United States Patent [19]

Strong

[11] **3,844,489**

[45] **Oct. 29, 1974**

[54] **WOOD CHIPPING APPARATUS**

[76] Inventor: **Donald E. Strong,** R.F.D. No. 1, Box 110, Remus, Mich. 49340

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[52] **U.S. Cl.** **241/55,** 144/176, 241/92, 241/101.7

[51] **Int. Cl.** **B02c 18/06**

[58] **Field of Search** 144/176; 241/55, 56, 92, 241/277, 101.7, 291

[56] **References Cited**

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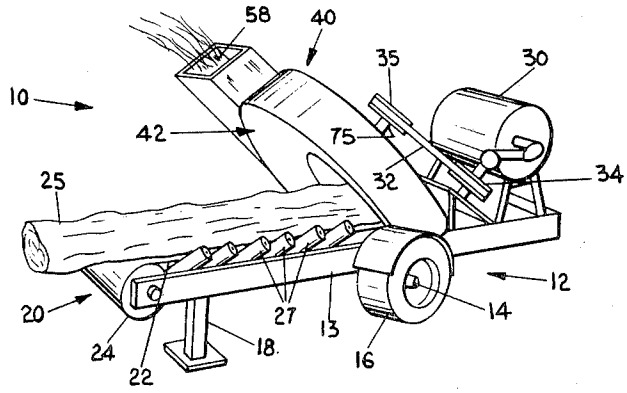
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Primary Examiner—Granville Y. Custer, Jr.
Assistant Examiner—Howard N. Goldberg
Attorney, Agent, or Firm—Price, Heneveld, Huizenga & Cooper

[57] **ABSTRACT**

A wood chipper includes a generally rectangular chipping block including a pair of cutting knives positioned on the edges of a pair of apertures extending through the block. Positioned on flat top and bottom edges of the rectangular block are chip clearing blades. The chipper block is rotatably positioned and enclosed in a housing which has an input aperture on one face thereof for receiving material to be chipped, and a discharge chute extending tangentially from the periphery of the housing for exhausting chips therefrom. The housing and chipper block therein are positioned on a frame at an acute angle relative to the direction of feed of material into the chipper.

14 Claims, 8 Drawing Figures



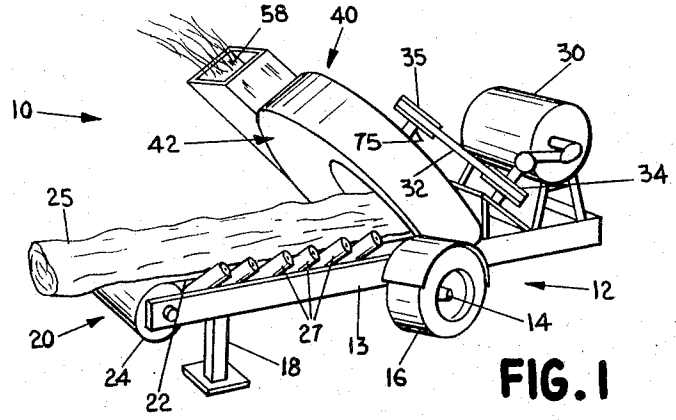


FIG. 1

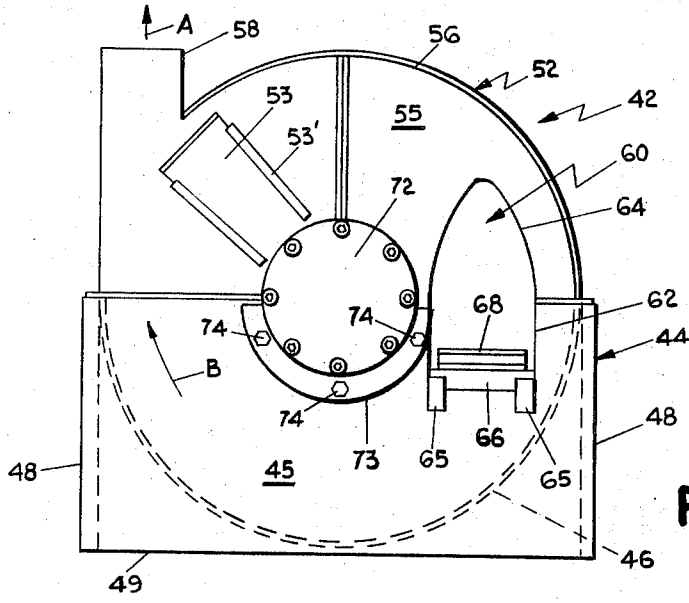


FIG. 3

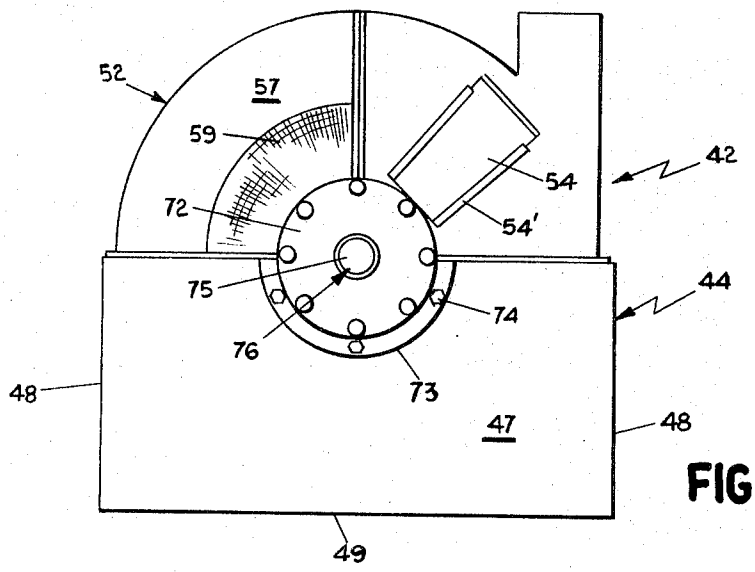


FIG. 4

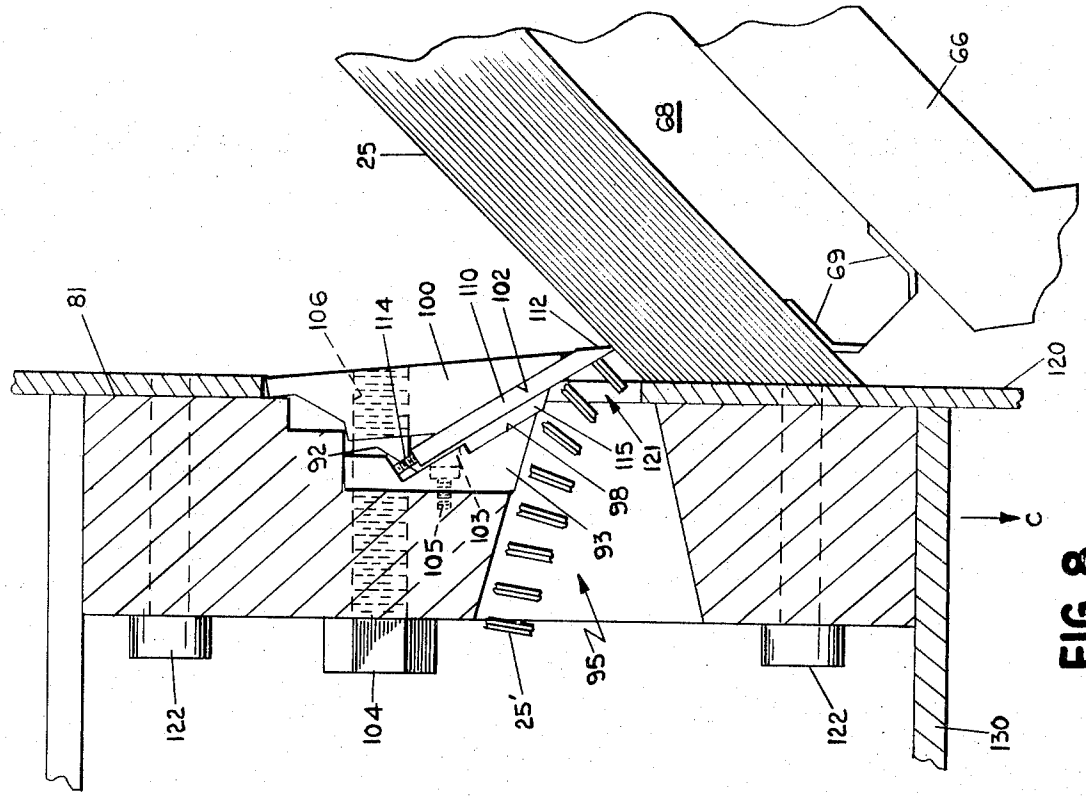

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FIG. 8

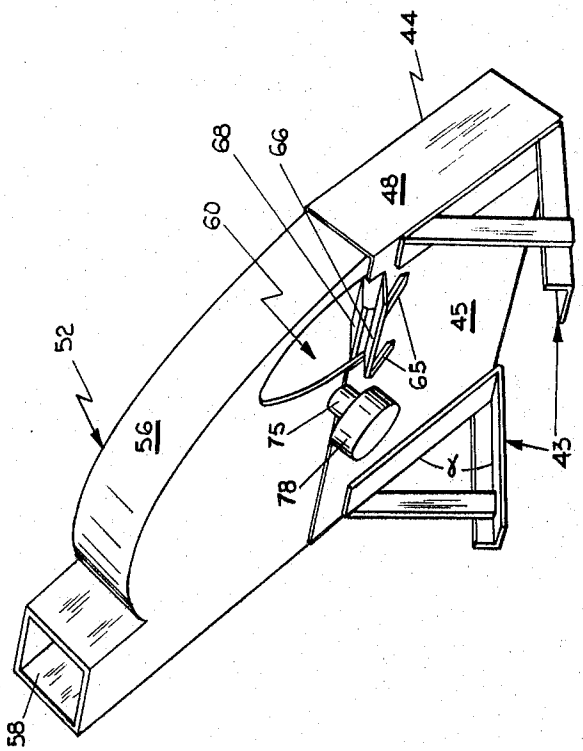

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FIG. 2

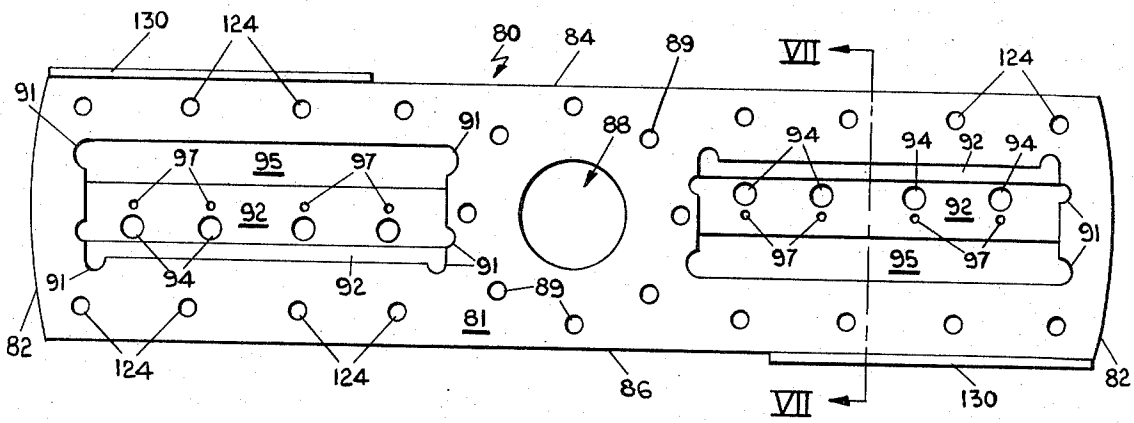


FIG. 5

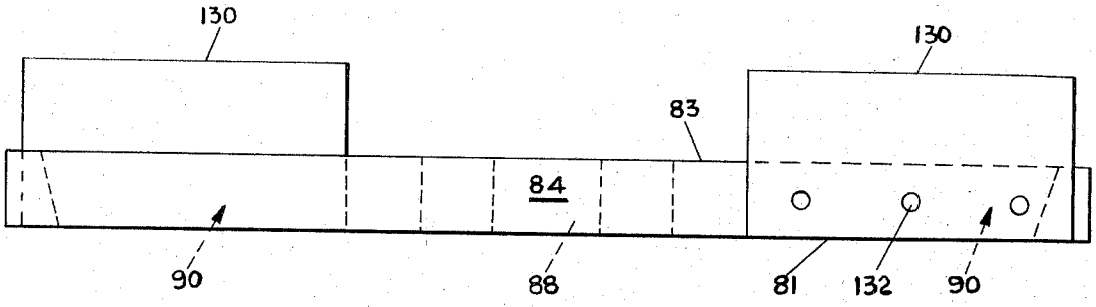


FIG. 6

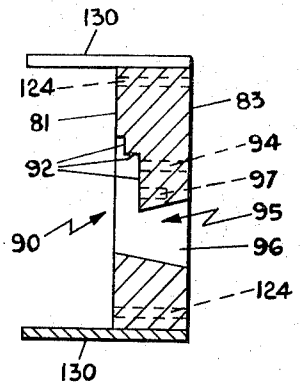


FIG. 7

WOOD CHIPPING APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates to a rotary wood chipper for reducing wood materials into chips and more particularly to improvements in such apparatus.

In tree trimming or removal operations, limbs and other scrap wood material must be disposed of, which in the past has been accomplished by burning the scrap wood. In populated areas, such burning increases the pollution content of the air which is undesirable. Recently, the scraps have been reduced to wood chips which can then be employed for paper manufacture or, in some cases, is used as a mulch around shrubs and the like. It is not generally feasible, however, to truck the wood scraps to a mill for processing in wood chippers since the expense of the gathering and shipping frequently outweighs the value of the resulting wood chips.

Some wood chippers have been designed which are portable and which are capable of processing at least small branches into wood chips which then can be gathered at the site of the tree trimming operation or can be distributed on the ground whereupon the chips will decay naturally without causing environmental pollution. Existing portable wood chipping apparatus, however, are generally not capable of handling relatively large limbs of medium sized trees (i.e., with diameters up to 15 inches). This is due to the relatively lightweight construction of the trailer-hauled portable wood chippers which are designed primarily for very small branches and not general duty purposes. On the other hand, existing wood chippers which are designed for larger pieces of wood material are extremely heavy and cannot easily be transported; or in cases where heavy duty chippers have been mounted on large trailers, the cost of the unit is prohibitive for small operators. Thus, there exists a need for a relatively heavy duty and yet portable chipper unit which is not overly costly.

SUMMARY OF THE PRESENT INVENTION

The apparatus of the present invention combines the desired durability and handling capabilities of large, heavyweight and fixed position wood chippers with the portability and inexpensiveness of present lightweight wood chippers which are incapable of handling frequently encountered materials and provides an improved portable wood chipper which can be transported to the situs of material to be chipped and can effectively be used for up to medium sized trees.

This is accomplished by the unique design of the chipper block which, instead of being a circular disc of relatively thick and therefore very heavy material, is a generally rectangular piece of material which has sufficient thickness and weight to accommodate medium sized trees while having reduced weight as compared with the disc type chipper such that it can be portably transported on a trailer. The block further provides flat edges which facilitates the mounting of chip removing blades and the chip removal.

Apparatus embodying the present invention includes a generally rectangular chipper block having at least one aperture therethrough and a chipper knife mounted on the side of the aperture. The block includes one or more chip removing blades positioned on a flat edge of the block which is enclosed and rotatably

mounted in a housing. The housing includes an aperture for receiving material on one side thereof and a discharge chute extending from the periphery thereof for the removal of wood chips. The housing is mounted on a suitable framework at an acute angle relative to the direction of feed such that the chipper knife tends to draw the material into the chipper.

The invention and its objectives, and the operation thereof can best be understood by referring to the following description together with the accompanying drawings in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view showing the portable wood chipping apparatus of the present invention mounted on a trailer and including an infeed conveyor for use therewith;

FIG. 2 is an enlarged perspective view of the chipping apparatus prior to mounting on the trailer;

FIG. 3 is a front elevational view of the chipper housing;

FIG. 4 is a rear elevational view of the housing;

FIG. 5 is a front elevation of the rectangular chipper block;

FIG. 6 is a plan view of the block shown in FIG. 5;

FIG. 7 is a cross-sectional view of the block taken along the lines VII—VII of FIG. 5; and

FIG. 8 is a fragmentary side elevational view, partially in cross section showing the knife mounting structure and illustrating the operation of the wood chipping apparatus.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, there is shown a portable wood chipping apparatus **10** comprising a trailer **12** having a frame **13** mounted on an axle **14** with a pair of wheels **16.** Suitable hitch means (not shown) are provided for coupling the trailer to a towing vehicle to transport the wood chipper. The trailer includes a retractable stand **18** which can be lowered to support the trailer such that the towing vehicle can be removed if desired when the chipper apparatus is in use. The wood chipper apparatus further includes feed means **20** such as a belt conveyor **22** which is strung between a pair of rollers **24** (one shown in the figure) to transport a log **25,** branches, or other wood material into the chipping apparatus. A plurality of angled guide rollers **27** are positioned on either side of the belt conveyor **22** to provide guidance for the movement of the log into the chipper. The conveyor can be driven by suitable conventional drive means not shown. In some embodiments, the powered conveyor will be unnecessary and a trough can be employed for manually feeding material to the chipper.

Positioned at the output end of the conveyor **22** is the wood chipper **40** which comprises a housing **42** which encloses the rotating portions of the wood chipper and provides controlled discharge of the wood chips from an output chute **58.** A gasoline powered drive motor **30** is positioned on the trailer and includes a drive pulley **34** and belt **32** coupling the motor to provide a rotary drive to the drive shaft **75** of the wood chipper by means of a pulley **35** mounted on shaft **75.** Several pulleys and interconnecting belts may be used as necessary.

Referring in detail to FIGS. 2 through 4, it is seen that the housing includes a rectangular base 44 having front and rear surfaces 45 and 47, respectively, joined by side walls 48 and a bottom panel 49. Brackets 43, suitably attached to the base 44, are employed to mount the housing on trailer 12 at an acute angle α(FIG. 2) of approximately 37° to the direction of feed of material into the chipper. Within the rectangular base is mounted a semicircular plate 46 which prevents the corners of the base from being clogged with wood chips during operation of the rotary chipper.

The housing 42 includes an upper portion 52 which is securely attached to the base 44 by suitable fastening means and which includes front and rear semicircular plates 55 and 57, respectively. A curved side wall 56 joins the front and rear plates and a rectangular discharge chute 58 extends tangentially from one side of the upper portion of the housing as shown in the figures. The front plate includes a slide plate 53 mounted within guide brackets 53' to provide access to the chipper block for knife replacement. The rear plate likewise includes a similar sliding plate 54 with guide means 54'. A screened air inlet 59 is provided in plate 57 to permit the entry of air which is circulated by the chipper and aids in exhausting chips from the discharge chute 58 in a direction indicated by the arrow A in FIG. 3. The direction of rotation of the chipper knives is indicated by arrow B in FIG. 3.

As shown in FIGS. 2 and 3, a material feed opening 60 is provided in the front surfaces of sections 52 and 44 and includes a rectangular bottom segment 62 formed in the base member 44, and a curved top portion 64 in the top section 52 of the housing. A support plate 66 extends outwardly from the bottom edge of aperture 60 and is supported by suitable brackets 65 extending between the bottom surface of the plate and the front of the base. Positioned on the support plate 66 is an anvil 68 which has hardened wear surfaces over which the material being fed into the chipper rides.

Mounted centrally to the base 44 on opposite sides thereof is a pair of bearing block assemblies 72 that are bolted to the housing by means of front and rear flanges 73 and suitable bolts 74 and which, as seen in FIG. 4, supports the rotary shaft 75 for the chipper. Shaft 75 includes a key receiving slot 76 such that the drive pulley 35 can be fixedly attached to the shaft. Mounted to the rotary shaft 75 within the hollow housing is the chipper block 80 and associated apparatus shown in detail in FIGS. 5 through 8.

The chipper block 80 comprises a generally rectangular block having a face or front surface 81, a rear surface 83, a top edge 84, a bottom edge 86 and arcuate ends 82. The ends 82 can be flat instead of arcuate. Edges 84 and 86 form relatively flat surfaces which serve as mounting surfaces for the chip removal blades as described below. Centrally located within the block is a shaft receiving aperture 88 extending therethrough and having a plurality of peripherally spaced apertures 89 for mounting shaft engaging flanges for the rotary shaft 75 (FIG. 2) of the wood chipper. It is noted here that the shaft mounting flanges and the bearing block assemblies for rotatably coupling the shaft to the housing are of conventional design. In addition to the central shaft receiving aperture, the chipper block 80 includes a pair of configurated recesses 90 which, as best seen in FIG. 7, each includes a knife holding recess 92 and a chip slot 95 with flared end 96 to permit the chips to pass through the block and circular face plate and be expelled from the housing as explained below.

As seen in FIG. 5, each of the configurated recesses 90 includes a plurality of apertures 94 extending therethrough for permitting the passage of knife clamp bolts 104 (FIG. 8). Adjacent these apertures are a plurality of threaded apertures 97 for receiving knife holder bolts 105 (FIG. 8) which secure the knife holder 93 against the recess 92 of the chipper block. The knife holder 93 includes a series of recesses 103 (FIG. 8) for receiving the bolts 105 which engage the threaded apertures 97 of the chipper block 80. A counter knife 115 is positioned against a slanted surface 98 of the knife holder 93 and provides a surface against which the cutting knife 110 is positioned. The cutting knife includes an adjustment screw 114 at the rear edge for adjusting the depth of cut of the knife. On the side of the knife remote from the counter knife 115 is positioned a knife clamp 100 which is secured to the chipper block by means of bolts 104 which extend through the apertures 94 and are threadably secured to threaded apertures 106 of the knife clamp 100. The knives, the counter knives, the knife holders and the knife clamps are elongated to fit within recess 90 and are of generally conventional design to permit ease of adjustment and/or removal for replacement.

As seen in FIG. 8, a wear plate 120 of hardened steel is attached to the front surface 81 of block 80. The wear plate 120 is a circular disc which is attached to the rectangular chipper block by means of a plurality of cap screws 122 extending through apertures 124 (FIG. 5) arranged in rows in the chipper block. The bolts are suitably threaded into the wear plate which includes a shaft receiving aperture aligned with aperture 88 as well as knife slots 121 (FIG. 8) which permit the extension of the knives 110 therethrough.

Attached to the chipper block at opposite ends and on the top and bottom surfaces 84 and 86, respectively, by means of bolts 132 (FIG. 6) are a pair of fan blades 130 which extend outwardly toward the rear surface 83 of the chipper block. The rectangular block which provides surfaces 84 and 86 greatly simplifies the mounting of the chip removing fan blades which have in the past required special clamps to permit the mounting of the blades to the periphery or the face of conventional circular cutting discs. Mounted as shown in FIGS. 6, and 7, the flat blades 130 extend from the middle portion of block 80 towards ends 82 and effectively draw air through intake 59 and exhaust the air through chute 58 as the block rotates. The wood chips, which pass through slots 95, are carried by the air stream or physically thrown by the blades to be discharged from the housing.

The operation of the chipper is illustrated in FIG. 8 where the movement of the chipper is in a direction indicated by the arrow C. The protruding sharpened edge 112 of chipper knife 110 contacts the end of log 25 resting against the hardened surfaces 69 of the anvil 68 and cuts the log in a slicing action into chips 25' which are forced partly by the knife 112 and shape of slot 95 and partly by their momentum through the chipper block. In addition to providing a current of air to exhaust the chips, the fan blades 130 physically contact the chips and tend to throw them out of the exhaust chute.

Although the chipper shown includes two knives, the block can be designed for a single knife. With the two-knife arrangement shown and a chipper block length of 60 inches rotatably driven at up to 700 r.p.m. by a 200 H.P. motor, logs up to 15 inches in diameter can be reduced to wood chips. The block thickness is approximately 4 inches while the circular hardened wear disc is ½ inch thick. These parameters can be varied depending upon the particular use intended for the chipper and the number of knives employed. Also, various modifications to the preferred embodiment will become apparent to those skilled in the art. Such modifications may include, for example, design changes in the chipper housing or the knife holding apparatus. These and other modifications, however, will fall within the scope of the present inventions as defined by the appended claims.

I claim

1. A chipper apparatus for chipping material comprising:

An elongated rectangular chipper block having front and rear surfaces and substantially flat edges extending along said block, said block including at least one knife receiving chip slot extending through said block between said front and rear surfaces;

a cutter knife positioned within said aperture and including a cutting edge extending from the front surface of said block;

a pair of fan blades oppositely and fixedly positioned on said edges extending outwardly from the rear surface of said chipper block and extending longitudinally along a portion of the length of said block;

a housing shaped to enclose said chipper block and including front and rear surfaces and a wall extending therebetween, said front surface having a material receiving aperture therein; said housing including a chipper exhaust chute extending from said wall and spaced from said receiving aperture;

means for rotatably positioning said chipper block within said housing to position said chipper block such that as it rotates, said chipper knife periodically passes adjacent the receiving aperture;

means for supporting material fed into said aperture; and

drive means for rotatably driving said chipper block whereby material fed into said aperture is reduced to chips which are exhausted from said discharge chute.

2. The apparatus as defined in claim 1 wherein said block includes a pair of elongated knife receiving chip slots formed in opposite ends of said block.

3. The apparatus as defined in claim 1 wherein said housing includes a generally circular interior side wall and wherein said exhaust chute extends tangentially from said wall.

4. The apparatus as defined in claim 1 and further including a frame adapted to hold said housing, and mounting means positioning said housing at an acute angle on said frame such that as said chipper block rotates, it tends to draw material into said housing.

5. The apparatus as defined in claim 1 wherein said supporting means includes an anvil having hardened wear surfaces and mounted along one edge of said receiving aperture.

6. The apparatus as defined in claim 1 wherein said means for rotatably positioning said chipper block within said housing comprises a shaft supported within said housing by bearings and extending through a central aperture in said chipper block and fixedly attached to said block, said shaft having at least one end extending from said housing.

7. The apparatus as defined in claim 1 and further including a circular wear disc fixedly positioned on said front surface of said chipper block and including a knife slot therein for permitting said knife to extend outwardly from said disc.

8. A portable wood chipper apparatus of the type comprising a rotary chipper positioned within an enclosed housing having a material input aperture and a chip discharge chute, said chipper including one or more chip slots each with a knife positioned therein, the improvement comprising:

an elongated rectangular chipper block having elongated relatively flat top and bottom edges; and

a pair of flat fan blades oppositely and fixedly positioned on said surfaces at opposite ends of said chipper to exhaust wood chips from said housing as said chipper block is rotatably driven.

9. The apparatus as defined in claim 8 and further including a wear disc positioned on one face of said chipper block to contact material fed into said chipper apparatus.

10. A rotary wood chipper comprising:

a rectangular chipper block whose width is significantly greater than its height and having front and rear surfaces and flat top and bottom edges, said block including a pair of chip slots having configurated edges to promote the passage of chips therethrough and permit the mounting of chipping knives at one edge thereof;

a pair of fan blades oppositely and fixedly positioned on said top and bottom edges of said block and extending along a portion of the length of said block and outwardly from the rear surface of said block;

a wear plate having slots therein positioned on said front surface of said block such that said slots are aligned with said chip slots of said block;

a pair of elongated chipper knives having a cutting edge;

means for mounting said chipper knives to one edge of said chip slots of said block such that said cutting edges extend outwardly at an acute angle from said wear plate;

a housing enclosing said chipper block and including front and rear surfaces adjacent said front and rear surfaces of said chipper block, respectively, and a wall extending between said surfaces, said front surface including a material input aperture positioned to align with the path of travel of said chipper knives, said housing further including a discharge chute extending tangentially from said wall to provide a discharge path for wood chips; and

means for rotatably mounting said chipper block in said housing.

11. The apparatus as defined in claim 10 wherein said rear surface of said housing includes an air intake formed therein opposite said discharge chute.

12. The apparatus as defined in claim 10 and further including support means postioned along a lower edge

of said material input aperture to support material fed into said chipper.

13. The apparatus as defined in claim **10** wherein said housing is positioned on a frame at an acute angle such that the cutting knives tend to draw material into the chipper during the operation of said chipper.

14. The apparatus as defined in claim **10** wherein said means for rotatably mounting said chipper block in said housing comprises an axle coupled to said block and supported by bearings on opposite sides of said block and mounted to said housing, said axle extending from said housing and coupled to drive means for rotating said chipper block.

* * * * *