PORTABLE COMPOST GRINDING APPARATUS

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Filed: Aug. 15, 1973

Appl. No.: 388,452


Int. Cl. .................. B02c 13/06

Field of Search ...... 241/50, 51, 56, 87.1, 88.4, 241/89.1, 89.2, 89.3, 101.7, 186 R, 186.4

References Cited

UNITED STATES PATENTS
1,934,180 11/1933 Fischer et al. .................. 241/51
2,307,400 1/1943 Gamble et al. .................. 241/51 X
2,505,023 4/1950 Williamson .................. 241/51 X

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ABSTRACT

A portable compost grinder including a generally semi-cylindrical housing having circumferentially spaced inlet and discharge openings, opposite axial air inlet openings and an axially mounted horizontally arranged driven shaft. A pair of closely spaced radially extending, convex-concave cutting blades is mounted on said driven shaft and a pair of fan assemblies also is mounted on said shaft on opposite sides of said pair of cutting blades. The fan blades or vanes of one of said assemblies have an opposite pitch relative to the vanes of the other assembly so that on rotation of the shaft, air is drawn into the housing in both radial directions. Composting material is fed into the housing through the inlet opening in a radial direction relative to the shaft. Rotation of the shaft forces the cutting blades into the composting material to drive the material into engagement with inwardly extending cutting teeth arranged spaced apart as a part of a grating assembly removable located interior of the housing adjacent the mouth of the discharge opening. Air introduced by the fan assemblies is used to drive the finely comminuted material through the grating to and through the discharge opening. The cutting blades extend radially longer than the vanes of the fan assemblies. In this manner the speed of rotation of the blade tips is increased to generate an area of reduced pressure or suction at the peripheral area traversed by the tips. The thus generated suction not only aids in driving the comminuted material through the grating but serves to carry large, partially comminuted material upwards from the grating to impinge upon the rear wall of the housing and effect continued passage through the grinder until satisfactory comminution has been achieved. A safety disconnect device, an improved feed system, many constructional features enabling easy disassembly and reassembly, as well as other advantageous features are described.

26 Claims, 9 Drawing Figures
PORTABLE COMPOST GRINDING APPARATUS

FIELD OF THE INVENTION

This invention relates to comminuting or grinding apparatus and more particularly provides a portable compost grinder particularly useful for reducing plant and animal debris such as leaves, twigs, tree branches, vines, hedge clippings, animal husbandry debris and the like to garden mulching or compost material.

Increasing interest in lawn and garden care has developed corresponding interest in machines which are capable of comminuting composting materials to reduce the same to a size which is readily decomposable to form a natural fertilizing material highly effective for spreading over soil and grass. Many prior comminuting machines have utilized a hammermill principle wherein rotating knives or blades are used to cut and chop material through repeated agitation of the material and cutting and breaking of such material until it has been reduced to a size which will pass through a screen-like discharge opening from the machine. In machines of this type, clogging becomes a serious problem since elongated strands tend to wrap themselves around the drive shaft mounting the rotating elements. Some materials such as leaves or the like tend to clog the screen of the discharge opening with the result that the opening becomes blocked, the machine must be stopped, torn down and cleaned before it can be returned to service. In an effort to eliminate the problem of clogging, means have been provided to generate air flow to draw the composting material from the discharge opening or screen or has provided foraminous walls which are periodically agitated to release the fine material and prevent clogging. The use of fan means to generate an air flow has been utilized but usually as a separate, independently mounted component with the air stream to be applied in a direction at will. It is not believed that the fluidics interior of the comminuting housing has been adequately appreciated so that means can be provided to assure the production of a comminuted material sufficiently fine prior to impact upon a screen or its equivalent so as to avoid clogging. Advantage can be taken of Bernoulli's principle in providing means to establish areas of low pressure within the comminutor housing whereby material is held in such relation to the comminuting blades that the efficiency of pulverization markedly is increased.

Concomitant with the desirable increased efficiency, it would be likewise advantageous to have a compositor or compost grinder which is sufficiently versatile so that it may be utilized in cooperation with various types of material handling and transporting apparatus. In addition, relative simplicity of construction to facilitate knock-down such as for cleaning and replacement of parts, also would be desirable. If one could increase the efficiency of such machines to a point where fewer horsepower drive means can effect desirable and efficient results considerable advantage would follow.

Additionally, versatility in the type of debris capable of being pulverized or comminuted has been a rare attribute in prior composting machines. The available compost grinding machines either are constructed for shredding plant debris such as grass cuttings, leaves, hedge cuttings, twigs and the like or have been particularly designed for treating animal debris such as would be gathered from barns, chicken houses, etc. where much foreign material is gathered and has to be treated. Among such material can be found stones, pieces of wood; even metallic debris can be encountered. Machines which have means for comminuting plant debris do not handle the type of debris picked up from barns, chicken houses and the like. The compost grinding machine which can handle both types of materials efficiently yet which is economical to operate, easy to knock down and reassemble and truly efficient in producing a compost material reduced to the desirable fine particle size has as yet been unavailable.

SUMMARY OF THE INVENTION

A compost grinder which includes a housing, a driven shaft having a horizontal axis of rotation, comminuting blade means carried by said shaft between its ends and fan means also carried by said shaft on opposite sides of said comminuting blade means, air intake means adjacent opposite ends of said shaft, inlet means and outlet means are arranged spaced along the periphery of the rotational path of said comminuting blade means, grate means disposed between said outlet and said outer periphery, feed means for introducing composting material radially to said comminuting blade means and drive means for operating both said driven shaft and said feed means in synchronism one with the other. The blades of the comminuting blade means extend radially outward further than the vanes of the fan assemblies so as to define a peripheral circumferential area of reduced pressure whereby material is held to the blade tips as they rotate imparting an increased velocity to material as it is dislodged from said tips to the grate means. The grate means include integral teeth extending radially inward toward the said peripheral area and plural parallel bracing bars are secured to the grate framework. The grate is capable of installation with the teeth extending inwardly toward the comminuting blade means or, where a coarse product is desired, simply is reverse mounted. A framework is provided of sufficient height to permit a wheebarrow or the like to be positioned below the discharge opening or, alternatively, to permit conveying belt means or the like to be positioned below the discharge opening. The framework of the machine further is provided with front wheels and rear handle means so as to render the apparatus portable, capable of movement from place to place easily and with little effort.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the compost grinder constructed in accordance with the invention, portions of which have been broken away to show interior details;

FIG. 2 is a fragmentary plane view of the compost grinder illustrated in FIG. 1, portions of which have broken away to show interior detail;

FIG. 3 is a fragmentary side view of the compost grinder illustrated in FIG. 1;

FIG. 4 is a fragmentary section taken along lines 4-4 of FIG. 2;

FIG. 5 is a view similar to that of FIG. 2 but illustrating the apparatus in a different stage of its operation;

FIG. 6 is a fragmentary detail of the compost grinder apparatus illustrated in Figure;
FIG. 7 is an exploded detail illustrating portions of the comminuting apparatus which is installed in the grinder illustrated in FIG. 1.

FIG. 8 is a section taken along line 8—8 of FIG. 7; and

FIG. 9 is a detail shown in section illustrating the assembly of the parts illustrated in FIG. 7.

DESCRIPTION OF PREFERRED EMBODIMENT

The compost grinder provided by the invention particularly is characterized by the provision of a horizontally disposed driven shaft arranged mounted within a housing. The shaft carries cutter blade means mounted for rotation with said shaft. Fan assemblies are mounted adjacent opposite ends of the shaft likewise for rotation with said shaft. Air intake ports are provided in the housing coaxial with said shaft. The fan blade assemblies have opposite pitch so that during rotation of the shaft, air is sucked into the housing in an axial direction from opposite air intake ports. The housing is provided with an inlet and an outlet or discharge chute circumferentially spaced from the inlet. Feed means are provided for introducing composting material into the housing. A grate assembly is provided interior of the housing and adjacent to the discharge opening. Composting material is fed in a direction radial to said rotational axis of the said driven shaft so that the rotating cutting blades pass downwardly into the composting material urging the composting material past the cutting teeth provided on the grate. The cutting teeth of the grate extend inwardly of the housing. The grate can be positioned reversibly.

The cutting blade assembly particularly is characterized in that the cutting blades are longer than the vanes of the fan whereby the blade tips extend radially outwardly further than the vanes. As a result, the tips of the cutting blades move faster than the fan blades creating a peripheral area of low pressure along the rotational path followed by said blade tips about the axis of the driven shaft. This effectively forces material to cling to the blade tips and thus be brought into more effective contact with the cutting teeth of the grate. The air, sucked into the housing by the fan blade assemblies, drives the comminuted compost material through the grate, to and through the discharge chute. These and other desirable features of a compost grinder provided by the invention herein shall be described hereinafter.

Referring to FIG. 1, the compost grinder 10 constructed in accordance with the invention comprises a chassis frame 12 on which is mounted a housing 14, preferably formed of sheet steel. The operational mechanisms of the grinder 10 are disposed in the housing 14 and includes feed means 16 and comminuting means 18. A motor 20 drivably is coupled directly to operate the rotary cutter means 22 of the comminuting means 18. The rotary cutter means 22 in turn, is linked operationally to drive the feed means 16. The comminuting means 18 also includes fan means 24 operable with the rotary cutter means 22 to introduce air axially into the comminuting chamber 26 of the housing 14. Composting material enters the chamber 26 radially, to rotary cutter means 22 and is driven thereby and by the axially introduced air, to stationary cutter means 28 and out from the comminuting chamber 26 therepast, by way of discharge opening or chute 30. The rotary cutter means 22 are constructed so as to generate an area of reduced pressure about the peripheral path traversed by the extremities of the cutter means 22, as will be explained hereinafter.

It is believed that the material being acted upon is driven to said extremities and maintained in motion because of the thus generated reduced pressure area. Larger partially comminuted portions of the composting material is directed first to a wall portion of the comminuting chamber 26, and then, back to the inlet area for additional passes through the rotary cutting means 22 until all are reduced to the desired particle size.

As illustrated in FIG. 1, the chassis frame 12 of the grinder 10 is formed using angled members 32 and 34 at the sides, and connecting tubular cross members 36 and 38 arranged as shown. Each of the angled side members 32 and 34 are bent at about 90° approximately midway between their ends to define a bend or peak 40. The forward ends of members 32 and 34 also are bent at an acute angle to define vertical legs 42 and 44. The legs 42 and 44 are secured to a hollow cross member 38. A rod 46 is disposed through member 38 to define a shaft extension 26 of the member 38 at the opposite ends. The rod 46 is provided with through openings at its ends. Wheels 48 are journaled on the rod 46 with cotter pins 50 utilized to retain the wheels 48 on rod 46.

The opposite ends 52 of members 32 and 34 are secured to the upper ends of posts 54. Posts 54 are provided with threaded bottom opening bores (not shown) to accommodate the threaded shafts 56 of flat base levelers 58. Rearwardly directed handles 60 are secured to the upper ends of posts 54 and offer to the user a purchase to enable manual locomotion of the compost grinder 10.

Cross member 62 of right-angle cross section is secured to members 32 and 34 at a location closer to the peak 40 than to the posts 54. A second cross member 64 is secured to upstanding member 66 which is in turn secured to the side members 32 and 34 at locations near the respective peaks 40 thereof. Members 66 are arranged substantially perpendicular to the members 34 and 34. A bridging bar 68 is seated in suitable openings formed near the free ends of members 66 and are secured therein by suitable bolts 70.

A platform 72 carrying a pair of parallel slots 74 is mounted on the bridging bar 68. The platform 72 is suitably braced by brace means not visible in the drawing. The motor mounting plate 76 is secured to platform 68 by suitable fastening means 78. The fastening means 78 are slidable in slots 74 to permit adjustment of the position of the motor 20 mounted to plate 76.

A rectangular frame 80 is secured to the legs 32 and 34 in vertically upright position and at a location between the peaks 40 and legs 42 and 44. The frame 80 is of L-shaped cross-section and includes right angle flange 82. The frame 80 is side braced by member 84 connected between cross member 66 and the upper portion of frame 80. The lower portion of frame 80 has notches 86 to enable seating thereof upon the side members 32 and 34 of chassis 12 and serves as the primary support for the housing 14.

The frame 80 is provided with a pair of hollow curved portions 88 at the upper ends of the side members 90 of frame 80. The portions 88 are coaxial, the axes horizontally disposed, that is, at right angle to the sides 90. Another pair of curved portions 92 are provided at the
lower ends of sides 90 and a third set of curled portions 94 are provided secured to the flanges 82 of frame 80 near the upper and the lower portions thereof, the axes of said curls 94 being arranged normal or perpendicular to the horizontal axes of curls 88. Curls 88 are capable to accommodate an elongate pin 96; curls 92 are capable of accommodating pins 98 and curls 94 are capable of accommodating pins 100. Accordingly there is thus defined suitable pin and hinge connections for securing demountably the housing parts to the frame 80 and maintaining the said parts in assembly.

The height of the peak 40 relative to the ground is selected to permit accommodation below the chute 30 of wheeled carrier means such as a wheel barrow or conveyor means for transporting the comminuted material to a desired location.

The housing 14 is formed of two sections 102 and 104. Section 102 shall be referred hereinafter as the rear section and section 104 shall be referred to hereinafter as the forward section.

The rear section 102 is defined by a pair of spaced opposite side walls 106 and an upright rear wall 108. Rear wall 108 includes an arcurate upper section 110. The rear edges of walls 106 conform to the configuration of wall 108. Accordingly, when assembled, a front and bottom opening enclosure 112 is defined, the perimeter configuration of the front or forward opening portion 114 rectangular in configuration. The front edges 115 of the housing section 102 includes a pair of outward directed curved 116 of length, diameter and configuration enabling seating between curls 94 so that the section 102 can be mounted to the frame 80 by the pin and hinge connection consisting of pin 100 accommodated respectively through curls 94 and 116.

The forward section 104 of housing 14 is defined by a pair of opposite side walls 118, arcuate top wall 120, arcuate front wall 122, and a bottom wall or trap door 124 hingedly connected to the side walls 118. The side walls 118 have semicircular outwardly opening notches 126 opening to the rearwardly facing edges of said side walls. The front wall 122 is foreshortened to leave an opening 128 between its free ends 130 and the trap door 124. Such opening 128 shall be referred to as the inlet or entrance to the comminuting chamber 26 defined interior of housing 14.

Elongated curl 132 is provided on the top wall 120 and the side walls 118 are suitably configured to form, with respective curls 88 and 90, and pins 94 and 98 respectively, pin and hinge connections for securing removably the section 104 to the frame 80. In this manner the assembly of housing 14 is completed by securing both sections 102 and 104 to frame 80 with the latter acting as a connecting bridge.

The housing 14 further includes a feeder housing 136 with an inlet hopper 138 formed as a part thereof. Side walls 118 have a pair of opposite, like forwardly directed extensions 140 defining the side walls of both the feeder housing 136 and the hopper 138. A floor 142 is provided between the extensions 140. The extensions 140 diverge at the entry end of the hopper 138 and hence the floor 142 is wider at the forward end, that is, the entrance to the hopper 138 than it is at its juncture with the trap door 124. At its juncture with the trap door 124, the floor 142 is provided with an accurately bent portion or lip 144 extending over the hinge connection between the trap door 124 and housing 14. The side extensions 136 are joined to the floor 142 along the longitudinal edges thereof. Vertically oriented slots 146 are provided in each side wall extension 140 respectively. The slots 146 are opposite and aligned one with the other. A top or bridging wall 148 is provided. One arm 150 of the hinge 152 is secured to wall 148. The other arm 154 of hinge 152 is secured to arcuate or domed cover 156. Cover 156 has a front lip 158 carrying a handle 160 and can be moved pivotally between an open condition and a closed condition thereby to complete the feed chamber 162 defined within the area bounded by floor 142, the pair of side extensions 140, and said cover 156.

A fixed shaft 164 is arranged between the extensions 140 across the mouth of the feed chamber 162. The shaft 164 is mounted in suitable aligned openings 166 formed in said extensions 140. A bottom opening dish-shaped skirt holder support 168 is mounted to shaft 164 for pivotal movement. The support 168 has a pair of rearwardly extending arms 170 terminating in a pair of tubular portions 172.

A driven feed shaft 174 is arranged horizontally disposed across the feed chamber 162 between the side extensions 140 with the opposite ends of said shaft 124 journalled in slots 146. The support 168 pivots about the axis of shaft 164, causing the portions 172 associated with shaft 174 to move with slots 146 raising and lowering said shaft 174. A pulley wheel 176 is secured to one end of shaft 174 rotatably to drive same. Suitable graphite impregnated bearings are provided.

Shaft 174 has a pair of like, somewhat resilient pin wheels 176 and 176* mounted thereon spaced one from the other. The pin wheels 176 and 176* rotate with the shaft 174. The pin wheel 176 is arranged with its arcuate blades 178 are offset relative to the position of blades 178* of pinwheel 176*. Each of the blades 178 and 178* have arcuate outer edges 180 and 180* which act as pushers against the composting material entering the feed chamber 162 from the hopper 138 when the pin wheels 176, 176* are rotated in the direction of arrow 182. The pinwheels preferably may be formed of semi-flexible belting material.

A slotted skirt 184 is secured to support 168. A flexible skirt 186, preferably formed of similar belting material is secured to the holder 184 by suitable fastening means 188. The skirt 186 functions as a height level regulator for the composting material passing therepast from hopper 138, pivoting the holder 184 to maintain the level of material so that the surfaces 180 can act as pushers upon the material.

A floor portion 142* is cantled downwardly on the comminuting chamber side of floor 142 so as to define ramp means leading to said commuting chamber 26 by way of inlet 28.

The comminuting means 18, according to the invention, includes the rotary cutter means 22 comprising a driven rotary cutter shaft 190 mounted horizontally across the chamber 26 and passing at opposite ends through the air intake openings defined by notches 126. The shaft 190 is channelled in pillow blocks 192 which are secured respectively to frame 80 by suitable fastening means 194. Pulley wheels 196 and 198 are secured respectively to the opposite ends of shaft 190 outside housing 14. Comminuting blades 200 and 202 have a common integral hub 204 mounted to shaft 190 for rotation therewith. The blades 200 and 202 extend radially outward from hub 204. The blades 200 and 202 are offset 90° one relative one another so that their
Each blade 200 and 202 has concave cross-section dishlike surfaces 206 and convex cross-section surfaces 208 as shown in FIG. 8. Each blade tapers toward the extremities thereof terminating in an arcuate end 210 which leads to a tip 212. The blades 200 and 204 are arranged centrally located relative to the shaft 190. As shown, blades 200 and 204 are of equal lengths but can be unequal.

The fan means 14 comprises a pair of fan assemblies 214 mounted to the shaft 190 for rotation therewith. The fan assemblies 214 are located on the shaft at opposite sides of blades 200 and 202 and between said blades and the side walls 118. Each fan assembly 214 rotates with the shaft 190. An inwardly extending, angularly disposed circular baffle 216 is secured near walls 106 and 118 interior of the section 102 and 104 respectively and bordering the air-intake openings 126 to define an enclosure within which the fan assemblies 214 are located when the shaft 190 is positioned operationally.

Each fan assembly 214 has a hub 218, a rim 220 and radially outwardly extending angled vanes 222 connecting the hub and rim. The vanes 222 are substantially shorter in their outward extension radially than the blades 200 and 202. The blades 200 and 202 extend outward radially at least twice, but here three times, the length of the vanes 222. The pair of fan assemblies 214 are arranged one relative to the other so that the respective vanes thereof are pitched oppositely so that exterior air is drawn into the chamber 26 axially when the shaft 190 is rotated. As shown herein, the pitch is 40°.

As will be evident from an inspection of the drawing, the baffle 216 is constructed of two parts due to the separability of the two parts of the housing 14. The section 224 of baffle 216 is secured to the inside vertical portions of frame 80 while section 226 of baffle 216 is secured to the inside of side walls 118 immediately adjacent the notches 126 thereof. When the housing 14 is assembled by assembly of sections 102 and 104, the circular baffle 216 is completed.

The comminuting means 18 further includes stationary cutter means 28 in the form of grate means 228 arranged disposed in intercepting relation to the flow of compost material from the rotary cutter means 22 to the chute or discharge opening 30. The grate means 228 comprises a plurality of spaced toothed parallel arranged elongate arcuate bars 232, each having inwardly directed cutting teeth 234. The bars 232 are arranged between a pair of top and bottom cross pieces 236, 236'. Suitable mounting openings 238 are provided in the cross pieces 236, 236'. Support rods 240 are passed through suitable openings formed in pieces 236, 236' whereby to space pieces 236, 236' and to complete the grate means 228. A holder plate 242 is secured to the upper surface 244 of rear wall 108. The upper piece 236 of the grate means is secured in flowably to said plate 242 by suitable fastening means such as the threaded pins 246 and the lower piece 236' of the grate means is secured removably to the frame 80 by suitable fastening means such as threaded coupling pins 248. Suitable mounting openings 238 formed in pieces 236, 236' cooperate with pins 246 and 248, respectively.

A plurality of spaced shredder rods 252 are arranged transverse the members 232, said rods 252 being passed through aligned passageways 254 formed in the members 232. The arcuate plane in which the rods 252 are disposed is spaced a small distance from the peripheral path taken by the tips 212 of blades 200 and 202.

The blade tips 212 follow a path disposed between adjacent bar members 232.

The trap door 124 is hingedly secured to the housing 14 to define the floor of comminuting chamber 26. A disabling mechanism in the form of a mercury switch 256 is mounted to and exterior of trap door 124. The weight of switch housing 257 and door 124 is sufficient to cause the trap door 124 normally to be open by the action of gravity. A spring biased ball and socket connection 260 latches the door in closed condition. A lever handle 262 is connected to coil spring 264 which in turn is secured to lug 266 on the door exterior. Pin 268 terminating in ball 270 at its free end, is secured fixedly to the handle 262 in a substantially right angle arrangement, and is pivotable at its juncture 263. The handle 262 is biased in the direction of arrow 264'. The ball 270 is biased in the direction of arrow 272 to seat in a socket 274 in the form of an opening formed in the frame 80. Accordingly, the door 124 is maintained in closed condition during operations of the grinder 10. Should debris or large particulate matter jam the blades or be lodged in blocking position relative thereto, the overload force generated thereby would overcome the bias of the spring 264 and thereby force the ball 270 from its socket 274 releasing the trap door 124. The door would open under gravity and the mercury switch 256 would open to deenergize the drive means operating the comminuting means 18.

The grate means 228 can be reversed to place the teeth 234 further away from the peripheral path of cutter blade means 22 for rough cut results. By reversal, it is meant that the portion 236 is connected to frame 80 and the portion 236' is connected to the plate 242. Also, the shredder rods 252 can be removed either completely or in part so that the resultant product is less fine. The drive means 276 including motor 20, for operating the comminuting means 18 and the feed means 16 comprises a primary drive train operative on the shaft 190 and a secondary drive train operative upon the shaft 174 of the feed means 16.

The primary drive train comprises a drive pulley 278 mounted on shaft 280 of motor 20. A pulley wheel 196 is mounted on the shaft 190 and an endless belt 284 couples the pulley wheels 278 and 196. A suitable guard arrangement 286 is pivotally mounted to limit exposure of the primary drive train, that is, the drive pulleys 278 and 282 linked by endless belt 284.

The secondary drive train comprises a pulley wheel 198 secured on the opposite end of shaft 190, a driven pulley wheel 290 secured to the shaft 174 of feed means 18 and, an endless belt 292 coupling the pulley wheels 288 and 290. Spring biased tensioning means 294 are provided to keep the belt 292 taut notwithstanding movement of the feed means 174. The tensioning means 294 comprise a groove pulley wheel 296 mounted for free rotation on a shaft 298. Shaft 298 is secured to one arm 300 of dog 302. Dog 302 is secured pivotally to the extension 310 which functions as the side wall of the feeder housing. The other arm 304 of dog 302 has an eye 306 in which one end 308 of coil spring 310 is fastened. The opposite end 312 of spring 310 is fastened to fixed arm 314. Fixed arm 314 is secured to the wall 140 at a location spaced from the dog
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302. The groove of pulley wheel 296 is aligned with the belt 292 and constant tension is applied to said belt 292. Suitable power switch means 316 is provided as shown.

It should be pointed out that the particular embodiment illustrated in the drawings and described herein illustrates merely one example of a compost grinder constructed in accordance with the invention. The manner of securing the two parts of the housing, for example is exemplary only and does not comprise a limitation on the scope of this invention. The housing can be of one part or plural parts likewise the number of blades, the number of pin wheels, the manner of mounting the housing to the framework carriage, the specific drive connections, the method of providing and mounting the various switch means and the like can be varied within the skill of the art without undue experimentation. The particular embodiment is intended to afford sufficient space thereunder to enable a wheelbarrow or lawn cart to be placed thereunder so as to catch the comminuted product as it is discharged from the chute 30. Obviously one can place a conveyor, an elevator or the like below the discharge chute so as to transport the product into a trunk or other carrier for delivery to a delivery location.

In the illustrated embodiment, the pitch of the vanes of the fan assembly is set at 40° and effectively controls the quantity of air introduced into the housing through the air intake openings to provide the desired amount.

What it is desired to be secured by Letters Patent of the United States is:

1. A compost grinder comprising: a housing having circumferentially spaced inlet and discharge openings and opposite axially aligned air intake openings, commingling means arranged within said housing and including rotary cutter means arranged for rotation about a horizontal axis substantially coaxial with said air intake openings within said housing and stationary cutter means arranged between said rotary cutter means and said discharge opening, feed means arranged to transport composting material to said comminuting means in a radial direction relative to said rotary cutter means, drive means, including a motor, operably connected to said rotary cutter means, means coupling said rotary cutter means to said feed means synchronously to drive same, and fan means associated with said rotary cutter means for operation therewith, said fan means arranged adjacent to said air intake openings whereby air is introduced axially into said housing simultaneously with the operation of said rotary cutter means propelling the composting material through the comminuting means and the discharge opening.

2. The compost grinder as claimed in claim 1 in which said rotary cutter means comprise driven shaft means horizontally disposed substantially coaxial with said air intake openings and across the interior of said housing, cutting blade means mounted on said shaft means intermediate the ends thereof and said fan means comprise fan assemblies mounted on said shaft means on opposite sides of said cutting blade means and adjacent said air intake openings interior of said housing, each fan assembly having a hub mounted to said shaft for rotation therewith, a rim and plural vanes extending radially between said rim and said hub, the pitch of said vanes of one fan assembly on one side of the blade means being opposite to the pitch of said vanes of the other fan assembly on the other side of said blade means whereby when the shaft is rotated in one direction air is drawn through the opposite air intake openings into said housing.

3. The compost grinder as claimed in claim 2 in which said cutting blade means comprise at least one elongate cutting blade having a central portion and tapering toward its opposite ends, said cutting blade being mounted on said shaft means by said central portion for rotation with said shaft.

4. The compost grinder as claimed in claim 2 in which said cutting blade means comprises a pair of elongate cutting blade members, each of said blade members having a central portion midway between its ends and each tapering gradually toward its opposite ends from said mid-portion and means securing said mid-portion to said shaft, one of said cutting blades being arranged angularly offset the other.

5. The compost grinder according to claim 4 in which said cutting blade members are offset angularly one relative to the other approximately 90°.

6. The compost grinder according to claim 2 in which said cutting blade means comprise at least one elongate cutting blade mounted upon said shaft for rotation therewith, said cutting blade extending radially outward in opposite directions an amount substantially greater than the radial extent of said vanes.

7. The compost grinder according to claim 4 wherein the pair of cutting blades are of equal length.

8. The compost grinder according to claim 4 wherein each of the pair of cutting blades extend radially outward of said shaft means a greater distance than the said vanes.

9. The compost grinders as claimed in claim 7 wherein each blade terminates at its outer ends in a concave portion and an outer tip.

10. The compost grinder according to claim 4 wherein each blade is bowed slightly transversely of the long axis of the blade so that one side of the blade is slightly concave and the other side of the blade is slightly convex.

11. The compost grinder according to claim 4 in which each portion of the blade has oppositely facing sides and oppositely facing edges, the edges of the blades being nonparallel and inclining toward the tip of the blade, said blade being truncated thereat.

12. The compost grinder according to claim 11 in which the truncated tip of one blade portion is concave.

13. The compost grinder according to claim 11 in which the truncated end of one blade portion is arcuate.

14. The compost grinder according to claim 1 in which there is provided grate means secured to the interior of said housing adjacent said discharge opening and comprise a curvilinear frame having opposite ends and sides, the sides being arcuate in lengthwise configuration, a plurality of arcuate elongate bars arranged edgewise in spaced parallel array extending parallel to said arcuate sides and secured to said opposite ends extending across said frame, said stationary cutter means comprise teeth extending from said arcuate bars projecting inwardly relative to said frame, toward said rotary cutter means and means for mounting said grate means to said housing.

15. The compost grinder as claimed in claim 14 in which said opposite ends of said grate means are symet-
11. The compost grinder as claimed in claim 14 in which rod means are arranged across said frame in spaced parallel array bridging said arcuate sides of the frame whereby to define auxiliary shredding means.

16. The compost grinder as claimed in claim 14 in which rod means are arranged across said frame in spaced parallel array bridging said arcuate sides of the frame whereby said grate means may be reversibly mounted relative to said rotary cutter means.

17. The compost grinder as claimed in claim 16 in which said rod means are removably engaged through said bars.

18. The compost grinder as claimed in claim 1 in which means are provided for generating an area of reduced pressure along the circumferential path traversed by the outermost portions of said rotary cutter means.

19. The compost grinder as claimed in claim 2 in which means are provided for generating an area of reduced pressure along the circumferential path traversed by the outermost portions of said rotary cutter means.

20. The compost grinder as claimed in claim 19 wherein said rotary cutter means include blade means mounted on said driven shaft means radially extending therefrom for rotation therewith, said blade means respectively terminating in blade tips and said blade tips extending radially substantially further than the radial extent of said vanes whereby to generate said area of reduced pressure upon rotation.

21. The compost grinder as claimed in claim 1 in which said housing includes a planar vertical rear wall.

22. The compost grinder as claimed in claim 1 in which there is safety disconnect means coupled to said motor and comprising a springloaded trap door, disconnect switch means mounted on said trap door, whereby blockage of said comminuting means causes the trap door to open, said safety switch means adapted to de-energize the motor when the said trap door opens.

23. The compost grinder as claimed in claim 1 and a framework chassis mounting said housing, said framework chassis spacing the discharge opening of said housing above ground to enable conventional transport of comminuted material from said discharge opening to a delivery location.

24. The compost grinder as claimed in claim 1 in which said feed means comprise shaft means mounted for rotation about an axis arranged spaced from but essentially parallel to said rotary cutter means to said shaft means and pin wheel means mounted on said shaft for rotation therewith, said pin wheel means having curvilinear blades extending radially outward of said shaft, the outer surfaces adapted to engage the composting material to push same toward the inlet opening.

25. The compost grinder as claimed in claim 1 in which said feed means comprise shaft means arranged between said inlet and said hopper means mounted for rotation about an axis parallel to the axis rotary cutter means, said link means coupling said rotary cutter means to said shaft means and pin wheel means mounted on said shaft, said pinwheel means having curvilinear blades extending radially outward of said shaft and leveling means operable coupled to said shaft means and positioned between said hopper and said shaft means.

26. The compost grinder as claimed in claim 1 in which said feed means comprise shaft means arranged between said inlet and said hopper means mounted for rotation about and axis parallel to the axis said rotary cutter means, said link means coupling said rotary cut- ter means to said shaft means and pin wheel means mounted on said shaft, said pin wheel means having curvilinear blades extending radially outward of said shaft and leveling means operable coupled to said shaft means and positioned between said hopper and said shaft means, said leveling means being pivotal to raise and lower said feed means whereby to assure pushing engagement of said pin wheels with the upper level of said composting material.

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