Jan. 1, 1963 A. L. HIGER 3,071,328

GARBAGE GRINDING MACHINE

Filed June 11, 1959

2 Sheets-Sheet 1

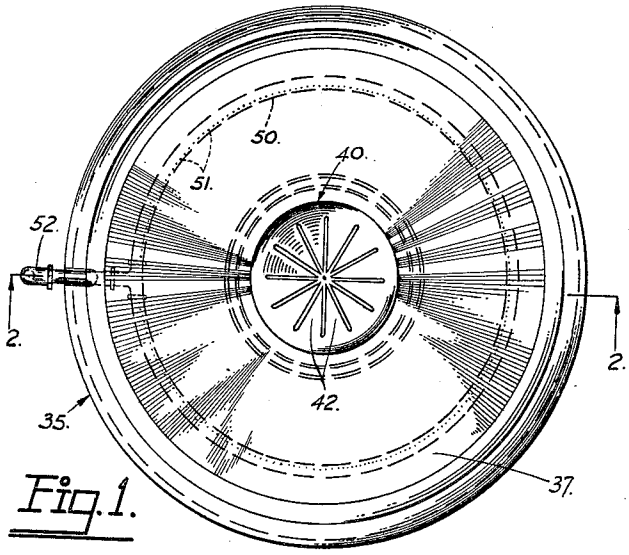


Fig. 1.

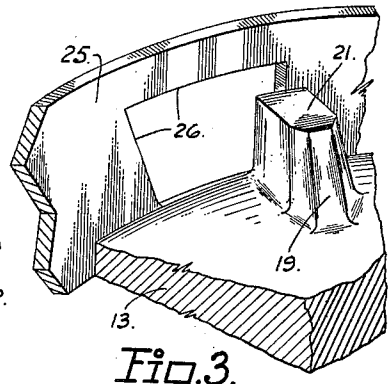


Fig. 3.

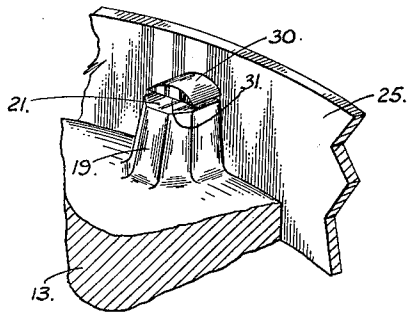


Fig. 4.

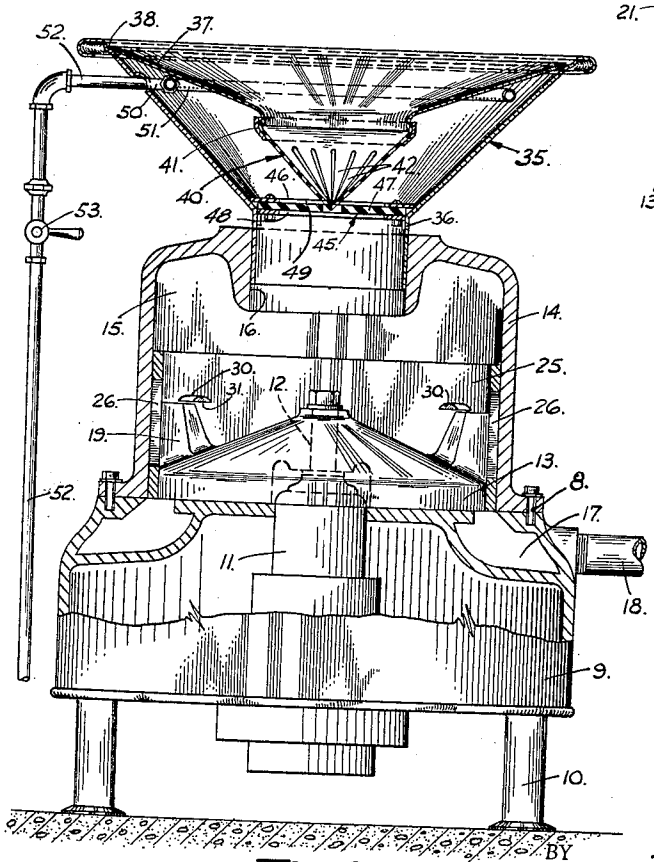


Fig. 2.

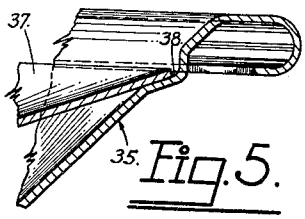


Fig. 5.

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GARBAGE GRINDING MACHINE

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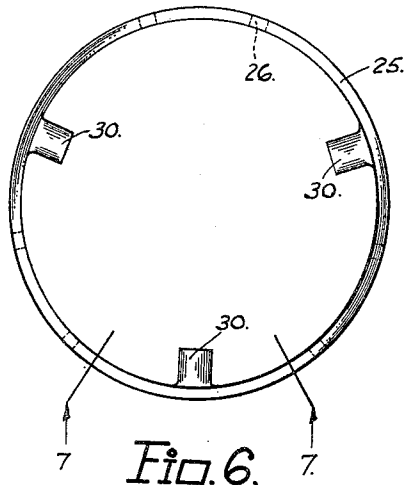


Fig. 6.

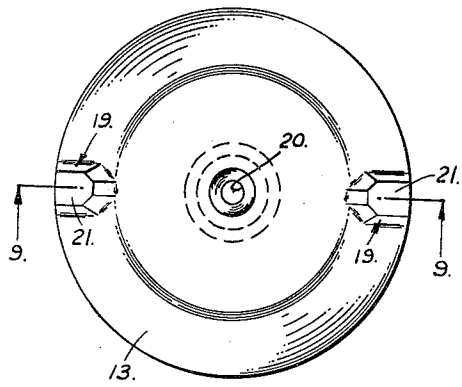


Fig. 8.

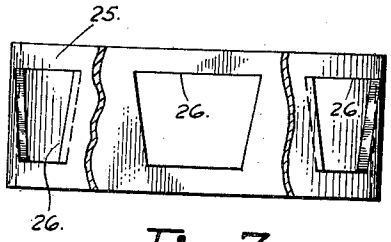


Fig. 7.

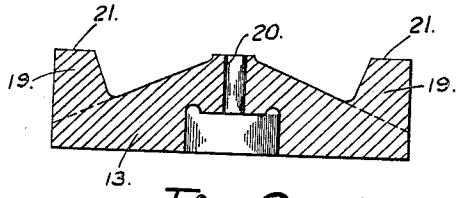


Fig. 9.

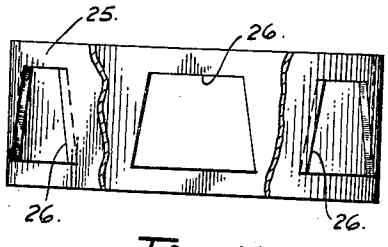


Fig. 11.

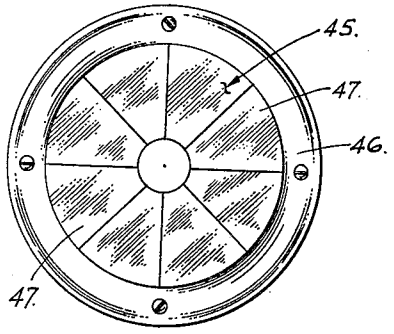


Fig. 10.

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GARBAGE GRINDING MACHINE

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2 Claims. (Cl. 241—46)

This invention relates to refuse disposal or garbage grinding machines and more particularly to a machine having an improved arrangement for cutting and disintegrating waste material and reducing it to a liquid or semi-liquid state.

One of the objects of this invention is to provide an improved refuse disposal or garbage grinding machine which reduces the number of operating parts.

Another object of the present invention is to provide an improved refuse disposal or garbage grinding machine which is simple in construction as compared to conventional machines of similar size and yet increases the cutting capacity and efficiency of the machine.

A further object of this invention is to provide a machine for grinding garbage and other waste material in which the cutting mechanism performs a self-cleaning action during the cutting operation preventing any objectionable clogging or resurgence of the material being ground and disposed of.

Yet another object of this invention is to provide a machine of the class described which is quiet in operation as compared to previously known machines in this art.

A still further object of this invention is to provide in such a grinding machine, a single cutting rotor, the upper surface of which is smooth and free of projecting sharp upstanding cutting devices, having integrally formed cutting members of hardened steel located for cutting action only at the outer peripheral edge of said rotor and which does not require separate or additional cutting blades or devices.

Another object of this invention is to provide, in a garbage grinder, a plurality of apertured cutting windows formed in the inner wall of the housing of the grinder and designed for cooperation with a cutting rotor having integrally formed upstanding cutting members formed at its outer peripheral edge in a manner to grind refuse and garbage at said edge, eliminating the necessity of separate or additional cutting blades or devices.

A still further object of the present invention is to provide improved loading means for a garbage grinder which includes dual flexible closure members which serve to reduce the noise produced by the machine in operation and eliminate outward splashing of the material being ground.

It is also an object of this invention to so construct the loading means that safety is provided for the operator by making it difficult to extend his hand or arm into the machine thereby avoiding accidents.

Further objects and advantages will become apparent from the following desription and accompanying drawings in which like references designate corresponding parts throughout the several views.

FIG. 1 is a plan view of the improved garbage grinding machine embodying the present invention.

FIG. 2 is a cross-sectional view taken on the line 2—2 of FIG. 1 showing the novel cuttnig rotor in elevation.

FIG. 3 is a perspective view illustrating a portion of one of the integral cutting members of the cutting rotor in its operative relation with one of the apertures of the cutting ring.

FIG. 4 is a perspective view illustrating a portion of one of the integral cutting members of the cutting rotor in its operative relationship with one of the shearing members projecting from the inner surface of the cutting ring.

FIG. 5 is an enlarged sectional fragmentary view taken on the line 5—5 of FIG. 1.

FIG. 6 is a plan view of the cutting ring.

FIG. 7 is a side view of the cutting ring shown partially in section which is taken along the line 6—6 looking in the direction of the arrows of FIG. 5, for the purpose of presenting a clear view of one of the cutting apertures.

FIG. 8 is a plan view of the cutting rotor.

FIG. 9 is a cross-sectional view of the rotor taken along the line 8—8 of FIG. 7 and looking in the direction of the arrows.

FIG. 10 is an enlarged sectional view taken along the line 10—10 of FIG. 2 affording a plan view of one of the flexible closure members.

FIG. 11 is a side view of a modified form of the cutting ring with a portion broken away, in a manner similar to FIG. 6, for the purpose of presenting a clear view of the modified cutting aperture.

It is to be understood that this invention is not limited to the structure selected for illustration which is merely illustrative thereof as is the terminology employed for purposes of description. There may be considerable variations and adaptions of all or part of the teachings in accordance with the requirements of commercial practice.

Referring now to the drawings there is shown an improved refuse disposal or garbage grinding machine having a base 9, mounted on legs 10, in which there is operatively mounted an electric motor 11 having an armature shaft 12 carrying a cutting rotor 13 and extending into the lower portion of a vertically extending cylindrical shaped housing 14. This electric motor 11 is properly sealed as is well known in the art.

The housing 14 extends upwardly to form a loading and grinding chamber 15 and is reduced at its upper portion to form a cylindrical neck-like opening 16.

The upper walls of the base 9 are designed to provide an annular discharge chamber 17 when the base is assembled with the housing 14 by suitable means such as bolts 8. This chamber 17 is adapted to direct the ground matter downwardly toward a drain pipe 18 through which it is flushed on to a sewer to which pipe 18 may be connected.

The improved cutting rotor 13 of this invention is round as shown in FIG. 8 and its upper surface is conical as shown in FIG. 2 and FIG. 9 of the drawings. A pair of cutting members 19, which are in the form of upwardly projecting ears or studs and are cast in one piece integrally with the cutting rotor 13, are provided at the exact peripheral edge of the rotor. The rotor has a center hole 20 which is enlarged on the underside of the rotor to facilitate mounting on the armature shaft 12.

The upwardly projecting cutting members 19 are substantially vertical at their outer periphery and have substantially flat horizontal top portion 21. The cutting members 19 are diametrically opposite each other in the embodiment of this invention which is here illustrated but it is understood that there may be three or more than the pair shown if desired.

The cutting members 19 as well as the rotor 13 of which they are an integral part, are of hardened steel, which hardening may be accomplished after casting by a suitable process well-known in the art. It will be particularly noted that, apart from the members 19 which are located at the extreme peripheral edge of the rotor 13, there are no sharp upstanding projections, cutting blades or other devices carried by the upper surface of the rotor and that the contour of this top surface is smooth and stream-lined. This reduces the danger of injury to the operator's hands because most of the cutting takes place at the outer peripheral edge of the rotor.

A cutting ring 25 is provided in the form illustrated in FIG. 6 and FIG. 7 which ring is of hardened steel and is assembled and fixed in the position illustrated in FIG. 2 by welding, swaging, or some other suitable well-known process. This cutting ring 25 may also be incorporated as a one piece steel casting integral with the housing 14 if desired and hardened after casting by a suitable process well-known in the art.

The cutting ring 25 is cylindrical in form and has three cutting windows or apertures 26 formed through its side walls as clearly illustrated in the drawings. In the form shown in FIG. 3 and FIG. 6 the greatest width of the cutting window 26 is at the top side of the window with the lower side slightly shorter causing the side cutting edges to converge towards each other in a downward direction. These apertures 26 may be cast in the inner wall of the housing if desired.

Three inwardly projecting lugs or shearing members 30 may be integrally formed on the inner cylindrical surface of the cutting ring 25 if desired and located intermediate the three cutting windows or apertures 26, their spacing being clearly illustrated in FIG. 6. These members 30 are also of hardened steel and the under surface 31 of each is flat horizontally and designed to cooperate with the cutting members 19 particularly with the flat horizontal top portions 21 of the cutting members as the rotor 13 rotates, in a manner which will be described hereinafter.

Naturally there may be more than three of these shearing members 30 if desired.

An improved loading means is provided for the machine of this invention which also serves as a closure for the top of the cylindrical housing 14 which is simple in construction and readily removable for cleaning purposes and which includes means to reduce noise and outward splashing of matter being ground. This novel loading means includes a conically shaped downwardly dished metal funnel-like member indicated generally by the numeral 35, having a cylindrical collar 36 formed at its lower end which is designed to snugly fit within the neck-like opening 16 of the cylindrical housing 14 which forms the loading and grinding chamber 15. The member 35 may be formed by stamping if desired.

The member 35 has another conically dished member 37 fitted within its upper peripheral edge by means of an annular shoulder 38 which is formed circumferentially adjacent and within the upper edge of member 37, thus the upper member 37 seats upon the shoulder 38, see FIG. 5, and may be separable and readily lifted from its seat on the shoulder 38 for cleaning purposes. This member 37 is dished to a shallower depth than the member 35, as shown in FIG. 2, and has an annular opening at its lower end.

A conically shaped flexible closure 40 is mounted at the lower end of the member 37 by means of a clamping ring 41 which is fixed to the lower end of the shallower dished member 37, by screws, bolts, or by other well known ring clamping means. The flexible closure 40 is composed of rubber, "Neoprene" or other flexible material such as plastic, or the like and has a plurality of downwardly depending closure fingers 42 formed by radially extending slots as clearly shown in FIG. 1 and FIG. 2. These fingers 42 of the conically shaped downwardly depending closure 40 are normally in the shape of a cone as shown in FIG. 2 and are easily spread apart for the insertion of material to be ground. After the material has passed through the flexible fingers 42 they snap back into normal conical position and act as a closure to prevent outward splashing of any upsurging material and reduce sound of operation of the grinder.

A second flexible closure member 45 is suitably mounted in a removable manner at 46 which is the point where the conical metal funnel member 35 is formed into the cylindrical collar 36. This closure member 45 is also composed of rubber or other desirable flexible material

and is radially slotted to form flexible finger portions 47 much in the manner of the finger portions 42 of the conical shaped closure 40, with the difference being that the second flexible closure member 45 and its flexible fingers 47 normally are flat disc-shaped and lie in a flat horizontal plane. See FIG. 10. The flat flexible closure 45 is clamped in any suitable manner between two flat metal rings 48 and 49. The upper ring 48 being of a sufficient diameter to seat on the shoulder formed at 46 where the conical member 35 is formed into the cylindrical collar 36 and the lower ring 48 being of sufficiently lesser diameter to fit within the collar 35.

This second flat disc-shaped flexible closure 45 serves, as does the first conical flexible closure 40, to further prevent any outwardly splashing of material and further reduces the operational noises of the grinder. The two closures 40 and 45 also reduce the chances of the operator extending his hand or arm down into the grinding chamber of the machine while it is in operation.

Novel means is provided for spraying water into the machine to assist the grinding and reducing operation and to wash and force the ground material along its way through the machine. For this purpose a water pipe is formed into a pipe ring 50 and mounted, by any suitable means, in the upper portion of the conical loading member 35 just below the upper shallow conically dished member 37, as illustrated in FIG. 1 and FIG. 2. The under and inner side of this pipe ring 50 is perforated with a multiplicity of holes 51 which function in the manner of a ring-shaped spray or shower. The pipe ring 50 is connected to a water supply pipe 52 which is connected to a source of water. A suitable shut-off valve 53 is located in the water supply pipe.

Thus water under the desired pressure will be sprayed in a conical pattern downwardly into the loading chamber.

A modified form of the cutting ring 25 is illustrated in FIG. 11 and by the dotted lines in FIG. 3, in which the cutting windows or apertures 26 are inverted so that the greater width of the window 26 is located at the bottom or lower portion of the window and the narrower width of this opening forms the top line of the window. Thus the cutting side edges of the opening taper toward each other in an upward direction. This arrangement is the reverse of the form disclosed in FIG. 6 and alters the direction of the cutting action which may be preferable in some conditions.

One of the principal features of this invention is the close fit which may be maintained if desired, between the outer periphery of the cutting rotor 13 including the outer peripheral cutting edges of the upstanding integrally formed vertical cutting and grinding members 19 and the vertical inner cylindrical wall of the cutting ring 25. The tolerated space there between may be arranged to be less than one sixty-fourth (1/64") of an inch if desired. This close fit between the hardened steel rotor 13 and its upstanding cutting members 19 and the inner wall of the hardened steel cutting ring 25 and the edges of the cutting windows 26 insures extremely fine cutting action and permits only completely ground waste material to be passed and washed there through into the discharge chamber 17 and on to the outlet pipe 18.

This extremely narrow annular space between the peripheral edge of the rotor 13 and inner surface of the ring 25 is the only exit for the waste material out of the grinding chamber 15 and into the discharge chamber 17 so that it will be apparent that the waste material may if desired be practically reduced to liquid or to a thin pulp form as it passes on into the discharge chamber 17.

The width of this space between the outer peripheral edge of the rotor 13 and the inner wall of the cutting

ring 25 may be predetermined at the time of the assembly of the machine to be of any size desired for any particular installation depending on the size, type, or character of the waste material to be disposed of.

The operation of this machine is as follows:

The waste material to be loaded into the machine and ground and disposed of is loaded or dumped into funnel-like conically shaped hopper member 35, and given a light push manually whereupon it passes through the flexible closure member 40 as the flexible fingers 42 of the closure flex and spread apart. The waste material next passes through the second horizontally disposed flat flexible closure 45 as the flexible fingers 47 of this second closure are similarly flexed downward and spread apart.

The material being treated now enters the grinding chamber 15 through the neck-like opening 16. After the material with which the machine is being loaded has passed through the flexible closure members 40 and 45, the fingers 42 of closure 40 and fingers 47 of the closure 45 snap back into closed position as shown in the drawings. This prevents back splashing and functions to insulate against the noises made by the grinding operation as herein before described.

The waste material now comes into contact with the grinding rotor 13 which is rotating at a suitable high rate of speed. The upstanding vertically projecting cutting members 19 agitate, toss and tumble the waste material as the rotor spins within the grinding chamber 15, which action prevents any possible packing and clogging. Centrifugal force plus the force of the water spray directs the waste into the cutting windows 26 of the cutting ring 25 and the peripheral vertical edges of the cutting members 19 come into high speed repeating cutting engagement with the hardened cutting edges of the windows 26 of the stationary cutting ring 25 effectively disintegrating the waste material.

As the upwardly vertically projecting cutting members 19 of the rotor 13 spin within the grinding chamber their upper portions 21 pass in close shearing relation with the underside 31 of the cutting members 30 which are integrally formed with the cutting ring 25 and project radially and horizontally inwardly into the grinding chamber 15, thus causing a repeating shearing and cutting operation between vertical members 19 and the horizontal members 30. This action aids greatly in the cutting and tumbling effect of the upstanding members 19. It is to be understood that these members 31 may be eliminated if desired in some forms of the machine.

Another feature of the arrangement above described is that the close fit of the rotor 13 and its upstanding members 19 and inner walls of the ring 25 provides and promotes a constant wiping action which cleans the inner cylindrical side walls of the ring 25. This is a further aid in the prevention of packing and clogging of the annular peripheral outlet as well as any part of the grinding chamber.

An outstanding feature of this machine is that the rotor 13 is adapted to be rotated in two directions by means of a reversible motor of a design which is well-known in the art. This feature together with the fact that two cutting substantially vertical side edges are provided in each of the three cutting windows or apertures 26 which are formed in the cutting ring 25, as clearly illustrated in FIGS. 3, 7 and 11 of the drawings, or which may be cast in the inner wall of the housing, as the case may be,

and the fact that two cutting edges are provided, one at each upstanding vertical edge of the cutting member 19 of the rotor 13, permits the desired cutting action in either direction in which the rotor is driven.

It is thus apparent that the effective cutting life of the machine is doubled through the provision of two directional operation of the rotor and the provision of double cutting edges on both the rotor element 19 and cutting apertures 26.

Another advantage of this reversible feature is that if the machine should become stuck or clogged, reversal of the direction of rotation of the rotor will tend to free and release the machine.

While the machine of this invention has been designed primarily for heavy duty commercial use, it is equally adaptable for home or domestic usage.

I claim:

1. In a garbage grinding machine, a vertically extending cylindrical housing, a rotor operatively mounted within the said housing, a plurality of upstanding cutting members formed integrally with said rotor at the peripheral edge thereof, a cylindrical cutting ring member mounted in a fixed position to the inner cylindrical wall of the housing, a plurality of relatively wide substantially rectangular cutting windows formed in said cutting ring which windows are wider at the upper edges than the lower edges thereof and wider than the upstanding cutting members, the side edges of said windows being at an angle to the perpendicular, said rotor being located for rotation within the cutting ring in close relation thereto and adapted, when actuated, to have its integral upstanding cutting members come into repeating cutting engagement with the cutting windows of the cutting ring.

2. In a garbage grinding machine, a vertically extending cylindrical housing, a rotor operatively mounted within said housing, a plurality of upstanding cutting members formed integrally with said rotor at the peripheral edge thereof, a cylindrical cutting ring mounted in a fixed position to the inner cylindrical wall of the housing, a plurality of relatively wide substantially rectangular cutting windows formed in said cutting ring which windows are wider at the lower edges than the upper edges thereof and wider than the upstanding cutting members, the side edges of said windows being at an angle to the perpendicular, said rotor being located for rotation within the cutting ring in close relation thereto and adapted, when actuated to have its integral upstanding cutting members come into repeating cutting engagement with the cutting windows of the cutting ring.

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