

Feb. 22, 1966

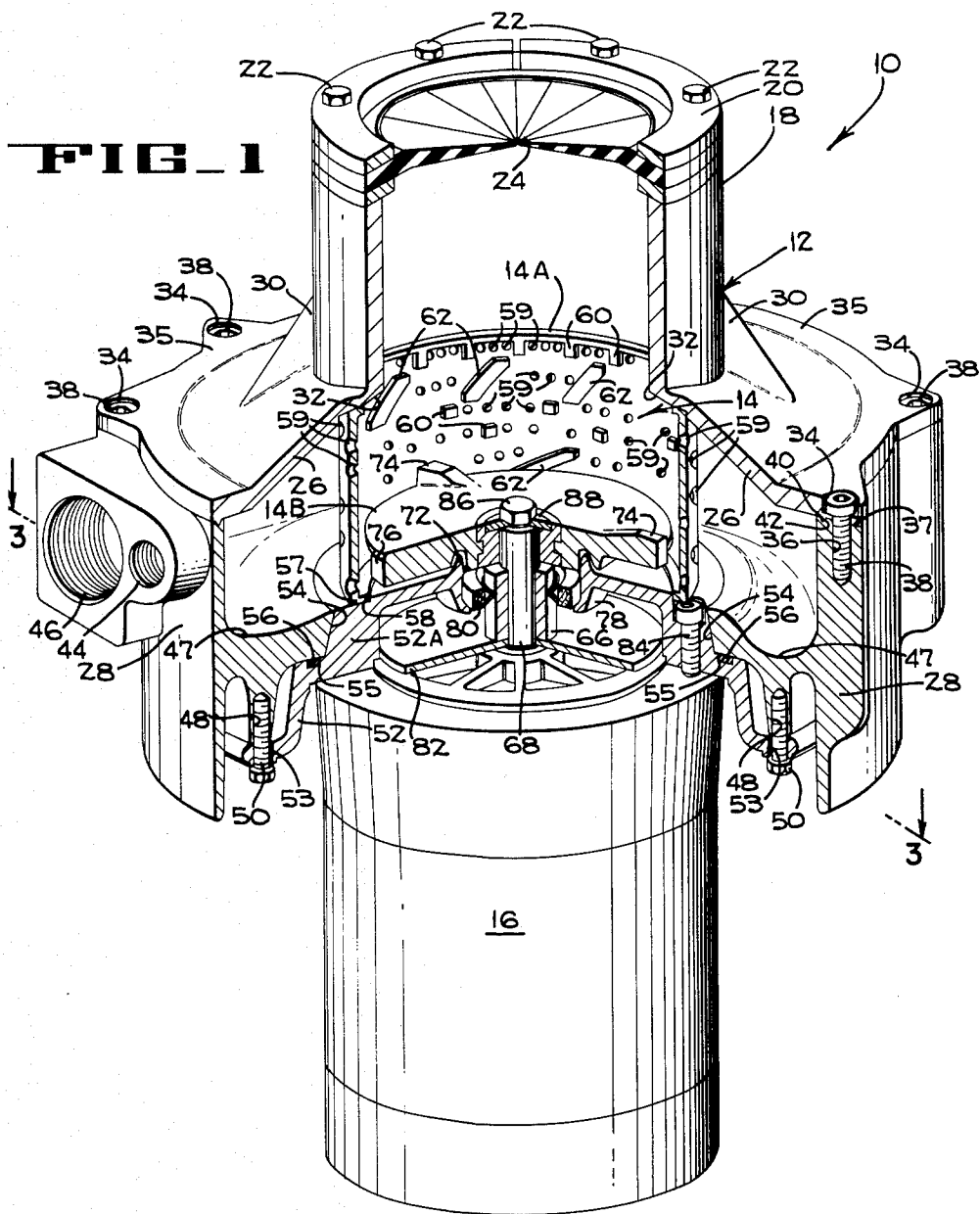
R. J. STOUT

3,236,462

WASTE DISPOSER

Filed Oct. 26, 1962

3 Sheets-Sheet 1



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FIG. 3

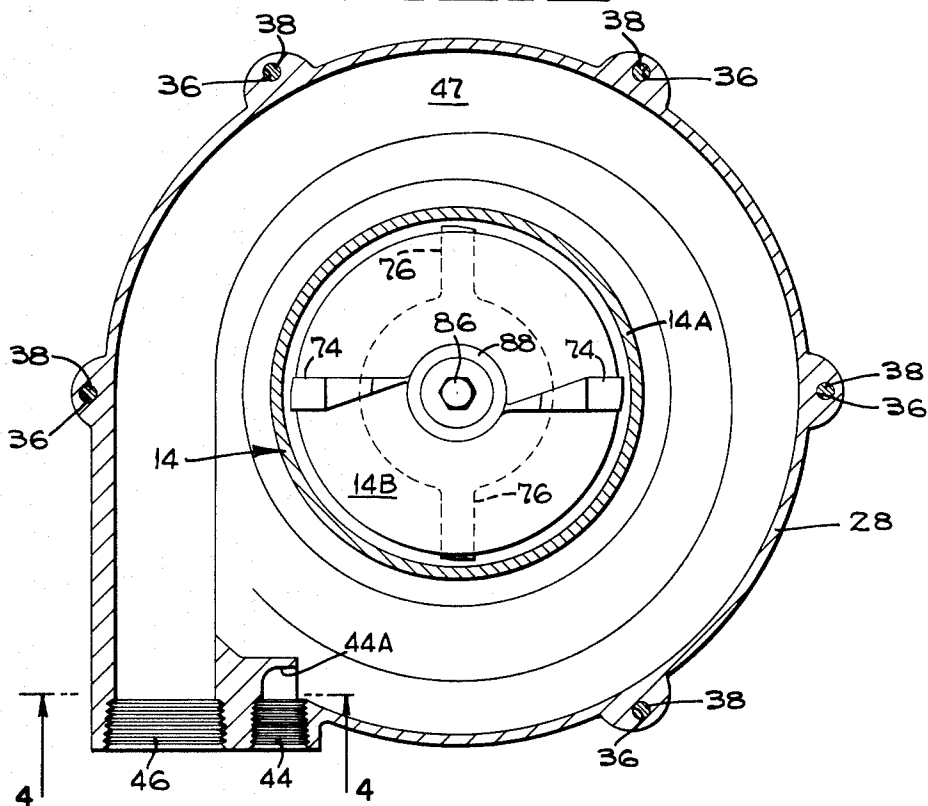
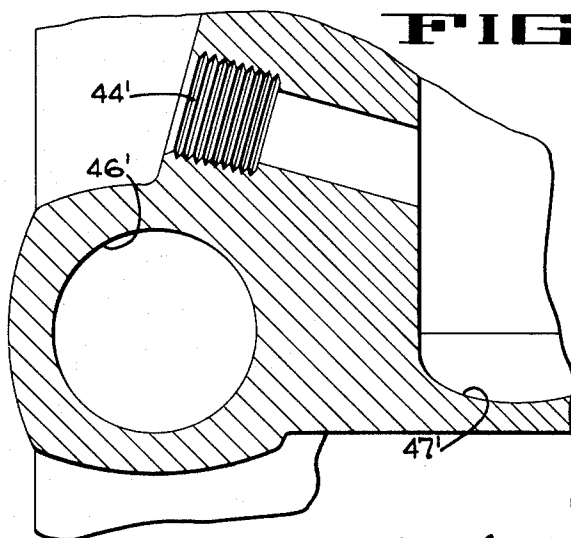


FIG. 4



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WASTE DISPOSER

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Filed Oct. 26, 1962, Ser. No. 233,283

3 Claims. (Cl. 241—60)

This invention pertains to waste disposal units, and more particularly, to an improved disposer for comminuting food wastes of the size and type found in restaurant kitchens.

Certain problems have been associated with waste disposers known in the art. These problems include the jamming of the disposer by bones, clogging of discharge orifices by a cohesive mass of waste material, violent ejection of waste material from a feed hopper, failure to grind to the necessary degree of fineness, and inefficient comminuting action requiring a large power input. The waste disposer of the present invention includes many features which cooperate to overcome these problems to a large extent.

An object of the present invention is to provide an improved disposer for rapidly grinding waste products to a size which will permit disposal, through normal plumbing into a sewer.

Another object is to provide a disposer in which waste material is comminuted with a maximum efficiency to a desired size.

Another object of the invention is to provide a disposer wherein centrifugal force causes waste material to be extruded through apertures in a sizing ring.

Another object is to provide a disposer in which a jet of water cleans waste material from apertures in a sizing ring and flushes the waste material through a drain passageway.

Another object is to provide a disposer having a simplified assembly of parts which can be removed from their mounting for replacement and repair without breaking any plumbing connections.

Another object is to provide a disposer having a sizing ring that can be inverted after becoming worn and thus double the effective life of the ring.

Another object is to provide a disposer which operates with a minimum of operational noise.

Another object is to provide an improved sizing ring for a garbage disposer.

Other objects and advantages of the invention will be apparent from the following detailed description, reference being made to the annexed drawings, in which:

FIGURE 1 is a perspective of a waste disposer having portions broken away to illustrate the present invention.

FIGURE 2 is a vertical section taken centrally through the sizing ring of the disposer of FIGURE 1.

FIGURE 3 is a horizontal section taken on lines 3—3 of FIGURE 1.

FIGURE 4 is a vertical section showing a modified arrangement of the water inlet and discharge outlets of the disposer, the view being taken at a position on the modified disposer corresponding to the position indicated by line 4—4 of FIG. 3.

With reference to FIGURE 1, the waste disposer includes a grinder housing 12, a grinding unit 14 including an apertured shredder ring 14A and a rotor 14B, and a drive motor 16. The grinder housing 12 has an upper cylindrical portion 18 which provides a hopper into which material to be comminuted is dropped. A closure cap ring 20 is secured to the top of the feed hopper by cap screws 22 which extend through the closure cap ring into internally threaded holes, not shown, in the upper rim of the feed hopper. A flexible diaphragm 24 is positioned between the upper rim of the feed hopper and the

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lower surface of the closure cap ring. This diaphragm acts as a splash guard to prevent the ejection of material from the feed hopper. Furthermore, the diaphragm tends to reduce operational noise from the waste disposer while permitting waste material to freely flow into the disposer.

At the lower end of the feed hopper 18 is a flared portion 26 which extends radially outward and downward from the hopper. A lower enclosure 28 projects downward from the outer peripheral portion of the flared portion. A plurality of ribs 30 extend between the hopper and the flared portion to provide support. The internal diameter of the cylindrical shaped feed hopper is less than that of the grinding unit 14 so that a guard ledge 32 (FIG. 2) overlies the grinding unit. This guard ledge prevents waste material from being violently ejected upwardly into the hopper and further reduces the operational noise. Also, material that is not small enough to pass through the discharge apertures of the grinder must be recirculated for further treatment. It was discovered that to accomplish this recirculation without causing jamming between the rotor and the overhanging ledge 32, the undersurface of the guard ledge 32 should be inclined upwardly and inwardly at about 15 degrees to the horizontal as shown in FIG. 2. With this inclination, the waste material is guided inwardly along a trajectory that eliminates jamming and facilitates recirculation of the material.

A plurality of holes 34 (FIG. 1) extend through an outer rim 35 of the flared portion 26 of the housing. Internally threaded holes 36 are provided in an upper surface 37 of the lower enclosure 28 to align with the holes 34. The flared portion 26 and the lower enclosure 28 are thus secured together by cap screws 38. A V-shaped downwardly projecting ring 40 is formed on the undersurface of the outer rim 35 of the flared portion 26, and fits within a corresponding V-shaped notch 42 in the upper surface 37 of the lower enclosure 28. This projection and corresponding notch aid in the centering of the flared portion on the lower enclosure and form a seal so that no gasket is required therebetween. Furthermore, the projection acts as a key to resist lateral forces which might tend to cause slippage of the members relative to each other.

As shown in FIGURES 1 and 3, a water inlet 44 and a waste material outlet 46 are provided in the lower enclosure 28. An annular discharge passage 47 is enclosed by the lower enclosure 28 and is in communication with the water inlet and waste outlet. As shown in FIG. 3, the water inlet has a rear wall 44A arranged to direct water into the housing along a path that is substantially tangential to the annular discharge passage. Since the rotor 14B is rotating counterclockwise (FIG. 3), the material is traveling in a counterclockwise direction along the discharge passage 47 toward outlet 46, and the spray of water from inlet 44 aids in the smooth movement of the material.

A plurality of internally threaded holes 48 (FIGS. 1 and 2) are provided in the bottom of the lower enclosure to receive hex head screws 50. An adapter plate 52 having bayonet slots 53 is secured to the lower enclosure 28 by the hex head screws. The upper portion 52A of the adapter plate 52 fits tightly within a central tapered bore 54 (FIG. 2) of the lower enclosure 28. A rectangular notch 55 is provided in the adapter plate at a point spaced outwardly from the upper portion 52A. An O-ring seal 56 fits within the rectangular notch to provide a water tight seal between the adapter plate and the lower enclosure.

The sizing ring 14A of the grinding unit 14 has a lower annular rim 57 which fits within a groove 58 on the upper

surface of the adapted plate 52. This sizing ring is tightly locked between the adapter plate 52 and the lower portion of the feed hopper 18 and, at its upper edge it is spaced outwardly from the guard ledge 32. The sizing ring 14A has a plurality of perforations 59 through which the comminuted waste material passes to reach the annular drain passage 47. These perforations are flared outwardly so that the diameter of the perforation on the inner surface of the sizing ring is less than the diameter of the perforation at the outer surface of the sizing ring. This outward flare aids in preventing the perforations from becoming plugged. Projecting inwardly from the vertical surface of the sizing ring 14A are a plurality of lugs 60 which are of a generally rectangular shape and a plurality of lugs 62 which extend diagonally along the inner vertical surface of the sizing ring.

As previously mentioned, in prior disposer units an excessive amount of jamming of the material being comminuted occurred and poor circulation of material was experienced. In connection with the present invention, it was discovered that the ratio of the height H of the shredder ring 14A to its internal diameter affected the performance of the disposer. Thus, it was found that the ratio of the height to the diameter should be in a range of between 0.33 to 1 and 0.6 to 1. When the ratio is less than 0.33 to 1, jamming of bones and other material occurs in an excessive amount. Above a ratio of 0.6 to 1, the grinding unit takes an unduly long time to clear itself. In one successful disposer constructed in accordance with the present invention, a ring having an internal diameter of 5.165" and a height of 3.012" was used, said ring having a ratio of 0.584 to 1. Another successful disposer has a ring with an internal diameter of 6.750", a height of 3.500" and, therefore, a height to diameter ratio of 0.518 to 1.

The number of perforations 59 and the diameter of the perforations on the inner and outer sides of the sizing ring 14A are extremely important to the operation of the waste disposer 10. The number of perforations should be within the range of between 116 and 220. When less than 116 perforations are used in the sizing ring, the ability of the ring to permit passage of ground material is limited to such an extent that it is commercially unacceptable. When more than 220 perforations are used, the strength of the ring will be weakened to an undesirable extent. A maximum discharge is achieved with a shredding ring having about 150 perforations and such a ring is, of course, strong enough for use in grinding ordinary restaurant waste including bones.

The optimum diameter of the perforations 59 at the interior surface of the sizing ring is between one-quarter of an inch and three-eighths of an inch. Below one-quarter of an inch, the capacity is reduced to an extent such that the sizing ring is commercially unacceptable while a diameter greater than three-eighths of an inch, will not reduce the waste material to desired particle size. The most desirable perforation configuration resembles a frustum of a cone having one-quarter inch diameter at the inner surface of the sizing ring and a three-eighths inch diameter on the outer surface of the sizing ring, while the wall thickness of the ring is three-sixteenths of an inch. The axis of the perforation is radial to the ring and the outward flare of the perforations tends to prevent waste material from plugging the perforations.

The lugs 60 and 62 on the shredder ring provide a unique, efficient comminuting action due to their particular configuration, dimensions and coaction with the rotor 14B. The vertical length of the lugs 62 along the height of the sizing ring, as indicated by the letter L in FIG. 2, should be less than one quarter of the height H of the sizing ring 14A. If the length L of a lug exceeds one quarter of the height H, an excessive amount of jamming occurs. The width of the lug 60 as indicated by the letter W in FIG. 2, should correspond to at least five degrees of arc along the inner surface of the sizing ring.

Such a width provides sufficient strength and surface area to accommodate normal wear on each vertical edge. The depth of the lugs, as indicated by the letter D in FIG. 2 should be at least 0.050 of an inch. A depth D less than this minimum size would reduce the cutting action and the grinding capacity to such an extent that the disposer would be unacceptable. In the previously mentioned disposer having a shredder ring with an internal diameter of 5.165", the depth of the lugs was 0.105", and in the ring of 6.75" diameter, the lugs had a depth of 0.094".

The lugs 60 and 62 should be arranged on the inner surface of the ring in such a manner that the vertical clearance between the adjacent lugs is zero, when the lugs overlap, or is a maximum of one-eighth of an inch. Should the clearance be greater than one-eighth of an inch, particles of waste material will tend to fill up the clearance area and thus impair the cutting action. The perforations 59 and the lugs 60 and 62 are arranged in a symmetrical pattern so that the sizing ring may be inverted and the general pattern will be the same. When the cutting edges of the lugs become worn on one side, inverting the sizing ring presents a new cutting edge for each lug. This feature doubles the life of the sizing ring.

The rotor 14B is disposed on the upper end of a sleeve 66 which encircles the upper end of the drive shaft 68. The rotor 14B is disc shaped and has an annular groove 70 on the under surface adjacent the sleeve 66. An annular projection 72 on the upper surface of the adapter plate 52 fits within the groove 70 and thus restricts the flow of water and waste material inwardly towards the drive shaft 68. A pair of aligned radially projecting cutting bars 74 (FIGS. 1 and 3) project upwardly from the surface of the rotor at the outer periphery, and a pair of radially projecting cutting blades 76 project downwardly from the lower surface of the rotor, said blades 76 being aligned and disposed perpendicular to a line passing through the cutting bars 74.

The adapter plate 52 has a hub portion 78 directly below the annular projection 72. A motor shaft seal 80 is seated in the lower portion of the hub between sleeve 66 and the hub 78. This seal prevents the passage of water along the outer surface of the sleeve 66 and into the motor 16. A slinger 82 is locked between the sleeve 66 and a shoulder on the drive shaft 68 and overlies the end of the motor so as to collect any water which might fall thereon and hurl it in a radially outward direction by centrifugal force due to the rotation of the slinger.

The adapter plate 52 is fastened to the motor 16 by a plurality of cap screws 84 only one being shown in FIG. 1. The rotor 14B fits over the drive shaft 68 and is locked on the shaft by a cap screw 86 which bears against a washer 88. It is to be noted that, when the rotor 14B is secured on shaft 68, the sleeve 66 is also locked in position.

The drive motor 16, the rotor 14B, the adapter 52, and the shredder ring 14A make up an integral assembly which is bolted to the lower end of the grinder housing 12 by the hex head bolts 50. As previously described, the motor and the grinder unit may be readily removed from the grinder housing by loosening the hex head bolts and rotating the motor slightly so that the heads of the bolts will register with the enlarged portion of the bayonet slots 53, permitting the unit to thus drop free of the grinder housing without disturbing the plumbing connections to the water inlet opening 44 or the waste discharge opening 46.

In operation, waste material is inserted into the feed hopper 18 together with sufficient water to make a thin slurry of the comminuted material. The waste material flows downward onto the rotor 14B and is thrust outwardly against the inner surface of the annular sizing ring 14A by the centrifugal force developed by the rotor. As the waste is propelled against the lugs 60 and 62, it is chopped into small pieces by the cutting bars 74. The small particles are forced outwardly through the perforations 59 while material which does not pass through the

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perforations moves either upwardly or downwardly along the inner surface of the sizing ring. The lugs 62 slope diagonally downward in the direction of rotation of the rotor 64, thus causing waste material to be deflected towards the rotor. Some of the small particles will pass between the sizing ring and the rotor and thus fall on the upper surface of the adapter plate 52. The cutting blades 76 on the lower surface of the rotor sweep the particles outwardly against the sizing ring 14A to grind them and to prevent particles of waste from moving inwardly under the rotor. When these particles have been chopped fine enough by the cutting blades 76, they pass outwardly through the lowermost apertures and are collected and transported along the annular drain passage 47. Other waste particles which move upwardly along the vertical inner surface of the sizing ring are guided by the guard edge 32 inwardly towards the center of the rotor whereupon they are recirculated and forced outwardly again, to be comminuted by the cutting bars 74 and forced through the perforations 59.

A jet of water is directed into the drain passage 47 through the water inlet 44. This jet of water tends to clean the outer surface of the sizing ring 14A and assists in carrying away the waste particles along the drain passage. A modification of the water inlet is illustrated in FIGURE 4. While the water inlet 44 shown in FIGURE 3 is generally parallel to discharge outlet 46 and has a right angle bend immediately upon entering the drain passage 47, the water inlet 44' shown in FIGURE 4, extends transversely above the discharge outlet 46' and is arranged above to direct a jet of water tangentially into the discharge passage 47'.

From the foregoing description, it will be apparent that the waste disposer of the present invention includes a unique relationship of parts which cooperate to provide an improved cutting action resulting in more efficient operation without jamming, clogging or violently ejecting waste material therefrom.

The fact that the ratio of the height of the shredder ring to its diameter has an important effect on the performance of a garbage disposer is considered to be a discovery of consideration and the teaching of the present specification concerning the optimum range of ratio is a definite contribution to this art.

Similarly the present disclosure of the optimum number of perforations in the shredder ring, and the size and generally frusto-conical configuration of the perforations contribute to a large degree in attaining fast, smooth discharge of material.

The upwardly and inwardly inclined ledge on the lower end of the cylindrical feed housing provides a unique, material-recirculation action within the disposer and prevents jamming of material under this ledge.

Another unique feature of the present invention resides in the discovery that the ratio of the height of each tooth to the height of the shredder ring of one to four or less precludes excess jamming and an inefficient action. While disposers disclosed in prior patents have had cutting teeth within this range, none of these prior art patents have disclosed the use of teeth within the specified range in such a pattern and so arranged relative to the path of the rotor that no waste material becomes hung-up or stratified on the inner face of the shredder ring between the teeth of the ring.

It will be understood that modifications and variations of the embodiments of the waste disposer disclosed herein may be resorted to without departing from the spirit of the invention and the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. A comminuting apparatus comprising, a flared upper housing having an outer annular rim with a V-shaped projection depending therefrom; a lower housing having an upper surface with a corresponding annular V-shaped notch to receive said projection whereby the flared upper

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housing and the lower housing are aligned and sealed together; a motor driven rotor rotatably mounted on said lower housing and disposed between said lower housing and said upper housing; said upper housing being provided with a feed chamber and an annular ledge overlying the periphery of said rotor; said ledge being provided with a frusto-conical surface facing said rotor and subtending an angle of substantially 15 degrees from a plane transverse to the axis of rotation of said rotor; a sizing ring releasably mounted between the outer periphery of said ledge and said lower housing, said sizing ring being provided with between 116 and 200 frusto-conical shaped perforations, the diameter of each perforation at the inner surface of said sizing ring being within the range of one-quarter inch to three eighths inch and the diameter of each perforation at the outer surface of said sizing ring being greater than said diameter at said inner surface; said sizing ring being provided with a multiplicity of lugs projecting inwardly from said inner surface at least 0.05 of an inch, said lugs having a width corresponding to the length of an arc along said inner surface subtending an angle of approximately five degrees around the axis of said rotor, said lugs being further arranged so that there is no more than one eighth of an inch of vertical clearance between the adjacent top and bottom portions of successive lugs, said sizing ring, said upper housing, and said lower housing defining an annular drain passage surrounding said sizing ring, said lower housing being provided with a waste outlet from said drain passage and a water inlet; and means for directing a jet of water from said water inlet into said drain passage tangentially of said sizing ring to flush waste material from said apertures and said drain passage into said waste outlet; said sizing ring having a height to internal diameter ratio in the range of from 0.33 to 1 to 0.60 to 1.

2. A comminuting apparatus comprising a motor driven rotor, a housing provided with a feed chamber and an annular ledge overlying the periphery of said rotor, said ledge being provided with a frusto-conical surface facing said rotor and subtending an angle of substantially fifteen degrees from a plane transverse to the axis of rotation of said rotor, and a sizing ring releasably mounted between the outer periphery of said ledge and said housing, said sizing ring being provided with between 116 and 200 frusto-conical shaped perforations, the diameter of each perforation at the inner surface of said sizing ring being within the range of one-quarter inch to three eighths inch and the diameter of each perforation at the outer surface of said sizing ring being greater than said diameter at said inner surface; said sizing ring being provided with a multiplicity of lugs projecting inwardly from said inner surface at least 0.05 of an inch, said lugs having a width corresponding to the length of an arc along said inner surface subtending an angle of approximately five degrees around the axis of said rotor, said sizing ring and said housing defining an annular drain passage surrounding said sizing ring, said sizing ring having a height to internal diameter ratio in the range of from 0.33 to 1 to 0.60 to 1.

3. A comminuting apparatus comprising a motor driven rotor, a housing provided with a feed chamber and an annular ledge overlying the periphery of said rotor, said ledge being provided with a frusto-conical surface facing said rotor and subtending an angle of substantially fifteen degrees from a plane transverse to the axis of rotation of said rotor, and a sizing ring releasably mounted between the outer periphery of said ledge and said housing, said sizing ring being provided with between 116 and 200 frusto-conical shaped perforations, the diameter of each perforation at the inner surface of said sizing ring being within the range of one-quarter inch to three eighths inch and the diameter of each perforation at the outer surface of said sizing ring being greater than said diameter at said inner surface; said sizing ring being provided with a

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multiplicity of lugs projecting inwardly from said inner surface at least 0.05 of an inch, said lugs having a width corresponding to the length of an arc along said inner surface subtending an angle of approximately five degrees around the axis of said rotor, said lugs being further arranged so that there is no more than one eighth of an inch of vertical clearance between the adjacent top and bottom portions of successive lugs, said sizing ring and said housing defining an annular drain passage surrounding said sizing ring, said sizing ring having a height to internal diameter ratio in the range of from 0.33 to 1 to 0.60 to 1.

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