallel to the axis of rotation, than the block 21. Inserts 25 are spaced laterally from one another and are provided with through holes 27 for receiving a locking bar 24 which is inserted into block 21 through a hole 23 which extends from one end of the block 21 to the other. Locking bar 24 may be retained in the block 21 by a pair of transverse retaining pins 29 which may be inserted in transverse holes 19 provided in the block 21. These pins 29 pass through holes (not shown) in the locking bar 24.

As seen in section in FIG. 2, the outer portions of holes 19 in block 21 are of reduced cross-sectional area to prevent the pins 29 from being dislodged by centrifugal forces during the rapid rotation of the hammers. The outer edges of inserts 25 may preferably be shaped in the manner shown in FIG. 3 to improve the tearing and shearing ability of the blades.

In the form of hammer illustrated in FIGS. 2 and 3, the block 21 has a length which is greater than the spacing between the discs 14 between which its legs 22 are pivotally supported on suspension bar 15. Thus, the extent to which the hammer block 21 may lay back is limited by the edges of the discs 14.

In some cases, it may be desirable to provide a "disappearing hammer," one which is free to rotate into the spacing between the rotor discs 14. Such a disappearing hammer 30 is depicted in FIG. 4. Except for the length of the heavy mass block 31, which corresponds to block 21 of hammer 20, the construction of hammer 30 may be basically similar to that of hammer 20 of FIGS. 2 and 3.

In FIG. 4, four inserts 35 are shown. These correspond to the three inserts 25 of FIGS. 2 and 3.

FIG. 5 is a schematic illustration depicting the fact that the hammers 30 are fully rotatable on their suspension bar 15.

In the embodiment shown in FIGS. 2 and 3, and also in the modified embodiment shown in FIGS. 4 and 5, the shredder tips or blades 25 and 35 are removable from the heavy block of the hammer. This has the advantage of permitting the shredder blades to be replaced when worn. In some cases, the shredder blades may be an integral part of the heavy block of the hammer, in which case the entire assembly must be replaced when worn. Several hammers of this type are depicted in FIGS. 6, 7 and 8. These figures illustrate that the number and position of the shredder blades may vary. These FIGS. 6, 7, and 8 also illustrate that the hammer may have but a single leg 22 rather than two legs 22 as illustrated in the embodiments of FIGS. 2-5.

The currently preferred embodiment of the invention, shown in FIGS. 9 and 10, illustrates the use of so-called "monolithic" hammers (without narrow legs) and still another method of mounting shredder tips or blades. The hammer of this embodiment includes a leg portion 40 having a hole 54, for hanging it on a suspension bar (not shown), running the entire width of leg 40. The peripheral or block portion 42 is connected to leg portion 40 through a thinner shank portion 41 which is the same width as both leg portion 40 and block portion 42.

One or more slots 43 extend through block portion 42 for the mounting of one or more shredder tips or blades 48. Preferably, slot 43 pierces the back 44 of leg portion 42, extending through the latter parallel to the plane of hammer rotation and emerges through the pe-

ripheral wall 45. Such positioning of slot 43, and appropriate shaping of the shredder tips or blades 48 makes it possible to present to the material undergoing shredding a chisel point 50 and a leading edge 49 which are inclined forwardly as they extends peripherally from the block portion 42.

Retention of shredder tip or blade 48 in the hammer can be facilitated by providing a slight convergence of the front 47 and back 46 walls of slot 43, and by providing a corresponding convergence of the front and back faces of the blades 48. This convergence prevents escape of the blades 48 from the slots under the influence of centrifugal force. To prevent escape of the blades 48 through the back ends of slot 43, keeper pins 52 may be provided. These extend in bores 51 extending from the front face 53 of block portion 42 into slots 43, where they engage angled rear faces 55 of blades 48.

It will of course be understood that the foregoing are but a few of many variations which can be made without departing from the spirit of the present invention.

What is claimed is:

1. A hammer for a crusher and/or shredder of the type including a rotor, said hammer comprising:
  - a. a relatively large, heavy, broad block for impacting and reducing heavier, harder types of materials fed to said crusher and/or shredder;
  - b. a plurality of narrow lighter shredder blades carried by said block and projecting therefrom for shredding lighter, softer types of materials; and
  - c. at least one leg projecting from said block in a direction opposite to that of said shredder blades said leg including means for pivotal connection to said rotor.
2. A hammer according to claim 1 wherein:
  - a. releasable locking means are provided for removably securing said shredder blades to said block.
3. A hammer according to claim 2, wherein said shredder blades have convergent front and back faces, and wherein said means for removably securing said shredder blades to said block comprises:
  - a. a plurality of slots extending through said block for receiving said convergent shredder blades, said slots having corresponding front and back walls convergent in the direction of projection of said shredder blades from said block, whereby escape of said blades from said slots under the influence of centrifugal force is prevented.
4. A hammer according to claim 2 wherein said means for removably securing said shredder blades to said block includes:
  - a. transverse slots in said block for receiving said shredder blades;
  - b. through holes in said shredder blades;
  - c. at least one lengthwise-extending hole in said block adapted to register with the through holes in said shredder blades when said shredder blades are inserted into said slots;
  - d. a locking bar insertable in said lengthwise-extending hole.
5. A hammer according to claim 4 wherein retaining pins are provided for retaining said locking bar in said lengthwise-extending hole.
6. A hammer for a rotary crusher and/or shredder having a rotor shaft, a plurality of rotor discs secured at spaced-apart positions on said rotor shaft, and suspension bars extending through said rotor discs parallel to said rotor shaft, said hammer comprising:

5

- a. a relatively large, heavy, broad block for impacting and reducing heavier, harder types of materials fed to said rotary crusher and/or shredder;
- b. leg means extending radially inwardly from said block for securing said block pivotally to a suspension bar; and
- c. a plurality of narrow shredder blades carried by said block and projecting radially outwardly therefrom for shredding lighter, softer types of materials.

7. A hammer according to claim 6 wherein said block has a length greater than the spacing between said rotor discs receiving said leg means.

8. A hammer according to claim 6 wherein said block has a length less than the spacing between said rotor discs receiving said leg means.

9. A hammer according to claim 6 wherein:

- a. means are provided for removably securing said shredder blades to said block.

10. A hammer according to claim 9, wherein said shredder blades have convergent front and back faces, and wherein said means for removably securing said shredder blades to said block comprises:

- a plurality of slots extending through said block for receiving said convergent shredder blades, said slots having corresponding front and back walls convergent in the direction of projection of said shredder blades from said block, whereby escape

6

of said blades from said slots under the influence of centrifugal force is prevented.

11. A hammer for a rotary crusher and/or shredder having a rotor shaft, a plurality of rotor discs secured at spaced-apart positions on said rotor shaft, and bars extending through said rotor discs parallel to said rotor shaft, said hammer comprising:

- a. a relatively large, heavy, broad block, said block comprising transverse slots;
- b. leg means extending radially inwardly from said block for securing said block pivotally to a suspension bar;
- c. a plurality of narrow shredder blades carried by said block within said transverse slots and projecting radially outwardly from said block, said shredder blades including through holes;
- d. at least one lengthwise-extending hole in said block adapted to register with the through holes in said shredder blades when said blades are inserted into said slots; and
- e. a holding bar insertable into said lengthwise-extending hole in said block and through the holes in said shredder blades.

12. A hammer according to claim 11 wherein retaining pins are provided for retaining said holding bar in said block.

\* \* \* \* \*

30

35

40

45

50

55

60

65