

Dec. 19, 1961

W. G. PONTIS
DOMESTIC APPLIANCE

3,013,736

Filed Feb. 26, 1958

3 Sheets-Sheet 2

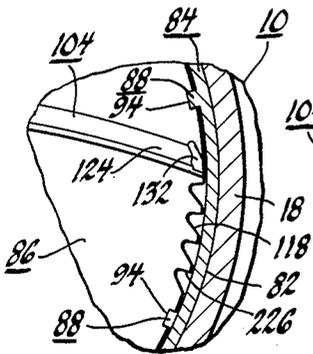


Fig. 2

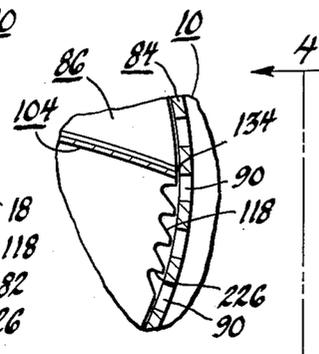


Fig. 3

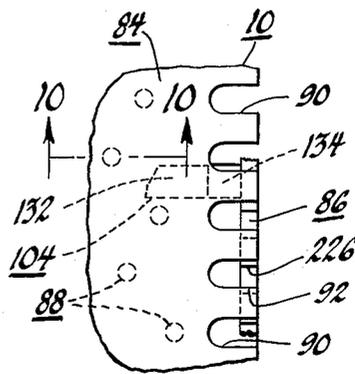


Fig. 4

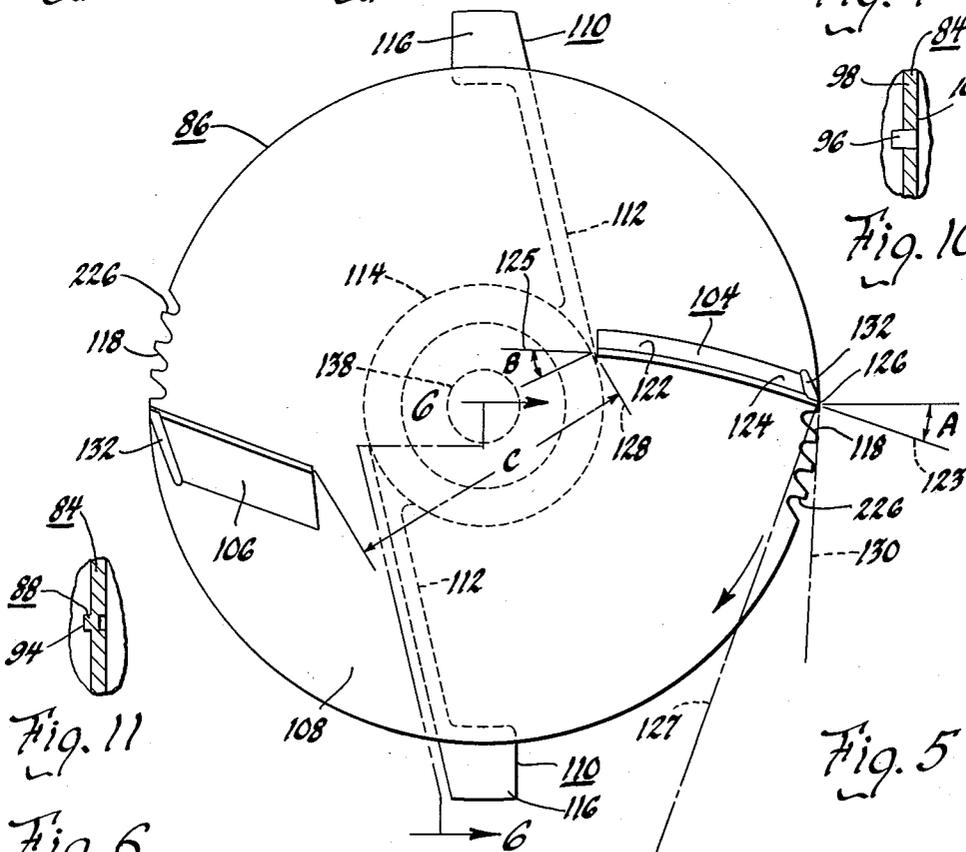


Fig. 5

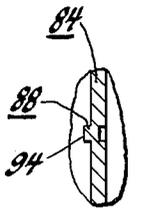


Fig. 11

Fig. 6

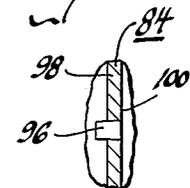
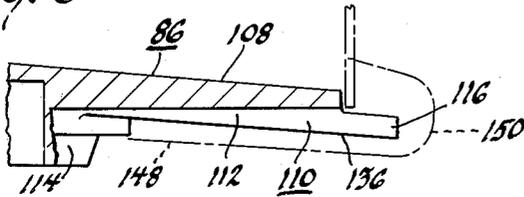


Fig. 10

INVENTOR.
William G. Pontis
BY Edwin S. Daywing
HIS ATTORNEY

Dec. 19, 1961

W. G. PONTIS
DOMESTIC APPLIANCE

3,013,736

Filed Feb. 26, 1958

3 Sheets-Sheet 3

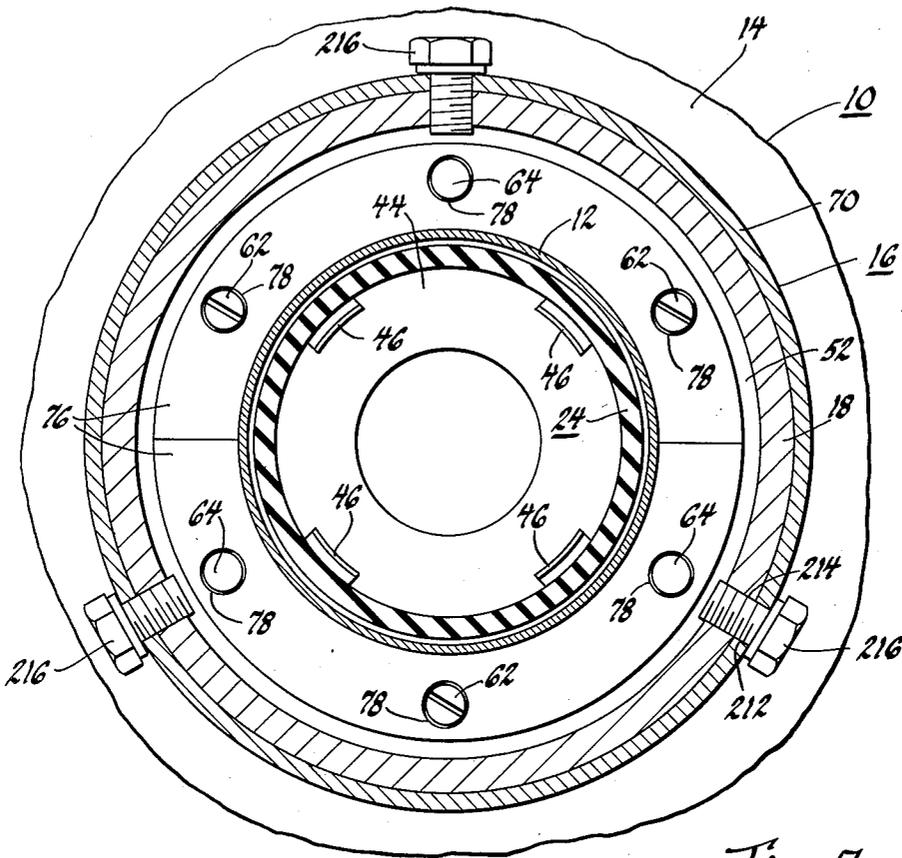


Fig. 7

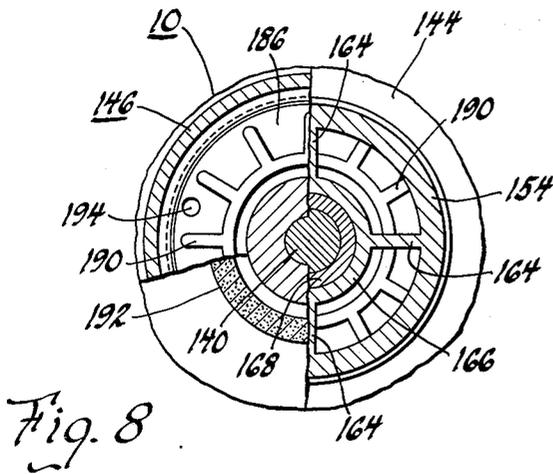


Fig. 8

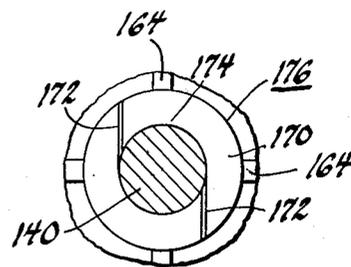


Fig. 12

INVENTOR.
William G. Pontis
BY Edwin S. Nyberg
HIS ATTORNEY

3,013,736

DOMESTIC APPLIANCE

William G. Pontis, Dayton, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Filed Feb. 26, 1958, Ser. No. 717,623

7 Claims. (Cl. 241-46)

This invention relates to a domestic appliance and more particularly to apparatus for comminuting waste in an improved manner to produce a flowable mixture suitable for discharge to the drain-line of a sink.

In particular, this device relates to apparatus for attachment to the outlet of a sink and having a power driven impeller for initiating the comminuting shredding and abrading of waste material placed within the device.

A particular object of this invention is the provision of an improved comminuting device which incorporates a differential obstacle bypass to aid an unloading escape-ment through a clearance in the open center of an im- peller, for particles tending to wedge or jam.

A further object of this invention is the novel configura- tion of an impeller cutting tooth wherein a curvature in the direction of impeller rotation effects a raking action at the cutting end of the tooth and, through a progressively increasing rake action, a jam-preventing unloading func- tion at the inner end of the tooth.

A further advantage of the improved waste disposer results in a controlled rate of comminution proceeding downwardly past a series of selectively placed stationary pins, a series of peripherally arranged cutter ports and a bottom row of open-slotted fibre cutting slots.

It is also an object of this invention to provide a lubri- cation system for vertically mounted motors wherein the oil system is permanently sealed and wherein liquid separa- tion of bearing surfaces for long-life operation is ac- complished without the need of anti-friction bearings, such as balls, rollers, etc.

A further object is the provision of an improved sta- tionary cutter liner.

Further objects and advantages of the present invention will be apparent from the following description, refer- ence being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a side sectional elevation of a food waste disposer embodying the invention;

FIGURE 2 is a sectional view taken along line 2-2 of FIGURE 1 and showing the relation of impeller cutter to the cutter liner pins;

FIGURE 3 is a sectional view taken along line 3-3 of FIGURE 1 showing the relationship between a lower portion of the impeller cutter and the outflow cutter ports of the cutter liner;

FIGURE 4 is an elevational view taken along line 4-4 of FIGURE 3 and showing the relationship of the periph- eral shearing teeth on the impeller with the bottom shear- ing edges of the outflow cutter ports;

FIGURE 5 is a plan view of the cutter impeller;

FIGURE 6 is a fragmentary sectional view taken along line 6-6 of FIGURE 5 and showing the rotary sweep device for removing comminuted waste from said disposer;

FIGURE 7 is a sectional view taken along line 7-7 of FIGURE 1 showing the waste disposer sink mounting means;

FIGURE 8 is a sectional view taken along line 8-8 of FIGURE 1 and showing the novel lubrication sealing arrangement of this invention;

FIGURE 9 is a fragmentary sectional view similar to FIGURE 8 and showing another lubrication arrangement;

FIGURE 10 is a sectional view taken along line 10-10 of FIGURE 4 showing an inserted cutter liner pin;

FIGURE 11 is a view taken along line 10-10 of FIG- URE 4 showing an extruded cutter liner pin; and

FIGURE 12 is a plan view taken along line 12-12 of FIGURE 9 to illustrate the centrifugally actuated oil grooves.

In accordance with this invention as depicted in FIG. 1, a disposer shown generally at 10 is supported in hanging relation from an outlet collar 12 on a waste or water receiving container or sink 14. Disposer 10 is comprised of a mounting assembly 16, and a comminuting chamber or hopper 18 having a volute pumping area 20 to which a drainage outlet 22 connects. A rubber or resilient insert 24 is formed with a flexible annular rib 26 and a rib 28 reinforced by ring 30 to effect an unyielding stable diam- eter for rib 28. A valley is formed between the annular ribs 26 and 28 to receive a radially inwardly directed collar flange 32 of the sink outlet collar 12. The bottom of the cup-shaped resilient member 24 is segmented by radially slitting at 34 to form yielding tabs 36. The cup- shaped member 24 may be removably installed in the sink outlet 12 by forcing it downwardly. The rib 26 will yield to pass inwardly extending rib 32 and it will expand again thereafter into liquid sealing engagement with an inward- ly projecting annular housing flange 38. When in place, the cup member 24 forms a waste inlet 40 having an upper shoulder 42. A stopper 44 carries four support tabs 46 which bear against the vertical sides of inlet 40 to hold the stopper 44 in either a raised liquid passing relation- ship or a lowered stopping relationship to the outlet open- ing 40. When raised, water may flow between the tabs 46, through the opening 40 and 33 into the comminuting chamber 18. The rubber tabs 36 will yield to pass larger waste particles. An adapter knockout plate may also be provided at 48 in the side of the comminuting chamber 18 for attachment of a dishwasher or the like.

The novel method of attachment of a comminuting chamber 18 to the depending outlet sink flange 12 will now best be understood with reference to FIGS. 1 and 7 wherein a simply connected, substantially vibrationless interconnection exists between the sink 14 and the disposer 10. A unitary mounting assembly 16 is comprised of a top support ring 50, a bottom support ring 52 and annu- lar rubber rings or bushings 54 and 56. The bushing 54 carries a depending portion 58 which carries ports 60 to receive three adjusting bolts 62 and the mounting assem- bly securing rivets 64. Similar ports 65 are provided in bushing 56 and are placed in matched relation to the ports 60 of bushing 54. The depending portion 58 of bushing 54 forms an annular recess 66 which receives a radially inwardly projecting flange 68 of a depending dis- poser support collar 70. The mounting assembly is thus supported in assembled relation by the three rivets 64 which are isolated from support flange 70 by the rubber bushings 54 and 56. The support collar 70 is further segregated from annular support ring 52 by a depending annular flange 72 of bushing 56. A plurality of adjust- ing bolts 62 are threaded in upper support ring 50 and lower support ring 52 and adapted to extend downwardly below the lower support ring 52 for subsequent adjust- ment of the disposer 10 to the sink opening 12. The bolts 62 are similarly isolated by bushings 54 and 56 from the vibrating portions of the disposer. The inwardly pro- jecting flange 68 of support collar 70 is formed with rec- esses 74 large enough to receive the bolts 62 and rivets 64 without touching collar 70. In attaching the mount- ing assembly 16 to the depending sink outlet collar 12, a split ring 76 having apertures 78 to receive the bolts 62 and rivets 64 is placed with its annular ledge 80 in rela- tionship to the depending collar flange 32. The bolts 62 are then tightened upon a shoulder portion 82 of the sink 14 thereby urging the mounting assembly 16 down- wardly against the split ring 76 which is stopped by flange

32. The mounting assembly is thereby securely attached to the sink but carries the disposer support collar 70 in rubber isolated relationship to the depending sink outlet 12.

The comminuting chamber or hopper 18 is formed with an inner recess 82 for receiving a hopper cutter liner 84. The recess 82 is cast with a one-half degree taper having a narrowest diameter at the upper portion of the recess 82. A similar one-half degree taper in complementary relationship to the taper of recess 82 is fabricated into the hopper cutter liner 84. The liner 84 may then be shrunk-fit into the recess 82. Another method of securing the cutter liner to the housing 18 is through a thermosetting cement which bonds the liner to the housing. Since the cutter liner 84 is heat treated to give the cutting surface (described hereinafter) a hardness of 55 to 60 Rockwell, it is desirable to resist temperatures in assembling the cutter liner to the casing 18 which would anneal the temper from these cutting edges or surfaces. One method of shrink-fitting prescribes heating the hopper casing 18 by a localized electrical field to expand the casing in the area of recess 82. The cutter liner 84 is dropped into the expanded recess 82 which then shrinks upon cooling into a snug hopper liner retaining capacity. Where the cutter liner 84 is formed of a comparatively soft metal utilized solely to support a plurality of spaced cutting pins, described more fully hereinafter, the cutter liner 84 may be firmly held to the casing 18 by performing a die casting operation of the hopper casing 18 about the cutter liner, supported on the die cast mold core.

The novel, descending, progressive comminuting procedures of this invention will now be more fully described with reference to FIGS. 1, 2, 3 and 4. The cutting assembly is comprised principally of the hopper mounted cutter liner 84 and a rotating impeller cutter 86 cooperating in a comminution process with the liner 84. The progressive downward comminuting action is facilitated by a plurality of pins, shown generally at 88, formed in concentric circles about the inner circumference of the cutter liner 84. The pins 88 are approximately $\frac{1}{8}$ " in diameter and arranged in twelve circles containing six pins each, one circle above the other. The circles of pins are so disposed that the plane defined by the top of one circle of pins coincides with the plane defined by the bottom of the pin circle immediately thereabove. For instance, the top of pin 88a is in the same plane as the bottom of pin 88b. Along the bottommost edge of cutter liner 84 a series of inverted-U outflow cutter ports 90 are cast in the liner, the open draft outflow ports permitting free down-flow. The outflow cutter ports 90 are arranged about the periphery of the liner 84 in a single plane and are formed with a bottom cutting or shearing edge 92. Where the cutter liner 84 is formed in a shell casting process the cutter pins 88 are machined to form a hard cutting edge about the periphery of a top surface 94. A fine grinding or machining process similarly creates an inside peripheral cutting edge on the outflow cutter ports 90. A fabricating procedure has also been used in forming the cutter liner 84, as best seen in FIGS. 10 and 11. In the arrangement of FIG. 10 tungsten carbide cutter pins 96 are inserted into a relatively soft stainless steel liner 98. This is accomplished by means of an automatic operation in which the cutter pin insert becomes its own piercing punch, employing the automatic magazine-equipped punch press for forcing the cutter pins 96 through the liner wall until the pin 96 bottoms on the exterior wall 100 of the liner 98. The pins 96 are tapered so that a tight fit is accomplished when the pins are forced into place in the liner wall. An extrusion process (FIG. 11) has also been used to form the cutting pins 88. In this process the pins 88 are machined to give a sharp-edge top surface 94, as described in connection with the shell casting process hereinabove. In both of the latter two fabricating operations the completed cylindrical hopper liner 84 is formed by wrapping the pin carrying liner element to form a cylinder and

welding the resultant abutting seam. Where the insert pin process depicted in FIG. 10 is used, the completed liner may be secured to the disposer casing 18 in conjunction with the die casting of this casing. Since only the pins 96 are hardened, the heat generated in the die casting operation will not anneal the pins. In positioning the cutter liner 84 in hopper casing 18 the liner is so disposed to place the uppermost point of the outflow cutter ports 90 in juxtaposition with the top wall 102 of the peripheral flange cavity formed at the bottom of casing 18.

Reference may now be had to FIG. 5 for a more complete understanding of the configuration of the impeller cutter 86. The impeller cutter is formed in a shell casting process wherein a curved cutter tooth 104 and a differential straight cutter tooth 106 is formed on the upper conical impeller surface 108. At spaced positions upon the bottom of the impeller 86 two identical rotary dynamic proximity sweep devices 110 are formed. The sweep devices 110 are formed with a radially inward depending rib 112 which projects tangentially from the hub 114 of the impeller 86. The ribs 112 terminate in an end portion 116 which extends beyond the outer peripheral edge of the impeller disc 86. With the impeller 86 rotating in the direction of the arrow (FIG. 5) the sweep devices 110 create a pumping action which sweeps any comminuted material from the disposer. Formed in the outer peripheral edge of the impeller disc 86 are perimeter clearance gristle cleaning cutters 118. Although four teeth are shown on opposite sides of the impeller disc in FIG. 5, it has been found that one tooth provides satisfactory shearing for the fibrous material produced during comminution.

A particular feature of this invention is the provision of a specifically designed curvature for the curved or rake cutter tooth 104. The tooth 104 is so designed to define an innermost escape section 122 and an outermost rake section 124. For domestic food waste disposal, the curvature of cutter tooth 104 should be such that a line 123 drawn tangent to the outer peripheral edge of the tooth rake section 124 forms an angle "A" with a line drawn radially from axis zero of disc 86 to the leading edge 126 of the rake section. Similarly, the design so configures the escape section 122 that a line 125 drawn tangent to the escape edge 128 forms an angle "B" with a radial line drawn to edge 128. Careful calibration of the curvature for tooth 104 has shown an acceptable range for angle "A" of 10-30° and a range for angle "B" of 30-50°. However, the most efficient comminuting action is found to exist when the leading rake angle "A" is 20° and the trailing escape angle "B" is 40°. The radius of curvature for tooth 104 has been found most effective as $10\frac{1}{2}$ " taken from the point 126 along a line 127 20° radially inwardly from a tangent 130 drawn to the outer periphery of the cutter impeller disc 86 at the outer leading edge 126 of curved cutter tooth 104. The significance of the specifically designed configuration is found in the cooperation of cutter tooth 104 with the cutter liner 84. The rake section 124 is so disposed to resist any attempt on the part of any given waste particle to impale, wedge or jam against the cutter pins 88. The receding rake angle forces the waste away from the wall, which is then either impelled back toward the cutter liner by the reverse curvature of the escape section 122 or allowed to escape through the opening "C" to the opposite side of the comminuting chamber. The centrifugal force generated by the rotation of cutter disc 86 provides a continuous urging of the waste material toward the cutting surfaces of the periphery of the comminuting chamber 18.

A straight tooth 106 is formed on the upper surface 108 of the impeller 86 diametrically opposite curved tooth 104. The rake angle which tooth 106 defines in relation to cutter liner 84 is the same as the angle formed by the rake section 124. The tooth 106 provides a differential cutting action in that its configuration is straight as compared to curved tooth 104 and its length is shorter. Thus,

5

it should be understood that the center escape opening "C" between the diametrically opposite cutter teeth is functional when used with a curved cutter tooth, i.e. stalling of the impeller 86 is minimized. As in the case of the curved blade, the small rake angle at the cutting end of the differential cutter tooth 106 is effective on the smallest waste particle in eliminating a wedging, jamming, stalling condition.

In elevation (FIG. 1), curved cutter tooth 104 and the differential cutter tooth 106 are seen to have identical configurations for their radially outer edges which are significant to provide the progressively finer downward comminuting action utilized so effectively in this invention. The cutter teeth 104, 106 both have an upper tapered portion 132 which cooperates with the lower circles of pins 88. A lower tooth cutting section 134 provides the sharp edge which, in conjunction with the outflow cutter ports 90, completes the comminution of the waste particles. The most effective taper for the upper portion 132 of cutter teeth 104, 106 has been found to be $1\frac{1}{2}^\circ$ in the direction indicated by FIG. 1. The turntable or upper surface 108 of impeller disc 86 is conically formed with an approximate 5° taper downward from the center axis of the impeller, as best seen in cross-section in FIG. 1.

As aforesaid, a rotary sweep device 110 is formed on the bottom of the impeller disc 86. As an aid in the clearance action, the sweep device has its lower edge 136 formed at the same angle as the top conical surface of the impeller disc, i.e. 5° downward taper from the impeller center toward the outer periphery. This downward taper places the sweep device 110 in close proximity to the outer limits of the outflow chamber to more effectively sweep the comminuted waste material from the disposer (FIG. 6). The impeller mounting arrangement in conjunction with the motor housing will now be disclosed with reference to FIG. 1. The impeller disc 86 is tapped at 138 to receive a threaded end portion of a motor shaft 140. The motor housing is formed with a lower prime mover section 142 and an upper section 144 in which resides a novel shaft lubricating system shown generally at 146. The upper motor section 144 is cast with its top so configured to cooperate with the comminuting chamber casing 18 to form the bottom half of a pump housing. In particular, a depressed sweep cavity 148 is formed with the same taper described in connection with the top surface 108 of the impeller disc 86 and the bottom edge of the sweep device 136. The outermost peripheral portion 150 of the cavity 148 is formed in volute fashion to slope slowly downwardly about the outer peripheral portion of the pump cavity 150 to a lowermost trough section 152 where it connects to drain outlet 22. In this regard, and with reference to FIGS. 1 and 6, the pump-out or sweep-out is seen actuated by the rotary motion of the sweep device 110. In view of its close proximity to the defining limits of the pump chamber the sweep device centrifugally urges the fluid waste to the outer peripheral portion 150 of the pump chamber. As it is swept toward the lowermost portion of the descending peripheral trough 152, it is impelled through the outlet 22 to drain.

An effective lubrication system has been devised for the disposer of this invention in which a life-time lubrication is provided. The upper motor section 144 is formed with a centrally located collar 154 having an upper annular recess 156 and a lower annular ledge 158. The impeller disc 86 defines a liquid sealing shoulder 160 and a thrust bearing surface 162. The depending collar portion 154 is formed with several radial support ribs 164 cast integral therewith. At the radially inner end of the ribs 164 and integral therewith a shaft bearing cylinder 166 is disposed in support relationship to motor shaft 140. Carried in the support cylinder 166 is a bearing metal liner 168 to provide the bearing surface in which the shaft 140 rotates. This liner has an

6

uppermost horizontal thrust support flange 170 (FIG. 12) in which oil grooves 172 are formed tangentially to the shaft receiving aperture 174. It is important to note that the bearing metal liner 168 is non-porous and in this regard may be eliminated by a preferred and simplified alternative arrangement seen more clearly in FIGURE 9. In this arrangement a portion of the casting 144 is formed to provide a bearing support cylinder 176 supported as in the above described arrangement by ribs 164. The FIG. 1 lubrication chamber 178 defined at its outer periphery by casting collar 154 is sealed closed at its bottom by an oil-tight seal arrangement 180 secured by an O ring 182 to the collar 154 and by crimping the lower annular edge portion of 154 over washer 184. The top of the lubrication cavity 178 carries an annular seal 186 secured to casting recess 156 by a snap ring 188. A Bellville washer 190 acts upon the radially inner end of seal 186 to force a carbon bearing ring 192 into oil-egress preventing, water-ingress eliminating engagement with shoulder 160 of impeller disc 86. A pressure relief opening 194 is provided at one point in the annular seal ring 186 to guard against pressure build-up within the lubricating chamber 178.

The lubrication system utilizes centrifugally actuated oil circulation to lubricate the motor shaft 140. With the impeller disc 86 rotating in a clockwise direction (FIGURE 12), the relative movement between impeller shoulder 162 and bearing liner flange 170 sets up a camming action which urges oil between the liner and the shaft into oil grooves 172. The relative rotational movement then initiates centrifugal forces in the oil grooves 172 thereby to throw any oil within the grooves radially outwardly. As oil is moved outwardly from the grooves, additional oil is drawn between the shaft 140 and liner 168 as a replacement therefor. In this manner, it may therefore be seen that an oil circulation is set up from the reserve cavity 178 inwardly at the bottom of bearing liner 168 to lubricate the shaft 140. Since the lubrication system is sealed, the lubricant is ageless and a permanent lifetime system is effected. Although oil alone will function effectively as a lubricating vehicle, a fibrous wicking comprised of 85% oil is particularly satisfactory.

A similar circulation, as seen by the arrows, is introduced in the lubrication arrangement of FIGURE 9. This embodiment has been further simplified by sealing the top of the lubricant chamber 178 by a single resilient seal 196 which seals against water ingress at 198 and against oil egress, at 200.

In assembling the impeller motor section 141 to the comminuting chamber 18, an upstanding tenon 202 cooperates with a mortice 204 and a gasket 206 to effect a tight liquid sealing engagement at the jointure. A snap ring 208 overlies a peripheral flange on both the impeller motor assembly 141 and the comminuting section 18 to securely retain the two in assembled relationship. To assemble the disposer 10 to the sink 14, an upper recessed flange 210 is placed in underlying relationship with the depending support flange 70 of sink mounting assembly 16. The disposer is rotated until the apertures 212 are in line with the chamber connecting openings 214 and the connecting bolts 216 inserted. The disposer 10 now depends in a rigid though relatively vibrationless connection with the sink outlet flange 12.

The novel progressive comminuting action provided by this invention will now be described with reference to FIGURE 1, 2, 3 and 4. The loading cap 44 is lifted to provide access for any bulk or waste desired to be comminuted. The tabs 36 yield to pass any material which will not flow through inlet cup opening 33. With the waste material in the hopper or chamber 18, water is introduced to the chamber and the motor 142 is energized to initiate the comminuting or grinding process. As food descends in the hopper 18, it meets first the upper circles of cutter pins 88. A progressive snagging action occurs

which breaks off or subdivides the larger waste particles whereby the leading edge of the pin cutting surface 94 snags into the waste. This snagging or shearing action increases as the full diameter of the pin proceeds through the waste material. The progressively larger cut of the pins 88 permits use of a smaller motor 142 than if the pins presented a straight frontal cutting surface. A second stage in the comminution occurs when the waste reaches a position adjacent the top of cutter teeth 104, 106 (FIGURE 2). At this point, the tolerance between the upper portion of tapered tooth segment 132 is greatest. As the waste is introduced to lower portions of tapered segment 132 (FIGURE 3), the cut becomes finer as the cutter teeth 104, 106 cooperate with the progressively lower circles of pins, i.e. those circles in which pins 218, 220, 222 and 224 lay. As the waste settles in the chamber 18, the conical configuration of the turntable of impeller disc 86 provides a third stage of progressive comminution wherein the reduced particles are acted upon by lower tooth segment 134 which cooperates with the outflow cutter ports 90 in effecting a thorough, complete comminution. In the comminution of many fibrous materials such as gristle and husks, long fibers or strings are generated which become jammed between the rotating impeller 36 and the cutter liner 84. For this reason, a fourth comminuting stage is required to shear or sever the lengths of fiber which would tend to jam and stall the disposer. FIGURE 3 is most illustrative of the shearing rotating impeller teeth 118 in which a leading cutting edge 226 moves relatively to a bottom shearing edge 92 of outflow cutter port 90 in extremely close proximity thereto. This action serves to reduce the lengths to a fineness which will eliminate any jamming which such tangled fibers could produce. The combined result is a freely flowable substance.

In the reduction process provided by the four stages outlined hereinabove, the waste is comminuted in a rapid manner to a fineness which is washed through the outflow cutter ports 90 into the waste removal chamber 20. The rapidly rotating sweep device arms 112 impel the waste and water to the outer peripheral trough of the pump housing. The rapid pumping action induces a centrifugal force to the fluid waste which carries it around the descending trough 152 to the outlet 22 where it is propelled quickly and positively into the sewage system.

Although the comminuting action provided by the above described device is both efficient and rapid, the shock absorbing mounting arrangement prevents a transmittal of vibration noises to the sink. The fineness of grind and the outlet force of the rotary dynamic sweep device combine to prevent clogging of the sewage system.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. A food waste disposer comprising a comminution chamber; means for connecting said chamber to the drainage outlet of a receptacle for food waste and water; a cutter liner disposed in said chamber, said cutter liner having radially inwardly directed shredding pins in independent spaced planar relation and outflow cutter ports; said outflow cutter ports having bottom shearing edges; a circular slightly conical impeller horizontally disposed in said chamber and having an upstanding curved tooth and an upstanding straight tooth adjacent said cutter liner, said curved tooth and said straight tooth having an upper portion and a lower portion, said upper portions cooperating with said pins and said lower portions cooperating with said cutter ports to comminute said waste; a radially directed outer peripheral tooth on said impeller, said peripheral tooth cooperating with said shearing edges to shear said waste; drainage means communicating with said chamber; a depending sweep device on said im-

PELLER to move said waste to said drainage means after said comminution; means for rotating said impeller and a closed centrifugally actuated circulating oil lubrication system for said rotating means.

2. A food waste disposer comprising a comminution hopper; means for connecting said hopper to the drainage outlet of a sink; a hopper cutter liner disposed in said hopper, said cutter liner having radially inwardly directed shredding pins, outflow cutter ports and bottom open shearing edges; a circulation impeller horizontally disposed in said hopper and having an upstanding curved tooth adjacent said hopper liner, said curved tooth having an upper portion and a lower portion, said upper portion cooperating with said pins and said lower portion cooperating with said cutter ports to comminute said waste; an outer peripheral tooth on said impeller; said peripheral tooth cooperating with said shearing edges to shear said waste; drainage means communicating with said hopper; means to move said waste to said drainage means after said comminution; and means for rotating said impeller.

3. A food waste disposer comprising a comminution hopper; means for connecting said hopper to the drainage outlet of a sink; a hopper cutter liner disposed in said hopper, said cutter liner having radially inwardly directed shredding pins, outflow cutter ports and bottom open shearing edges; a circulation impeller horizontally disposed in said hopper and having an upstanding curved tooth adjacent said hopper liner, said curved tooth having an upper portion and a lower portion, said upper portion cooperating with said pins and said lower portion cooperating with said cutter ports to comminute said waste, said curved tooth further having a leading rake section and a trailing escape section, said rake section forming substantially a 20° angle with a line drawn radially from the center of said impeller to the outer end of said rake section and said escape section forming substantially a 40° angle with a line drawn radially from the center of said impeller to the inner end of said escape section; an outer peripheral tooth on said impeller; said peripheral tooth cooperating with said shearing edges to shear said waste; drainage means communicating with said hopper; means to move said waste to said drainage means after said comminution; and means for rotating said impeller.

4. A cutter tooth rotatable disc-like for a comminuting impeller having a substantially planar top surface, said tooth extending upwardly from said top surface and having a leading rake section and a trailing escape section, said tooth configured in a manner whereby a tangent on said top surface to the end of said rake section forms a 20° angle with a line drawn radially on said top surface from the center of said impeller to the outer end of said rake section, and whereby a tangent on said top surface to the end of said escape section forms a 40° angle with a line drawn radially on said top surface from the center of said impeller to the inner end of said escape section.

5. A rotatable disc-like comminuting impeller having a conically formed top surface, a first cutting member concave in the direction of rotation of said impeller and extending upwardly from said top surface, and a second non-radial cutting member extending upwardly from said top surface; said first cutting member having a leading rake section and a trailing escape section, said rake section forming substantially a 20° angle with a line drawn radially on said top surface from the center of said impeller to the outer end of said rake section, and said escape section forming substantially a 40° angle with a line drawn radially on said top surface from the center of said impeller to the radially inner end of said escape section.

6. A rotatable disc-like comminuting impeller having a conically formed top surface, a first cutting member concave in the direction of rotation of said impeller and

9

extending upwardly from said top surface, and a second non-radial cutting member; said first cutting member having a leading rake section and a trailing escape section, said rake section forming substantially a 20° angle with a line drawn radially on said top surface from the center of said impeller to the radially outer end of said rake section.

7. A rotatable disc-like comminuting impeller having a conically formed top surface, a first cutting member concave in the direction of rotation of said impeller and extending upwardly from said top surface, and a second non-radial cutting member; said first cutting member having a leading rake section and a trailing escape section, said escape section forming substantially a 40° angle with a line drawn radially from the center of said impeller to the radially inner end of said escape section.

5

10

15

1,609,718
1,778,860
2,539,619
2,665,853
2,793,714
2,824,702
2,836,369

29,745

10

References Cited in the file of this patent

UNITED STATES PATENTS

Holland-Letz ----- Dec. 7, 1926
Lindenfelser ----- Oct. 21, 1930
Goodall ----- Jan. 30, 1951
Nicholson ----- Jan. 12, 1954
Luenberger ----- May 28, 1957
Lee ----- Feb. 25, 1958
Strehlow ----- May 27, 1958

FOREIGN PATENTS

Germany ----- Dec. 13, 1884