Oct. 28, 1952 J. H. POWERS 2,615,636

WASTE DISPOSAL APPARATUS WITH TIME DELAY SWITCH

Filed May 19, 1949 2 SHEETS—SHEET 1

Fig. 1.

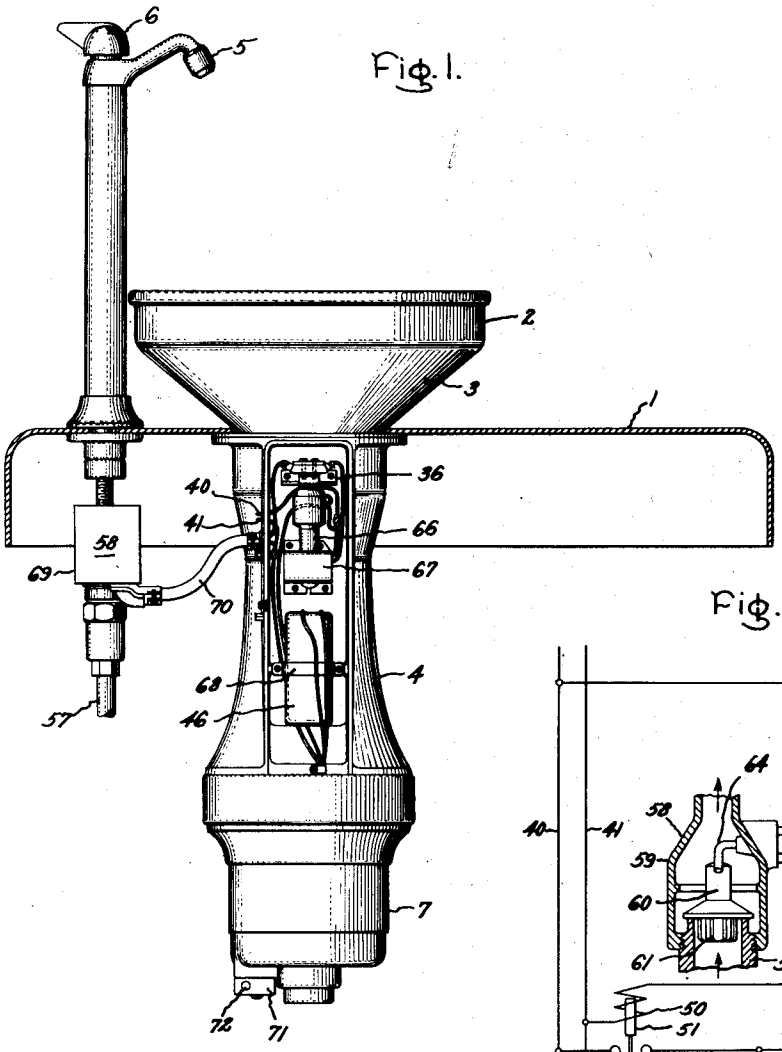

Fig. 3.

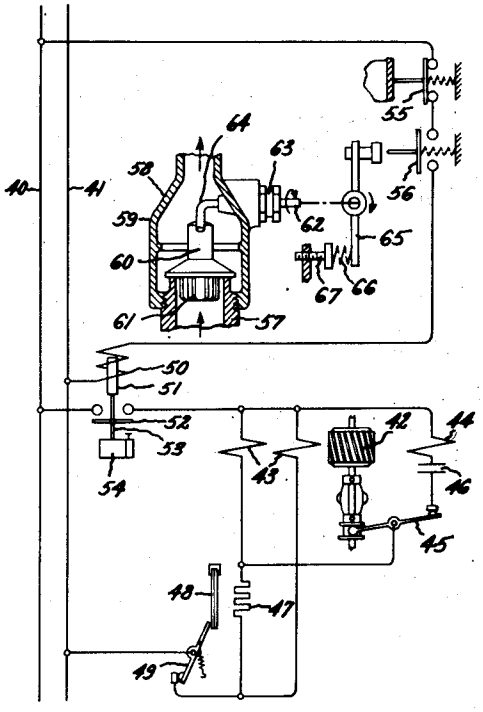

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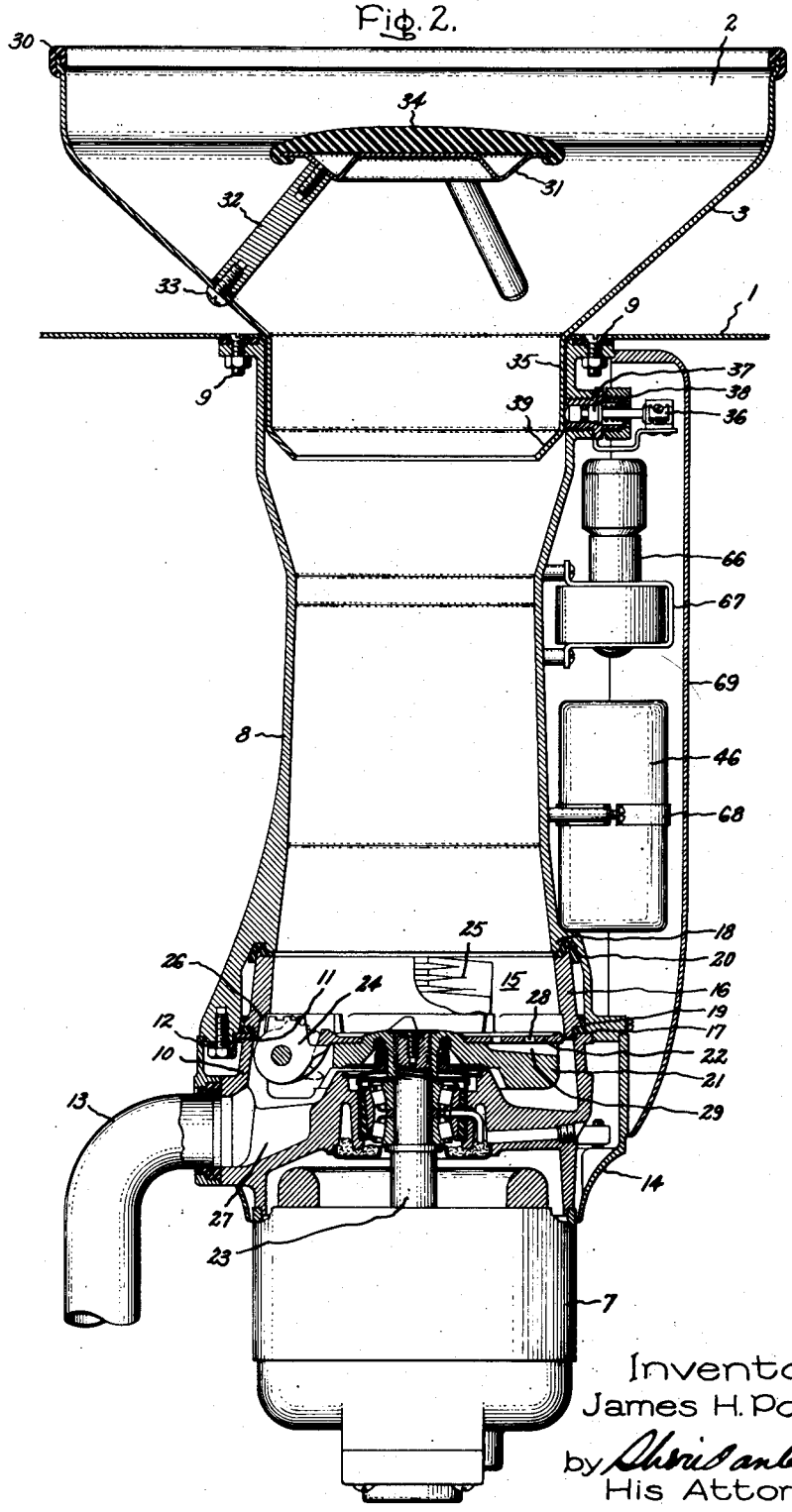
Fig. 2.



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UNITED STATES PATENT OFFICE

2,615,636

WASTE DISPOSAL APPARATUS WITH TIME DELAY SWITCH

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1 Claim. (Cl. 241—36)

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

Among the objects of the invention is the provision of an improved and simplified control mechanism for increasing the efficiency, reliability, and safety of operation of such waste disposal apparatus.

In the operation of waste disposal apparatus of the kind referred to, a generous flow of water is necessary at all times to facilitate reduction of the waste materials to a proper flowable state for passage through the discharge clearances and piping system of the apparatus, and to act as a carrier for flushing the comminuted material to the sewer or other receiving means. This prerequisite becomes particularly important in commercial installations where large quantities of garbage and other kitchen waste materials are to be disposed of by the use of such apparatus. With inadequate water flow, the sewer pipes may become plugged; also, if the process of comminution is started before an adequate flow of water reaches the grinding chamber, there is danger of overloading the apparatus, clogging it up, and causing permanent injury to the operating parts.

It is, therefore, a primary object of my invention to provide waste disposal apparatus in which operation is prevented or delayed until the proper volume of water is present in the comminuting or grinding chamber.

For use in commercial installations, such as restaurants and hotels, the waste disposal apparatus should present a large waste receiving volume. Also, the apparatus should lend itself to rapid clearance of garbage from plates, dishes and utensils. It is, therefore, a further object of my invention to provide waste disposal apparatus, particularly suitable for use in such commercial installations, fulfilling these requirements.

In accomplishment of the foregoing objectives, a feature of my invention consists of a control system for starting and stopping the operation of the comminuting apparatus, arranged to delay commencement of operation until an adequate time has elapsed from the start of flow of water to allow the water to reach the comminuting chamber. It is also a feature of my invention to provide a new and improved waste

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receiving receptacle or flush bowl mountable on the upper portion of the apparatus for receiving large quantities of waste; and this waste receiving receptacle is provided with a guard over the entrance into the comminuting apparatus, which guard also serves as a bumper pad against which dishes may be struck to aid in clearing the waste material.

The features of my invention which I believe to be novel are set forth with particularity in the appended claim. My invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings in which Fig. 1 is a front elevation of the installed apparatus; Fig. 2 is a sectional view in elevation taken at right angles to the view shown by Fig. 1; and Fig. 3 is a schematic diagram of the control system.

Referring to the drawings, the installation illustrated is particularly suitable for commercial installation, although it will be understood that the apparatus disclosed is not limited solely thereto. As shown by Fig. 1, the apparatus is positioned at a suitable location on a counter 1. A waste receiving receptacle or flush bowl 2 presents a large opening above the counter surface for reception of the waste material, and inwardly directed side walls 3 extend downwardly into the mouth of the comminuting apparatus 4. A non-splash water spigot 5 controlled by valve 6 is arranged above the flush bowl so that a stream of water may be directed into the flush bowl to aid in clearing the waste material and to provide a generous supply of water for the disposal operation. The comminuting apparatus 4 is driven by an electric motor 7.

To provide adequate volume for the reception of waste material and a chamber for the comminuting or grinding operation, a casing 8, best seen in Fig. 2, is attached under counter 1 by bolts 9. The lower part of the casing has a frusto conical shape leading into a grinding or comminuting chamber. Attached to the lower end of casing 8 is a bottom flange 10 carrying the electric motor 7. Flange 10 is clamped against a shoulder 11 on the bottom of casing 8 by a clamping ring 12. The bottom flange is provided with an outlet 13 for connection with the drain line or sewer. A removable shield 14 may be used to enclose the bottom flange to protect the bearing structure and mechanism supported within the flange.

A shredding chamber 15 is formed in the lower end portion of casing 8. This chamber is provided with a frusto conical wall 16 positioned between a shoulder 17 on bottom flange 10 and a shoulder 18 internally formed in casing 8. Resilient rings 19 and 20 are arranged between the shredding chamber wall 16 and the shoulders to reduce the transmission of vibrations and to provide a liquid seal. Positioned in the lower end of shredding chamber 15 is a fly-wheel 21 carrying thereon a replaceable disc 22 of wear resisting material. Fly-wheel 21 and disc 22 are attached to motor shaft 23 which is rotatably mounted in bottom flange 10. Impeller blades 24 are carried by fly-wheel 21, so that when the fly-wheel is rotated by motor 7, a similar motion will be imparted to the waste material and water in the shredding chamber. When the fly-wheel 21 is at rest, impeller blades 24 will be in the dotted line position shown by Fig. 2. However, as the fly-wheel is rotated, the impeller blades 22 will move by centrifugal force to the full line position. With the impeller blades 24 in the full line position, they are in shearing relation with shredding members 25 mounted at spaced points around shredding chamber wall 16. By reference to Fig. 2, it will be seen that impeller blades 24 are positioned on the radii of fly-wheel 21 so that they are at right angles to shredding chamber wall 16. In operation, the rotation of fly-wheel 21 and impeller blades 24 cause the mixture of garbage and water to be whirled within the comminuting chamber 15. The centrifugal force causes the solid chunks of waste material to be thrown outwardly against wall 16. Thus, as the larger particles or pieces of material whirling within the comminuting chamber strike the shredding members 25, a grinding or comminuting action takes place reducing the entire mass to a flowable state. The importance of the presence of a large volume of water within the comminuting chamber can be readily appreciated, since otherwise the solid material would merely be reduced to a paste rather than a flowable mixture. Since the impeller blades are freely pivoted, the possibility of jamming is reduced.

A series of straining grooves 26 are provided at the lower end of side wall 16 communicating with an annular receiving chamber 27 within bottom flange 10. The size of straining grooves 26 is selected so that only such particles as may be discharged safely into the sewer system will pass. From the annular receiving chamber 27, the comminuted waste material may flow out through drain pipe 13 into the sewer system.

It frequently occurs in the use of waste disposal apparatus, that large quantities of water will be emptied into the apparatus when the driving mechanism is at rest. It is, therefore, desirable to provide an additional means for passage of such liquid through the apparatus into the drain line. For this purpose, I have provided a series of apertures 28 through the surface of disc 22, these apertures opening into recessed areas 29 on the face of fly-wheel 21. Thus, liquid may pass through apertures 28 and into the annular receiving chamber 27 and hence to the drain line. The size of these apertures may be larger than the size of the straining grooves 26, since during operation of the comminuting mechanism, all of the solid particles of waste material will be confined by the centrifugal force to an annulus in contact with the comminuting chamber walls 16.

The above description of the comminuting chamber and grinding mechanism is illustrative of arrangements known in the art. The specific embodiment illustrated by this portion of the disposal apparatus is more fully disclosed and described in my copending application Serial No. 62,946, filed December 1, 1948, and now Patent 2,562,736, dated July 31, 1951, assigned to the assignee of the present application. This invention, however, is not limited to this particular form of comminuting mechanism and other arrangements or devices for reducing particles of waste material into a flowable mass suitable for discharge into the sewer may be equally suitable.

The particular embodiment illustrated by the drawings is for an apparatus particularly suitable for a commercial installation. For commercial use, a large flush bowl or waste receiving receptacle is needed to handle the large volume of food scraps left on dishes by the patrons and the unusable scraps from the kitchen. To receive the waste material, therefore, I prefer to use the large bowl-shaped receptacle 2 having a wide mouth or opening with inwardly directed side walls 3 leading into the entrance to casing 8. A rubber ring 30 covers the upper edge of bowl 2 to avoid chipping or cracking of china plates and other dishes being cleared of refuse. A guard 31 is mounted within flush bowl 2 over the opening into the comminuting chamber. Guard 31 is supported on legs 32 which are in turn mounted on the inwardly depending walls 3 of the flush bowl by screws 33. Such a guard reduces the danger of dishes or silverware being dropped into the grinding chamber, prevents the operator from reaching into the comminuting or grinding chamber while the mechanism is in motion, and protects the operator from flying waste particles. On the upper surface of guard 31, I provide a resilient bumper pad 34, of rubber or like material, so that the dishes may be struck against this guard to facilitate clearance of the scraps from the dishes. As a further aid in cleaning the refuse from the dishes, a stream of water is directed into the flush bowl and against bumper pad 34. For this purpose, the water passes through the non-splash nozzle 5 under control of valve 6.

At the lower end of flush bowl 2, a straight side wall portion 35 extends downwardly into casing 8 of the comminuting mechanism. The external diameter of portion 35 is proper to fit snugly, but removably, in the mouth of casing 8. Thus, the flush bowl 2 may be removed at any time for cleaning and to provide access to the grinding chamber. However, when flush bowl 2 is removed, it is highly desirable that a means be provided to prevent operation of the grinding or comminuting mechanism. Otherwise, there is a danger of serious injury to the hands of the operator, or of foreign, non-disposable articles being dropped into the rotating mechanism. I, therefore, employ an interlock switch 36, so that motor 7 can be operated only when flush bowl 2 is mounted in the position shown by Fig. 2. Switch 36 is actuated by a plunger 37 which is biased inwardly by a spring 38. Thus, when the flush bowl 2 is removed from casing 8, spring 38 will force plunger 37 inwardly, resulting in the contacts of switch 36 being opened to prevent operation of the motor. The lower extremity of the side walls of flush bowl 2 are beveled inwardly to form the sloping wall portions 39. This beveled portion 39 aids in camming plunger 37 inwardly

to close switch 36 when the flush bowl is replaced in position on casing 8.

The components of my invention and their inter-relation may be more readily understood by a reference to the schematic wiring diagram shown by Fig. 3. Electrical energy for operation of the motor is supplied from power lines 40 and 41. In this schematic diagram, the motor is shown as having a rotor 42, main field coils 43, and a starting coil 44. A centrifugally operated switch 45 is provided for disconnecting starting winding 44 after the motor has come up to its normal speed, and a capacitor 46 is connected in series with the starting winding to improve the starting characteristics of the motor. A suitable overload relay is connected in the motor circuit, and as here shown, the overload protection consists of a heater element 47 in series with a portion of the main field, a bimetallic strip 48, and a pivoted contact arm 49 in operative relation with the bimetallic strip. Damage to the motor is thus precluded in the event of an overload or jamming of the disposal apparatus.

Assuming that the overload relay is in its normally closed position, power is supplied to the motor through a time delay relay. There are numerous time delay relays suitable for this application having a delayed movement to closed position while permitting instantaneous opening of the contacts. The schematic diagram of Fig. 3 is illustrative of such a relay in which an energizing coil 50 acting on an armature 51 tends to close contactor 52 by means of a stem 53. In accordance with my invention, movement of contactor 52 to its closed position is delayed for a predetermined period of time after application of power to energizing coil 50 by a timing device 54. Timer 54 may be any one of several types, such as mechanical, hydraulic, or pneumatic to delay closing of contactor 52 while permitting instantaneous opening thereof. As an example, a suitable time delay relay is available in the form of a solenoid operated mercury switch from Durakool, Inc., of Elkhart, Indiana.

Application of power to the coil 50 of the time delay relay for starting the driving motor is controlled by interlock contactors 55 and 56. Contactor 55 is the switch blade of switch 36 which is operated to its closed position upon mounting of flush bowl 2 in the mouth of casing 8, as described above. Interlock 55, therefore, prevents operation of the driving motor unless flush bowl 2 is properly positioned. Interlock 56, which is normally open, is closed in response to a predetermined flow of water through the water supply pipe or conduit 57. The purpose of interlock 56 is to prevent operation of the disposal apparatus unless the prerequisite volume of water is flowing into the apparatus. While carrying out the present invention various forms of flow responsive devices may be employed for operation of interlock 56, but I prefer to employ the improved switch which forms the basis of my Patent 2,244,373, granted June 3, 1941, and assigned to the assignee of the present invention. Sufficient details of the construction of this flow responsive device are given herein to insure an understanding of the present invention.

As will be seen best from Fig. 3, the flow responsive device 58 has a housing 59 connected by pipe-threaded fitting with the incoming water line 57 at its lower end and to the water discharge conduit at its upper end. Within housing 59 is an axially movable flow actuable element in the form of a plunger 60 which seats on the end of water supply pipe 57 projecting into housing 59. The bottom portion of plunger 60 is provided with longitudinally extending ribs 61, the spaces between adjacent ribs serving to prevent jamming of the plunger due to collection of scale or other solid particles in the clearance between plunger 60 and the inside of water supply conduit 57. For operation of the switch interlock, a crank shaft 62 is rotatably mounted in housing 59, a suitable gland 63 preventing leakage of water. Crank 62 has a bent-over portion 64 resting on top of plunger 60 whereby any movement of plunger 60 causes partial rotation of crank 62. The outer end of crank 62 carries a switch operating arm 65 biased by a spring 66 in a direction to oppose movement imparted by flow of water through housing 59. An adjustable member 67 acting on spring 66 permits adjustment to the proper operating point. Switch operating arm 65 is so positioned with respect to contactor 56 that, upon rotation in a clockwise direction, the switch operating arm presses on the contactor stem to close interlock 56. The components of flow responsive device 58 are so proportioned and adjusted that contactor 56 will be moved to its closed position only when an adequate flow of water is passing through housing 58. Thus, a proper flow of water into the disposal apparatus is at all times insured before the comminuting mechanism can be placed in operation. Furthermore, any interruption of water flow will result immediately in opening of interlock 56, breaking the circuit to relay coil 50, and thus terminating motor operation.

The flow responsive device and the time delay relay may be located at any convenient point with respect to the disposal apparatus. Interlock switch 36, permitting operation of the unit only when flush bowl 2 is in position, must, of course, be mounted near the mouth of casing 8 for cooperation with the flush bowl. For convenience, I prefer to mount the interlock switch 36, the time delay relay assembly 66, and the motor starting capacitor 46 on the side of casing 8. This arrangement provides a satisfactory location for the components of the control system, and reduces the length of wire required for interconnecting these components. For mounting time delay relay assembly 66 on casing 8, a mounting clamp 67 is employed. Likewise, a clamp 68 is used for attaching capacitor 46 to casing 8. To protect these elements in their mounted positions, a removable cover 69, as shown by Fig. 2, is provided.

Flow responsive device 58 preferably is enclosed in a housing 69, along with the interlock switch 56. This device can be located anywhere in the water supply line leading to valve 6; however, for convenience, I prefer to mount this device as near as possible to the time delay relay assembly 66 and interlock switch 36. Therefore, as shown by Fig. 1, flow responsive device 58 is mounted on water supply conduit 57 just under the work surface 1. An insulated cable 70 extends from device 58 to within the housing formed by casing 8 and cover 69.

With respect to the overload relay for motor 7 comprising the elements 47, 48 and 49, as shown by Fig. 3, the preferable location is on the housing of motor 7. As shown by Fig. 1, this overload relay is enclosed in a housing 71, having a relay reset button 72.

Various modifications may be desirable on the above arrangement of equipment. For example, a manually operable switch may be installed at a convenient location near the work surface for

starting and stopping the motor 1. Such a switch may be wired in series with the interlock switch 55 and the flow control interlock 56 so that in any event the grinding mechanism cannot be operated unless the flush bowl 2 is properly positioned and there is an adequate flow of water into the apparatus. A further possible modification is to replace the hand controlled water supply valve 6 by a solenoid operated water supply valve. Such a solenoid operated water supply valve would be adjusted to insure an adequate flow of water into the apparatus.

With respect to the setting on time delay relay 66, it has been found that a delay of approximately 6 seconds is desirable to insure that water from discharge nozzle 5 reaches the grinding or comminuting chamber. In the embodiment illustrated, this delay of 6 seconds prevents the starting of the comminuting mechanism for 6 seconds after the water supply has been adjusted to the minimum rate of flow. If, for any reason, water flow is interrupted or flush bowl 2 is removed during operation, the motor circuit is instantaneously opened.

From the above description taken in connection with drawings, it will be seen that a new and improved disposal device is provided. One advantage of the above arrangement is in the flush-bowl or waste-receiving receptacle construction, which provides an increased volume for reception of waste material, and by the addition of the resilient striker plate the clearing of waste material from dishes and cooking utensils is facilitated. The above disclosed construction also results in increased safety inasmuch as the operator cannot come in contact with the moving grinding apparatus. A further and important advantage of this apparatus is in the delay in starting of the comminuting mechanism until an adequate water supply is in the comminuting chamber. Thus, the comminuted waste is in all cases reduced to a proper flowable mixture suitable for discharge into the sewer, and the danger of clogging or plugging up the drain line or sewer is substantially eliminated.

While the present invention has been described by reference to particular embodiments thereof, it will be understood that numerous modifications may be made by those skilled in the art without actually departing from the invention. I, therefore, aim in the appended claim to cover all such equivalent variations as come within the true spirit and scope of the foregoing disclosure.

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

In combination with a waste disposal appliance including a comminuting casing having comminuting means therein and a drain beyond said comminuting means into which the comminuted material is fed from said casing, an electric motor for driving said comminuting means, and a water supply conduit system for supplying water to said casing to aid in the operation of said comminuting means in comminuting waste material and disposing it into said drain, of an electro-responsive time delay switch which when energized moves in a predetermined time interval to one controlling position and when de-energized moves instantaneously to another controlling position, connecting means connecting said switch in the energizing circuit of said motor to energize the motor to operate said comminuting means when said switch moves to said one position and to de-energize said motor to stop said comminuting means when said switch moves to said other position, and a fluid responsive switch in said conduit system connected to control the energization of said time delay switch to energize it only when there is a predetermined minimum volume of water flowing in said system to said casing, whereby said motor is energized to operate said comminuting means a predetermined interval of time after said predetermined minimum volume of water flowing to said casing has been established, and is de-energized to stop said comminuting means instantly upon cessation of flow of at least said predetermined minimum volume of water in said system.

JAMES H. POWERS.

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