Sept. 8, 1959 R. A. CLAUSEN 2,903,192

DISPOSER FOR WASTE MATERIAL

Filed May 10, 1957 3 Sheets-Sheet 1

Fig. 1

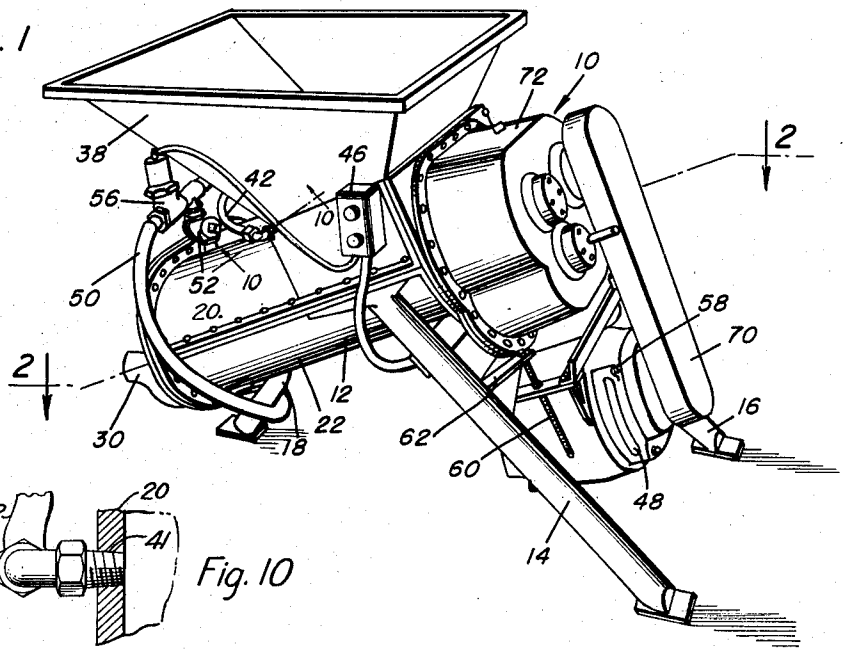


Fig. 10

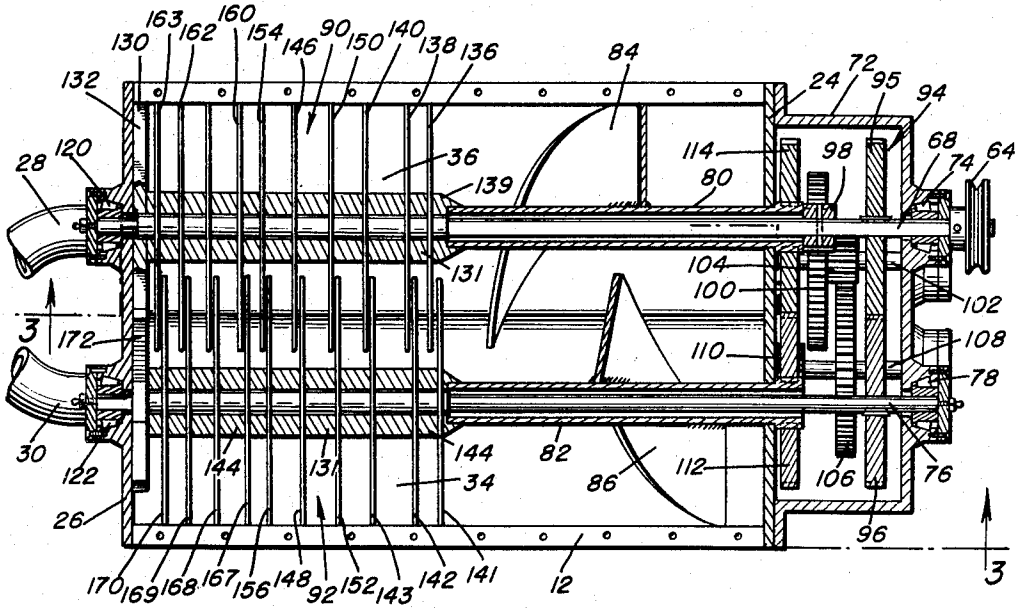


Fig. 2

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Filed May 10, 1957 3 Sheets-Sheet 2

Fig. 3

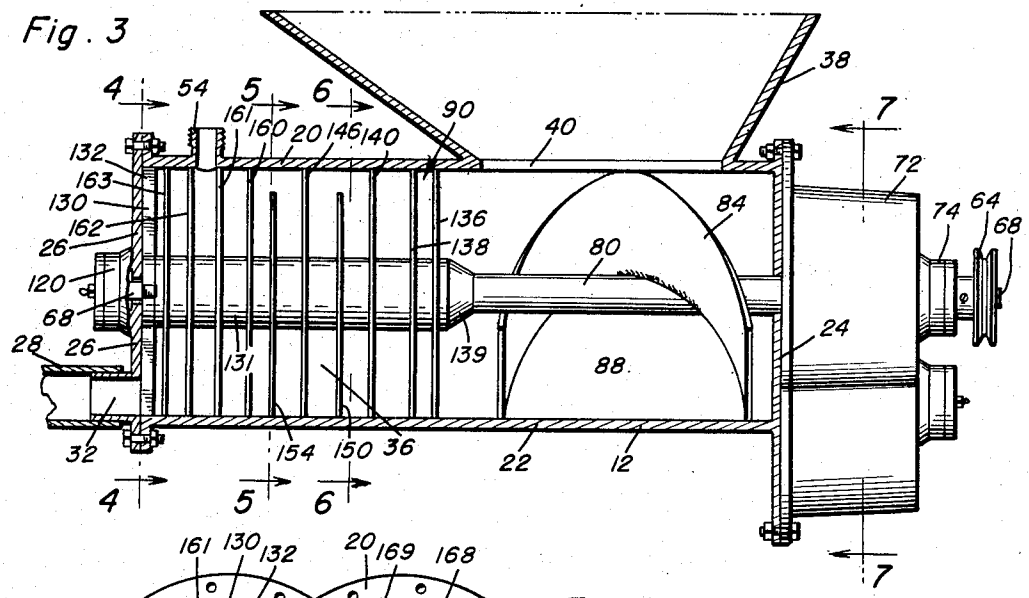


Fig. 4

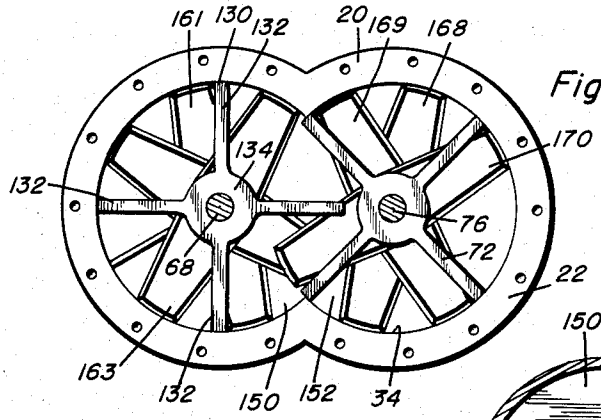


Fig. 5

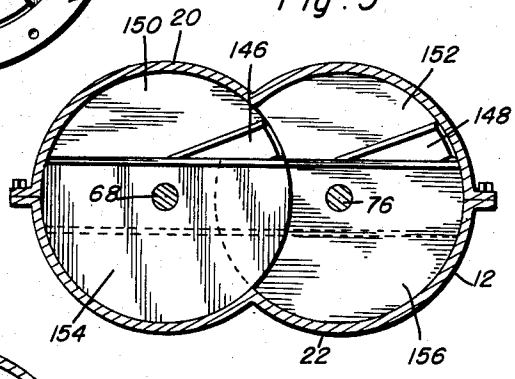
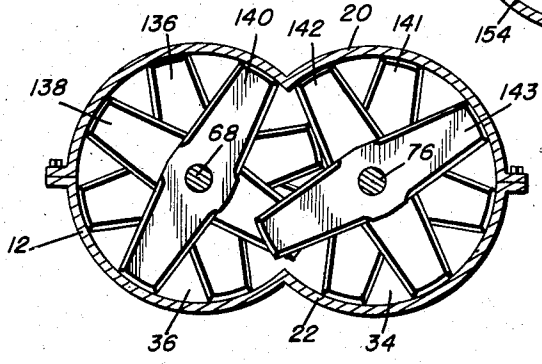


Fig. 6



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Sept. 8, 1959 R. A. CLAUSEN 2,903,192

DISPOSER FOR WASTE MATERIAL

Filed May 10, 1957 3 Sheets-Sheet 3

Fig. 7

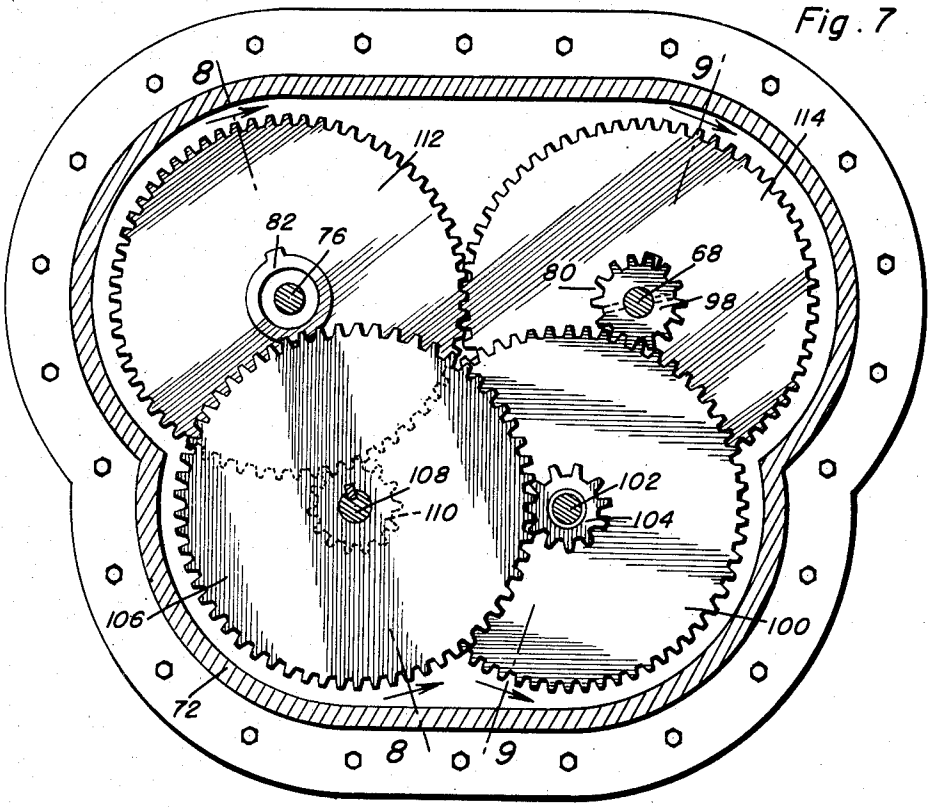


Fig. 8

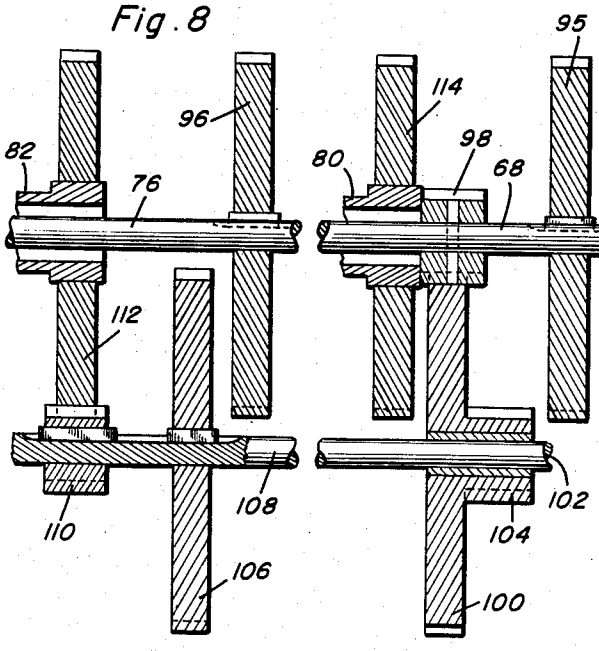


Fig. 9

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2,903,192

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2,903,192

DISPOSER FOR WASTE MATERIAL

Robert A. Clausen, Ontario, Oreg.

Application May 10, 1957, Serial No. 658,339

14 Claims. (Cl. 241—43)

This is a continuation-in-part application of my copending application Serial No. 522,208, which was filed on July 15, 1955, now abandoned.

This invention relates to a machine for sub-dividing waste into very small particles which will be passed easily through ordinary waste plumbing lines.

An object of the invention is to provide a smoothly operating high-capacity machine which will sub-divide vegetable trimmings and other waste to a very small size before permitting them to pass into the sewer. This materially reduces the possibility of clogging the drain lines in a plumbing system thereby enabling the flow of waste to be continuous.

A further object of the present invention is to provide a waste disposing machine which grinds the vegetable waste or other grindable matter by a novel arrangement of blades and feed augers. A typical embodiment of my invention has parallel shafting on which there are a pair of feed augers in side-by-side relationship to each other which operate at a slower speed than the interdigitated downstream knives on the same axis of shaft rotation, the knives and auger on one side of the machine operating in a direction opposite to the knives and auger on the other side of the machine and being disposed in parallel troughs through which the waste material is adapted to be propelled by the action of the augers and aided by water under pressure and even the angle of inclination of the troughs.

Another object of the invention is to provide a waste disposing machine which has an entrance for the waste and at least one waste feed auger to accept and propel the waste into a comminuting zone that has two groups of knives and splash disks in side-by-side relationship and at least slightly interdigitated with each other. The waste material is sub-divided into very small particles, for example material whose average particle size is no more than an eighth of an inch. The first stage of handling the waste is a cutting operation with knives of each group doing the initial severing while the back pressure is applied onto the waste material by the force of subsequent material propelled by the augers and by flushing water which is adapted to be introduced into the waste receiving chamber with the waste material.

Then, the waste material passes to a second stage of cutting which consists of additional knives in two groups, these being spaced from the first stage knives by splash disks. Additional splash disks on the downstream side of the second stage of knives hold the waste material temporarily dammed while it is being acted on by the knives and after release of the material it passes into the final cutting stage consisting of a plurality of knives and in advance of the discharge paddles which maintain the discharge opening or openings free at all times.

One of the features of the invention is the group of splash disks that are so constructed that they temporarily hold the advancing waste to permit it to be thoroughly cut by the knives in the various stages. The actual flow

of material in my machine is in essence a continuous stream with the entrance of waste material being fed and the material being propelled at once into the various stages of the machine. The cutter stages have the knives and the splash disks operating at a comparatively high rate of speed whereby upon observation of the performance of the machine it would seem that the waste material is fed into the entrance and almost immediately discharged down the waste line in the sewer system. This is done very quickly and effectively with the capability of the machine being such as to service commercial uses such as in super markets, hotels, hospitals, military service installations or any other high volume handling of food having a waste byproduct.

One of the important features of this invention is the even flow of finely divided particles of waste thoroughly mixed with water which enters the sewerage system. There is no plugging or clogging of the sewer lines because the waste is not hammered into a bulky pulp but is cut into small particles. Moreover, the knives of the various cutting stages and the splash disks operate at a high speed with a comparatively constant pressure of waste being impressed thereon which further tends to achieve the feature of constant outlet quantities.

Other objects and features of importance will become apparent in following the description of the illustrated form of the invention.

Figure 1 is a perspective view of a machine constructed in accordance with the invention, this being a trimming table type disposer;

Figure 2 is a sectional view taken on the line 2—2 of Figure 1 with the cutter being schematically represented;

Figure 3 is a longitudinal irregular sectional view taken on the line 3—3 of Figure 2;

Figure 4 is a transverse sectional view taken on the line 4—4 of Figure 3 and showing in elevation the discharge paddles, some of the comminuting knives and the interdigitation of the knives and the paddles at the discharge end of the machine;

Figure 5 is a transverse sectional view showing one pair of splash disks in the cutter of the machine and taken approximately on the line 5—5 of Figure 3;

Figure 6 is a transverse sectional view taken on the line 6—6 of Figure 3 and showing the initial group of knives that are fed by the augers;

Figure 7 is a sectional view taken approximately on the line 7—7 of Figure 3 and showing a part of the gear drive which causes the feed augers to operate at a speed considerably less than the speed of the cutters and in a definite phase relationship;

Figure 8 is a fragmentary largely schematic sectional view taken on the line 8—8 of Figure 7;

Figure 9 is a largely schematic sectional view taken on the line 9—9 of Figure 7 and further showing the gearing of the machine; and

Figure 10 is an enlarged fragmentary sectional view taken on the line 10—10 of Figure 1.

In the accompanying drawings there is a machine 10 for sub-dividing vegetable or other waste material into small particles prior to discharging the same into the community sewer plumbing system. Machine 10 is constructed of a housing 12 supported by legs 14, 16 and 18 that are arranged in tripod formation. The housing has an upper section 20 and a lower section 22 with mating flanges that are bolted together. Front end wall 24 and rear end wall 26 close the ends of the housing.

The bottom section of the housing is formed to generate two upwardly opening troughs while the top section complements the same, forming two downwardly opening troughs. Dimensioning of the legs 14, 16 and 18 is such that the troughs and housing forming the troughs

are arranged at an angle to facilitate the flow of waste and water toward the discharge end of the machine. Discharge pipes **28** and **30** which may be branches of a Y, are adapted to connect with the waste line in the sewerage system of the community or to any other suitable waste disposing conductor. The pipes **28** and **30** are attached to outlets in the form of nipples **32** at the discharge ends of the two troughs **34** and **36** that are formed in the housing **12**.

A waste material inlet hopper **38** is attached to the upper section **20** of the housing and registers with the waste material inlet **40** in the top section **20** of housing **12**. A flushing water inlet **41** is registered with the entrance **40** and a water conducting pipe line **42** is connected with it by standard pipe fittings. The purpose is to add flushing water with the waste as the waste is introduced into the machine through hopper **38** and entrance **40**. The control for the flushing water passing through conductor **42** is preferably automatic in that water is admitted when motor switch **46** is closed. This switch is wired to control the actuation of motor **48** which, through a transmission, actuates the cutters and feed augers of the machine.

Additional water is applied to a pipe line **50** which is connected to a source of water under pressure and connected by pipe fitting **52** to the nipple **54** at the top of the upper section **22** of housing **12**. An electrically operated valve **56** is arranged in the pipe line **50** to control the water flow through nipple **54** and into the final stages of cutters in housing **20** and therefore, it is also wired for control by switch **46** or by electrical equipment triggered by the closing of switch **46**, as a relay. The electrically operated valve **56** is a standard, commercially available solenoid or other electromagnetic valve.

Motor **48** is suspended from a motor hanger **58** that is pivoted at one side and adjustably mounted, as by adjustment screw **60**, so that the entire motor is capable of being adjusted to function as a belt tightener. Adjustment screw **60** is passed through a tapped hole in motor hanger **58** and is carried by bracket **62** welded or otherwise secured to the leg **14**. Other arrangements for adjusting the elevation of the motor **48** may be adopted since the only function is to tighten the belts entrained around the drive pulley or pulleys **64**. A single belt or plural belts are used to establish a substantially silent drive connection between the shaft of motor **48** and pulley **64** or plural pulleys that are secured to shaft **68**. The belts are preferably encased in a guard **70** which is secured to the gear box **72**, the latter being bolted to the end wall **24** of housing **12**.

Shaft **68** is mounted for rotation in bearing **74** while a similar shaft **76** is mounted for rotation in bearing **78**. The bearings are carried by the outer wall of gear box **72** and are of a high quality type. Hollow shaft **80** is concentrically arranged on shaft **68**, and hollow shaft **82** is concentrically arranged on shaft **76**. Waste material feed augers **84** and **86** are attached respectively to hollow shafts **80** and **82** and are located in the waste material receiving chamber **88** below entrance **40**. Cutters **90** and **92** respectively are attached to shafts **68** and **76** respectively and are propelled by these shafts.

The transmission **94** in gear box **72** is constructed to cause the cutters **90** and **92** together with their shafts **68** and **76** to rotate at a considerably higher speed than the augers **80** and **86** on auger shafts **80** and **82** respectively.

In achieving this, transmission **92** is preferably a gear transmission and constructed of gear **95** which is keyed to shaft **68** and driven directly by shaft **68** through the previously discussed belting, coupling shaft **68** to the motor **48**. It is understood that a chain drive may be adopted in place of the belting or some other standard transmission may be used in place thereof. Gear **96** is keyed or otherwise secured to shaft **76** and located in gear box **72**. Gears **95** and **96** are in mesh with each other and since they are of the same size, having the same number of teeth, shafts **68** and **76** will rotate in opposite directions and at the same speed. Hence, cutters **90** and **92** will be similarly actuated. Assuming a clockwise rotational input to shaft **68**, this shaft and its cutter will rotate clockwise while shaft **76** and the cutter **92** which is carried by it, will rotate in a counterclockwise direction.

Hollow shafts **80** and **82** are rotated by power derived from shaft **68**. Pinion **98** is keyed, pinned or otherwise secured to shaft **68** and is enmeshed with gear **100** which is mounted on lay shaft **102**. All of the gears described previously and to be described subsequently together with their shafts are mounted in the gear box **72**, there being appropriate bearings provided for lay shaft **102** in the opposite walls of the gear box. Pinion **104** is attached to gear **100** and enmeshed with gear **106** that is attached to lay shaft **108**, as by being keyed (Figure 8). The lay shaft **108** drives pinion **110** which is also keyed to shaft **108** and which is enmeshed with gear **112**. Gear **112** is rigidly attached, as by being keyed or otherwise secured to the inner end of hollow shaft **108** which is located in gear box **72**. Suitable seals for the oil in the gear box are used where found desirable or necessary. The hollow shaft drive gear **112** is enmeshed with a similar hollow shaft drive gear **114** which is attached to the inner end of shaft **80** within gear box **72**. By following through the gear train it will be seen that for a clockwise rotational input of shaft **68**, hollow shaft **70** will be similarly rotated in a clockwise direction while the counterclockwise moving shaft **76** will have as a companion to it the counterclockwise rotating hollow shaft **82**.

The outer ends of shafts **68** and **76** are mounted for rotation in bearings **120** and **122** which are carried by end wall **26** of the housing **12**. Means for introducing lubricant for these bearings are associated with the bearings and seals of standard form may be used at this end of the machine where found desirable or necessary.

It is of importance in the invention that the cutters **90** and **92** rotate in opposite directions and be interdigitated with each other so that they are self-cleaning and so that effective sub-dividing of the waste material to very fine particles is achieved.

Cutter **90** is attached to shaft **68** and is composed of a plurality of members which are held in spaced relationship to each other by means of spacers **131** on shaft **68**. Discharge paddle **130** is at the lower end of cutter **90** and is made of a plurality of spokes **132** emanating from hub **134**, the spokes being arranged to scrape over the outlet **32** and keep it clean and open at all times. The opposite end of cutter **90** is composed of three knives **136**, **138** and **140** which are held spaced apart by spacers **131** and which are frictionally held onto the shaft **68** or otherwise attached, as by being pinned or keyed. The end spacer **139** is specially constructed with a bearing to accommodate the confronting end of hollow shaft **80**. Knives **136**, **138** and **140** are interdigitated with corresponding knives **141**, **142**, and **143** held spaced apart by means of spacers **144** on the end of shaft **76**, the last mentioned knives **141**, **142** and **143** being part of cutter **92**. All of these knives have sharp leading edges and are of approximately rectangular shape (Figure 4) and they are directly fed by augers **84** and **86**. Therefore, they form the first cutting stage of the machine, this stage being designated as such arbitrarily in that it receives first the mixture of waste material and water introduced to chamber **88**.

The next stage in the cutting operation is done by knives **146** and **148** respectively which are on and driven by shafts **68** and **76** and which respectively constitute parts of cutters **90** and **92**. However, separating the stages are deflectors or disks **150** and **152**, each being slightly greater than semi-circular and attached to the

shafts 68 and 76. They rotate with the shafts of cutters 90 and 92 and form an interruption in the continuity of travel from the first stage to the second stage and thereby further assure that there will be complete comminuting of the waste material. The edges of the splash disks are sharpened so that they, too, are capable of a cutting function.

The third stage is isolated from the second stage by means of splash disks 154 and 156 which are attached to shafts 68 and 76 and which are of a structure and function identical to splash disks 150 and 152. The third stage consists of a group of four knives 160, 161, 162 and 163 that are attached to shaft 68 and held apart by spacers. This group of knives coacts with a group consisting of knives 167, 168, 169 and 170 respectively which are attached to shaft 76 and which are interdigitated with knives 160, 161, 162 and 163. Discharge paddle 172 is on shaft 76 and is the same in structure and function as discharge paddle 130. However, it keeps the drain for trough 34 clean and open at all times while discharge paddle 130 functions to do the same job for trough 36.

In operation, waste material is placed in chamber by being spilled into the hopper 38 and passing through entrance 40. The augers 84 and 86 operate at the correct speed in relation to the speed of the cutters for feeding the waste to the cutters at the optimum rate. In models where water is applied with the waste material either at chamber 88 or in advance of chamber 88, this water will be introduced either automatically or manually by either electrically operating a valve or manually operating a valve.

When the start button of the switch 46 is operated, motor 48 is energized and through the belt or other intermediate transmission, transmission 94 is actuated. The transmission is such that the cutters 90 and 92 are operated in opposite directions and at a rate of speed that is higher than the simultaneously operated feed augers 84 and 86. Therefore the waste and water is propelled along troughs 36 and 34 to the first, second and third stages of the cutters that are successively arranged on shafts 68 and 76. Although the actual comminuting of refuse is so fast that it seems to be a continuously flowing operation, the splash disks make certain that the passing of the waste material through the machine is done only after the waste material is finely subdivided and thoroughly mixed with water that enters housing 12 at the third stage of the cutters. Copious quantities of water and finely divided waste are propelled through the outlets of the machine, these outlets being maintained clean and unclogged by the discharge paddles 130 and 172.

It is appreciated that this machine is capable of continuous or intermittent operation with equal success. Moreover, various changes may be made in the machine without departing from the scope of the following claims.

What is claimed as new is as follows:

1. A machine for disposing waste through a sewer line, said machine comprising an elongated inclined housing having a pair of parallel troughs which are angularly inclined from an upper waste receiving end to a lower sub-divided waste discharging end, a first pair of aligned shafts in a first of said troughs, a second pair of aligned shafts in the second of said pair of troughs, said pairs of shafts being parallel to each other, means operatively connecting the shafts of said first pair to rotate said shafts of said first pair in unison and at different speeds, means operatively connected with the shafts of said second pair of shafts for rotating the same in unison and at different speeds, cutters on one shaft of each pair, and means connected to the other shafts of said pairs of shafts for feeding the waste to the cutters.

2. The machine of claim 1 wherein said cutters are on the shafts which operate at a speed in excess of the other shafts, and said waste feeding means comprising augers which are attached to said other shafts that are moving at a lower speed than said shafts that have said cutters thereon.

3. The machine of claim 2 wherein there are means including a motor for operating said pairs of shafts actuating means.

4. The machine of claim 3 wherein there is a water inlet connected with said housing in the region of said cutters, a valve and pipe to conduct water to said inlet, and means which are operated in unison with said motor for opening said valve simultaneously with the energization of said motor.

5. The machine of claim 4 wherein there are means to introduce water with the waste so that the waste is delivered by said augers to said cutters in a wet state and to facilitate the flushing of the particles that are sub-divided from the waste as the same are propelled longitudinally along said troughs.

6. The machine of claim 5 wherein each cutter consists essentially of a plurality of blades, splash disks separating certain of said blades and thereby constituting cutter stages, and at least some of said blades of one cutter being interdigitated with some of the blades of the other cutter.

7. The machine of claim 6 wherein there is a discharge cleaning paddle at the outer end of each cutter and secured to the shaft in each pair which rotates at a higher speed.

8. The machine of claim 7 wherein there is an opening at the upper part of said housing which constitutes a waste entrance, a hopper registered with said entrance to direct the waste into said housing, a waste receiving chamber in said housing and registered with said opening, and said augers being located in said waste receiving chamber.

9. The machine of claim 8 wherein said means to rotate said shafts actuate both shafts of one pair in one direction and both shafts of the other pair in an opposite direction.

10. The machine of claim 1 wherein said means for actuating the first pair of shafts actuates said shafts in one direction and said means for actuating said other pair of shafts rotate said other pair of shafts in the opposite direction.

11. A refuse disposing machine comprising the combination of a pair of cutters, a housing in which said cutters are operable, said cutters being disposed in side-by-side relationship to each other, means for propelling said cutters in opposite directions, feed means for delivering the waste to the cutters, means for operating said waste feed means in coordination with and at a speed different from the speed of said cutters, said means for actuating said feed means including a pair of shafts, a first and a second shaft on which said cutters are respectively mounted, said means to feed the waste including augers that are attached to said first mentioned pair of shafts and being aligned with said first and second shafts on which the cutters are mounted.

12. In a machine for sub-dividing particles of waste, the machine including a housing, a pair of shafts disposed in said housing and parallel to each other, cutters on said shafts, the improvement comprising means for operating one of said shafts in one direction and for operating the other of said shafts in the other direction, a waste entrance in said housing, means to deliver the waste which is passed through said entrance to said cutters, said cutters each being composed essentially of a plurality of spaced, parallel blades arranged in stages, and deflectors carried by said pair of shafts to interrupt the flow of waste in said housing and separate said blades into said stages.

13. In a machine for sub-dividing particles of waste, the machine including a housing, a pair of shafts disposed in said housing and parallel to each other, cutters on said shafts, the improvement comprising means for operating one of said shafts in one direction and for op-

erating the other of said shafts in the other direction, a waste entrance in said housing, means operating at a speed different from the speed of said cutters to deliver the waste which is passed through said entrance to said cutters, said cutters each being composed essentially of a plurality of spaced, parallel blades arranged in stages, splash disks carried by said shafts and separating said blades into said stages, and at least some of the blades of each cutter, and said splash disks being interleaved with each other.

14. In a machine for sub-dividing particles of waste, the machine including a housing, a pair of shafts disposed in said housing and parallel to each other, cutters on said shafts, the improvement comprising means for operating one of said shafts in one direction and for operating the other of said shafts in the other direction, a waste

entrance in said housing, and means to deliver the waste which is passed through said entrance to said cutters, said cutters each being composed essentially of a plurality of spaced, parallel blades arranged in stages, said means for feeding the waste to said cutters comprising conveyors which are actuated at a speed less than the speed of said cutters.

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