UNITED STATES PATENT OFFICE

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KITCHEN WASTE DISPOSAL UNIT

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9 Claims. (Cl. 241—123)

This invention relates generally to so-called "garbage" disposal units adapted for use in homes, and pertains more particularly to such a unit adapted to exert a marked comminuting action upon kitchen waste whereby the same may be flushed down the conventional drain without danger from the standpoint of clogging. This application is a continuation-in-part of my earlier application Serial Number 662,595, filed April 6, 1946, now abandoned.

One of the particular objects of the invention is to provide a construction which is relatively inexpensive to manufacture, easily maintained in operating condition, and one having a relatively long useful life.

A further object of the invention is to provide a kitchen waste disposal unit adapted to exert a "chopping" action which is effective in the fine commination of fibrous materials, whereby such materials are quickly reduced to comparatively short length fragments or pieces, and which is further adapted to produce a marked shearing of such comminuted particles in a further disintegration of the mass acted upon, whereby the residual pulp may be readily flushed from the device and carried away by a conventional drain.

A further object of the invention is to provide a device of the character described having comminuting and disintegrating means working in close cooperation, wherein the comminuted waste material is carried through the device and to the drain through the agency of a flushing stream of water or the like.

A further object of the invention is to provide a kitchen waste disposal unit having a plurality of rotatably mounted comminuting elements arranged in spaced relation within a tubular comminuting duct, said comminuting elements being mounted for translatory movement in annular paths coaxial with said tubular duct, with the peripheral surface of the comminuting elements in close peripheral spacing to the inner periphery of said tubular ducts.

A further object of the invention is to provide a device for the disposal of kitchen waste and the like having a tubular duct member defining a comminuting zone having a vertically extending axis of symmetry, and preferably of cylindrical configuration, with a head member rotatably disposed below the zone to define a bottom wall therefor, the head member being mounted for rotation about said axis of symmetry and carrying a plurality of comminuting members mounted thereon and extending upwardly within the aforesaid zone from adjacent such bottom wall, the comminuting members being circular in cross section and rotatably mounted upon the head member for rotation about axes parallel to the aforesaid axis. The preferred construction is such that the diameter of the rotatable comminuting elements, and the spacing thereof from each other on the head member, is so selected with respect to the internal diameter of the comminuting zone of the duct member portion as to cause the peripheral outline of the comminuting elements to be disposed in closely spaced relation to the inner periphery of the comminuting zone, and to also define a central unobstructed space at the upper surface of the head member within the annular zone traversed by the comminuting elements during rotation of said head member.

A further object of the invention is to provide a device of the character described in which the tubular comminuting duct is provided with discontinuous surfaces of a preferred type adapted to enhance the comminuting action.

A further object of the invention is to provide a kitchen waste disposal unit of the type provided with a plurality of rotatably mounted comminuting elements arranged for planetary motion within a tubular comminuting duct, in which coacting comminuting surfaces are provided on the exterior of the comminuting elements and the interior of the comminuting duct, and in which the comminuting elements are provided with disintegrating surfaces in addition to those functioning in direct coaction with the comminuting surfaces on the duct, such additional surfaces being disposed in advance of the coacting surfaces on said comminuting elements with respect to the direction of flow of material through the unit, to provide a multi-stage grinding or comminuting action on the material subjected to treatment by the unit.

According to a preferred embodiment of the invention, illustrated in the accompanying drawings, the device may comprise a tubular duct adapted to be mounted upon a kitchen sink at the position of the conventional sink discharge opening, which duct carries adjacent its lower end a gyratory comminuting device adapted to be gyrated in close peripheral proximity to the tubular duct and to establish therewith a comminuting zone in which the action upon the waste material is essentially a chopping action, means defining a radially-flared downwardly expanded disintegrating zone below the comminuting zone which is adapted to shred the waste material which has been finely chopped in the comminuting zone,
and a generally annular duct subjacent the disintegrating zone adapted to receive the disintegrated material for discharge to a drain or waste pipe, together with drive means for rotating the comminuting and disintegrating members, and, preferably, means for supplying a quantity of flushing fluid to the comminuting zone. The structure of the present invention is distinguished from prior disclosure in the provision of a pair of rotatable comminuting members defining a gyratory comminuting device, operating in opposition to one another against the peripheral portions of the duct, and in the provision of a preferred comminuting surface forming such peripheral portions.

The above and other objects of the invention will be more particularly brought out in the ensuing description of a preferred embodiment, as illustrated in the accompanying drawings, in which:

Fig. 1 is a vertical section through the device of my invention;
Fig. 2 is a transverse section as taken on line 2—2 of Fig. 1;
Fig. 3 is a sectional detail as taken on lines 3—3 in Fig. 1;
Fig. 4 is an inverted plan view of the upper portion of the device, as taken on line 4—4 in Fig. 1; and
Fig. 5 is an exploded perspective view showing the rotating head assembly employed in the device.

Referring to the drawings, the device may comprise a tubular duct adapted to be mounted in a suitable opening in the bottom wall of a kitchen sink or the like, and to this end the tubular duct may comprise an upper portion I which is flanged to fit within an opening 2 in a sink 3 and retained in position thereon through the agency of a Jamb nut 4. Attached to the lower projecting end of the duct I I provide a lower tubular duct portion 5, which may be retained in place through the agency of a Jamb nut 5a, and which is preferably expanded downwardly to define a generally cylindrical comminuting zone 6. The duct 5 is then carried downwardly and flared outwardly as at 7 and secured to a discharge bowl member 8 defining an annular discharge passage 9 provided with a discharge opening 10. Within the space 8 and at the bottom of the comminuting zone 6 I provide a comminuting and disintegrating head member 14 rotatably supported on the bowl 8 as through bearings 12 and 19 carrying a shaft member 14 which projects through the bottom of the bowl 8 and is provided with a coupling 15 to which a drive motor may be connected. Such a drive motor is illustrated with particularity at 12 in Fig. 1 of my above mentioned pending application, and is omitted herein. It is intended that this motor will rotate the head 14 at a relatively high speed, for example, about 1750 R. P. M. has been found desirable where a minor diameter of about 4½” is provided for the zone 8 together.

The comminuting head 14 carries a plurality of comminuting elements 16 arranged for rotation on pins 17 extending upwardly into the comminuting zone 6 parallel to the axis of rotation of the head 14, as defined by the shaft 14. The comminuting elements 16 are of generally circular cross section and are provided with a plurality of cutting edges such as vertically extending radial projections 18 spaced peripherally thereabout, and defining a circular cross-section peripheral outline for the element.

The internal surface of the duct 5 which defines the comminuting zone 6 is preferably provided with a plurality of ribs 19 having inwardly directed surfaces 20 arranged to lie in a surface of revolution having a vertically extending axis of symmetry which is a prolongation of the axis of rotation of the head member 14, and the diameter of the element 16 is so selected, and the supporting pins 17 so located as to cause the ridges or cutting edges 18 to lie in very close spacing to the surfaces 20, on the order of .005 inch, for example, so that these cutting edges will sweep across the surfaces 20 upon rotation of the head member 11. The diameter and position of the elements 16 are preferably also selected with respect to the internal diameter of the comminuting zone 6 in such manner that an appreciable open space is established at the central portion of the head 14, and the diameter of the annular zone traversed by the elements 16.

The head member 11 is preferably provided with a flat conical peripheral ledge portion 22 extending outwardly of the position of the element 16, which is provided with a plurality of spirally extending flutes 23, and the lower end of the tubular duct 5 at the position of the flared skirt portion 7 is coactingly shaped with respect to the portion 22 of the head 11, as at 24 and is provided with a plurality of radially disposed notches 24a. The fluting provided at 23 and 24a is preferably such as to utilize the rotation of the head 11 to facilitate outward movement of material through the seats between the coacting portions of the head 11 and the duct member, as shown more particularly in Figs. 4 and 5.

Water supply means are preferably provided as at 25 for the introduction of a supply of flushing fluid to adjacent the upper end of the tubular duct formed by the portions 1 and 5, as through the agency of an annulus 26 provided with a plurality of water discharge openings 27, and located on a ledge 28 in the tubular duct 1. Water supply to the annulus 26 may be provided through the agency of a nipple 29 threaded through the wall of the duct 1 and into the annulus 26, through which water connections may be established.

I further preferably provide a baffle member adjacent the upper end of the duct portion 1 which will be such as to permit the supply of the head waste into the comminuting zone 6 during operation of the device, but which will effectively prevent water and small particles from being thrown outwardly of the device into the sink area. To this end I may provide a flat central partition 30, formed of a deformable material which is provided with an upstanding collar 31 retained within a recess 32 in the duck 1 through the agency of a spring retaining ring 33. The partition 30 may desirably be formed of a tough resilient material such as a medium vulcanized rubber, synthetic rubber, or the like, and is provided with a plurality of transverse slits 34 as illustrated more particularly in Fig. 3. The kitchen waste may be forced downwardly through the partitions 30 by opening the slits 34 under downward pressure, and after the material has passed through the openings formed by the slits, the slits will close by the restoring forces in the partition and effectively close, and thereby prevent water from being thrown back into the kitchen sink.

It has been determined that a more effective disintegrating action by the disintegrating ele
ments f is obtained if the inwardly projecting ribs 19 provided in the zone 6 are arranged in groups providing at least two closely adjacent inwardly directed surfaces 20 which are spaced from adjacent groups by a distance relatively greater than the spacing of the surface in any one group. For example, referring to Figs. 1 and 2, I have provided the ribs 19 in pairs with a comparatively small space (in a peripheral direction) between the adjacent surfaces 20, as at 35, the internal surface of the duct 5 being recessed as at 36 between adjacent groups of ribs 19, the length (in a peripheral direction) of the recesses 36 being preferably at least equal to and preferably somewhat greater than the combined length of surfaces 20 in the group. This type of spacing appears to result in facilitating a wedging action of the cutting edges 18 on the kitchen waste which is caught between the elements 16 and the recesses 36 of the duct 5 in the comminuting zone 6, producing a marked disintegration and fragmentation of material such as chop shop, chicken bones, etc., while the action of the cutting edges 18 of the elements 16 on the inwardly directed surfaces 20 of the ribs 19 appears to be more of a chopping action which is effective on thin materials such as lettuce leaves, and the like, as well as on fragments formed by the prior breakdown of the material. The provision of a greater proportion of the inwardly directed surfaces 20 accentuates the chopping action on such thin materials, to the detriment of the disintegration of more solid objects such as bones, but it is apparent from my investigations that a combination of both of these surfaces and recesses is required for overall handling of the average waste material resulting from kitchen operations.

As additional comminuting surfaces which will serve to assist in breaking down bones, and the like, I may provide upstanding knives or projections 37 at the upper end of the elements 16, such projections being provided with sharp cutting edge portions as shown at 38. The rotation of the elements 16 in the annular path 21 as a result of rotation of the head member 11, and the rotation of the individual elements 16 about their own axes on the pins 17 as a result of the cutting action produced by engagement of the cutting edges 18 upon kitchen waste which is pressed against the inwardly directed surfaces 20 of the ribs 19, produce a violent churning action of the knives 37 at the level of the upper ends of the elements 16, which results in a preliminary disintegration of kitchen waste supplied through the duct portion 1. In this connection, the outward flaring of the duct portion 5 below the inlet defined by the duct portion 1 as represented by the shoulders 33 in Fig. 1, is of assistance in maintaining the material within the disintegrating zone under the action of the knives or projections 37, inasmuch as the projections 37 tend to throw fragments upwardly and outwardly due to the rapid rotation of the head member 11 carrying the element 16, and these fragments are thrown against the shoulders 33 and thereby returned to the comminuting zone for further action.

When the material has become sufficiently fine to pass outwardly the comminuting zone 6 through the annular passage 49 between the fluted portions 22 and 24, assisted by the hydraulic flow action of the supplied water, the material is discharged into the annular passage 9 and carried away from the device through the passage 10.

The assembly of the head 11 on the shaft 14, as visualized in Fig. 5, may be established by providing a flange 40 on the upper end of the shaft 14, upon which the head 11 may be secured as by cap screws 41. The pins 17 may be flanged at their lower ends, as at 42, and may be assembled on the head 11 through openings 43, the flanges 42 seating in recesses 44 on the underside of the head and being retained by cap screws 45.

After assembly of the head structure, the comminuting elements 16 may be dropped onto the pins 17, a rather close running fit being provided, and in the operation of the device there is no tendency for the elements 16 to be thrown off the pins 17 in view of the fact that the loads imposed thereupon during the grinding and comminuting action are to a great extent in a downward direction.

I prefer to provide some protection for the bearings 12 and 13, to prevent access of water thereto, and for this purpose I may provide a flanged sleeve 46 mounted between the flange 40 and the head 11 and having a depending sleeve portion carrying an O-ring 47 adapted to ride on the central neck portion 48 of the bowl 8.

Assembly of the head, shaft and bearings within the bowl 8 is conventional, as will be apparent from the drawings.

In the use of the device, material is supplied past the partition 30 into the comminuting zone 6 during rotation of the head member 11 by the motor or other means provided and the whirling comminuting elements 16 which constantly scan the inner periphery of the lower portion of the zone 6 will engage the material and subject it to a combined crushing and cutting action, the crushing action taking place primarily between elements 16 and the lodging recesses 36 in the duct portion 5 and the cutting action takes place between the sharp cutting edges 18 of the comminuting element 16 and the inwardly directed surfaces 20 of the ribs 19. The resulting action causes the elements 16 to individually rotate on their supporting pins 17, causing the upstanding projections 37 on the elements 16 to rotate and engage any relatively large pieces of waste material. As the material is ground it falls downwardly to the space 49 between the annular flange portion 22 of the head 11 and the opposing fluted continuation 24 of the duct portion 5, and if the material is fine enough when it reaches that position, it will pass outwardly through the flutes or between the opposing surfaces, which are normally caused to be spaced on the order of 0.20 inch as an example. There is no tendency for material to accumulate at the bottom of the zone 6, inasmuch as the cutting edges 18 on the elements 16 extend practically flush with the upper surface of the head 11, and the ribs 19 on the duct member 5 are terminated only slightly above this upper surface of the head 11, causing the lower portions of the cutting edges 18 to be in a position to exert a final chopping action at the position of the space 49, thus making any final size reduction in the material and preventing a clogging and accumulation of material at this space.

A continuous flow of water through the water supply means 25 is of particular advantage in flushing the comminuted material out of the device, into the annular discharge passage 9 and thence through the discharge opening 10 to a sewer or other convenient connection.

The above described embodiment of my invention is presented for the purpose of illustration,
and modifications therein will occur to those skilled in the art, wherefore I do not choose to consider my invention to be limited to the specific showing herein, but rather to the scope of the appended claims.

I claim:

1. In a device for the disposal of kitchen waste and the like, the combination which comprises: a duct member provided with a vertically extending generally cylindrical portion defining a commuting zone and provided with a plurality of angularly spaced inwardly projecting rib members having inwardly directed surfaces lying in a surface of revolution about the axis of said duct portion; a head member rotatably disposed subjacent said zone for rotation co-axial with said portion; means for rotating said head member; a pair of commuting elements carried by said head member in diametrically-spaced relation, said commuting elements being of generally cylindrical peripheral outline with their axes extending upwardly from said head member into said zone, parallel to the axis of rotation of said head member; and a pair of pins secured to and projecting upward from said head member and rotatably supporting the respective commuting elements on said head member for rotation individually about their respective axes within said commuting zone, said pins constraining said commuting elements to move in a definite annular zone about the axis of rotation of the head member upon rotation of said head member; said commuting elements being provided at their upper ends with upwardly projecting knives, the diameter of said commuting elements and the spacing thereof from each other on said head member being such with respect to the internal diameter of said cylindrical portion of said duct member as to cause the peripheral outline of said elements to be disposed in closely spaced relation to said inwardly directed surfaces of said rib members and to define a central unobstructed space at the upper surface of said head member within the annular zone traversed by said elements during rotation of said head member.

2. In a device for the disposal of kitchen waste and the like, the combination which comprises: a tubular duct member defining a commuting zone having a vertically extending axis of symmetry and provided with a plurality of angularly spaced inwardly projecting rib members having inwardly directed surfaces arranged to lie in a surface of revolution about said axis, a head member rotatably disposed below said zone for rotation about said axis and having an upper surface cooperating with said duct member to define a bottom end wall for said commuting zone; means for rotating said head member; a plurality of commuting members of generally circular cross-section mounted on said head member and extending upwardly within said commuting zone from adjacent said upper surface and provided at their upper ends with upstanding knives having upwardly directed sharp cutting edges; and a pair of pins secured to and projecting upward from said head member and rotatably supporting the respective commuting members on said head member for rotation individually about their respective vertical axes in closely spaced relation to said inwardly directed surfaces of said rib members; said pins constraining said commuting members to move in a definite annular zone about the axis of rotation of the head member upon rotation of said head member.

3. In a device for the disposal of kitchen waste and the like, the combination which comprises: a tubular duct member provided with a plurality of inwardly projecting rib members having inwardly directed surfaces arranged to lie in a surface of revolution having a vertically extending axis of symmetry, said rib members extending generally in the direction of said axis of symmetry and being spaced peripherally from one another in groups, and the spacing of adjacent groups being greater than the peripheral length of the inwardly directed surfaces of the rib members of a group, to provide a plurality of inwardly directed commuting surfaces alternated with outwardly extending recesses and define a commuting zone in said duct member; a head member rotatably disposed below said zone for rotation about said axis of symmetry and having an upper surface cooperating with said duct member to define a bottom end wall for said commuting zone; means for rotating said head member; and a plurality of commuting elements mounted on said head member and extending upwardly within said commuting zone from adjacent said upper surface, said commuting elements being provided with a plurality of peripherally projecting commuting portions arranged to define a peripheral outline of generally circular cross-section, and being rotatably mounted on said head member for rotation about axes concentric with their circular cross-section and parallel to said axis of symmetry.

4. In a device for the disposal of kitchen waste and the like, the combination which comprises: a tubular duct member provided with a plurality of inwardly projecting rib members having inwardly directed surfaces arranged to lie in a surface of revolution having a vertically extending axis of symmetry, said rib members extending generally in the direction of said axis of symmetry and being spaced peripherally from one another in groups, and the spacing of adjacent groups being greater than the peripheral length of the inwardly directed surfaces of the rib members of a group, to provide a plurality of inwardly directed commuting surfaces alternated with outwardly extending recesses and define a commuting zone in said duct member; a head member rotatably disposed below said zone for rotation about said axis of symmetry and having an upper surface cooperating with said duct member to define a bottom end wall for said commuting zone; means for rotating said head member; and a plurality of commuting elements mounted on said head member and extending upwardly within said commuting zone from adjacent said upper surface, said commuting elements being provided with a plurality of peripherally projecting commuting portions arranged to define a peripheral outline of generally circular cross-section, and being rotatably mounted on said head member for rotation about axes concentric with their circular cross-section and parallel to said axis of symmetry, the upper surfaces of said commuting elements and the spacing thereof from each other on said head member being such with respect to the internal dimensions of said commuting zone as to cause the peripheral outline of said elements to be disposed in closely spaced relation to said inwardly directed surfaces on said rib members, and define a central unobstructed space at the upper surface of said head member within the annular zone traversed.
by said elements during rotation of said head member.

5. In a device for the disposal of kitchen waste and the like, the combination which comprises: a tubular duct member provided with a plurality of inwardly projecting rib members having inwardly directed surfaces arranged to lie in a surface of revolution having a vertically extending axis of symmetry, said rib members extending generally in the direction of said axis of symmetry and being spaced peripherally from one another in groups, and the spacing of adjacent groups being greater than the peripheral length of the inwardly directed surfaces of the rib members of a group, to provide a plurality of inwardly directed comminuting surfaces alternated with outwardly extending recesses and define a comminuting zone in said duct member; a head member rotatably disposed below said zone for rotation about said axis of symmetry and having an upper surface cooperating with said duct member to define a bottom end wall for said comminuting zone; means for rotating said head member; and a plurality of comminuting elements mounted on said head member and extending upwardly within said comminuting zone from adjacent said upper surface, said comminuting elements being circular in cross-section and rotatably mounted upon said head member for rotation about axes parallel to said axis.

6. In a device for the disposal of kitchen waste and the like, the combination which comprises: a duct member provided with a vertically extending portion defining a substantially cylindrical comminuting zone and provided with a plurality of angually spaced inwardly projecting rib members, said rib members extending generally parallel to the axis of said comminuting zone and having inwardly directed surfaces arranged to lie in a substantially cylindrical surface of revolution about said axis; a head member rotatably mounted adjacent the lower end of said comminuting zone for rotation about said axis; means for rotating said head member; a pair of comminuting elements of generally cylindrical form; and a pair of pins secured to and projecting upwardly from said head member and rotatably supporting the respective comminuting elements on said head member for rotation individually about vertical axes spaced radially outward from the axis of rotation of said member; said pins constraining said comminuting elements to move in a definite annular zone about the axis of rotation of the head member upon rotation of said head member; said comminuting elements extending upwardly from said head member within said comminuting zone and being each provided with a plurality of angually spaced vertically extending outwardly projecting ridges whose outer edges lie in a substantially cylindrical surface and are so disposed as to move in close proximity to the inwardly directed surfaces of said inwardly projecting rib members upon rotation of said head member.

7. In a device for the disposal of kitchen waste and the like, the combination as set forth in claim 6, said comminuting elements being also provided at their upper ends with upwardly projecting knives.

8. In a device for the disposal of kitchen waste and the like, the combination which comprises: a duct member provided with a vertically extending portion defining a substantially cylindrical comminuting zone and provided with a plurality of inwardly directed surfaces lying in a surface of revolution about the axis of said comminuting zone; a head member rotatably mounted adjacent the lower end of said comminuting zone for rotation about said axis; means for rotating said head member; a pair of comminuting elements of generally cylindrical form; and a pair of pins secured to and projecting upwardly from said head member and rotatably supporting the respective comminuting elements on said head member for rotation individually about vertical axes spaced radially outward from the axis of rotation of said member; said pins constraining said comminuting elements to move in a definite annular zone about the axis of rotation of the head member upon rotation of said head member; said comminuting elements extending upwardly from said head member within said comminuting zone and having an upper surface cooperating with said duct member to define a bottom end wall for said comminuting zone; means for rotating said head member; and a plurality of transversely spaced comminuting elements mounted on said head member and extending upwardly within said comminuting zone from adjacent said upper surface, said comminuting elements being constrained to rotate with said head member about said axis of symmetry and being so positioned on said head member as to move in closely spaced relation to the inwardly directed surfaces of said rib members.

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