Dec. 21, 1954 J. H. POWERS 2,697,558

WASTE DISPOSAL APPARATUS WITH SECONDARY WASTE REDUCER

Filed Nov. 27, 1953

FIG. 1

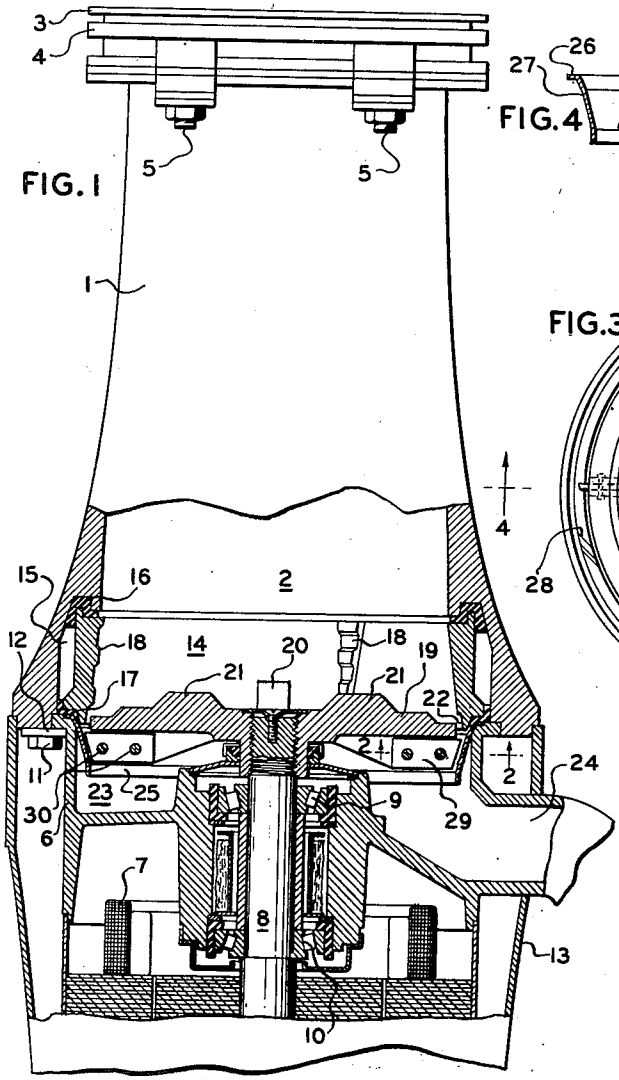


FIG. 4

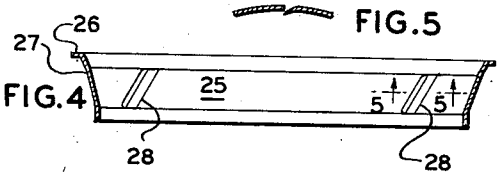


FIG. 5

FIG. 3

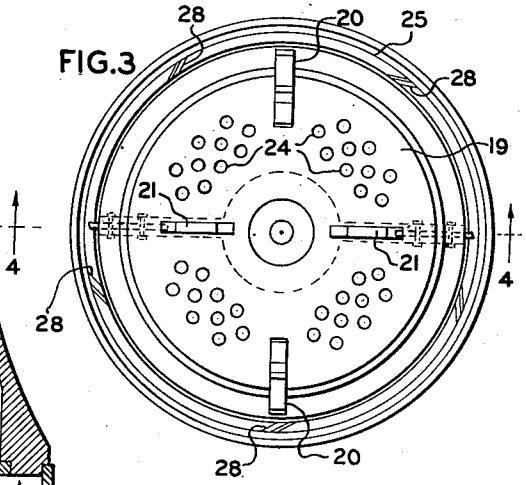


FIG. 7

FIG. 6

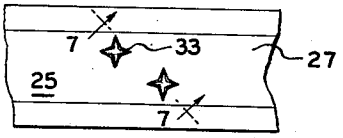


FIG. 9

FIG. 2

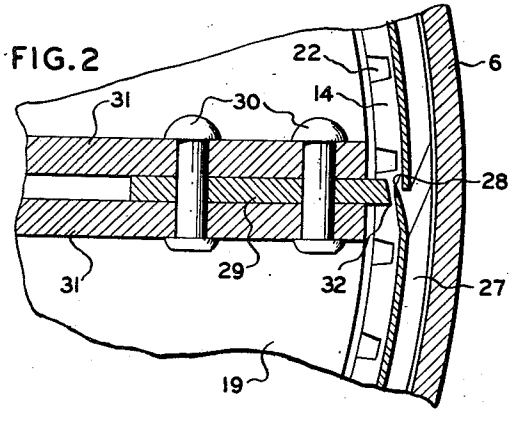
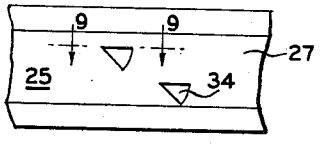


FIG. 8



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2,697,558

WASTE DISPOSAL APPARATUS WITH SECONDARY WASTE REDUCER

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Application November 27, 1953, Serial No. 394,780

12 Claims. (Cl. 241—160)

The present invention relates to apparatus for the disposal of waste material, and more particularly to apparatus for attachment to a sink drain for receiving a mixture of garbage and water and reducing or comminuting the solid particles to produce a flowable mixture suitable for discharge to the sink drain line.

Waste comminuting apparatus of the type to which this invention is directed includes a main shredding chamber housing shredding means suitable for reducing solid particles of waste to a flowable state, a drain receiving chamber below the main shredding chamber, and strainer means for preventing large particles from passing from the main shredding chamber into the drain receiving chamber where such particles might clog or plug the sink drain line. Although the straining passages employed in such apparatus are of relatively small cross-sectional area it has been found that they do not prevent the passage of fibers and other long stringy material such as celery and corn fibers, peapods, etc. Various attempts have been made to provide auxiliary shredding means for insuring the complete comminution of the material discharged from the grinding chamber into the draining chamber but none, so far as I am aware, have been wholly effective in cutting vegetable fibers and similar stringy material. Apparently one of the difficulties involved is that waste material of this type frequently rolls into ball-like masses small enough to pass into the drain chamber, and then resumes its elongated form as it passes through the drainage system.

Accordingly a principal object of my invention is to provide waste disposal apparatus including a secondary shredding device particularly adapted to comminute and cut into short lengths long stringy material discharged from the primary grinding chamber.

Another object of my invention is to provide waste disposal apparatus including secondary shredding means arranged to comminute both small waste particles and long fibers so that such fibers are cut into small lengths even though they are rolled into small ball-like masses by the primary grinding means.

Still another object of my invention is to provide a secondary shredding mechanism for waste disposal devices which will effectively cut and comminute fibrous waste materials, which may be economically manufactured, and which may be replaced when it is worn to the extent that it is no longer effective.

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

Briefly stated in accordance with one aspect of my invention I provide a circular flange having cutting edges projecting from its inner surface, and mount the flange in a position surrounding the flywheel of a waste disposal unit having a primary grinding chamber above the flywheel and a drain receiving chamber therebelow. I further provide means on the periphery of the flywheel carrying one or more shearing edges which are generally parallel to the surface of the flange and are positioned in cutting relationship with the cutting edges on the flange. Preferably the flange extends downwardly into the drain receiving chamber and slopes inwardly toward the center of the flywheel so that the cutting edges more effectively intercept the waste material as it is discharged from the main grinding chamber.

For a better understanding of my invention, reference may be made to the accompanying drawing in which:

Fig. 1 is an elevation view, partly in section, of a waste disposal device embodying my invention.

Fig. 2 is an enlarged sectional view taken on line 2—2 in Fig. 1.

Fig. 3 is a top plan view of the circular flange and flywheel forming a part of my invention.

Fig. 4 is a sectional view of the circular flange taken along the line 4—4 in Fig. 3.

Fig. 5 is a detailed sectional view taken on the line 5—5 of Fig. 4.

Fig. 6 is a fragmentary view showing a modified form of my invention.

Fig. 7 is a detailed section taken on the line 7—7 in Fig. 6.

Fig. 8 is a fragmentary view showing still another modified form of my invention.

Fig. 9 is a detailed sectional view taken on the line 9—9 in Fig. 8.

Referring first to Fig. 1 of the drawing, I have shown a waste disposal device having a generally cylindrical casing **1** enclosing a grinding or shredding chamber **2** at the bottom of which the comminuting or shredding of the waste material takes place as will be later described. The upper end of casing **1** is provided with means suitable for supporting the waste disposal device in the drain opening of a sink or the like, the supporting means including a supporting flange **3**, a clamping flange **4** and clamping bolts **5**, all arranged so that the open top of casing **1** is supported in alignment with the sink drain opening. Preferably a combined sink stopper and control device similar to that disclosed and claimed in my Patent 2,185,037 is removably supported in the sink drain opening and arranged to control the operation of the waste disposal unit. However since this device forms no part of the present invention it need not be further described here.

At the lower end of the casing is a bottom flange **6** carrying an electric motor **7** having a shaft **8** rotating in upper and lower bearings **9** and **10**. Flange **6** is secured to the lower end of casing **1** by means of a plurality of bolts **11** (only one being shown) threaded into the bottom edge of the casing at spaced points around its periphery. These bolts carry under their heads clamping washers **12** which extend inwardly and engage portions of flange **6**. The assembly including flange **6** and the motor **7** is enclosed by a shield **13** depending from the casing and secured by suitable means such as bolts (not shown) passing through the bottom of the shield and engaging the frame of motor **7**.

The grinding or shredding mechanism of the waste disposal device is located at the bottom of shredding chamber **2** and includes a generally cylindrical wall member **14** removably seated in an annular recess **15** in the lower edge of casing **1**. Resilient sealing and supporting gaskets **16** and **17** at the top and bottom respectively of wall **14** assist in the frictional holding of the parts in their proper position and seal the joint between the casing and the bottom flange **6**. These gaskets also reduce vibration which might be transmitted from the comminuting mechanism to the sink or other supporting structure. Carried on the inner surface of wall **14** are projecting shredding members **18** spaced at intervals around its periphery. Shredding members **18** cooperate with other elements of the shredding mechanism hereinafter described to form the primary shredding means of my improved waste disposal device.

Positioned at the bottom of shredding chamber **2** is a flywheel **19** threaded on the motor shaft **8** so as to rotate therewith when motor **7** is energized. On the top surface of flywheel **19** I provide upwardly extending impeller means adapted to impel waste material in shredding chamber **2** radially outwardly against shredding members **18**. The impeller means carried by flywheel **19** may include two retractable centrifugally operated impeller blades **20** similar to the impeller blades disclosed and claimed in my Patent 2,577,152. To supplement the action of impeller blades **20**, additional impeller means such as abutments or lugs **21** may be provided on flywheel **19**, theses lugs being located radially inward from impeller blades **20** and spaced in quadrature with respect thereto as shown.

In operation, impeller blades **20** cause a mixture of water and waste material to be whirled around the shredding chamber at a speed such that the solid particles are moved outward by centrifugal force and reduced or comminuted by being tumbled against the teeth or serrations of shredding members **18**. There is also a further comminuting action resulting from the shearing action between the impeller blades **20** and shredding members **18**. Lugs **21** engage the waste material in the vicinity of the central portion of the flywheel and cooperate with impeller blades **20** to insure that such waste material is put into rotation as soon as a shredding operation is started.

At the bottom of wall **14** and adjacent the periphery of flywheel **19** are located a series of straining grooves **22**, the upper ends of which communicate with the shredding chamber and the lower ends of which discharge into an annular drain receiving chamber **23** having an outlet **24**. As waste material in shredding chamber **2** is comminuted and reduced to small particles, a flowable mixture of water and such particles is discharged through grooves **22** into drain receiving chamber **23** where it is further comminuted, cut and reduced by secondary shredding means hereinafter described.

Since, during operation, the mixture of garbage and water is in the form of an annulus adjacent the side walls of the shredding chamber, any solid material remaining in the shredding chamber when the motor is stopped will settle onto the flywheel adjacent the straining grooves **22** and may sufficiently block the grooves so that normal sink drainage does not flow through the shredding chamber into the drain line. This disadvantage may be overcome by providing additional openings **24** through the flywheel **19** so that normal sink drainage may bypass grooves **22**. This construction is described and claimed in my Patent 2,482,125.

Although waste material comminuted in shredding chamber **2** is reduced to small particles which will pass through straining grooves **22**, it is still found that certain waste materials are not thoroughly comminuted before discharge into the drain line. This is particularly true with materials such as corn husks, celery fibers, pods and other material which may be broken down in the shredding chamber into long strands of fiber or stringy material. Such fibers frequently pass through straining grooves or the running clearance between the flywheel and the shredding chamber wall, and hence to the sink drain line, where they may become matted and twisted and finally clog the drain line. As mentioned above, it appears that these fibrous materials are frequently rolled into ball-like masses in the main shredding chamber, and pass through the straining grooves in this form.

To overcome this difficulty I provide secondary shredding means including a circular flange supported at its top edge between the gasket **17** and flange **6** so that it extends downwardly into drain receiving chamber **23** adjacent the periphery of flywheel **19**. Referring to Figs. 3, 4 and 5 circular flange **25** includes a horizontal top portion **26** by means of which it is mounted in my waste disposal device, and an annular portion **27** inwardly inclined from its upper to its lower edge. Projecting inwardly from annular portion **27** are a plurality of cutting edges **28** positioned at spaced intervals. Cutting edges **28** are formed on integral inwardly deflected generally rectangular portions of flange **25** and are inclined from top to bottom in the direction in which the periphery of flywheel **19** moves as it sweeps past cutting edges **28**. As viewed in Fig. 3, the direction of rotation of flywheel **19** is counterclockwise, while in Fig. 2 the direction of rotation is clockwise.

My secondary shredding means also includes one or more cutter bars **29** carried by flywheel **19**, and fixedly secured thereto adjacent its periphery by suitable fastening means such as rivets **30** extending through spaced web portions **31** on the bottom of the flywheel. Preferably cutter bar **29** is made of a hard cutting material such as carbon tool steel, for example, and is generally rectangular in shape with a shearing edge **32** generally parallel to the surface of annular portion **27** of circular flange **25**. Shearing edge **32** extends outwardly from flywheel **19** into cutting relationship with cutting edges **28** on flange **25**, the clearance between the two cutting edges being approximately $\frac{1}{32}$ of an inch, for example. Since shearing edge **32** is perpendicular to the plane of rotation of the flywheel, shearing action between it and cutting edge **28** progresses

from top to bottom, it being recalled that cutting edge **28** is inclined from top to bottom in the direction in which shearing edge **32** moves as it sweeps past the cutting edge. This arrangement insures that the waste material is drawn over the cutting edges and forced in a downward direction into the drain receiving chamber. Furthermore, because the annular portion **27** of ring **25** slopes inwardly toward the center of the flywheel, waste particles discharged through straining grooves **22** or the running clearance between flywheel **19** and wall **14** are retained on the annular inclined surface long enough to be swept against one of the cutting edges **28** by cutter bar **29**. In effect it appears that the waste particles are held by centrifugal force on the inclined surface of flange **25** for a long enough period to insure shearing or cutting of the particle and fibers. This arrangement is an important feature of my invention and provides substantially improved secondary cutting action as compared with the cutting action of prior art devices in which a cutter extending outwardly from the flywheel sweeps the discharge ends of straining grooves at the periphery of the flywheel.

Referring to Figs. 6 and 7 which show a modified form of my invention, cutting edges **33** are formed on an inner surface of flange **25** by the zigzag edges of star-shaped openings punched in the side wall of annular portion **27**. It will be observed that in this embodiment the cutting edges are formed on partially severed triangular portions of flange **25** inwardly deflected by the punching operation, and that at least one of the cutting edges is inclined from top to bottom in the direction in which the cutter bar **29** moves as it sweeps past the cutting edges.

Still another embodiment of my invention similar to that shown in Fig. 6 is shown in Figs. 8 and 9, in which triangular portions of flange **25** are inwardly deflected to form a pair of cutting edges, one of which is inclined from top to bottom in the direction in which cutter bar **29** moves as it sweeps past the triangular portions. Thus both of these modified forms of my invention include inclined cutting edges arranged to cooperate with shearing edge **32** so that the waste particles and material are drawn over the cutting edges and forced downwardly into the drain receiving chamber.

From the above disclosure it is seen that I have provided secondary comminuting means to further insure that material discharged from the primary shredding chamber into the sink drain line is properly comminuted or reduced to a form suitable for discharge into the drain system. In particular the vegetable fibers and other stringy material, which frequently is rolled into ball like masses by the primary shredding mechanism are cut into short lengths which cannot intertwine to clog the drainage system. Furthermore it will be observed that both the cutter bar and the flange on which the cutting edges are formed are removable and may be replaced when the shearing or cutting edges become worn. The present invention also permits the main shredding means to be designed for more rapid comminution since the secondary shredding means may be relied upon to reduce any of the larger particles discharged through the straining grooves.

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

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

1. In apparatus for comminuting waste material, primary shredding means including a wall defining a main shredding chamber, shredding members on the inner surface of said wall, a flywheel positioned at the bottom of said shredding chamber, upwardly extending impeller means carried by said flywheel, straining grooves in said wall extending from within said shredding chamber past the periphery of said flywheel into a drain receiving chamber, and secondary shredding means comprising a circular flange extending downwardly into said drain receiving chamber adjacent the periphery of said flywheel, a plurality of cutting edges projecting from the inner surface of said flange, a cutter bar carried by said flywheel, and a shearing edge on said cutter bar generally parallel to said surface of said flange and extending outwardly from said flywheel into cutting relationship with said cutting edges.

2. In apparatus for comminuting waste material, pri-

mary shredding means including a wall defining a main shredding chamber, shredding members on the inner surface of said wall, a flywheel positioned at the bottom of said shredding chamber, upwardly extending impeller means carried by said flywheel, straining grooves in said wall extending from within said shredding chamber past the periphery of said flywheel into a drain receiving chamber, and secondary shredding means comprising a circular flange extending downwardly into said chamber adjacent the periphery of said flywheel, the diameter of the upper edge of said flange being at least equal to the diameter of the lower edge thereof, a plurality of cutting edges projecting from the inner surface of said flange, a cutter bar carried by said flywheel, and a shearing edge on said cutter bar generally parallel to said surface of said flange and extending outwardly from said flywheel into cutting relationship with said cutting edges.

3. In apparatus for comminuting waste material, primary shredding means including a wall defining a main shredding chamber, shredding members on the inner surface of said wall, a flywheel positioned at the bottom of said shredding chamber, upwardly extending impeller means carried by said flywheel, straining grooves in said wall extending from within said shredding chamber past the periphery of said flywheel into a drain receiving chamber, and secondary shredding means comprising a circular flange surrounding the periphery of said flywheel extending downwardly into said drain receiving chamber and sloping inwardly toward the center of said flywheel, a plurality of cutting edges projecting from the inner surface of said flange, a cutter bar carried by said flywheel, and a shearing edge on said cutter bar generally parallel to said surface of said flange and extending outwardly from said flywheel into cutting relationship with said cutting edges.

4. In apparatus for comminuting waste material, primary shredding means including a wall defining a main shredding chamber, shredding members on the inner surface of said wall, a flywheel positioned at the bottom of said shredding chamber, upwardly extending impeller means carried by said flywheel, straining grooves in said wall extending from within said shredding chamber past the periphery of said flywheel into a drain receiving chamber, and secondary shredding means comprising a stationary circular flange surrounding the periphery of said flywheel, said flange including an annular portion inwardly inclined from its upper to its lower edge, a plurality of cutting edges projecting inwardly from said annular portion of said flange, a cutter bar carried by said flywheel, and a shearing edge on said cutter bar generally parallel to said surface of said flange and extending outwardly from said flywheel into cutting relationship with said cutting edges.

5. In apparatus for comminuting waste material, primary shredding means including a wall defining a main shredding chamber, shredding members on the inner surface of said wall, a flywheel positioned at the bottom of said shredding chamber, upwardly extending impeller means carried by said flywheel, straining grooves in said wall extending from within said shredding chamber past the periphery of said flywheel into a drain receiving chamber, and secondary shredding means comprising a circular flange extending downwardly into said drain receiving chamber adjacent the periphery of said flywheel, a plurality of cutting edges projecting from the inner surface of said flange, a cutter bar carried by said flywheel, and a shearing edge on said cutter bar generally parallel to said surface of said flange and extending outwardly from said flywheel into cutting relationship with said cutting edges, said cutting edges being formed on integral inwardly deflected generally rectangular portions of said flange and being inclined from top to bottom in the direction in which said shearing edge moves as it sweeps past said cutting edges.

6. In apparatus for comminuting waste material, primary shredding means including a wall defining a main shredding chamber, shredding members on the inner surface of said wall, a flywheel positioned at the bottom of said shredding chamber, upwardly extending impeller means carried by said flywheel, straining grooves in said wall extending from within said shredding chamber past the periphery of said flywheel into a drain receiving chamber, and secondary shredding means comprising a circular flange extending downwardly into said chamber adjacent the periphery of said flywheel, the diameter of the upper edge of said flange being at least equal to the diameter of the lower edge thereof, a plurality of cutting edges projecting from the inner surface of said flange, a cutter bar carried by said flywheel, and a shearing edge on said cutter bar generally parallel to said surface of said flange and extending outwardly from said flywheel into cutting relationship with said cutting edges, said cutting edges being formed on integral inwardly deflected generally rectangular portions of said flange and being inclined from top to bottom in the direction in which said shearing edge moves as it sweeps past said cutting edges.

7. In apparatus for comminuting waste material, primary shredding means including a wall defining a main shredding chamber, shredding members on the inner surface of said wall, a flywheel positioned at the bottom of said shredding chamber, upwardly extending impeller means carried by said flywheel, straining grooves in said wall extending from within said shredding chamber past the periphery of said flywheel into a drain receiving chamber, and secondary shredding means comprising a circular flange surrounding the periphery of said flywheel extending downwardly into said drain receiving chamber and sloping inwardly toward the center of said flywheel, a plurality of cutting edges projecting from the inner surface of said flange, a cutter bar carried by said flywheel, and a shearing edge on said cutter bar generally parallel to said surface of said flange and extending outwardly from said flywheel into cutting relationship with said cutting edges, said cutting edges being formed on integral inwardly deflected generally rectangular portions of said flange and being inclined from top to bottom in the direction in which said shearing edge moves as it sweeps past said cutting edges.

8. In apparatus for comminuting waste material, primary shredding means including a wall defining a main shredding chamber, shredding members on the inner surface of said wall, a flywheel positioned at the bottom of said shredding chamber, upwardly extending impeller means carried by said flywheel, straining grooves in said wall extending from within said shredding chamber past the periphery of said flywheel into a drain receiving chamber, and secondary shredding means comprising a stationary circular flange surrounding the periphery of said flywheel, said flange including an annular portion inwardly inclined from its upper to its lower edge, a plurality of cutting edges projecting inwardly from said annular portion of said flange, a cutter bar carried by said flywheel, and a shearing edge on said cutter bar generally parallel to said surface of said flange and extending outwardly from said flywheel into cutting relationship with said cutting edges, said cutting edges being formed on integral inwardly deflected generally rectangular portions of said flange and being inclined from top to bottom in the direction in which said shearing edge moves as it sweeps past said cutting edges.

9. In apparatus for comminuting waste material; primary shredding means including a wall defining a main shredding chamber, shredding members on the inner surface of said wall, a flywheel positioned at the bottom of said shredding chamber, upwardly extending impeller means carried by said flywheel, straining grooves in said wall extending from within said shredding chamber past the periphery of said flywheel into a drain receiving chamber, and secondary shredding means comprising a circular flange extending downwardly into said drain receiving chamber adjacent the periphery of said flywheel, a plurality of cutting edges projecting from the inner surface of said flange, a cutter bar carried by said flywheel, and a shearing edge on said cutter bar generally parallel to said surface of said flange and extending outwardly from said flywheel into cutting relationship with said cutting edges, said cutting edges being formed on integral inwardly deflected partially severed triangular portions of said flange, one of the cutting edges on said triangular portions being inclined from top to bottom in the direction in which said shearing edge moves as it sweeps past said cutting edges.

10. In apparatus for comminuting waste material, primary shredding means including a wall defining a main shredding chamber, shredding members on the inner surface of said wall, a flywheel positioned at the bottom of said shredding chamber, upwardly extending impeller means carried by said flywheel, straining grooves in said

wall extending from within said shredding chamber past the periphery of said flywheel into a drain receiving chamber, and secondary shredding means comprising a circular flange extending downwardly into said chamber adjacent the periphery of said flywheel, the diameter of the upper edge of said flange being at least equal to the diameter of the lower edge thereof, a plurality of cutting edges projecting from the inner surface of said flange, a cutter bar carried by said flywheel, and a shearing edge on said cutter bar generally parallel to said surface of said flange and extending outwardly from said flywheel into cutting relationship with said cutting edges, said cutting edges being formed on integral inwardly deflected partially severed triangular portions of said flange, one of the cutting edges on said triangular portions being inclined from top to bottom in the direction in which said shearing edge moves as it sweeps past said cutting edges.

11. In apparatus for comminuting waste material, primary shredding means including a wall defining a main shredding chamber, shredding members on the inner surface of said wall, a flywheel positioned at the bottom of said shredding chamber, upwardly extending impeller means carried by said flywheel, straining grooves in said wall extending from within said shredding chamber past the periphery of said flywheel into a drain receiving chamber, and secondary shredding means comprising a circular flange surrounding the periphery of said flywheel extending downwardly into said drain receiving chamber and sloping inwardly toward the center of said flywheel, a plurality of cutting edges projecting from the inner surface of said flange, a cutter bar carried by said flywheel, and a shearing edge on said cutter bar generally parallel to said surface of said flange and extending outwardly from said flywheel into cutting relationship with said cutting edges, said cutting edges being formed on integral inwardly deflected partially severed triangular portions of said flange, one of the cutting edges on said triangular portions being inclined from top to bottom in the direction in which said shearing edge moves as it sweeps past said cutting edges.

12. In apparatus for comminuting waste material, primary shredding means including a wall defining a main shredding chamber, shredding members on the inner surface of said wall, a flywheel positioned at the bottom of said shredding chamber, upwardly extending impeller means carried by said flywheel, straining grooves in said wall extending from within said shredding chamber past the periphery of said flywheel into a drain receiving chamber, and secondary shredding means comprising a stationary circular flange surrounding the periphery of said flywheel, said flange including an annular portion inwardly inclined from its upper to its lower edge, a plurality of cutting edges projecting inwardly from said annular portion of said flange, a cutter bar carried by said flywheel, and a shearing edge on said cutter bar generally parallel to said surface of said flange and extending outwardly from said flywheel into cutting relationship with said cutting edges, said cutting edges being formed on integral inwardly deflected partially severed triangular portions of said flange, one of the cutting edges on said triangular portions being inclined from top to bottom in the direction in which said shearing portion moves as it sweeps past said cutting edges.

No references cited.