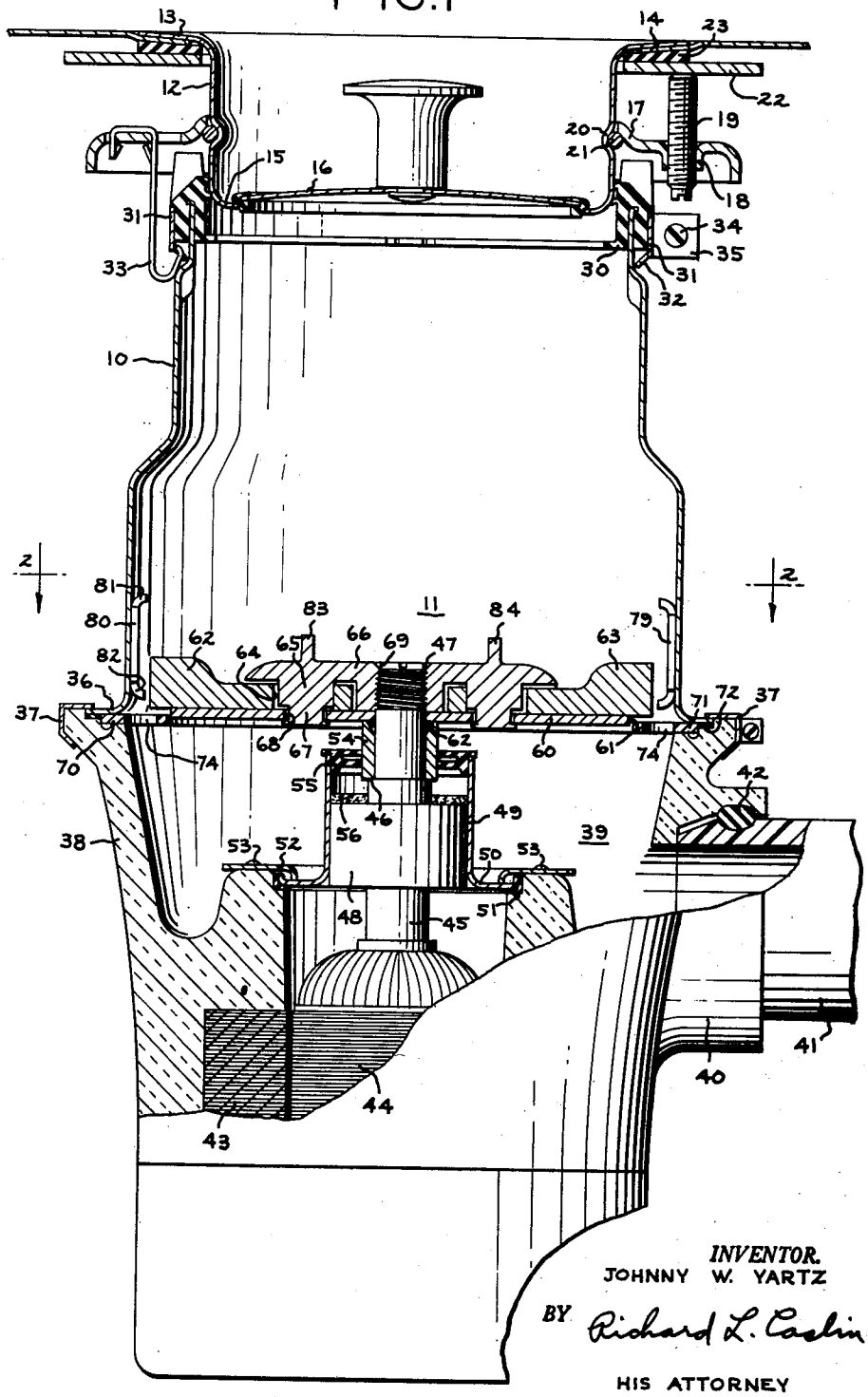
Nov. 26, 1963 J. W. YARTZ 3,112,077

WASTE DISPOSAL APPARATUS

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FIG. 1



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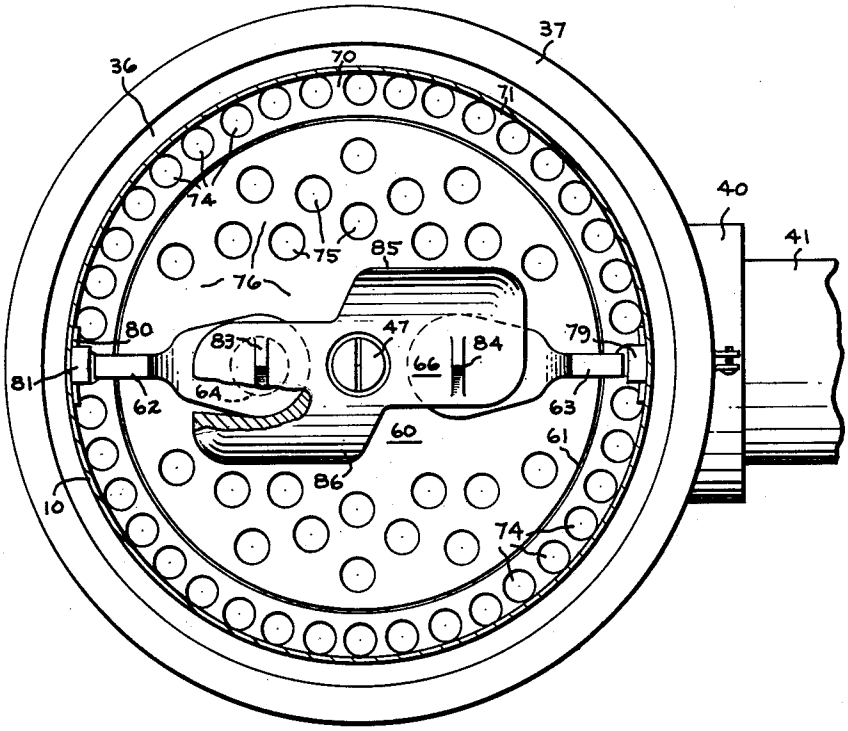


FIG.2

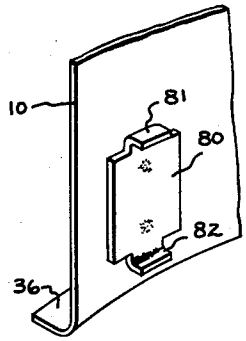


FIG.3

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3,112,077

WASTE DISPOSAL APPARATUS

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Filed Aug. 22, 1961, Ser. No. 133,143
6 Claims. (Cl. 241—73)

This invention relates to food waste disposal apparatus of the type which is attached to a sink drain for receiving a mixture of garbage and water and from which a mixture of comminuted waste and water is directed to the drain pipe.

The invention is especially applicable to apparatus employing a stationary shredding means in cooperation with a rotatable flywheel with pivoted impeller means serving to force waste material against the shredding means and with the rotatable portions of the apparatus being driven at speeds heretofore generally considered impractical.

Various problems in food waste disposal apparatus construction and operation include the possibility of jamming of the movable parts under certain conditions, the possibility of stoppage of the drain due to an excessive rate of discharge from the apparatus, the possibility of generating excessive noise during the operation of the apparatus, the possibility of overheating of the motor, the difficulty in meeting space limitations for installation, and the ever present matter of securing cost reduction without sacrificing of other desirable features.

This invention contemplates the provision of novel and improved construction and relative arrangement of portions of the conventional types of food waste disposal apparatus making it practical to drive the rotatable parts at high speeds while at the same time overcoming problems of the above indicated nature.

Further objects and advantages of the invention will become apparent as the following description proceeds and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In accordance with the invention I provide a hopper and a drainage chamber receiving water and comminuted waste material from the hopper after passage through apertures in an annular stationary metering and straining ring interposed between the hopper and the chamber. A stationary shredding means is mounted upon the hopper separately from the ring, and the apertures in the ring are of such size and so located that the angular momentum of the contents of the hopper cannot force the discharge of those contents too rapidly into the chamber. This angular momentum is normally of a relatively high value established by the presence of water or water and waste material in the hopper, by the diameter of the hopper, and by the speed of rotation of an impeller, the distal end of which normally travels in an orbit overlying the inner edge of the annular ring and preferably overlying a portion of the apertures therein. A circular flywheel driven by an electrical motor normally operating at a speed of not less than about 6000 r.p.m. provides a mounting for the impeller means. This impeller means is pivoted so that its distal end swings outwardly under centrifugal forces, but may also pivot inwardly to avoid jamming actions. Moreover, the motor preferably is characterized by a high starting torque, and the flywheel includes at least some imperforate portions which together with the imperforate portions of the ring serve to prevent too rapid a drainage of the contents of the hopper into the drainage chamber while the apparatus is operating, the periphery of the flywheel being disposed in close running clearance with the inner edge of the annular ring.

For a better understanding of the invention, reference may be made to the following description and accompanying drawings in which:

FIG. 1 is an elevational view, partly in section, of one embodiment of a waste disposal device incorporating the present invention;

FIG. 2 is a sectional plan view taken along line 2—2 of FIG. 1; and

FIG. 3 is a fragmentary perspective view of a portion of the hopper wall showing a shredding means.

Referring to FIG. 1, I have shown my invention in one form as applied to a waste disposal device having a generally cylindrical tubular casing or hopper 10 providing an interiorly grinding or shredding space 11 at the bottom of which the comminuting of waste material takes place rapidly as will later be described. The hopper may conveniently be formed of sheet metal, stainless steel being preferred, and at its upper end is provided with means suitable for supporting the device in the drain opening of a sink or the like. This supporting means for example, may include a cylindrical tubular sleeve 12 which is arranged to be inserted down through the sink opening and having at its upper end an outwardly extending circular flange 13 adapted to overlie the edge 14 of that drain opening. The lower end of the sleeve is provided with an inturned flange 15 adapted to support a suitable sink stopper 16. The sleeve 12 not only serves to direct the waste material and water to the hopper 10 but also serves as a supporting means for the waste disposal device. Accordingly, the sleeve itself is rigidly secured to the bottom wall of the sink. This may be accomplished by means of a metal mounting ring 17 which encircles the depending sleeve 12 and is provided with a series of spaced bosses 18 having corresponding threaded bolts 19 engageable therein. On its inner periphery the ring 17 is seated on a snap ring 20 which is confined within a suitably shaped groove 21, on the outer circumference of the sleeve 12, and to resist upward movement of that sleeve. The bolts function to clamp the flange 13 of the sleeve 12 to the floor of the sink by means of a clamping ring 22 encircling the sleeve 12 and having a vibration-dampening gasket 23 interposed between that clamping ring and the undersurface of that sink. As will be apparent, when the bolts 19 are screwed upwardly they will pull the flange 13 of the sleeve into tight engagement with the sink around the edge 14 of the opening therein and compress the gasket between the clamping ring 22 and the undersurface of the sink.

As shown and described in a copending application of Johnny W. Yartz and Francis J. Clements, Serial No. 133,219 filed August 22, 1961 and assigned to the General Electric Company, the assignee of the present application, the upper end of the hopper is embedded in a vibration-dampening boot 30 adapted for mounting in sealing contact with the outer surface of the sleeve 12. A clamp band 31 having a flange 32 for arrangement with the lower end of a series of supporting hooks 33 is arranged in circumferential clamping relation to the boot and may be tightened by means of a conventional screw 34 joining the two ends, one end being shown at 35, of that clamp band 31. The upper ends of the supporting hooks in turn are mounted within suitable recesses in the mounting ring 17 and these hooks serve to support the hopper 10 securely in position under the sleeve 12 while at the same time the boot 30, which preferably is formed of rubber, serves to prevent transmission of vibration from the hopper to the sleeve and to effect a sealing against passage of liquid between that hopper and the exterior of that sleeve.

At its lower end the hopper 10 is formed with an outwardly flaring flange 36 which is tightly clamped, as by means of a clamping band 37, to the upper end of a motor housing 38. This housing preferably, but not necessarily, is molded of plastic material, an epoxy resin being suitable for this purpose, and is formed in its upper portions

with a sloping bottom drainage chamber 39 leading to a side outlet 40. A drain conduit 41 suitably sealed against liquid leakage by means of a vibration-dampening rubber O-ring 42 connects the drainage chamber to the stationary drain line from the sink.

In the preferred embodiment of the invention an electric motor characterized by its high starting torque and relatively high running speed during the comminuting of the waste material, is mounted within the motor housing in encapsulated relation thereto. Such a motor may comprise an A.C. series wound motor and in the conventional food waste disposer for household usage the motor would be of fractional horsepower size. Suitable leads, not shown, extend to the motor and form part of an electrical circuit having the customary switches and overload protective relay therein, the nature of which form no part of the present invention and, being conventional, are not shown herein. The stator 43 of the motor may be embedded in the plastic motor housing and with an armature 44 being supported at its lower end upon a conventional thrust bearing mounted in the bottom wall of the motor housing. Extending upwardly from the armature is a shaft 45 having an inwardly directed shoulder 46 and with a threaded upper end 47 projecting into the hopper grinding space 11. This shaft is journalled in a suitable bearing 48 which in turn is positioned within a tubular cylindrical bearing cup 49, the lower end of which includes a laterally extending flange 50. The periphery of the flange 50 is supported by a sealing ring 51 resting in a recess within the rotor space of the motor housing thus to prevent leakage of liquid into the motor and at the same time serving to enclose that motor. An annular bearing cup ring 52 having a downwardly facing rim pressing against the flange 50 serves to hold the described assembly in proper position, the bearing cup ring 52 being securely affixed to the motor housing as by means of a series of screws 53.

A short metallic sleeve bushing 54 extending axially of the motor shaft and resting at its lower end upon the shoulder 46 of that shaft serves to position an improved rotatable comminuting assembly to be described hereinafter. A suitable resilient-material end cap 55 which fits with a tight fit interiorly of and over the top edge of the bearing cup 49 also surrounds the bushing 54 with a tight fit and prevents leakage of liquid into the bearing cup 49. A conventional lubrication wick 56 preferably is enclosed within the bearing cup.

As best shown in the co-pending application of Francis J. Clements, Serial No. 133,142, filed August 22, 1961, and assigned to the General Electric Company, the assignee of the present invention, the rotatable comminuting means may comprise a circular flywheel 60 having a central opening receiving with a loose fit the upper end 47 of the motor shaft and with the flywheel having a circular peripheral outer edge 61. The central portion of the flywheel is adapted to bear against the upper end of the bushing 54. A small rubber O-ring 62 to prevent leakage of liquid along that shaft is interposed between the bushing and the flywheel. One or more swinging impellers, here shown as two at 62 and 63, are mounted to partake of the rotation of the flywheel. These impellers may each have a vertical hole 64 therethrough to receive a cylindrical shaft portion 65 of a retainer member 66, the hole 64 being so located as to permit swinging or pivotal motion of the impeller about that shaft portion 65. An extension 67 of the shaft portion 65 projects downwardly and is received in a hole 68 formed in the flywheel 60. For ease of handling, the extensions 67 are rolled over to hold the flywheel impellers, and retainer in an assembled relation.

The retainer member 66 is provided with a centrally located threaded aperture 69 and upon being screwed downwardly upon the threaded end 47 of the motor shaft thus confines the flywheel against the bushing 54 and the impeller or impellers between the flywheel and retainer member. Accordingly the motor shaft, the flywheel, the impellers, and the retainer member are joined together for rotation as a unit.

With the above described portions of the disposal apparatus in mind, reference now is made to FIGS. 2 and 3 depicting significant structure employed in the carrying out of the present invention. Since the rotatable portions of the apparatus are to move at a speed generally considered impractically high, conventional motor speeds in this type of apparatus being about 1760 r.p.m. or about 3600 r.p.m., it is apparent that an angular momentum of high magnitude will be imparted by the impeller or impellers to the contents of the hopper 10 within the grinding space 11. In the event that a conventional grinding ring having radial openings draining the contents of the hopper into the drainage space 39 were to be employed, this angular momentum would cause the water and waste material to move rapidly into the drainage chamber and to clog the drain conduit 41, or the gooseneck portion or trap of the drain outlet. This difficulty is avoided, however, by provision of a suitable metering ring 70 which further serves as a strainer and, as shown, the ring 70 may be of flat annular shape having an outer peripheral portion 71 engageable in a recess within the upper part of the motor housing and held in place by the flange 36 of the hopper, a suitable sealing ring 72 being positioned under that flange to prevent leakage of liquid thrown toward this junction of the respective parts. The metering ring further has an inner peripheral portion terminating in an edge spaced closely adjacent the circular edge 61 of the flywheel and with a close running clearance, for example, in the order of 0.035–0.040 inch. As will be understood, the rotatable unit of the comminuting means is dynamically balanced and the threads of the shaft and retainer are such as to tighten the parts of the unit together during turning of the shaft.

As a significant feature, the metering ring contains a plurality of holes 74 between its inner and outer peripheral portions and through which water and comminuted waste material pass into the drainage chamber 39. The number, size and positioning of these holes with respect to the sweeping movement of the contents of the hopper is such as to result in a predetermined metering discharge of those contents when the impellers are travelling at a speed of rotation of 6000 r.p.m. or higher and this rate of discharge is such as to permit the expelled material to pass through the drain piping without clogging. It has been found that exceptionally satisfactory results are secured when the metering ring is disposed in a horizontal plane providing passage of the material axially of the hopper into the drainage chamber.

Since the apparatus when at rest should not obstruct flow of water from the sink to the drain outlet, I prefer to employ a number of holes 75 in the flywheel so that such water may have a comparatively free flow without having to pass entirely through the holes in the metering ring. The number and size of such holes in the flywheel, however, is such that a substantial imperforate area 76 of the flywheel remains, which in conjunction with the imperforate areas of the ring 71 will assure the desired metering action during usage of the apparatus.

As a further significant feature of the invention, the stationary grinding or shredding member cooperating with the rotatable portions of the comminuting means is physically separate from the metering ring through which the comminuted waste passes. As best seen in FIG. 2, this shredding member may conveniently comprise a metallic pad 79 which may be readily welded in position upon the sheet metal hopper 10, a similar pad 80 being located on the diametrically opposite wall of the hopper. Heretofore, the welding of the pads has not been possible on cast shredding rings. These pads 79 and 80 are each provided with an upper inwardly projecting lip 81 with a suitably sharpened edge, and with a similar lower lip 82 spaced vertically from the upper lip. These lips of

the pad are located above the metering ring 70 and the innermost edge of the lower lip 82 is located so that the distal ends of the pivoted impellers 62 and 63 will move in an orbit closely adjacent thereto during the comminuting action. As will be understood the lower lip 82 is so located as to intercept waste materials of higher specific gravities and the upper lip is located so as to intercept waste materials of lower specific gravities. Suitable flipper means 83 and 84 may be located on the upper surfaces of the retainer 66 so as to prevent material riding with the retainer and as best seen in FIG. 2 the leading edges 85 and 86 of the retainer may be suitably sloped so as to propel material upwardly in the grinding space 11.

In general for use in domestic food waste disposers only two grinding pads are required with the result as has been shown in FIG. 2 that substantially all of the circumference of the inner wall of the hopper is unobstructed. Moreover since the metering ring preferably is physically separate from the hopper that inner wall may be kept smooth and imperforate and will offer less resistance to the movement of the volume of water and waste material thereacross than found in other types of hopper constructions. Accordingly a steady angular momentum may be imparted to the contents of the hopper under the influence of the impellers and at the same time those impellers will be receiving from those contents a substantial and steady torque loading all of which is desirable for usage of the aforementioned high speed motor. It will of course be understood that water is continually being supplied to the hopper from the sink during the comminuting of the waste material and that water and comminuted waste material are constantly being dispensed into the drainage chamber 39 but at a rate insufficient to clog the drainage outlet.

As one feature of the invention a clear difference in the sound of the grinding noise has been noted during the operation of the described apparatus. Not only is the intensity of the grinding sound of vibration associated with such operation less noticeable but it appears to be of a less annoying nature than found in conventional apparatus. The reason for this is not completely understood but it may be somewhat analogous to the difference in sounds associated with a hammer mill assembly and with less massive abrading or milling actions where the cutting is more uniform. For example in comminuting bones within the hopper it may be that such bones being entrained in the swirling mass of material and pushed by the impellers can now be pressed against the sharpened lips of the pads and receive a repeated nicking action rather than relying on the hammer stroke of the pivoted impellers in cooperation with dozens of cutting teeth on the shredding ring. It further is noted that even when employing only two grinding pads and with a rotatable assembly having two impellers the comminuting action for a given volume of waste may be completed in less time than when using conventional waste disposers with lower speed motion and many more grinding pads. This reduction in required time of operation which is limited largely to the rate at which the metering ring permits discharge is of course desirable when employing the high starting torque type of motor since it obviates the danger of overheating of such motor. In addition it is desirable from the point of view of the user of the apparatus.

It is preferred to have the distal ends of the impellers travel in an orbit lying outboard of the peripheral edge 61 of the flywheel. These impellers as disclosed in the aforementioned Clements application form part of a dynamically balanced rotatable assembly and are used in pairs. The holes 74 in the metering ring further serve a straining function preventing oversize particles of waste from entering the drainage chamber and due to the scouring action of the mass of materials being impelled at high angular momentum the materials failing to pass through the holes 74 are immediately re-entrained in the swirling mass above the metering ring and then brought into further contact with the lips of the pads 79 and 80. Although the use of only two shredding pads is preferred the invention is not limited to this number since one or more such pads may be employed. However when more than two pads are used a slower cominuting action occurs and the torque loading on the impellers is substantially increased.

While I have shown and described a specified embodiment of my invention I do not desire my invention to be limited to the particular construction shown and described and I intend by the appended claims to cover all modifications within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a food waste disposal apparatus having a stationary hopper with an imperforate side wall enclosing a comminuting chamber, a rotatable comminuting assembly including a circular flywheel and a waste impeller means mounted on the top surface of said flywheel, the flywheel having a vertical axis of rotation and forming a bottom wall of said comminuting chamber, a drainage chamber disposed beneath said flywheel for receiving water and comminuted waste material from said hopper, a flat horizontally disposed metering ring physically confined between said hopper and drainage chamber and having a plurality of vertical apertures therein for joining said chambers with each other, said ring being located in substantially the same plane as the flywheel but slightly below the top surface of the flywheel, at least one waste shredding pad mounted on the inner side wall of said hopper in close proximity to the path of movement of the distal end of said impeller means, and motor means for rotating said flywheel.

2. In a food waste disposal apparatus having a hopper of thin sheet metal with an imperforate side wall enclosing a comminuting chamber, a rotatable comminuting assembly including a circular flywheel and at least one swinging impeller pivotally mounted on the top surface of said flywheel, the flywheel having a vertical axis of rotation and forming a bottom wall of said comminuting chamber, a drainage chamber disposed beneath said flywheel for receiving water and comminuted waste material from said hopper, a flat metering ring surrounding the flywheel and lying in substantially the same plane as the flywheel with the top surface of the flywheel slightly above the metering ring, the metering ring having a plurality of vertical apertures therein joining said chambers with each other, a waste shredding pad welded upon the inner wall of said sheet metal hopper in close proximity to the path of movement of the distal end of said pivoted impeller, and motor means for rotating said flywheel at high speeds above 6000 r.p.m. thereby to cause said impeller to impart to the contents of said hopper an angular momentum carrying said contents with substantial force against said shredding pad until such time as the size of each individual waste particle has been reduced so that it is able to drop through one of the vertical apertures in said metering ring.

3. In a food waste disposal apparatus as recited in claim 2 wherein the welded shredding pad is of flat sheet material that is made integral with the imperforate wall of the hopper, the lower horizontal edge of the sheet projecting inwardly from the hopper wall within the plane of the path of movement of the impeller, while the upper horizontal edge of the pad projects in a similar manner inwardly from the hopper wall but is spaced above said plane of movement of the impeller.

4. In a food waste disposal apparatus having a vertical hopper with an imperforate side wall enclosing a comminuting chamber, at least one shredding pad attached to the inner surface of said side wall, a narrow metering ring of thin sheet material assembled within the comminuting chamber around the side wall of the hopper and beneath the shredding pad, the ring having a plurality of vertical apertures extending completely around the ring, a rotatable comminuting assembly including a flywheel

located within the center of said ring and in the plane thereof to rotate about a vertical axis, motor means for driving the flywheel at a high speed greater than 6000 r.p.m., and impeller means located on the top surface of the flywheel, the outermost end of the impeller means extending beyond the periphery of the flywheel to sweep over a portion of the apertures in the metering ring and in close proximity to the shredding pad when the flywheel is rotated.

5. In a waste disposal apparatus having a vertical hopper with an imperforate side wall enclosing a comminuting chamber, at least one shredding pad attached to the inner surface of said side wall, a drainage chamber disposed beneath said comminuting chamber for receiving water and comminuted waste material from said hopper, a narrow metering ring of thin sheet material being sandwiched between the lower end of the hopper and the upper end of the drainage chamber, said ring having a plurality of vertical apertures extending completely around the ring for passing comminuted waste and water from the comminuting chamber to the drainage chamber, a flywheel located within the center of the metering ring and lying within the plane thereof to rotate about a vertical axis, motor means for driving the flywheel at a high speed greater than 6000 r.p.m., and impeller means located on the top surface of the flywheel, the outermost end of the impeller means extending beyond the periphery of the flywheel and overlying a portion of the metering ring and being in close proximity to the shredding pad when the flywheel is rotated.

6. In a food waste disposal apparatus having a vertical hopper with an imperforate side wall enclosing a comminuting chamber, a pair of shredding pads attached to the inner surface of said side wall at diametrical opposed positions, a narrow metering ring of thin sheet material

assembled within the comminuting chamber around the side wall of the hopper and beneath the shredding pads, the ring having a plurality of vertical apertures extending completely around the ring, a drainage chamber located under the hopper for receiving water and waste material that passes from the hopper through the apertures in the metering ring, the metering ring being clamped between the lower portion of the hopper and the upper portion of the drainage chamber, a flywheel located within the center of said ring and lying in the plane thereof to rotate about a vertical axis, motor means for driving the flywheel at a high speed greater than 6000 r.p.m., and a pair of swinging impellers located on the top surface of the flywheel at diametrically opposite positions, the outermost end of each impeller extending beyond the periphery of flywheel to sweep over a portion of the apertures in the metering ring and in close proximity to the shredding pads when the flywheel is rotated.

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