Sept. 1, 1959 J. R. HOAGLUND 2,902,225

WATER-POWERED AND WATER-CLEANSED GARBAGE GRINDER

Filed Jan. 3, 1958 2 Sheets-Sheet 1

Fig. 1

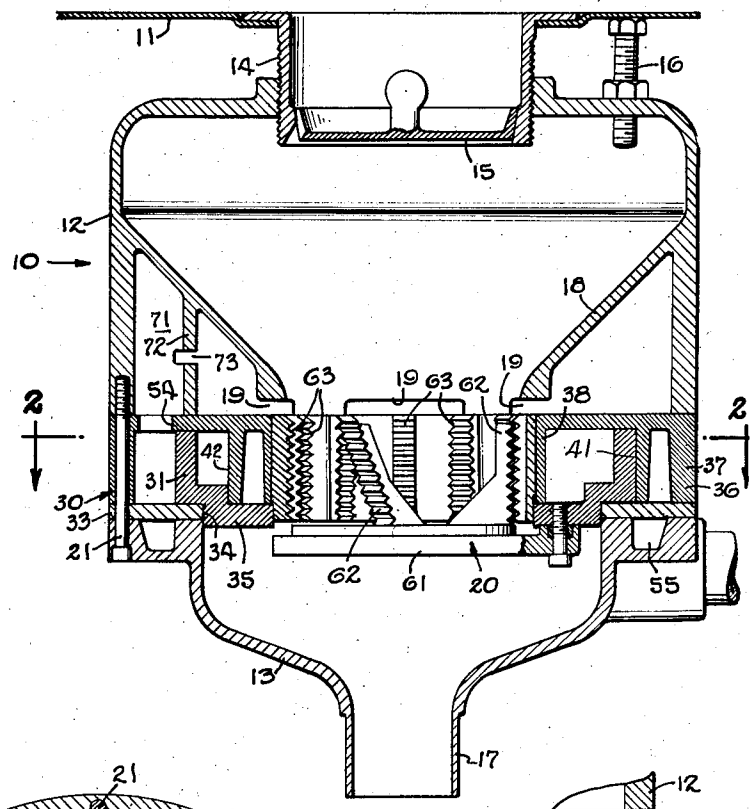
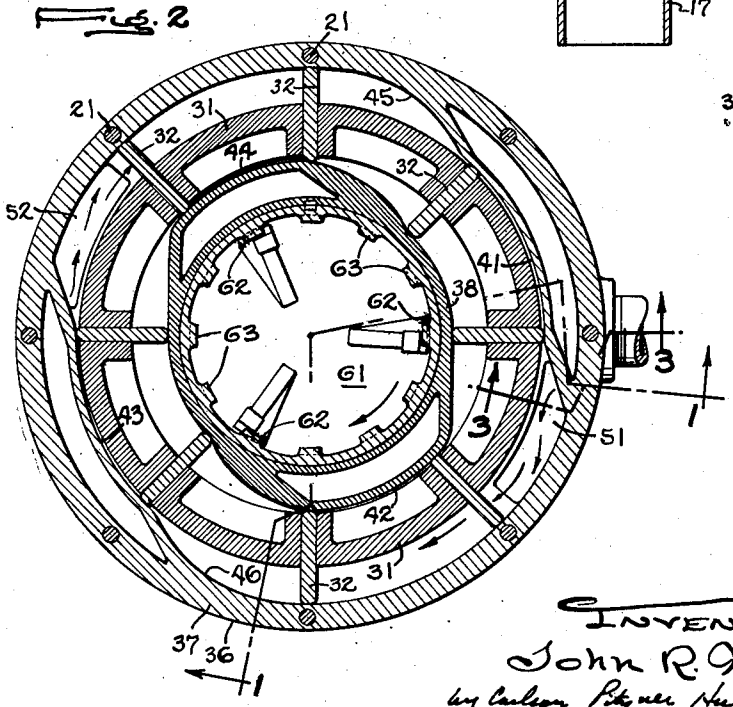


Fig. 2



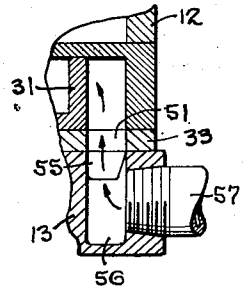


Fig. 3

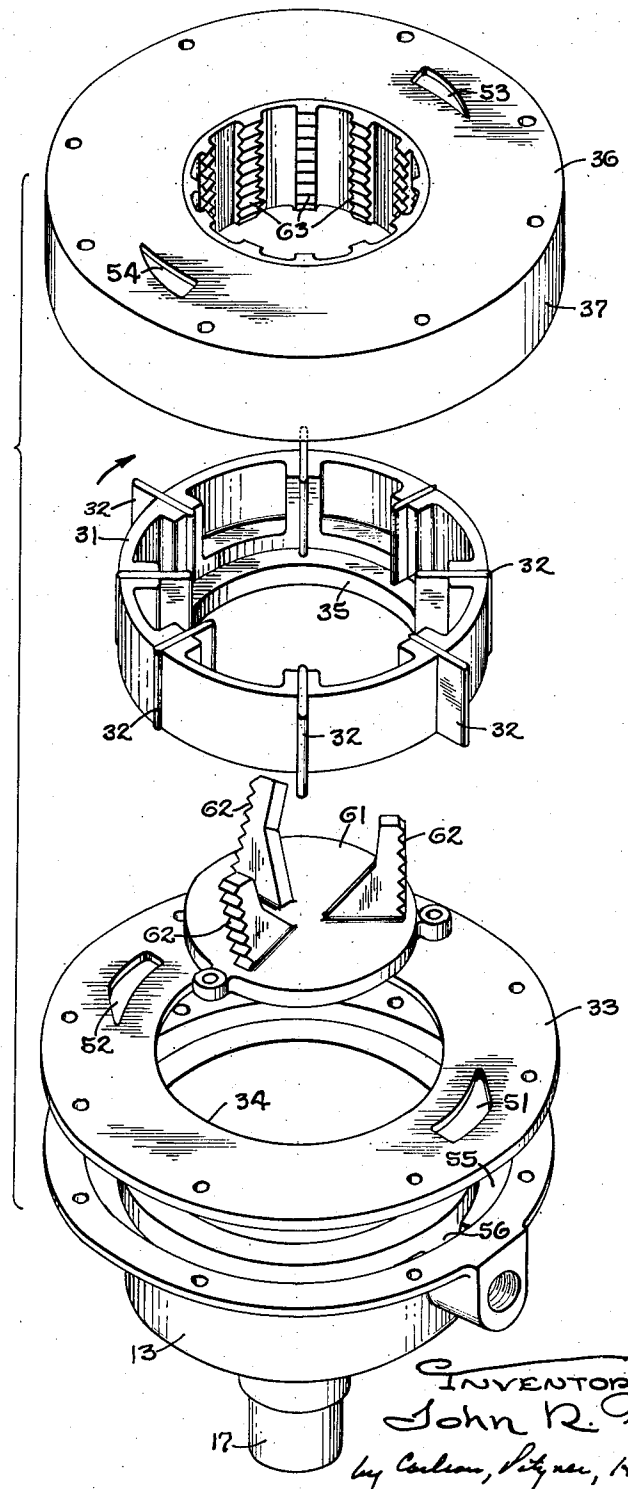
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WATER-POWERED AND WATER-CLEANSED GARBAGE GRINDER

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Fig. 4



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WATER-POWERED AND WATER-CLEANSED GARBAGE GRINDER

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5 Claims. (Cl. 241—42)

This invention relates generally to waste disposal devices and more specifically to a garbage disposal unit particularly adapted for use in home kitchens.

It is an object of the invention to provide a novel water-powered waste grinding and disposal unit that is exceptionally compact and yet operates with a powerful, positive grinding action. It is also an object to provide a unit of this type having larger effective grinding surfaces than prior known units of comparable size and compactness.

It is a further object to provide an improved unit of the above character wherein the water utilized to power the grinding mechanism is thereafter directed over the grinding surfaces in a smooth, cleansing flow without splashing. It is a related object to provide a grinding machine of this type whose rotating elements are effectively lubricated by the same water supply used to power and to clean the grinding elements.

It is a more detailed object to provide a waste disposal unit having a grinding mechanism driven by a novel water-powered rotor arranged to operate with a "flywheel action" that smooths out the grinding operation and "stores up" energy enabling the mechanism to effectively shred solid, tough particles of waste material.

It is a collateral object to provide a water motor for a waste disposal unit of the above type that is in hydraulic balance and therefore does not require a central shaft or supporting bearings.

It is an additional object to provide a water powered waste disposal unit that is reliable, foolproof, and economical to manufacture and operate.

Other objects and advantages of the invention will become apparent upon reading the attached detailed description and upon reference to the drawings in which:

Figure 1 is a vertical section taken along line 1—1 in Figure 2 with some parts shown in elevation;

Fig. 2 is a horizontal section of the waste disposal unit shown in Fig. 1, taken along the line 2—2 in that figure;

Fig. 3 is a fragmentary vertical section taken along the line 3—3 in Fig. 2;

Fig. 4 is an exploded perspective view of the major parts comprising the disposal unit shown in Fig. 1.

While the invention will be described in connection with a preferred embodiment, it will be understood that I do not intend to limit the invention to that embodiment. On the contrary, I intend to cover such alternative embodiments and constructions as may be included within the spirit and scope of the appended claims.

Turning first to Fig. 1, there is shown a waste disposal unit 10 constructed in accordance with the present invention mounted beneath a sink or tub of which only a portion of the bottom 11 is shown. In the embodiment illustrated, the unit 10 comprises an upper cylindrical housing 12 and a funnel-shaped bottom portion 13. To provide access to the interior of the unit, the housing 12 has a top opening into which is threaded a conventional sink drain unit 14 carrying a removable stopper 15. One or more conventional abutment screws 16

may be provided in the top of housing 12 to accurately position the unit beneath the sink. The bottom 13 tapers down to an annular exhaust opening 17 which is connected to the fluid sewage disposal facilities available.

Within the housing 12, and forming a waste receiving cavity beneath the drain 14, is a funnel-shaped skirt 18 formed integrally with the walls of the housing 12. The skirt 18 also defines, together with the wall of housing 12, an annular chamber, triangular in cross section, at the bottom of the housing to which, later, more detailed reference will be made. It may be noted at this time that this chamber opens inwardly into the waste-receiving cavity by the provision of peripherally spaced, arcuate openings 19 formed at the bottom of the skirt 18. Disposed beneath the skirt 18 and in communication with the waste receiving cavity is a grinding unit 20 adapted to be driven by a water powered driving unit 30.

It is a feature of the invention that the grinding unit 20 and the driving unit 30, taken together, form a generally flat, cylindrical assembly which is sandwiched between the housing 12 and the bottom portion 13 to form the compact waste disposal unit 10. To secure the unit 10 in assembled relation, a plurality of bolts 21 are seated in the bottom 13 and extended through the driving unit 30 into threaded engagement with the housing 12.

In accordance with the present invention, the driving unit 30 includes a journaled rotor 31 operatively connected to the grinding unit 20 and having closely encased propelling vanes against which water under pressure may be directed so as to positively drive the rotor and thus operate the grinding unit. In the present embodiment, the rotor 31 comprises an annular cage-like structure best shown in Fig. 4 which supports a plurality of circumferentially spaced and radially slidable impeller vanes 32. In the present embodiment there are eight evenly spaced vanes. For journalling the rotor 31, an annular bottom ring or plate 33 having a center opening 34 is provided.

The rotor 31 rests on the plate 33 and has a depending annular bearing ring 35 formed integrally therewith which fits loosely within the opening 34. The rotor 31 and its ring 35 are preferably formed of a bearing material, such as aluminum or bronze, so that the rotor may freely revolve on the bottom plate 33.

For closely encasing the impeller vanes 32, an annular, inverted cup-shaped enclosure 36 having an outer cylindrical wall 37 and an inner cylindrical wall 38 is fitted over the rotor 31 and into abutment with the bottom plate 33. The enclosure walls 37, 38 are spaced so that the impeller vanes 32 can be slid radially from the rotor 31 into engagement with the outer enclosure wall 37, or the vanes can be fully retracted within rotor 31 where they will engage the inner enclosure wall 38. When a vane 32 is fully extended into engagement with the wall 37 it completely blocks an annular passage formed by plate 33, rotor 31 and enclosure 36, so that introducing water under pressure into this passage against the extended vane will positively drive the vane and thus turn the rotor 31.

In order to control the radial sliding movement of the vanes 32 into the annular passage in which they are driven by water under pressure and to block this passage so that the water pressure may exert a positive force against an extended vane, arcuate cams 41, 42 and 43, 44, are provided, as can be best seen in Fig. 2. The outer cams 41, 43 are preferably integral portions of the outer enclosure wall which extend inwardly from the wall 37 to closely surround the outer periphery of rotor 31 and thereby effectively block the annular, water pressure passage formed between rotor 31 and the enclosure 36. The inner cams 42, 44 are integral portions of the inner enclosure wall 38 and are positioned to urge the slidable vanes 32 outwardly into contact with the outer enclosure wall 37 ad-

jacent the points where cams 41, 43 have blocked the annular passage. The blocking cams 41, 43 have curved portions 45 and 46, respectively, for urging the slidable vanes 32 inwardly as the rotor 31 revolves.

Thus, as the rotor 31 revolves in the direction of the arrow shown in Fig. 2, the slidable vanes 32 are successively urged inwardly by the curved cam portions 45, 46 so that they pass around the blocking cams 41, 43. Upon further rotation beyond the cams 41, 43 the vanes 32 are urged outwardly into contact with the outer enclosure wall 37 by the inner cams 42, 44. After passing one of the cams 42, 44 each vane becomes, in effect, a piston movable in an arcuate closed cylinder defined by the enclosure 36, the plate 33, the rotor 31, and the just-passed cam 41 or 43.

Pursuant to the invention, water under pressure is introduced into the closed annular passage behind the impeller vanes 32 as they are urged outwardly by the inner cams 42, 44, and is discharged from the passage before the cams are again urged inwardly by the outer cams 41, 43. In the present embodiment, water is introduced into the passage through arcuate openings 51, 52, formed in the bottom plate 33, and is discharged from the passage through generally triangular-shaped openings 53, 54 formed in the top of the enclosure 36. For conducting water to the openings 51, 52, an annular channel 55 is formed in the upper wall of the bottom portion 13 of the disposal unit. Water under pressure is supplied to the annular channel 55 through a passage 56, formed as an integral portion of the bottom 13, and a pipe 57 threadably coupled thereto and extending from a suitable, convenient source of water.

To briefly summarize the operation of the driving unit 30, it can be seen that when water under pressure enters the annular passage, formed by the rotor 31, the bottom plate 33 and enclosure 36, through the openings 51, 52, it positively urges an impeller vane 32 before it, and thus drives the rotor 31. As the rotor 31 rotates, successive ones of the vanes 32 are cammed outwardly by the inner cams 42, 44 into the enclosed passage and thus into the path of the flowing water.

As the rotor continues to revolve, the slidable vanes 32 are successively carried into contact with the cam portions 45, 46 and are cammed inwardly. The water trapped between two of the formerly extended vanes 32 is forced with a pump-like action upwardly through the openings 53, 54 and thus is discharged from the annular passage.

It is of significance to note that the rotor 31 is in hydraulic balance since the forces tending to revolve the rotor are spaced 180 degrees around the rotor's periphery. This tends to produce a smooth, powerful rotor drive with a minimum of friction between the rotor and its fixed support. It should also be noted that the construction of the driving unit 30 is such that the vanes 32 function as a series of pistons and thus positively drive the rotor, which may be sharply contrasted with an impositive, water-wheel type of operation. It will, therefore, be appreciated that the driving unit 30, although compact, is quite powerful.

Further in accordance with the invention, the grinding unit 20 comprises sets of vertically disposed grinding elements arranged within the annular rotor 31 and connected to be driven thereby. In the present embodiment, a disc 61, secured to the rotor 31, carries a plurality of upstanding inner grinding elements 62 that cooperate with a plurality of outer grinding elements 63 formed integrally on the inner enclosure wall 38. The cooperating grinding elements 62 and 63 have inter-fitting saw teeth which, upon relative movement of the grinding elements, shred or chew interposed pieces of waste material so that the material may thereafter be conveniently disposed of as a liquid or sludge. To impart added strength and rigidity to the grinding structure,

the upstanding grinding elements 62 lean slightly in the direction of their rotation, as can be seen in Fig. 2.

To secure the disc 61 on the rotor 31 and thus drive the inner grinding elements 62, a plurality of spaced lugs extend from the periphery of the disc so as to underlie the bearing ring 35 of the rotor 31. The lugs are bolted or screwed directly to the bearing ring (see Fig. 1) so that the entire assembly of the rotor 31 and the grinding disc 61 rotates as one unit.

In operation, waste particles fall upon the disc 61 which is rapidly rotated by the driving rotor 31. The waste is flung outwardly by centrifugal force to be caught and chewed between the cooperating saw teeth on the grinding elements 62, 63. When the particles of waste are reduced to a sufficiently small size, they fall downwardly through the annular gap between the lower edge of the bearing ring 35 and the periphery of the disc 61.

Since the grinding unit 20 is located within the driving unit 30, the rapidly rotating rotor 31, the vanes 32, and the entrapped water in the surrounding annular passage, exert what may be called a "flywheel effect" on the rotating grinding unit. The energy stored in the rotating portions of the driving unit 30 is thus readily available to overcome the resistance of solid, tough particles being shredded between the grinding teeth of elements 62, 63. All of the rotating mass of the driving unit 30 is on the outside of the grinding teeth, and therefore has a significant mechanical advantage to aid in overcoming whatever resistance the grinding teeth may encounter. For this further reason, the disclosed unit is smooth and powerful in operation.

It is a further feature of the invention that the water which is used to power the unit 10 also serves to both lubricate the rotating parts and to wash the waste through and clean the grinding elements. With reference to lubrication, it can be seen that those portions of the rotor 31 and the bearing ring 35 which rotatingly engage the bottom plate 33, are immediately adjacent the annular passage into which water under pressure is introduced. Thus, the inherent leakage of the water from this passage tends to lubricate the relatively sliding portions of the driven rotor.

For directing the water from the annular water pressure passage so that it will flow smoothly over the cooperating grinding surfaces, the water is discharged from openings 53, 54 into baffle chambers 71, only one of which is shown (see Fig. 1). It will be remembered that as the rotor 31 is rapidly revolved, water is discharged upwardly in spurts through the discharge openings 53, 54 in enclosure 36. The baffle chambers 71 formed over each of the openings 53, 54, contain and smooth out these spurts and thus provide a continuous, uniform flow of water over the grinding elements.

Forming each of the chambers 71 is a wall portion 72 extending downwardly from the skirt 18 to enclose a portion of the triangularly-sectioned chamber between the housing 12 and the skirt 18. Venting the baffle chambers 71 are openings 73 formed in each of the walls 72. From the openings 73, the water is free to spill into the chamber between housing 12 and skirt 18, and thereafter flow through the openings 19 to wash over the grinding elements 62, 63. By baffling the spurting water discharged from the openings 53, 54 by temporarily enclosing it within the chambers 71, the water flows in a more even and uniform stream from the openings 19 without splashing or turbulence. The water flow is thus better able to wash the waste from the grinding elements and keep the grinding unit 20 clean.

I claim as my invention:

1. A water-powered, waste disposal unit comprising, in combination, a cylindrical outer housing defining a waste-receiving cavity, an annular ledge around the inside of said housing, an annular water-powered rotor journaled within said housing and supported on said ledge, said rotor having closely encased propelling vanes, grinding

elements supported within said housing and connected for being operated by the rotation of said rotor, means for introducing water under pressure to said encased propelling vanes to positively rotate the rotor and thus drive said grinding elements, and means for directing the water from said vanes into said housing so as to wash the waste through, and clean, the grinding elements.

2. A water-powered waste disposal unit comprising, in combination, a cylindrical outer housing defining a waste receiving cavity, a bottom member fixed to said housing defining an outlet opening for waste and water and an annular ledge around the inside of said housing, an annular, water-powered rotor within said housing and supported on said ledge, said rotor having enclosed propelling vanes, a plurality of grinding elements carried for rotation by said annular rotor within its center opening, a group of fixed grinding elements in cooperative relation to said first mentioned grinding elements, means to introduce water under pressure to said enclosed propelling vanes to positively rotate the rotor and thus drive said grinding elements, and means for directing the water from said vanes into said housing so as to wash the waste through, and clean, the grinding elements.

3. In a waste disposal unit having grinding elements within a housing and a source of water pressure, a water-powered drive unit for operating said grinding elements comprising, in combination, an annular cup-shaped enclosure having inner and outer cylindrical walls, a rotor having radially slidable vanes and being journaled for rotation within said enclosure between said walls, cams spaced alternately on said inner and outer walls to urge said vanes outwardly against the outer wall and inwardly within the rotor, respectively, as the rotor rotates, an annular cover plate fixed to said enclosure to retain said rotor therein and closely overlie the extended vanes, and means for introducing water from said source of pressure behind said vanes as they are cammed outwardly and to vent the water before the vanes are cammed inwardly so that the rotor is positively driven by the water pressure.

4. In a waste disposal unit having a source of rotative power and a housing with both access and exhaust openings, a waste-grinding means comprising, in combination,

a plurality of fixed saw toothed grinding elements arranged annularly within said housing, each element having a set of teeth longitudinally of said housing and in the same planes as the corresponding teeth of the other elements, a rotating element operatively connected to said source of power and carrying a plurality of rotatable, angularly spaced grinding elements, each rotatable element having a set of teeth spaced longitudinally of said housing and to interfit within the teeth of said fixed elements, and means for directing the passage of waste from said access opening to said exhaust opening through the interengaging teeth of said fixed and rotatable grinding elements.

5. A water-powered, waste disposal unit comprising, in combination, a cylindrical outer housing defining a waste receiving cavity, an annular ledge formed on the inside of said housing, a pair of opposed arcuate cams contiguous with the inside of said housing and engaging said ledge, an annular rotor supported on said ledge and journaled for rotation between said cams, said rotor having a plurality of peripherally spaced and radially slidable impeller vanes, said cams being effective to slide said vanes inwardly upon rotation of said rotor, an annular member closely overlying said rotor and supporting a second pair of opposed arcuate cams in engagement with the interior of said annular rotor and annularly spaced from said first pair of annular cams so as to urge said vanes outwardly upon rotation of said rotor, means for introducing water under pressure against the vanes at the points where said vanes are cammed outwardly and for discharging this water at the points where the vanes are cammed inwardly so as to positively and rotatively drive said rotor, and grinding means effective upon rotation of said rotor to shred waste placed in said cavity.

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