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H. HIGER

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CUTTING AND DISINTEGRATING MACHINE

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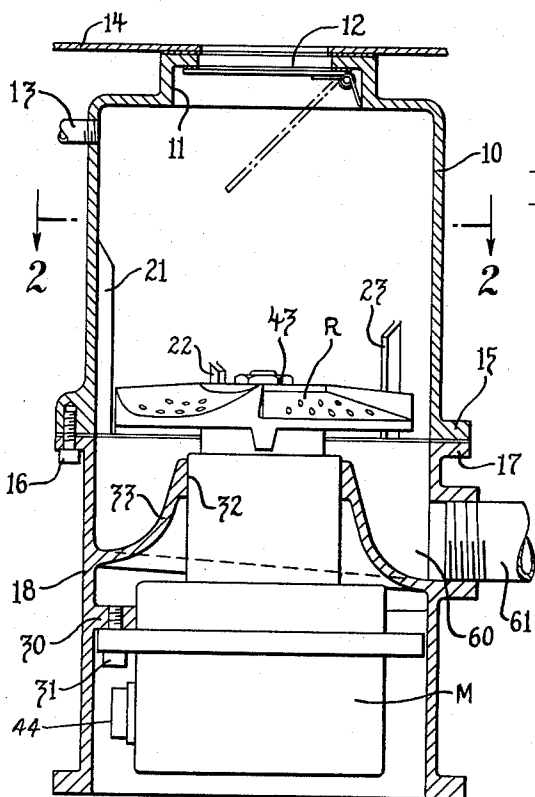


Fig. 1

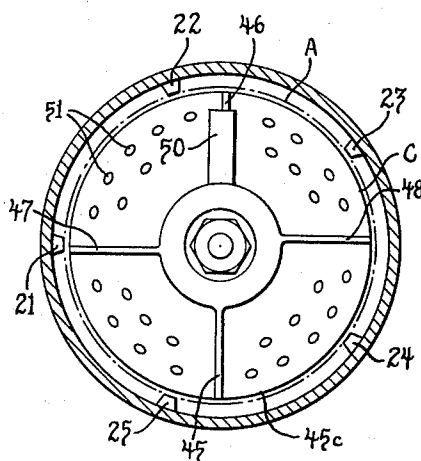


Fig. 2

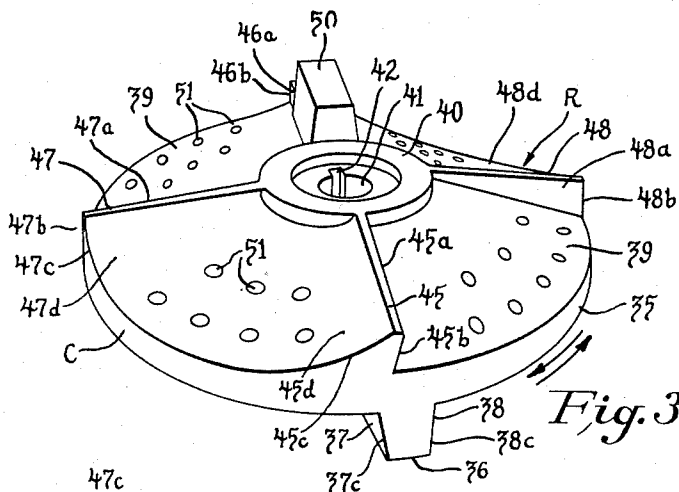


Fig. 3

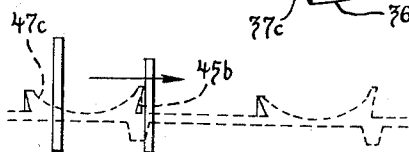


Fig. 4

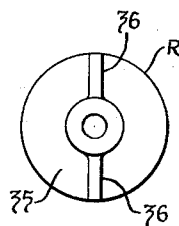


Fig. 5

INVENTOR.
HARRY HIGER

BY *Gregory S. Dolgner*

ATTORNEY.

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CUTTING AND DISINTEGRATING MACHINE

Harry Higer, 1823 Farnum St., Royal Oak, Mich.

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3 Claims. (Cl. 241—36)

This invention relates to an improved matter-cutting and disintegrating machine such as a garbage disposal machine adapted particularly, but not exclusively, for household use.

Serious difficulties have been confronted by those skilled in the art in constructing machines of this general nature, particularly for household use. These difficulties result primarily from the fact that for household use a machine of this nature has to be very compact in order to fit under a kitchen sink and be of relatively small diameter, such as approximately 6". With machines of such a size the rotor usually does not have enough momentum and strength to break and disintegrate many pieces of garbage that are invariably produced in the kitchen and have to be disposed of either by means of garbage disposal units or be taken out of the house and disposed of in some other manner, such as placing them in a garbage can that would be removed by the city garbage collector. Such pieces are corn cobs, broken glass, olive and prune pits, chicken bones, beef bones and the like. Obviously, the greater the number of such pieces of garbage that the garbage disposal machine cannot disintegrate, the greater is the need for retaining a garbage can into which such matter has to be deposited. Inversely, the smaller the number of pieces which cannot be disposed of by the machine, the greater is the effectiveness and the utility of the garbage disposal machine or device. In order words, an ideal garbage disposal machine would be one which would cut and disintegrate every piece of kitchen garbage requiring disposal. Inversely, a garbage disposal machine that can dispose only of soft pieces such as bread but is unable to cut many pieces of kitchen garbage and requiring stoppage and removal of such pieces by hand from the garbage receiving chamber of the machine and thus presenting danger of cutting fingers is a very objectionable and undesirable type of machine.

One of the objects of the present invention is to provide an improved garbage disposal machine which can be made very compact and particularly of the size to go under a kitchen sink and to have a diameter of approximately 6", and yet capable of crushing most of the pieces of garbage that are normally produced in a family kitchen.

Another object of the present invention is to provide an improved garbage disposal machine particularly for household use, which does not become stalled, thus endangering its electric motor but reverses itself and attacks the stalling piece at a different angle of cutting, thereby decreasing the danger of burning the electric motor and gradually breaking up most of the pieces that would otherwise stall the machine.

A further object of the present invention is to provide an improved garbage disposal machine particularly for household use in which large pieces, that would otherwise not be worked upon by the disintegrating element of the machine, are first progressively broken up into smaller pieces, whereupon the cutting element of the machine starts to operate on such individual pieces at the same

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time rather, thus eliminating the condition where such element operates on a piece working from its outside, thus working for a long time on a single piece only.

A still further object of the present invention is to provide a garbage disposal machine in which the matter to be cut, and particularly strong and large pieces thereof, is maintained in suspension in the chamber of the machine by being thrown forwardly and upwardly, rotating therein rather than accumulating at the bottom of the chamber and presenting the danger of clogging and stalling the machine.

A still further object of the invention is to provide a machine of the foregoing nature having improved means for discharging the cut matter and preventing its accumulation in the machine.

It is an added object of the present invention to provide an improved machine specified above which is simple and rugged in construction, safe and dependable in operation, relatively inexpensive to manufacture and easy to service.

Further objects and advantages of this invention will be apparent from the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification, wherein like reference characters designate corresponding parts in the several views.

Fig. 1 is a sectional view taken along the vertical axis of the machine.

Fig. 2 is a transverse sectional view taken in the direction of the arrows on the section plane passing through line 2—2 of Fig. 1.

Fig. 3 is a perspective view of the rotor shown separately.

Fig. 4 is a diagram illustrating the nature of the cutting operation occurring in the disclosed machine.

Fig. 5 is a bottom view of the rotor.

It is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology and terminology employed herein is for the purpose of description and not of limitation.

In accordance with the invention, I provide a machine in which the disintegrating or cutting operation proceeds in several stages. If the piece to be cut is relatively large, such as a large chicken bone, corn cob or a piece of glass, it is first broken up in the upper portion of the chamber of the machine into several smaller pieces. The breaking means are constructed to accommodate the biggest possible piece that the intake opening of the machine can receive. The breaking of such large pieces continues progressively until the originally loaded piece is broken into smaller and smaller pieces where they are of such a character that they can be caught by the cutting blades of the machine and cut between two blades and disintegrated for discharge. If a piece so caught between two blades is too strong for cutting in that particular position and stalls the machine, the rotor of the machine reverses and takes the piece on another set of blades at a different angle of cutting. Particularly, the machine will tend to push such a piece up rather than down and thus to move it into a position for cutting off from it only a portion of a smaller size or throwing the piece upwardly at a certain angle of inclination and thus imparting to such uncut piece motion along the walls of the chamber. As the piece falls down again, the cutting process is repeated.

Referring specifically to the drawings, there is shown therein, by way of example, a machine embodying the present invention. The machine illustrated in the drawings comprises generally a casing consisting of an upper

casing portion 10 having at its top a throat 11 closed by a downwardly opening door 12 of any suitable construction, and having at its top a water inlet 13. The door 12 registers with the opening provided in the bottom 14 of a kitchen sink (not shown fully). The lower edges of the casing 10 are provided with flanges 15 secured with the aid of screws 16 to the flanges 17 provided around the top edges of a base casing 18.

The casing portions 10 and 18 are preferably cylindrical. On the walls of the upper case portion 10 at the inner surfaces thereof there is provided a plurality of inwardly projecting blades. In the embodiment illustrated herein there are provided five inwardly projecting blades 21, 22, 23, 24 and 25. The blades 21-25 extend downwardly to substantially the same plane, which may be the plane of the bottom edges of the casing portion 10. However, these blades extend upwardly to different distances. In other words, the blades 21-25 are of different lengths as is best shown in Fig. 1, where the blade 21 is shown as the longest blade, with the blade 22 being a short blade, while the blade 23 is a blade of an intermediate length. Blade 24 may also be a short blade, while blade 25 may be either a short blade or a blade of an intermediate length.

The blades 21-25 extend inwardly of the casing to a certain uniform distance. Therefore, their cutting edges lie in the same cylindrical plane such as generally designated by the phantom line A.

In the lower casing portion 18 there are provided flanges or lugs such as 30 to which there is connected with the aid of screws 31 a motor-rotor assembly M, the upper end of which is sealingly fitted, as indicated at 32, in the throat 33. To the armature shaft (not shown) of the electric motor there is drivingly connected the rotor generally designated by the letter R. The details of construction of the motor-rotor assembly M do not form per se a part of the present invention and need not be described herein in detail.

The rotor R comprises a short cylindrical body with its cylindrical surfaces designated by the letter C. The bottom 35 of the rotor body is flat and has provided thereon two radially extending ridges 36, see Fig. 5. At the intersection of the side walls 37 and 38 of said ridges 36 with the cylindrical surface C there are formed edges 37c and 38c.

The top of the body of the rotor is conical, as shown at 39, with a hub 40 being provided at the top thereof. A bore 41 having a key slot 42 is provided in the center of the rotor body for connection thereof to the armature shaft with the aid of a nut 43, or in any other suitable manner. On the top of the conical surface of the rotor body there is provided a plurality of radial ridges. In the embodiment illustrated herein there are provided four such ridges. These ridges form two sets of rotor blades cutting in two opposite directions, since the rotation of the rotor may be reversed as explained below. The ridges 45 and 46 having radial cutting edges 45a and 46a, and vertically extending cutting edges 45b and 46b, cut when the rotor rotates in the counter-clockwise direction. On the other hand, ridges 47 and 48 having radial cutting edges 47a and 48a, and vertically extending edges 47b and 48b cut when the rotor rotates in a clockwise direction.

The surfaces forming the cutting edges 45a, 46a, 47a and 48a are inclined and, therefore, form at said edges a positive rake. As is best shown in Figs. 3 and 4, the back faces 45d and 47d form mean angles of approximately 30° with the horizontal and merge smoothly into the conical surface of the body of the rotor as well as into each other. Therefore, said faces or sides produce at their intersections with the cylindrical surface C of the rotor R inclined edges 45c and 47c. It will be noted that the cutting edges 45b, 46b, 47b and 48b are formed at intersections of opposite sides of the respective ridges with the cylindrical surface C of the rotor R. Thus, both the cutting edges 45b, 46b, 47b and 48b as well as the cutting edges 45c, 46c, 47c

and 48c are disposed, in effect, within the cylindrical surface C of the rotor R.

It will be understood that when the edges 45a and 45b operate as cutting edges due to rotation of the rotor in a counter-clockwise direction, the edge 45c will be a trailing edge. On the other hand, the edge 47c will then be a cutting edge, and its engagement with the vertically extending blade on the casing will proceed upwardly. Such a condition is best shown in Fig. 4. On the other hand, when the rotation of the rotor is in a clockwise direction, the edges 47a, 47b and 45c will be cutting edges, while the edges 45a, 45b and 47c will be trailing edges. The conditions with respect to ridge 46 and 48 will be similar to those described above with respect to ridges 45 and 47, except for being affected by the provision of a breaking lug 50, since construction of the latter is similar to the construction of ridges 45 and 47.

It will now be understood in view of the foregoing, that in operation of the machine, should a piece of matter get between any of the ridges and stall the machine, reversal of the rotor, which is attained in a manner well known in the art by a reversing switch 44, provided on the motor, will operate to release the piece from such an engagement. Being released, such piece will get into a position for cutting in a different manner and if not crushed then, it will again reverse the machine until it is cut. The inclined faces such as 45d and 47d operate to throw the matter to be cut upwardly and to keep it in motion and in suspension. In actual operation of the machine, observation of the matter shows that most of it rotates above the rotor in a whirl-like manner, filling the entire chamber formed within the upper casing portion 10 above the rotor R. The matter does not settle down at the bottom of the chamber on the rotor and does not overload the same. This feature also operates to keep the machine clean and, therefore, the machine is, in effect, self-cleaning.

Means are provided to break large pieces progressively before the cutting edges begin operating on them. In the present embodiment, said means are exemplified by a lug 50 formed on the ridge 46 and extending for a certain distance upwardly. The lug 50 cooperates with the longest blade 21 to catch between them particularly long pieces and to break or cut the same into equal or unequal pieces. Thereupon, such pieces may be caught again between the same lug and a lower blade, or even between one of the radial ridges and any of the blades and disintegrated.

In machines of relatively small size it is preferable to provide only one lug such as 50 and to balance the rotor by removing some metal from the body thereof adjacent to the lug to ensure a proper static and dynamic balance of the rotor. Provision of two lugs on small rotors often creates a condition where a particularly large piece does not get caught between such lugs and the blades for quite a period of time. However, in larger machines use of two lugs is preferable as inherently balanced.

The rotor body is perforated as shown at 51. In operation of the machine the cut matter passes through the space between the walls of the casing portion 10 and the cylindrical surface C of the rotor R into the annular chamber 60 together with water flowing from the outlet 13. The liquid so produced is circulated therein by the ridges 36 creating a certain pressure by centrifugal action and causing the matter to be discharged through the conduit 61 leading into a sewer or another place of disposal.

It will be noted that while the rotor has four cutting ridges, the casing has five blades and, therefore, only one ridge is in cutting contact with one casing blade at a time, thus reducing the strength and power requirements on the machine. It will be understood, of course, that the breaking lug may be exerting breaking pressure at the same time as one pair of the blades is in cutting

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engagement. However, disadvantages of such a condition are not serious.

By virtue of the above disclosed construction, the objects of the present invention listed above and numerous additional advantages are attained.

I claim:

1. In a garbage disposal apparatus, a casing having a cylindrical passage forming in its upper portion a matter-loading space, a plurality of blades provided on said casing in the lower portion thereof and extending radially into said passage for an equal distance, a rotor operatively mounted in said passage within the space defined by said casing blades, said rotor comprising a cylindrical body having a conical top and closing said passage except for the peripheral space forming an annular discharge grading slot interrupted by said casing blades, and an even plurality of radial ridges on the conical top of the rotor, said ridges being inclined alternately in a clockwise direction and in a counter-clockwise direction and having formed thereon radial cutting edges as well as cutting edges at the periphery of said ridges where said periphery forms with the periphery of the rotor body a continuous smooth surface bounded by said edges.

2. The invention defined in claim 1, with each of said ridges being inclined toward its adjacent ridge on one side and away from its adjacent ridge on the other side, with the sides of the ridges, which sides are inclined at their lower portions toward each other, merging smoothly into the body of the rotor and into each other.

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3. In a garbage disposal apparatus, a casing having a cylindrical passage forming a matter-loading space, a plurality of blades provided on said casing in the lower portion thereof, and extending inwardly into said passage, a rotor operatively mounted in said passage within the space defined by said blades, said rotor comprising a cylindrical body having a flat bottom and a conical top, a plurality of radially extending ridges provided on said conical top to form two sets of blades, with each set including two blades, one set having its two blades inclined in a clockwise direction and the other set having its two blades inclined in a counter-clockwise direction, with the sides of adjacent ridges, which sides are inclined at their lower portions toward each other, merging smoothly into the body of the rotor and into each other an electric motor driving said rotor, and a reversing switch for said motor.

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