

Aug. 16, 1960

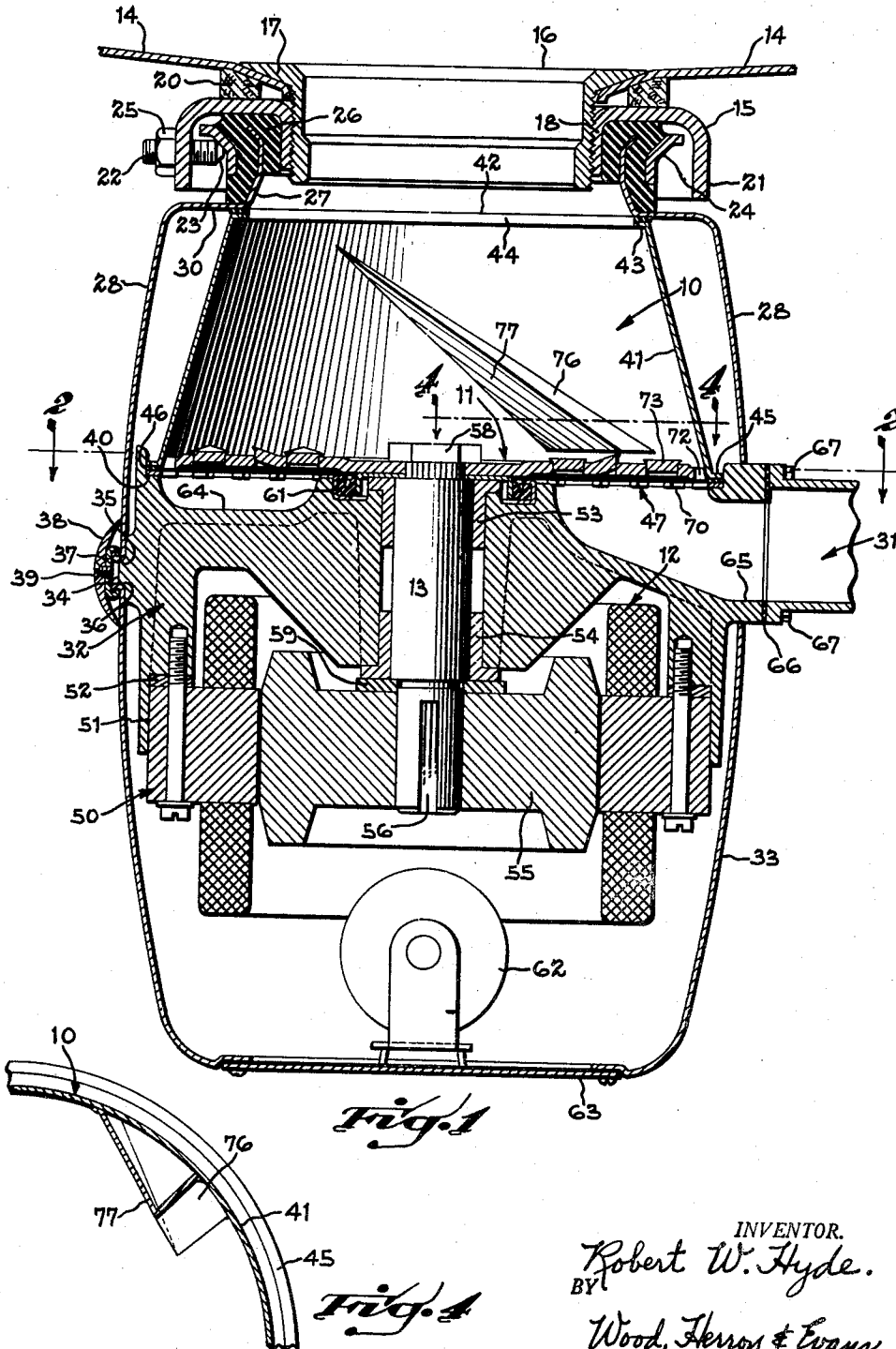
R. W. HYDE

2,949,246

GARBAGE DISPOSAL UNIT

Original Filed Dec. 20, 1951

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

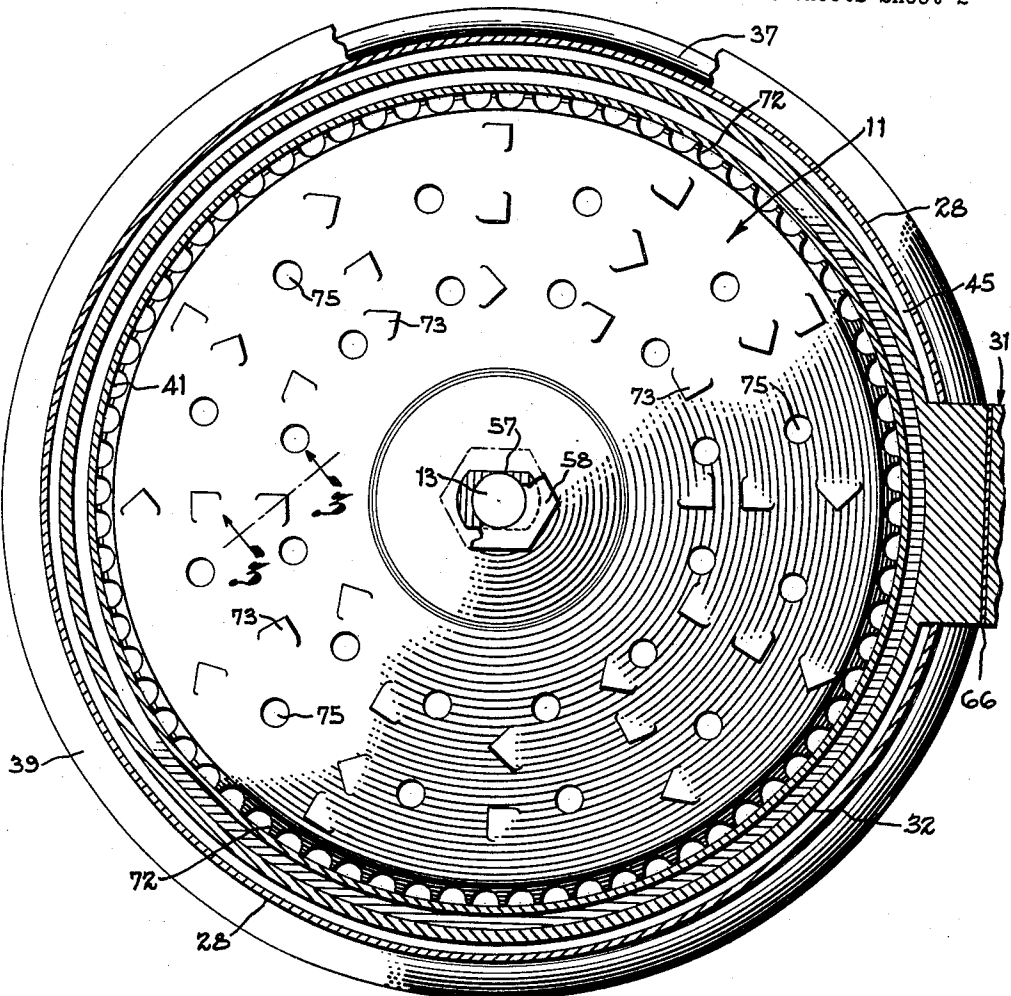


Fig. 2

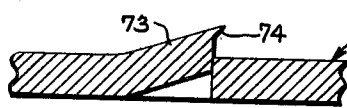


Fig. 5

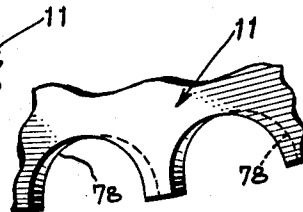


Fig. 6

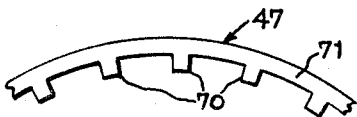


Fig. 5

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4 Sheets-Sheet 3

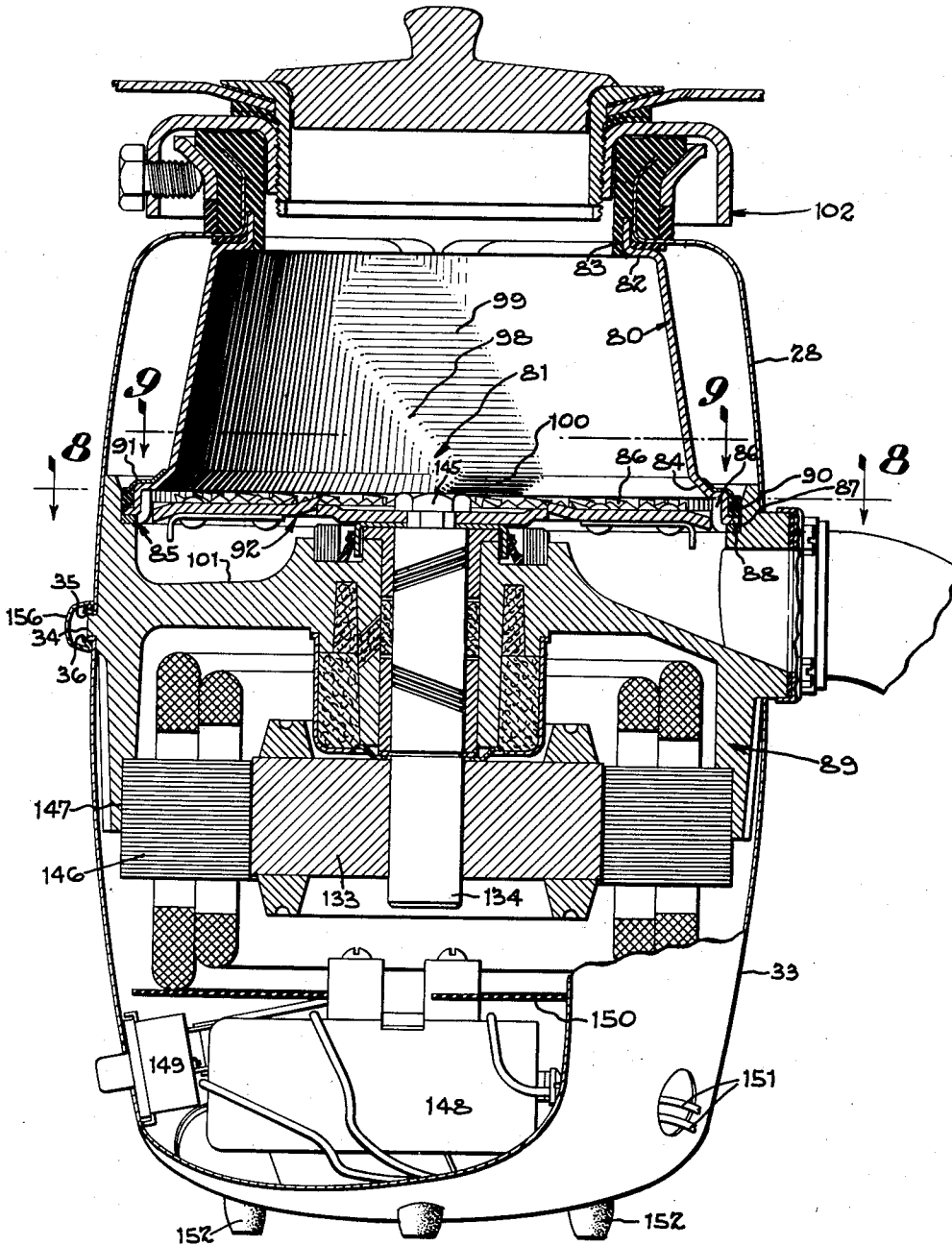


Fig. 7

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4 Sheets-Sheet 4

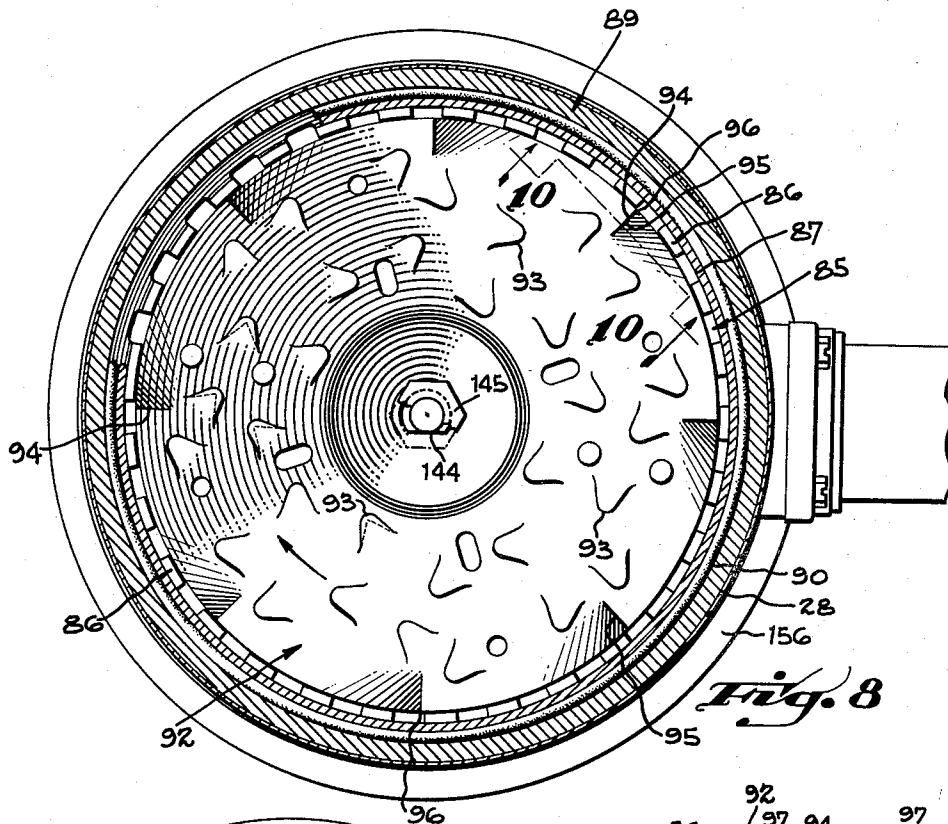


Fig. 8

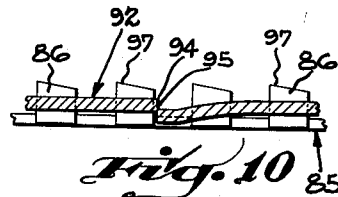


Fig. 10

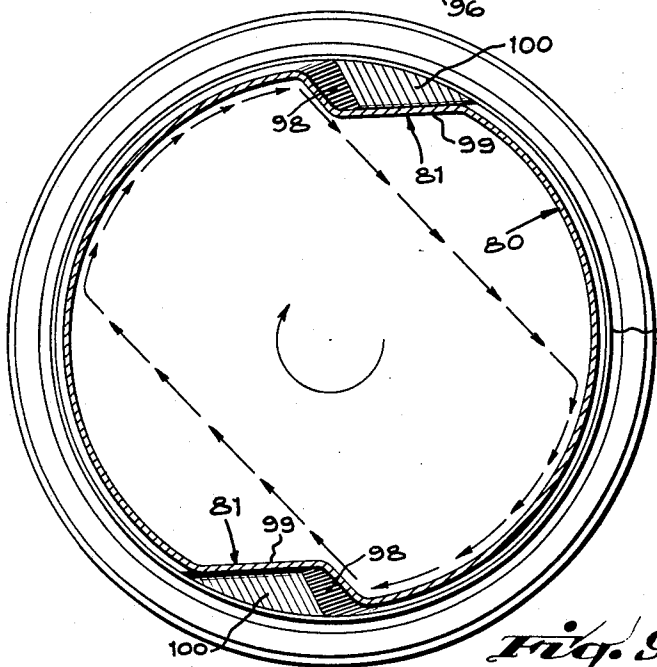


Fig. 9

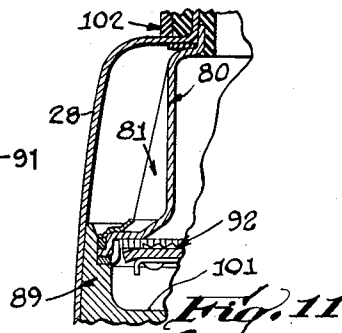


Fig. 11

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2,949,246

GARBAGE DISPOSAL UNIT

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Continuation of abandoned application Ser. No. 262,626, Dec. 20, 1951. This application Nov. 18, 1953, Ser. No. 392,873

19 Claims. (Cl. 241-46)

This invention relates to garbage disposal units of the type designed for installation in houses, apartments and other places where the capacity demands are not unduly severe. It is the primary object of the invention to provide an efficient garbage disposal unit, of the type referred to, which can be manufactured and sold for a price which is considerably lower than the average price of garbage disposal units now on the market.

This application is a continuation of my copending application which was filed December 20, 1951, Serial No. 262,626, now abandoned.

The units now available, generally include a comminuting chamber, a rotatable impeller, and an electric motor; these elements being disposed upon a common vertical axis, with the impeller located at the lower end of the comminuting chamber and in direct driving connection with the motor which is beneath it. In the usual installation the disposal unit is mounted beneath the kitchen sink in the drain line, and garbage deposited in the comminuting chamber through the drain opening in the sink. When the unit is being operated, water is run into the chamber to flush the comminuted garbage from the unit and through the drain line to the sewer or septic system. Heretofore, garbage disposal units have employed a plurality of vanes, sets of so-called "hammers," or other protuberances which were formed as part of the impeller, or mounted upon it, and which functioned to forcibly throw the garbage against toothed plates or other comminuting surfaces mounted upon, or formed as part of, the wall of the comminuting chamber. In other words, of the two elements, the impeller or the chamber wall, past designers have used the latter to do the comminuting, the impeller functioning primarily as a means for forcibly directing the garbage against the chamber wall.

In the present disposal unit this relationship is reversed. Comminuting is done primarily by means of a spinning cutter disc, this disc being installed in the unit in the same relative position as the impellers of the past, and the means for directing garbage to the comminuting element being disposed upon the chamber wall. It is found that this reversal of relationship greatly simplifies the construction. For one thing it is unnecessary to make the parts nearly as heavy as in past units. Furthermore, the parts can be made by simple stamping or forming operations as contrasted with casting and forging operations. It is also found that the present unit is quieter running than the impeller type unit. In addition, there are no shiftable parts, such as the hammers of past impellers, which are apt to move and throw the unit out of balance, the result being that there is little, if any, vibration to the present unit while in operation.

To insure fine division of the discharged garbage, a shearing ring is employed which cooperates with the spinning cutter disc to cut stringy materials. Few of the past constructions were designed to do this and oftentimes

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drains were clogged by such things as the strings in celery and other fibrous vegetables where these string-like particles were permitted to pass through the unit. The shearing ring is simple in design and also adapted to be made by inexpensive stamping or dieing operation.

The results of tests have shown that the simplification of construction has not adversely affected the operating efficiency of the unit as compared with the more expensive, complex, and heavier units of the past. The rate of discharge is about average, being somewhat slower than the very fast discharge types, and faster than the slow ones. However, there is a distinct advantage to the rate of discharge of the present unit because where the discharge rate is exceptionally high, drain systems tend to become overburdened and clog.

Other objects and features of the invention will be readily apparent to those skilled in the art from the following detailed description of the drawings in which:

Figure 1 is a cross sectional view through the central axis of a garbage disposal unit incorporating the principles of the present invention.

Figure 2 is a cross sectional view taken on the line 2-2 in Figure 1.

Figure 3 is an enlarged fragmentary cross sectional view taken on the line 3-3 in Figure 2.

Figure 4 is a fragmentary cross sectional view taken on line 4-4 in Figure 1.

Figure 5 is a fragmentary view, in elevation, showing a portion of a shearing ring used in the unit.

Figure 6 is a fragmentary top plan view of a portion of the comminuting disc illustrating a modified construction of the marginal cutting edges.

Figure 7 is a cross sectional view taken through the central, vertical axis of a modified form of a garbage disposal unit incorporating the principles of the invention.

Figure 8 is a cross sectional view taken on the line 8-8 of Figure 7 showing a preferred form of the cutter disc.

Figure 9 is a cross sectional view taken on the line 9-9 of Figure 7. The arrows superimposed on this view represent the flow pattern of food waste during the operation of the unit. The cutter disc is not included in this view for clarity.

Figure 10 is a fragmentary cross sectional view taken on the line 10-10 of Figure 8.

Figure 11 is a fragmentary cross sectional view taken on a plane through the vertical central axis of the disposal unit, said plane passing through one of the vanes provided on the inner wall of the casing.

The unit of this invention disclosed in Figures 1-6 in general, includes a comminuting chamber 10, a rotatable comminuting element 11, and an electric motor 12, which drives the rotatable element. These parts are mounted upon a common vertical axis which is also the axis of the motor shaft, shown at 13. The comminuting chamber is open at the top and the unit mounted directly beneath the drain opening of a kitchen sink, part of which is shown in section at 14. Preferably the unit is suspended from a mounting ring 15 which is secured to a sink sleeve 16. The sink sleeve may be of substantially conventional design having an annular flange 17 about its top which engages the sink surface surrounding the drain opening. Beneath the sink the sink sleeve is threaded externally to receive the mounting ring. In the embodiment shown, the ring 15 has an inner collar portion 18 which is threaded internally so that it may be drawn up on the sink sleeve 16 to compress a washer 20 made of soft fiber or similar material between its upper surface and the underneath surface of the sink about the drain opening. The outer margin of the mounting ring is turned down or flanged as at 21 and

is bored and tapped radially to receive threaded studs 22. These studs are bevelled at their inner ends as at 23, and engage a wedge ring 24, which is at the top of the unit and arranged so that it is forced upwardly when the studs are tightened upon it. By providing three or more of the threaded studs, the unit may be fastened securely and centered correctly with respect to the opening in the sink sleeve. Preferably lock nuts, such as the one shown at 25, are used to lock the studs in position once they have been adjusted.

In the embodiment shown, the wedge ring 24 is molded onto a rubber, vibration dampening annulus 26 which is designed to fit the lower face of the mounting ring 15 surrounding collar 18. Molded into or imbedded in the rubber annulus is a neck 27 formed at the top of an upper part 28 of the housing for the unit, the neck 27 extending upwardly from a flange 30 which is turned inwardly from the housing wall.

The above described mounting has several advantages. For one thing, the only connection between the unit and the sink itself is through the molded rubber annulus. Thus, all vibration in the unit is absorbed before reaching the sink, which by its very nature is a rather effective sounding board. Another advantage of this mounting is that it is short coupled. This means that the distance between the bottom of the sink and the outlet of the unit, generally indicated at 31, is correspondingly shortened. In the preferred embodiment, this distance is somewhere in the neighborhood of five inches. In many installations particularly in older houses, this distance is quite critical, and if too great, makes it impossible to connect a garbage disposal unit to existing drain pipe facilities without making extensive and expensive alterations.

The unit is built upon a body casting or frame 32, which is near the middle of the unit. The frame constitutes a base or foundation for all parts of the unit since they are either attached to or supported by it. Generally speaking, the comminuting members are mounted above the frame, and the electric motor and its wiring disposed below it. The parts of the unit above the frame are enclosed by upper housing 28, and the parts below the frame enclosed by lower housing 33. The two parts of the housing seat in annular grooves which are cast into the periphery of the frame, leaving an annular bead, indicated at 34, between them (see Figure 1). The seats above and below the bead are rounded to accommodate turned over rims of the respective upper and lower housing parts, the rims being indicated at 35 and 36 respectively. These turned over rims 35 and 36 accommodate a snap on band 37, the band itself being hidden from view by a decorative strip 38 which is secured to the band by metal screws such as the one shown at 39. This method of fastening the two housings together and to the central frame 32, is quite economical and makes the assembly of the unit rather easy. It also adds considerably to the appearance of the unit.

The upper face of frame 32 is milled out annularly to provide a seat 40 which accommodates the lower edge or rim of a casing, indicated at 41, which defines the comminuting chamber 10. The casing is held frictionally between seat 40 and a shoulder 42 which is formed near the upper end of the upper housing part 28 where flange 30 and neck 37 join one another. The upper edge or rim of casing 41 is turned inwardly to provide a small flange or beading 43 on which is seated a rubber gasket 44. This gasket is interposed between shoulder 42 and beaded edge 43. At its lower end the casing 41 is turned outwardly to provide a small annular flange or beaded edge 45. At this end of the casing also, a rubber gasket 46 is employed to cushion the casing from its seat upon frame 32. Gasket 46 rests upon a shearing ring 47 to be described in detail below, the ring 47 resting directly upon seat 40. It is to be noted that the casing

41 which defines the comminuting chamber is frusto-conical in shape tapering outwardly from top to bottom. The reason for this will be explained below.

The motor for the unit is attached to the under side of frame 32. The motor stator and its windings are indicated generally at 50. The stator is bolted in an annular seat 51, machined into the frame marginally. If desired, a hard fiber washer 52 may be interposed between the stator 50 and seat 51. Motor shaft 13 is rotatably journaled in upper and lower bronze bearings, 53 and 54 respectively which are seated within a central bore which extends vertically through frame 32. The lower end of shaft 13 depends below the frame and has a rotor 55 press-fitted tightly upon it, and locked against turning by a key 56. The upper end of the motor shaft 13 has its opposite sides machined off to provide flats 57 (see Figure 2) and the rotating element 11 seated thereon. Above the rotating element 11, the upper end of shaft 13 is threaded to accommodate a nut 58. When tightened, the nut draws a lock ring 59 up against the lower bushing 54 to hold the motor and shaft assembly in place. A packing gland 61 surrounds the upper bushing and is seated within the upper face of frame 32 to insure that no liquid seeps past the shaft bearings to the motor.

In the embodiment shown, the motor is of the capacitor start type, a capacitor being shown at 62. Preferably the capacitor is mounted upon a removable plate 63 in the lower end of the lower part 33 of the housing. Although not shown, it will be understood that the necessary wiring for the motor may also be mounted on removable plate 63.

The upper face of frame 32 is channeled out to provide an annular trough 64 which leads to an outlet 65 formed at one side of the frame. Outlet 65 is joined with the drain line 31, a gasket 66 being installed between the two mating surfaces, and the drain line 31 pulled up tight by means of bolts 67 which pass through a flange at the end of the drain line and thread into appropriately tapped holes in the frame around the outlet.

The body casting or frame design, disclosed in the drawings, is preferred for the reason that the moving parts are very effectively cooled by the flush water which is passing through the unit when the unit is in operation. It is to be noted that the stator is mounted directly upon the frame so that it receives the cooling benefits of the water. Thus, with there being little likelihood of the stator overheating it may be made smaller than would otherwise be the case. It is also found that the cooling of the frame makes it unnecessary to use expensive ball or roller bearings for mounting the motor shaft. Furthermore, the construction shown cuts down on the overall height of the unit, makes the construction less expensive, and is comparatively light in weight.

The rotating element or cutter disc 11, which is shown in detail in Figures 2 and 3 of the drawings, comprises the main comminuting element of the present disposal unit. Preferably this element is formed from a steel plate by stamping or dieing operations, and tempered or hardened subsequent to such operations. The center of the element is depressed slightly in the area of packing gland 61 and the outer marginal rim likewise depressed so that these two portions lie in the same plane, which plane is removed only slightly upwardly from the plane of the shearing ring 47 noted above. The shearing ring includes a multiplicity of circumferentially spaced teeth 70, which extend inwardly radially from an annular base portion 71 which is engaged upon seat 40. Teeth 70 cooperate with a plurality of shearing edges 72 formed at the outer marginal rim of element 11 by stamping out semi-circular portions of the edge and spacing the semi-circular portions to leave disc material between them. From Figure 1, it will be seen that when stringy articles pass through the marginal semi-circular openings, shear-

ing edges 72 in cooperation with teeth 70 cut them into pieces of a size which can pass freely through the drain system.

The upper surface of element 11 has a plurality of V-shaped tangs 73 formed upon it, these tangs being struck upwardly by a stamping operation during the initial formation of the element. Preferably, after the tangs are struck up, they are re-worked from the upper side of the element by reverse stamping so that their edges are swaged over to provide a sharp knife-like edge such as that shown at 74 in Figure 3. The pattern of these tangs may be a random one, however, it is preferred that they be oriented as shown in Figure 2 so as to present either the apex of the V or a flat side thereof in the direction of rotation of the element, this being clockwise in Figure 2. At least each tang should be oriented so that a flat side is at no time ahead of a radial line from the axis of the element through the apex of the V. In addition to the tangs, the plate may be perforated by a plurality of drain holes such as those shown at 75. A greater number of tangs than those shown may be employed however, it is found that the number illustrated is sufficient for satisfactory operation when a standard 1725 r.p.m. motor is used for driving the element. When garbage is placed in the comminuting chamber and the motor turned on, the plate-like comminuting disc revolves and the garbage is forced outwardly by centrifugal force against the chamber wall. Since this wall tapers outwardly and downwardly the garbage is wedged downwardly against the spinning disc where it is cut by the tangs 73 and shredded by the shearing edges 72 at the margin of the disc. I prefer to use a pair of directing vanes disposed at opposite sides of the chamber, one of which is shown at 76, for turning the garbage back in toward the center of the disc and to prevent high speed rotation of the mass of garbage. The vanes should be set at an angle so that they slant downwardly in the direction of disc rotation. Otherwise expressed, the upper end of each vane is in advance of the lower end relative to food waste impinging upon a vane under the action of the rotating disc. The vanes impart a tumbling action to the garbage and also give it a downward component which tends to force it against the spinning disc. These vanes 76 may be cast or made from sheet metal as shown in Figure 4. Preferably each vane is triangular in cross section tapering from a point at the top to a broad base terminating just above the lower end of the comminuting chamber. Also it is to be noted that the slope of the side 77 of the vane against which the spinning garbage is thrown by the spinning disc is larger and nearer a tangent than the other face in order to avoid an abrupt angle in which garbage could lodge. In operation garbage disposed upon the spinning disc tends to equalize itself, that is, it spreads over the disc and does not bunch up or collect at one side, where its concentrated weight might give rise to an objectionable vibration in the unit. It should be noted in this connection, that the garbage is ground, shredded or comminuted as the result of relative movement between it and the disc. In past constructions the garbage was caught upon projections on a whirling impeller and rotated with it until ground up by contact with cutting elements on the wall. So often the garbage bunched up or collected at one side in a mass which unbalanced the unit giving rise to severe and noisy vibrations. In the present unit the garbage is constantly being turned from the outer periphery of the spinning disc in toward the center by the vanes so that it is being continuously agitated or tumbled and is never permitted to rest so that it can bunch up or attain the velocity of the comminuting disc to cause vibration or avoid the grinding and shredding action of the tangs 73. Particles discharged from the unit can never be larger than the openings or indentations in the edge of the disc, however, it is quite unlikely that a particle this large would be passed because of teeth 70. In fact,

tests have shown that the discharge is exceedingly finely divided, being in the nature of a slurry or sludge rather than in the nature of discrete particles.

The discharge rate or action of the unit may be increased by the expedient shown in Figure 6. In this view, which is a top plan view, the cutting edges at the margin of the disc are formed at a slight angle as indicated at 78. This angle may be from 20 to 30 degrees to the vertical so that a multiplicity of propeller-like surfaces are provided. The angulated surfaces are arranged so that when the disc is spinning, the flush water is pulled through the disc, i.e., forced downwardly. Where in the instance shown in Figure 2, the teeth at the edge of the disc are formed by a die descending vertically, the ones in Figure 6 are formed by a die which descends at an angle. It will be obvious though that the angulated surfaces 78 of the cutting edges may be formed by means other than stamping.

The modified form of the unit of this invention, which is the subject of Figures 7-11, follows generally the basic construction of the unit described above. There are, however, modifications in the basic design which increase the overall efficiency of the unit. The same major elements are employed. That is, the modified form includes a comminuting chamber 10, a rotatable comminuting element 11 and an electric motor 12, which parts are mounted upon a cast frame or body casting and which are enclosed within upper and lower housing members or housing shells 28 and 33, respectively.

In the modification, food waste is cut up or comminuted in three stages. The first stage takes place when the food waste first falls onto the spinning cutter disc. Soft waste is disintegrated substantially instantly upon being struck by the sharp cutter disc teeth. Food waste which is not comminuted in the first stage is cut up or disintegrated in the second stage when it moves, under the action of centrifugal force, to the outer marginal rim area of the cutter disc. In this second stage, the vanes described above come into play to direct the food waste from the comminuting chamber wall back onto the spinning disc. The third stage begins when the pieces of food waste have been reduced in size to a point where they may pass under the vanes and into an annular recess surrounding the rim of the disc where the teeth of a shearing ring further cut or shed the waste into particles of a size to pass safely through the drainage system.

In all three of the stages, solids in the food waste are continuously subjected to a cutting action (as contrasted with a mashing or squashing action), the theory being to reduce or sub-divide the solid pieces of food waste by repeatedly cutting off tiny particles, and then further cutting or subdividing these particles, until the whole mass is sub-divided to a point where the particles are a size which may be flushed safely through the drainage system. It is found that reducing the food waste in this way does not produce a substantial amount of froth or foam. The discharge is more on the order of a thin slurry which will pass through a drainage system faster and more readily than a frothy or foamy discharge.

In the modification, the casing on the inner cone which defines the comminuting chamber is indicated generally at 80. In the instance shown, two direction vanes 81-81 are formed as part of the wall of the casing, these vanes being located substantially diametrically opposite to one another, as shown in Figure 9. It will be seen that the vanes 81-81 are substantially the same functional shape as the vanes 76-76 shown in Figures 1 and 4. The casing 80 tapers upwardly and is turned inwardly at the upper end thereof to provide an annular shoulder 82. At the inner edge of shoulder 82, an upstanding flange 83 is provided, this flange being seated within a modified form of vibration dampening rubber annulus which is disclosed in divisional application Serial No. 815,992 filed May 26, 1959. Adjacent the lower end thereof,

the wall of casing 80 is flared outwardly sharply as at 84. It will be seen from Figure 7 that the flaring provides an annular recess above the outer marginal edge of the cutter disc. In the present instance, a shearing ring 85 is employed having upstanding teeth 86. These teeth reside within an annular seat 87 which is formed in the wall of the casing at the lower end of the recess, the wall being turned outwardly and then downwardly as shown in Figure 7.

The lower edge of the casing 80, as at 88, is turned outwardly below seat 87 to provide a flared rim which seats on top of the shearing ring 85. The body casting, which is indicated in the present instance by the numeral 89, has an annular shoulder formed in it to accommodate the shearing ring. It is preferred that the shearing ring be press fitted into place against the shoulder. A large neoprene O ring 90 may be employed to seal the outer marginal edge of the casing 80, the ring being held in place by a retainer 91 which extends around the outside of the casing just above the O ring. The retainer may be spot welded to the casing.

The cutter disc which is indicated in the modified unit by the numeral 92 is slightly different in construction from the one employed in the unit of Figures 1-6, inasmuch as the upstanding teeth 86 of cutter ring 85 make the shearing edges 72 unnecessary. It will be noted from Figure 8 that the teeth or tangs indicated at 93 on cutter disc 92 are oriented in substantially the same pattern shown in the unit of Figures 1-6. The shapes of the teeth are modified slightly, however, in order to provide a greater overhang than that shown at 74 in Figure 3. A preferred method of forming the teeth 93 is disclosed in my co-pending application filed December 14, 1953, Serial No. 397,984, now Patent No. 2,787,174. The method results in extremely sharp knife-like edges on the teeth which speed the comminution of the waste and which are less likely to be dulled over prolonged, hard use. The function of the teeth and the operation of the cutter disc remain substantially unchanged.

At eight evenly spaced points around the periphery of the cutting disc, the edge thereof is struck down to expose a radially disposed edge 94, and a face 95 below the edge. The face 95 is exposed in the direction of rotation of the cutter disc and presents a substantially sharp, right angular shearing edge 96 to the upstanding teeth 87 of shearing ring 85. See Figure 10. It will be noted also in this figure that the upper edge of each of the teeth 86 is angulated to present a sharp edge 97 to oncoming food waste. The eight exposed faces 95 in the marginal rim area of the cutter disc and the teeth on the shearing ring provide the third-stage cutting action referred to above.

The second stage cutting action is illustrated diagrammatically in Figure 9. It will be assumed that food waste having large, solid particles therein is being subjected to the cutting action of the teeth 93. Obviously, in order for the cutter disc teeth to be effective, there must be some relative movement between them and the food waste; for, if the food waste were permitted to come to a rest relative to the spinning disc, it would simply travel with the disc and although it might be worn away in time by rubbing against the chamber wall, it would not be cut up and disintegrated in the efficient manner of which the present unit is capable. The vanes 81, which in the present instance are formed as part of the casing or inner cone wall 80, insure that substantial relative movement is maintained at all times between the disc and food waste. These vanes, it will be noted from Figures 7 and 9, each present an angulated face 98 to oncoming food waste which slopes upwardly toward the oncoming waste at substantially 55° to the plane of the spinning disc. The face 98 as will be seen from Figure 9 also is disposed in a plane, a trace of which on the cutter disc is disposed substantially chordally as shown by the arrows in Figure 9. The other upright wall of the vane, which

is indicated at 99, preferably is disposed substantially vertically. The third wall 100 at the bottom of the vane may flare upwardly and inwardly toward the disc at substantially the same angle as the wall of the casing in recessed portion 84 thereof.

Referring again to Figure 9, and specifically to the vane which is shown in the upper half of this figure, the trace of an extension of the face of wall 98 of this vane on the disc follows the line of arrows slanting downwardly toward the right in this figure; and, as shown, this line, which is a chord, subtends an angle of approximately 110°. Otherwise expressed, the chord subtends an arc of 110° on the circle generated by a point on the revolving disc. Hence, the chord length is substantial. Looking at it another way, food waste upon the rotating cutter disc is directed by the face of the vane across the disc so that it strikes the wall of the casing at a place spaced substantially away from the vane in the direction of rotation of the disc. Food particles thus directed do not strike the wall of the casing immediately adjacent to the vane, but are given an appreciable inward direction, thereby maintaining the substantial relative movement between the disc and food waste to which reference has been made.

The vanes thus described do two things. First, they tumble or agitate the food waste; and second, they direct it. Referring now to Figure 9, it will be appreciated that any displacement of a mass of food waste relative to the center of the spinning disc will bring about a relative acceleration or change of speed between the food waste and the disc. Starting with a solid piece of food waste, when it falls onto the spinning disc it is instantly engaged by the teeth 93 and started toward the wall of casing 80. The piece is moved along the wall until it strikes one of the two vanes 81. The piece of waste then is directed by the slanting face 98 of the vane in a direction which is substantially chordal with respect to the center of the disc. Once thus directed, the centrifugal force, imparted to the piece of waste by the spinning disc, is no longer effective; for, as soon as the particle is deflected off of the face 98 it has a new line of movement and has inertia in the new direction. When moving in this direction, it, of course, has movement relative to the teeth 93 on the disc. In this relative movement, the teeth are moving considerably faster than the solid pieces of food waste, because the waste is slowed down through its contacts with the wall of the casing and the vanes. The waste being subjected to the cutting action of the teeth and the directing action of the vanes follows a path which is roughly rectangular. At two sides of the "rectangle," the waste move in a substantially straight line after coming off of the vanes. At the other two sides of the rectangle, the waste moves in an arcuate path as defined by the wall of the casing 80. The waste continues in this path until it is reduced in size sufficiently to pass under the vanes into the annular recess at which time it is subjected to the cutting action of the exposed faces 95 in the marginal rim area of the cutter disc and to the shearing action of the teeth 86, on the shearing ring.

The roughly rectangular path of the food waste shown diagrammatically in Figure 9 applies also to the embodiment of the unit which is disclosed in Figures 1-6. Third stage cutting action also takes place in the unit shown in Figures 1-6, however, it is to a lesser extent than in the modified form of the unit.

The particle size of food waste which is permitted to pass the cutting disc and shearing ring into a drain trough indicated at 101 (which is provided underneath these elements) varies. However, the largest "cube" usually found is approximately 1/8 of an inch in size. Some paper thin pieces may be slightly larger, however, it is found that 85% of the discharge will pass through a standard 1/8 inch screen.

After food waste has been acted upon by the cutter disc and the cooperating shearing edges on the periphery of the cutting disc and the upstanding teeth 86 of cutter ring 85, it is washed into the drain trough indicated gen-

erally by the numeral 101. For a detailed disclosure of the drain trough reference is made to divisional patent application Serial No. 838,196, filed September 4, 1959. For details of the construction of the mount ring, indicated generally at 102, for the unit by which it is attached to a sink, reference is made to divisional patent application Serial No. 815,992, filed May 26, 1959. Also for details of the housing construction, including upper and lower shells 28 and 33 respectively, and the snap ring designated 156, reference is made to divisional application Serial No. 815,991, filed May 26, 1959.

Following the general principles of the construction of the embodiment of the invention disclosed in Figures 1 through 6, the embodiment of the invention of Figures 7-11 also includes a motor rotor 133 which drives a shaft 134. The shaft is appropriately journaled as in bearings as shown and extends up through the vertical central axis of the body casting 89. The upper end of the shaft is configured to provide a flat indicated at 144 in Figure 8, this flat fitting an opening in the center of cutter disc 92 to key the disc to the shaft. A nut 145 is threaded onto the upper end of shaft 134 immediately above the disc, the threads being such that the nut tends to tighten as the disc rotates.

The stator 146 of the motor fits into a seat 147 machined into the underside of the body casting 89, the underside of this casting being configured to provide clearance for the motor windings. Also as shown, the lower end of housing shell 33 encloses a capacitor 148 for the motor circuit, an overload switch 149 of conventional construction, the capacitor and overload switch being separated from the motor by an insulating wall 150. Leads 151 for the electrical system of the unit enter the lower shell 33 through an opening as shown. It is preferred that rubber bumpers or feet 152 be provided for the underside of the unit so that it may be stood in upright position prior to installation.

Reference is also made to copending application Serial No. 309,263, filed September 6, 1952, now Patent No. 2,709,046, which discloses a stopper which may be used in conjunction with the unit. Copending application Serial No. 431,895, filed May 24, 1954, now Patent No. 2,896,866, discloses a preferred form of baffle fingers which are provided to prevent water from splashing out of the unit when it is in operation. These same fingers also serve to caution a person when placing food waste into the unit not to insert his fingers so far that they might be caught by the cutting edges on the spinning disc. Also as explained in the copending application to which reference has been made the fingers cause a curtain of water to form over the opening of the unit when it is in operation, this curtain of water acting as a silencer to deaden cutting noises which might otherwise be heard through the throat of the unit.

In substance, the outstanding feature of the unit is its low cost. However, efficiency of operation, rate of discharge and fine division of the material discharge have not been sacrificed for economy. The unit is comparatively small and light in weight, but in spite of this operates just as efficiently as the larger, expensive units of the past. It is also to be noted that the construction and arrangement of the parts makes it possible to enclose the unit within an attractive housing, something which has been given little consideration by past designers. The unit is also permanently sealed, since the snap-on band 37, when seated, is difficult to remove without destroying it. Of course, other types of bands than the one shown may be used, but the one illustrated is preferred because it prevents tampering with the unit, it being preferred that repairs when necessary be done by the manufacturer.

Having described my invention, I claim:

1. In a garbage disposal unit, a body casting, a shaft journaled in the center of said body casting for rotation about a vertical axis, a cutter disc disposed immediately above said body casting and in driving connection with the upper end of said shaft, said cutter disc having a

plurality of cutting teeth on the upper face thereof, an electrical motor disposed beneath said body casting and in driving connection with the lower end of said shaft, an annular seat formed in the upper face of said body casting surrounding said annular seat and concentric with the outer edge of said circular cutting disc, a shearing ring immovably mounted in said seat, said ring configured to present a plurality of shearing edges to the outer edge of said disc, said outer edge of said disc configured to present a plurality of shearing edges to the shearing edges on said shearing ring, a frusto-conical casing, said casing seated on said shearing ring, the lower portion of said casing tapering sharply inwardly to define an annular recess above the outer edge of said circular cutting disc, said casing above said recess tapering less sharply inwardly to define with said cutting disc a comminuting chamber, and the wall of said casing configured to provide at least one directing vane which extends inwardly therefrom above said recess, said directing vane having a slanting face thereon disposed to direct particles of food waste which are on the rotating cutter disc and which are too large to enter said annular recess in a direction on the cutter disc which is substantially chordally with respect to the center thereof, whereby such large particles are subjected to the cutting action of the teeth on the cutter disc, and particles of smaller size are subjected to the shearing action of the shearing edges on the shearing ring and on the outer edge of the cutter disc.

2. In a garbage disposal unit, a rotatable cutter disc, said cutter disc having a plurality of cutting teeth on the upper face thereof, a shearing ring surrounding and concentric with the outer edge of said circular cutting disc, said ring configured to present a plurality of shearing edges to the outer edge of said disc, said outer edge of said disc configured to present a plurality of shearing edges to the shearing edges on said shearing ring, a casing seated on said shearing ring, the lower portion of said casing tapering sharply inwardly to provide an annular recess above the outer edge of said cutting disc, said casing above said recess tapering less sharply inwardly to define with said cutting disc a comminuting chamber, at least one directing vane associated with the wall of said casing at the inner side thereof above said recess, said directing vane having a slanting face thereon disposed to direct particles of food waste which are on the rotating cutter disc and which are too large to enter said annular recess in a direction on the cutter disc which is substantially chordally with respect to the center thereof, whereby such large particles are subjected to the cutting action of the teeth on the cutter disc until they are reduced in size to a point where they may enter said annular recess and be subjected to the shearing action of the shearing edges on the shearing ring and on the outer edge of the cutter disc.

3. In a garbage disposal unit, a body casting, a shaft journaled in the center of said body casting for rotation about a vertical axis, a cutter disc disposed above said body casting and in driving connection with the upper end of said shaft, a plurality of cutting teeth on the upper face of said cutter disc, an electrical motor disposed beneath said body casting and in driving connection with the lower end of said shaft, an annular seat formed in the upper face of said body casting surrounding and concentric with said circular cutting disc, a shearing ring immovably mounted in said seat, said ring having a plurality of spaced shearing edges thereon, the outer edge of said disc configured to present a plurality of shearing edges to the shearing edges on said shearing ring, a casing seated on said shearing ring, the lower portion of said casing configured to define an annular recess above the outer edge of said cutting disc, the wall of said casing above said recess configured to provide at least one directing vane which extends inwardly therefrom, said directing vane having a slanting face thereon disposed to direct particles of food waste

which are on the rotating cutter disc and which are too large to enter said annular recess away from said recess, whereby such large particles are subjected to the cutting action of the teeth on the cutter disc, and particles of smaller size are subjected to the shearing action of the shearing edges on the shearing ring and on the outer edge of the cutter disc.

4. In a garbage disposal unit, a body casting, a shaft journaled in the center of said body casting for rotation about a vertical axis, a cutter disc disposed above said body casting and in driving connection with the upper end of said shaft, said cutter disc having a plurality of cutting teeth formed as an integral part therewith and extending above the upper surface thereof, an electrical motor disposed beneath said body casting and in driving connection with the lower end of said shaft, an annular seat formed in the upper face of said body casting surrounding and concentric with the outer edge of said circular cutting disc, a shearing ring immovably mounted in said seat, said ring configured to present a plurality of shearing edges to the outer edge of said disc, said outer edge of said disc configured to present a plurality of shearing edges to the shearing edges on said shearing ring, a casing, said casing seated on said shearing ring, the lower portion of said casing tapering sharply inwardly to define an annular recess above the outer edge of said circular cutting disc, said casing above said recess tapering gradually inwardly to define with said cutting disc a comminuting chamber, and the wall of said casing configured to provide at least one directing vane which extends inwardly therefrom above said recess, said directing vane having a slanting face thereon disposed to direct particles of food waste which are on the rotating cutter disc and which are too large to enter said annular recess in a direction on the cutter disc which is substantially chordally with respect to the center thereof, whereby such large particles are subjected to the cutting action of the teeth on the cutter disc until reduced in size to a point where they can enter said annular recess and be subjected to the shearing action of said shearing edges, a drain trough formed in said body casting immediately below said cutter disc and in the annular area thereof between said shearing ring and the upper end of said drive shaft, said drain trough spiralling downwardly through substantially 360° from a shoulder adjacent a drain opening to said drain opening, and a paddle depending from the underside of said cutter disc into said drain trough, the lower end of said paddle clearing said shoulder during rotation of the cutter disc but moving in a circular path which is sufficiently close to the outer portion of the shoulder to prevent stringy materials from piling up on said shoulder during the operation of the unit.

5. In a garbage disposal unit, the combination comprising a circular disc rotatable about a vertical axis, fixed cutting elements on the upper face of said disc presenting cutting edges in the direction of rotation thereof, a casing surrounding said disc and extending upwardly therefrom to define a chamber into which garbage may be placed for comminution by said rotating disc, at least one vane associated with the wall of said casing and projecting therefrom into said chamber to overhang the marginal edge of said disc, said vane presenting a face into the path of garbage on the rotating member, and said face being disposed on a slant such that the upper end thereof is in advance of the lower end thereof in the direction of rotation of the disc and such that a trace of an extension of the surface of said face lies upon a chord of the circle generated by a point on the outer edge of the rotating disc and such that said chord is of substantial length but subtends an arc of less than 180°, whereby garbage impinging upon said face under the action of the rotating disc is directed downwardly by said face onto the cutting elements and inwardly of the outer edge of the disc generally along a path which ex-

tends across the disc between the center and outer edge thereof.

6. The combination as set forth in claim 5 in which the vane is formed as an integral part of the wall of said casing and in which a radius is provided between the wall of the casing and said slanting face.

7. The combination as set forth in claim 5 in which the face on the vane tapers upwardly so that it is wider at the lower end than at the upper end, whereby the lower end has a greater directing effect upon garbage impinging thereon than the upper end.

8. The combination as set forth in claim 5 in which said cutting edges are distributed over the upper face of the disc from adjacent the center thereof to adjacent the outer edge thereof.

9. The combination as set forth in claim 5 in which the lower end of the vane is spaced slightly above the cutting elements on the upper surface of said disc.

10. The combination as set forth in claim 5 in which the casing is in the shape of a frustum of a cone and the innermost edge of the vane is substantially vertical.

11. The combination as set forth in claim 5 in which said chord subtends an arc of said circle greater than 60° but less than 180°.

12. In a garbage disposal unit, the combination comprising a circular disc rotatable about a vertical axis, fixed cutting elements on the upper face of said disc presenting cutting edges in the direction of rotation thereof, a casing surrounding said disc and extending upwardly therefrom to define a chamber into which garbage may be placed for comminution by said rotating disc, a pair of vanes associated with the wall of said casing and projecting therefrom into said chamber to overhang the outer edge of said disc at opposite sides thereof, each of said vanes presenting a face into the path of garbage on the rotating disc and each face being disposed on a slant such that the upper end thereof is in advance of the lower end thereof in the direction of rotation of the disc and such that a trace of an extension of the surface of said face lies upon a chord of the circle generated by a point on the outer edge of the rotating disc and such that said chord is of substantial length but subtends an arc of less than 180°, whereby garbage impinging upon each face under the action of the rotating disc is directed downwardly by each face onto the cutting elements and inwardly from the outer edge of the disc generally along a path which extends across the disc between the center and outer edge thereof.

13. The combination as set forth in claim 12 in which the inner surface of the wall of the casing between vanes is smooth.

14. In a garbage disposal unit, a rotatable circular comminuting member having cutters thereon presenting cutting edges in the direction of rotation of said member, a casing surrounding said member and extending upwardly therefrom to define a chamber into which garbage may be placed to be acted upon by said member, at least two vanes associated with the wall of said casing, said vanes being spaced apart circumferentially of said member and projecting inwardly from the wall of the casing to overhang the outer marginal edge of the member, and each vane including a face which is disposed upon a slant such that the upper end thereof is in advance of the lower end thereof in the direction of rotation of the member and such that a trace of an extension of the surface of said face lies on a chord of the circle generated by a point on the outer edge of the rotating member and such that said chord is of substantial length but subtends an arc which is less than the circumferential spacing of the vanes, whereby garbage impinging upon a face of a vane under the action of the rotating disc is directed downwardly by said face onto the cutting edges on said member and is directed inwardly from the outer edge of the member generally along a path which extends across the member from said vane to the wall of the casing at a

place spaced from the next vane in a direction counter to the direction of rotation of the member.

15. In a garbage disposal unit, the combination of a body casting which is generally circular as viewed from above, an annular drain trough in the upper face of said body casting, a drive shaft projecting vertically through the center of said body casting, a circular disc in driving connection with the drive shaft immediately above said drain trough, fixed cutting elements on the upper face of said disc presenting cutting edges in the direction of rotation thereof, a frusto-conical casing seated on the body casting immediately outwardly of the periphery of said disc and extending upwardly therefrom to define a chamber into which garbage may be placed for comminution by said rotating disc, at least one vane associated with the wall of said casing and projecting therefrom into said chamber to overhang the marginal edge of said disc, said vane presenting a face into the path of garbage on the rotating member, and said face being disposed on a slant such that the upper end of said face is in advance of the lower end thereof in the direction of rotation of the disc and such that a trace of an extension of the surface of said face lies upon a chord of the circle generated by a point on the outer edge of the rotating disc and such that said chord subtends an arc of at least 60° but less than 180° , whereby garbage impinging upon said face under the action of the rotating disc is directed downwardly by said face onto the cutting elements and inwardly of the outer edge of the disc along a path which generally follows said chord.

16. In a garbage disposal unit, the combination of a body casting which is generally circular as viewed from above, an annular drain trough in the upper face of said body casting, a drive shaft projecting vertically through the center of said body casting, a circular disc in driving connection with the drive shaft above said drain trough, fixed cutting elements on the upper face of said disc presenting cutting edges in the direction of rotation thereof, a frusto-conical casing seated on the body casting immediately outwardly of the periphery of said disc and extending upwardly therefrom to define a chamber into which garbage may be placed to be acted upon by said cutting elements, a pair of vanes associated with the wall of said casing and projecting inwardly therefrom to overhang the outer edge of said disc in diametrically opposed relationship, a face upon each vane presented toward garbage which is on the rotating disc, and each face being disposed upon a slant such that the upper end thereof is in advance of the lower end thereof in the direction of rotation of the disc and such that a trace of an extension of the surface of said face lies upon a chord of the circle generated by a point on the outer edge of the rotating disc and such that said chord is of substantial length but subtends an arc of less than 180° , whereby garbage impinging upon said face from the rotating disc is directed both downwardly onto the cutting elements on the disc and across the disc generally along a path which meets the casing at a place spaced from the opposite vane in the direction counter to the direction of rotation of the disc.

17. In a garbage disposal unit, the combination comprising a circular disc rotatable about a vertical axis, cutting elements on the upper face of said disc presenting cutting edges in the direction of rotation thereof, a frusto-conical casing surrounding said disc and extending upwardly therefrom to define a chamber into which garbage may be placed for comminution by said rotating disc, a plurality of shearing edges at the periphery of said disc, stationary means disposed beneath said disc and including shearing edges projecting radially inwardly immediately below the first mentioned shearing edges which are cooperable with the first mentioned shearing edges to cut stringy waste material, and a vane associated with the wall of said casing and projecting therefrom into said chamber to overhang the marginal edge

of said disc, and said vane presenting a face into the path of garbage of the rotating member, and said face being disposed on a slant such that the upper end of said face is in advance of the lower end thereof in the direction of rotation of the disc and such that a trace of an extension of the surface of said face lies upon a chord of the circle generated by a point on the outer edge of the rotating disc and such that said chord is of substantial length but subtends an arc of less than 180° , whereby garbage impinging on said face under the action of the rotating disc is directed downwardly by said face onto the cutting elements and inwardly of the outer edge of the disc generally along a path which extends across the disc between the center and outer edge thereof.

18. In a garbage disposal unit, the combination comprising a circular disc rotatable about a vertical axis, fixed cutting elements on the upper face of said disc presenting cutting edges in the direction of rotation thereof, a frusto-conical casing surrounding said disc and extending upwardly therefrom to define a chamber into which garbage may be placed for comminution, the lower portion of said casing being flared outwardly and downwardly adjacent the disc to define an annular recess with the outer edge of the disc, the outer marginal area of said disc having shearing edges thereon, additional shearing edges disposed within said recess and cooperable with the shearing edges on said disc, a vane associated with the wall of said casing and projecting therefrom into said chamber, the lower end of the vane terminating above the cutting elements on the upper face of the rotating disc, said vane presenting a face into the path of garbage on the rotating member, and said face being disposed on a slant such that the upper end of said face is in advance of the lower end thereof in the direction of rotation of the disc and such that a trace of an extension of the surface of said face lies upon a chord of the circle generated by a point on the outer edge of the rotating disc and such that said chord subtends an arc greater than 60° but less than 180° , whereby garbage impinging thereon under the action of the rotating disc is directed downwardly by said face onto the cutting elements and inwardly of the outer edge of the disc generally along a path which is between the center of the disc and the outer edge thereof, and whereby pieces of garbage too large to enter the annular recess are repeatedly directed down onto the cutting elements by said face and after being reduced in size to an extent to enter the recess are further subjected to the cutting action of the respective shearing edges in the outer marginal area of said disc and those disposed within said recess.

19. In a garbage disposal unit, the combination comprising a circular disc rotatable about a vertical axis, fixed cutting elements in the upper face of said disc presenting cutting edges in the direction of rotation thereof, a frusto-conical casing surrounding said disc and extending upwardly therefrom to define a chamber into which garbage may be placed for comminution, the lower portion of said casing being flared outwardly and downwardly adjacent the disc to define an annular recess with the outer edge of the disc, the outer marginal area of said disc having shearing edges thereon, additional shearing edges disposed within said recess and cooperable with the shearing edges on said disc, a pair of vanes associated with the wall of said casing and projecting therefrom into said chamber in diametrically opposed relationship, the lower ends of the vanes terminating above the cutting elements on the upper face of the rotating disc, each of said vanes presenting a face into the path of garbage on the rotating member, and each face being disposed on a slant such that the upper end of said face is in advance of the lower end thereof in the direction of rotation of the disc and such that a trace of an extension of the surface of said face lies upon a chord of the circle generated by a point on the outer edge of the rotating disc and such that said chord sub-

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tends an arc greater than 60° but less than 180°, whereby garbage impinging thereon under the action of the rotating disc is directed downwardly by said face onto the cutting elements and inwardly of the outer edge of the disc generally along a path which meets the wall of the casing on the other side of the disc at a place spaced from the opposite vane in a direction counter to the direction of rotation of the disc, and whereby pieces of garbage too large to enter the annular recess are repeatedly directed down onto the cutting elements by said faces and after being reduced in size to an extent to enter the recess are further subjected to the cutting action of the respective shearing edges in the outer marginal area of said disc and those disposed within said recess.

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