Dec. 26, 1961 V. L. THOMPSON 3,014,671

WASTE DISPOSER APPARATUS

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FIG. 1

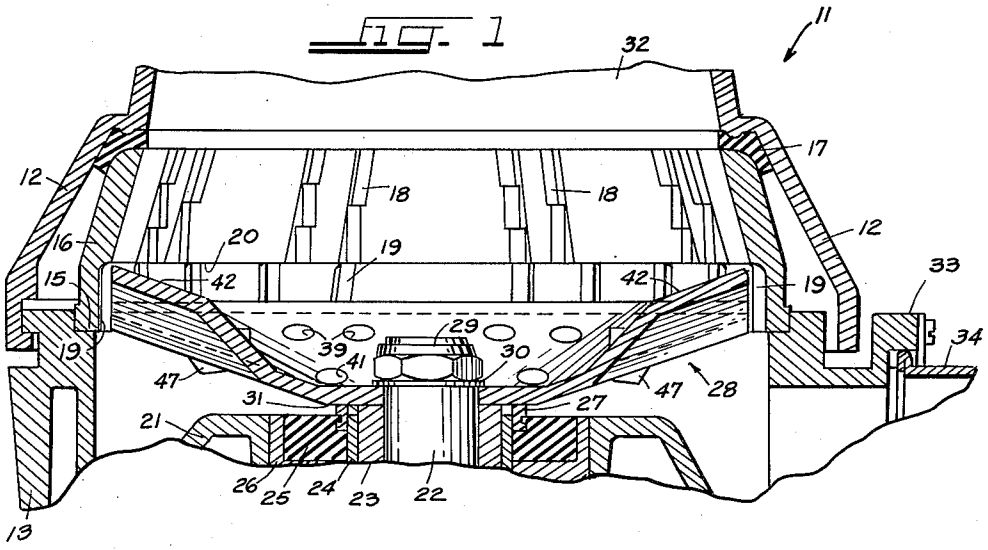
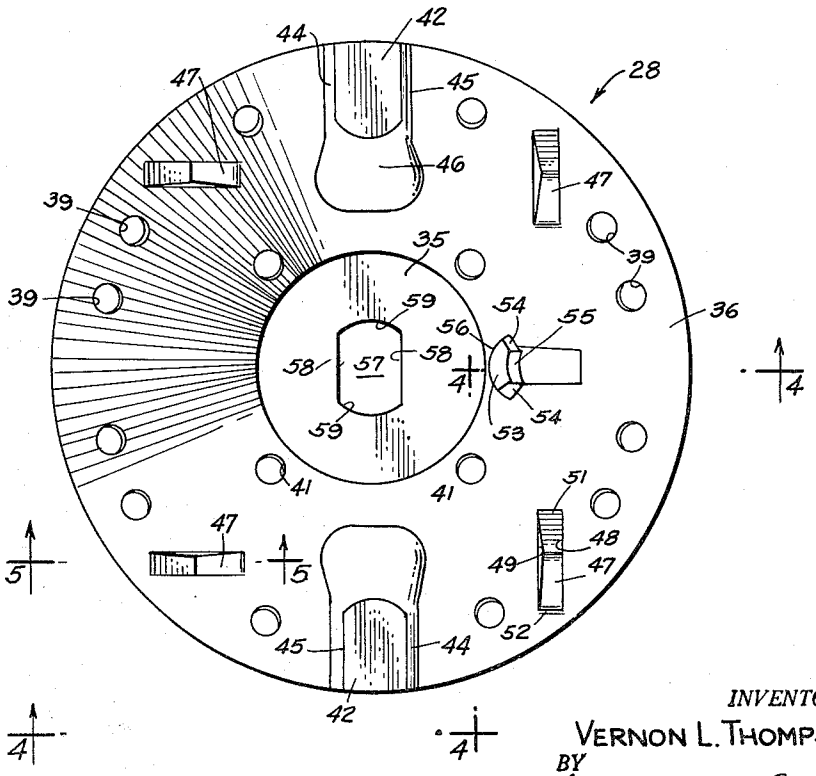


FIG. 2



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FIG. 3

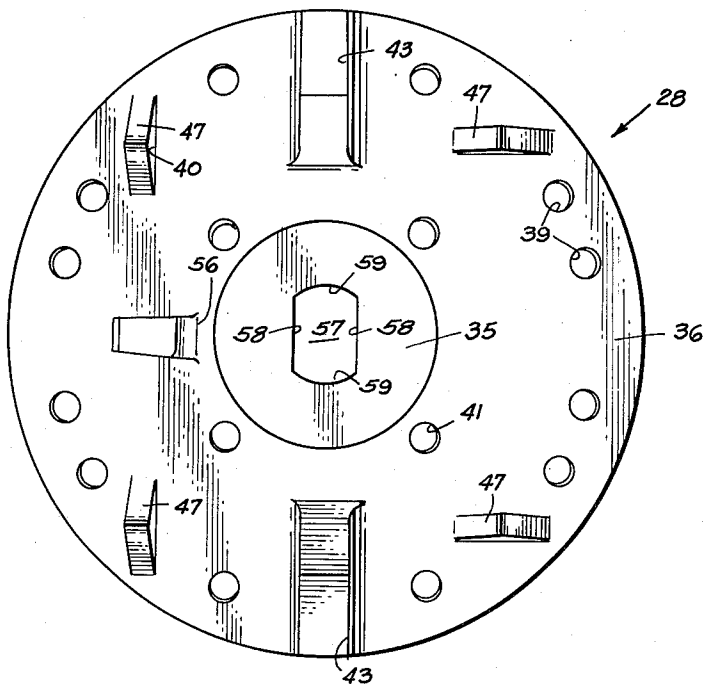


FIG. 4

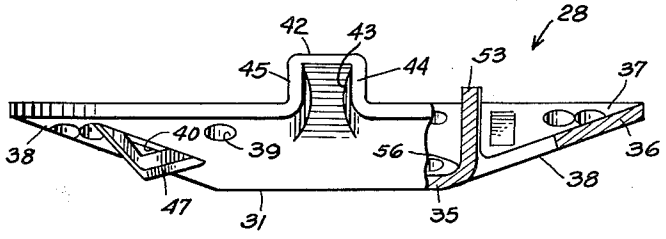
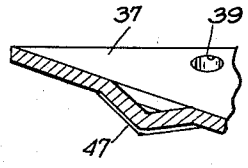


FIG. 5



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United States Patent Office 3,014,671 Patented Dec. 26, 1961

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WASTE DISPOSER APPARATUS

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Filed May 21, 1959, Ser. No. 814,734
8 Claims. (Cl. 241—296)

This invention relates to a rotor unit for a waste comminuting device, especially to such rotors as used in household and commercial kitchen waste disposal units.

Kitchen waste food disposal units commonly employ a circular rotor element, which is generally driven by an electric motor, for impelling food waste generally radially outwardly against a shredder ring which surrounds the rotor element. It has been a general practice to fabricate such rotor elements by a casting process. Such a method of fabrication, of course, requires molds. Additionally, it is generally necessary to heat treat the cast rotor to relieve stresses therein and to grind at least portions of the rotor to obtain necessary smoothness of surface and oftentimes to remove portions of the rotor to obtain necessary balance. The heat treating operation often introduces undesirable distortion, and this may lead to an undesirably large number of rejection parts. Also, cast materials are by their nature somewhat brittle and subject to having cracks therein and such cracks are not always visible. Such hidden cracks have been known to cause operational failures of such cast rotors which have necessitated replacement of the entire disposal unit.

It is desirable that a kitchen disposal unit quickly obtain a high rotary velocity to quickly obtain a large impacting action to avoid malfunctioning due to lodgement of large bones and other items such as pins and needles, which may accidently be dropped within the disposal unit, between the rotor and stationary parts of the disposal unit. The cast rotor elements heretofore generally used had to be relatively heavy and of a thick section to obtain the necessary strength because of the relatively inelastic properties of cast materials. Such heavy cast rotors, while producing an excellent impacting action at the full rotor speed, have a large starting inertia which increases the time required to build up a high rotational velocity. For this reason, disposal units embodying such cast rotors have been subject to malfunctioning due to lodgement of large bones and other items as noted between the operating parts.

It is, therefore, a primary object of this invention to form a rotor unit for a comminuting device in a simple and economical manner by performing a series of cutting and forming operations on a sheet of metal stock.

It is another object of this invention to provide a relatively light weight rotor sufficiently elastic to absorb impact without fracture and yet providing sufficient strength to prevent permanent distortion.

It is another object of this invention to provide a rotor for a waste comminuting device with a concave waste food receiving surface which impels waste food upwardly into a shredder ring to provide a more efficient tumbling action which permits quicker comminution of such waste food than disposal units embodying rotors which rely primarily on a radial distribution of such waste food to a shredder ring.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show a preferred embodiment of the present invention and the principles thereof and what is now considered to be the best mode contemplated for applying those principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention.

In the drawings:

FIG. 1 is an elevation, in section, of a portion of a waste food comminuting unit and illustrates an embodiment of a rotor unit constructed in accordance with this invention;

FIG. 2 is a plan view of the rotor unit illustrated in FIG. 1;

FIG. 3 is a bottom view of the rotor unit illustrated in FIG. 1;

FIG. 4 is an elevation view, partly in section, taken in the direction of the arrows 4—4 of FIG. 2; and

FIG. 5 is a sectional view taken in the direction of the arrows 5—5 in FIG. 2.

Referring to FIG. 1 of the drawings, a household kitchen waste food disposal unit is indicated generally by the reference numeral 11. The disposal unit comprises an outer housing having an upper section 12 connected by a bayonet-type latch to a lower section 13. An upper surface of the housing section 13 is provided with an interior annular recess 15 and the lower edge of a shredder ring 16 is seated thereon. An annular gasket 17 provides a seal between the upper edge of the shredder ring and the interior surface of the housing section 12. The upper portion of the shredder ring 16 is provided with a plurality of vertically extending saw-tooth shredder elements 18 which are circumferentially spaced about the inner surface of the shredder ring. The lower portion of the inner surface of the shredder ring 16 is provided with an annular recess 20, which has a plurality of vertically extending circumferentially spaced shredder teeth 19.

A housing 21 is disposed concentrically within the housing section 13 and provides a shield for an electric motor, not shown, which drives a shaft 22 centrally disposed within the housing 21. A bearing 23, bushing 24, resilient annular ring 25, and bushing 26 concentrically surround the shaft 22 and position the shaft within the motor housing 21. A sealing ring 27 has a lower portion positioned and engaged between the innermost upper edge of the resilient ring 25 and the bushing 24 and projects upwardly therebetween.

A rotor element 28, described in detail hereinbelow, is attached to the shaft 22 by suitable means such as a lock nut 29 and washer 30. The rotor element 28 has a flat lower surface 31 at the central portion thereof which engages the upper surface of the bearing 23 and the seal ring 27. Thus, the ring 27, which is spaced radially outwardly from the bearing 23 and the shaft 22, seals the shaft and bearing to prevent the entry of foreign matter therein.

The upper exterior housing section 12 provides a large central opening 32 for the entry of food waste to the shredding or comminuting area. The lower housing 13 is provided with a boss 33 which receives a flanged conduit 34 internally thereof for removing comminuted food from the shredding area.

In accordance with this invention the rotor element 28 is a one-piece unit formed from a sheet of metal stock. The rotary unit is preferably formed from a high tensile strength steel which is resistant to corrosion, such as a stainless steel alloy. Heat-treated hot-rolled steels have also been found to be satisfactory, if plated to resist corrosion. As is seen with reference to FIGS. 2 and 3, the plate 28 is circular and comprises a flat central disk portion 35 surrounded by an annular section 36 which is integrally joined with the central disk 35 at the periphery of the disk. As seen in FIG. 4, the annular section 36 is inclined with respect to the central disk 35 to present a concave surface 37 at the waste food receiving face of the rotor. The inclination of the annular section 36

also provides a convex surface 38 on the side of the rotor opposite that of the concave waste food receiving surface 37. The annular section 36 is provided with a plurality of circumferentially spaced cylindrical apertures 39 and may also be provided with a second inner row of circumferentially spaced cylindrical apertures 41. These apertures serve to permit water and comminuted food to pass through the rotor element from the shredding chamber to the outlet conduit 34.

The annular section 36 is additionally provided with a pair of diametrically opposed lugs 42 which project from the concave surface 37 and provide corresponding recesses 43 in the lower convex surface 38, as illustrated in FIG. 4. The lugs 42 include a pair side members 44 and 45 which extend in perpendicular relation with the concave surface 37. The side members 44 and 45 extend in parallel relation one to the other and also extend generally in a radial direction. These vertically extending side members 44 and 45 constitute impelling elements for throwing waste food particles against the inner surface of the shredder ring 16 in a manner to be described hereinbelow. As is seen with reference to FIG. 2, the innermost portions of the lugs 42 are smoothly blended into the upper surface of the annular section 36 by inclined surfaces 46.

With particular reference to FIGS. 2 and 5, it is seen that the annular section 36 is provided with a plurality of downwardly projecting V-shaped members 47. These members 47 comprise rectangular-shaped strips of the annular section which are cut along a pair of parallel, closely adjacent sides 48 and 49 and which are integral with the section 36 at the ends 51 and 52 of the strips 47. The strips 47 are bent and expanded from their central portions and provide V-shaped members in section. These V-shaped members constitute impeller blades for pumping water and comminuting food from the shredding area out the exhaust conduit 34. It should be noted that the manner in which the strips are cut and expanded from the plate provide additional orifices 40 through the plate.

There is also formed in the annular section 36 a generally perpendicularly extending tab 53. The tab 53 is formed from the plate section 36 by cutting the tab along the radially extending sides 54 and also across the top 55 of the tab. The tab is then bent upwardly and out of the plane of the section 36 about the base line 56. The tab 53 presents a relatively abrupt projection in the upper concave face of the plate 28 and serves to engage such rounded and smooth surfaced food waste elements as orange and grapefruit rinds to throw such elements into the shredder ring. It should be noted that the base 56 of the tab is aligned generally tangentially rather than radially so that the stresses developed by the food waste particles impacting on the surfaces 54 of the tab are absorbed across the longer dimension of the base rather than the shorter dimension. That is, the tab 53 is formed in such a manner that the stresses developed by the waste food particles impacting thereon are absorbed in a direction perpendicular to the direction in which the tab is bent from the plate 28.

An aperture 57 having a pair of flat and parallel extending sides 58 connected by a pair of curved sides 59 is formed centrally of the disk section 35 of the rotor plate 28. The flat sides 58 permit the rotor 28 to be assembled on the motor shaft 22, which is formed with similar flats, in a locked relation so that the rotor plate 28 is rotated with the shaft 22 without the necessity of an auxiliary keyway or pin connection.

In the operation of the disposal unit 11 illustrated in FIG. 1, food wastes are deposited on the upper concave surface of the rotor plate 28. Rotation of the plate 28 by the motor shaft 22 causes such food waste to be engaged by either the vertically extending sides 44 or 45 of the lugs 42, depending upon the direction of rotation of the plate 28, to cause the food waste particles deposited on the concave surface of the rotor plate to rotate therewith. Such rotation of the food waste particles causes these particles to move outwardly by centrifugal action. Because the surface 37 of the rotor plate is inclined upwardly such food wastes are caused to move both outwardly and upwardly and into engagement with the shredder teeth 18 and 19 of the shredder ring. The shredded particles then fall back toward the central portion of the rotor plate where they are again impelled outwardly and upwardly into the shredder teeth. Thus, the food waste particles are subjected to a tumbling action which permits the particles to be comminuted into quite small particles in a very rapid manner. Concurrently with such comminution of the food waste particles within the shredder chamber, water is admitted thereto through the opening 32. The water serves to flush shredded particles through the apertures 39 and 41 and to the space below the rotor plate 28. There the downwardly projecting V-shaped members 47, rotating in the fluid mixture, act as pump blades and impel the water and shredded food waste particles out the exhaust conduit 34 in a positive manner.

As noted hereinabove, the upwardly projecting tab 53 engages the waste elements, which, by reason of their configuration or surface characteristics, might tend to slide over the lugs 42. Thus, the tab 53 engages these elements to throw them against the shredder teeth with sufficient force to cause them to be shredded and reduced in size along with the other waste admitted to the shredding chamber.

It should be noted also that the relatively large nut 29 tends to displace the material to be shredded outwardly to prevent such material from riding on the center of the plate without being subjected to the comminuting action of the disposal unit.

In accordance with this invention, the rotor plate 28 is formed in a simple and economical manner from sheet metal stock. The method of forming the rotor 28 comprises the following steps;

(1) The overall circular plate is cut from a sheet of metal stock by a punching or stamping operation;

(2) The plurality of cylindrical spaced orifices 39 and 41 are formed in the plate by a punching or a drilling operation;

(3) The outer annular section 36 of the plate is bent about the circumferential periphery of the central disk section 35 to provide the generally concave and convex surfaces of the opposite sides of the plate;

(4) The lugs 42 are formed by expanding diametrically opposed sections of the plate;

(5) The pumping elements 47 are formed by cutting through the annular section 36 along a pair of parallel and closely adjacent lines, and the strip defined therebetween is expanded into a downwardly projecting V-shape by exerting a force on the central portion of the strip;

(6) The tab element 53 is formed by cutting through the annular section 36 of the plate along the sides 54 and 55 of the tab and then bending the tab upwardly from the concave surface 37 about the uncut base 56.

(7) The shaft receiving aperture 57 is punched from the central part of the disk 35.

While the steps outlined above in forming the plate 28 have been set forth in a specific order, it is apparent that the order of performing the various steps may be varied and that two or more of the specific steps may be combined in one forming operation.

Thus, by a series of simple and easily performed cutting and forming operations, there is provided a light weight but strong rotor element for a waste comminuting unit which provides structural elements for impelling particles to be comminuted into the teeth of a surrounding and upwardly extending shredding ring regardless of the size or surface configuration of such particles. The rotor element also provides downwardly projecting pump-

ing elements for pumping comminuted particles out an exhaust conduit in a positive manner. The rotor unit, because it is formed from a rounded metal sheet, is sufficiently elastic to absorb impact without fracture, and because the rotor plate may be formed from a high tensile strength steel, it possesses sufficient strength to prevent permanent distortion.

In comparison with the cast rotor units heretofore known, the rotor of this invention is of relatively light weight so that it possesses low rotational inertia and is rapidly brought up to full rotational speed by the powering motor. Thus, the rotor is effective to provide a high impacting action almost immediately upon initiation of its rotation. For this reason the rotary unit of this invention is less subject to malfunctioning due to lodgement of obstructing items between the rotor and the other operating parts of the disposal unit than the cast rotor units heretofore known.

The dished upper surface of the rotor unit provides a tumbling action which serves to comminute the waste particles more rapidly than the substantially flat surfaced rotors in general use which rely primarily on centrifugal action alone to obtain the comminuting action.

Except for grinding or otherwise machining a portion of the lower surface **31** of the central disk to provide a more effective sealing surface for the seal **27**, the rotor constructed in accordance with the method outlined hereinabove requires no machining operations to balance or otherwise finish the rotor prior to installation in the disposal unit. That is, the rotor as formed is essentially symmetrical and the forming operations required to produce the rotor do not produce any rough or jagged surfaces that require machining. It should be noted also that all portions of the rotor plate are of substantially uniform sectional thickness throughout.

Hence, while I have illustrated and described the preferred embodiments of my invention, it is to be understood that these are capable of variation and modification.

I claim:

1. A rotor unit for a waste comminuting device comprising, a one piece circular plate member stamped from a metal sheet and having first and second opposed surfaces, said plate member having a plurality of circumferentially spaced, cylindrical apertures extending therethrough, said plate having a pair of diametrically opposed lug sections projecting from said first surface and recessed from said second surface, and said plate having a plurality of impeller blades comprising strips cut from the plate at the side portions only of the strips and integral with the plate at the end portions of the strips, said strips being bent and expanded at their central portions to form impeller members projecting from the second surface.

2. A rotor unit for a waste comminuting device comprising, a one piece circular plate member having first and second opposed surfaces and having a flat central disk and an annular section surrounding and integrally joined to the central disk, said plate member having a plurality of spaced, cylindrical apertures extending therethrough, said annular section having a pair of diametrically opposed lug sections projecting from said first surface and recessed from said second surface, each of which provides a pair of side members extending in perpendicular relation with the first surface and said annular section having a plurality of rectangular strips cut from the plate at the side portions only of the strips and integral with the plate at the end portions of the strips, said strips being bent and expanded to form impeller members projecting from the second surface.

3. A rotor unit for a waste comminuting device comprising, a one piece circular plate member stamped from a metal sheet and having a flat central disk and an annular section surrounding the central disk and integrally joined thereto, said annular section being inclined with respect to said disk to present a generally concave first surface on one side of said circular plate member and a generally convex second surface on the opposite side of said plate member, said plate member having a plurality of circumferentially spaced, cylindrical apertures extending therethrough, said annular section having a pair of diametrically opposed lug sections projecting from said first surface and recessed from said second surface, each of which provide a pair of side members extending in perpendicular relation with the first surface, and said annular section having a plurality of rectangular strips cut from the plate at the side portions of the strips and integral with the plate at the end portions of the strips and forming V-shaped members projecting from the second surface.

4. A rotor unit for a waste comminuting device comprising, a one piece circular plate member stamped from a metal sheet and having a flat central disk and an annular section surrounding the central disk and integrally joined thereto, said annular section being inclined with respect to said disk to present a generally concave first surface on one side of said circular plate member and a generally convex second surface on the opposite side of said plate member, said plate member having a plurality of circumferentially spaced, cylindrical apertures extending therethrough, said annular section having a pair of diametrically opposed lug sections projecting from said first surface and recessed from said second surface, each of which provide a pair of side members extending in perpendicular relation with the first surface, said annular section having a plurality of rectangular strips cut from the plate at the side portions of the strips and integral with the plate at the end portions of the strips and forming V-shaped members projecting from the second surface, and said annular section having a tab member cut from the plate at the sides and end of the tab and attached to the plate at the base of the tab and projecting in perpendicular relation with the first surface.

5. A rotor unit for a waste comminuting device comprising, a one piece circular plate member stamped from a metal sheet and having a flat central disk and an annular section surrounding the central disk and integrally joined thereto, said annular section being inclined with respect to said disk to present a generally concave first surface on one side of said circular plate member and a generally convex second surface on the opposite side of said plate member, said plate member having a plurality of circumferentially spaced, cylindrical apertures extending therethrough, said annular section having a pair of diametrically opposed lug sections projecting from said first surface and recessed from said second surface, each of which provide a pair of side members extending in perpendicular relation with the first surface, said annular section having a plurality of rectangular strips cut from the plate at the side portions of the strips and integral with the plate at the end portions of the strips and forming V-shaped members projecting from the second surface, said annular section having a tab member cut from the plate at the sides and end of the tab and attached to the plate at the base of the tab and projecting in perpendicular relation with the first surface, and said plate member being stainless steel and said disk, annular section, lug sections, rectangular strips and tab member being of substantially uniform section throughout.

6. A rotor unit for a waste comminuting device comprising, a one piece circular plate member stamped from a metal sheet and having a flat central disk and an annular section surrounding the central disk and integrally joined thereto, said annular section being inclined with respect to said disk to present a generally concave first surface on one side of said circular plate member and a generally convex second surface on the opposite side of said plate member, said plate member having a plurality of circumferentially spaced, cylindrical apertures extending therethrough, said annular section having a pair of diametri-

cally opposed lug sections projecting from said first surface and recessed from said second surface, each of which provide a pair of parallel side members extending in a generally radially outward direction and perpendicular relation with the first surface, said annular section having a plurality of rectangular strips cut from the plate at the side portions of the strips and integral with the plate at the end portions of the strips and forming V-shaped members projecting from the second surface, said annular section having a tab member cut from the plate at the sides and end of the tab and attached to the plate at the base of the tab and projecting in perpendicular relation with the first surface, said V-shaped and tab members providing apertures through the plate additional to said cylindrical apertures, said plate member being stainless steel and said disk, annular section, lug sections, rectangular strips and tab member being of substantially uniform section throughout, and said central disk having a shaft receiving aperture formed with a pair of parallel sides.

7. A rotor unit for a waste comminuting device comprising, a circular plate member having concave and convex opposed surfaces, said plate member having a plurality of circumferentially spaced, cylindrical apertures extending therethrough, said plate having a pair of diametrically opposed lug sections projecting from said concave surface, and said plate having a plurality of impeller blades comprising strips cut from the plate at the side portions only of the strips and integral with the plate at the end portions of the strips with portions of said strips between said end portions of said strips projecting from said convex surface.

8. A rotor unit for a waste comminuting device comprising, a circular plate member having concave and convex opposed surfaces, said plate member having a plurality of circumferentially spaced, cylindrical apertures extending therethrough, said plate having a pair of diametrically opposed lug sections projecting from said concave surface, and said plate having a plurality of impeller blades comprising strips cut from the plate at the side portions only of the strips and integral with the plate at the end portions of the strips with said strips being bent and expanded at their central portions into V-shaped projections extending below said convex surface.

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