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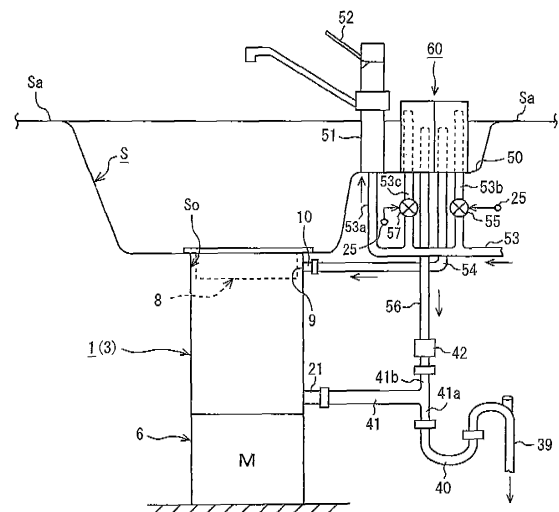
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(54) **GARBAGE TREATMENT DEVICE**

(57) Crush water is supplied to a housing in a hopper (3). Rinse water is supplied to a trap pipe (40) that is connected to a discharging outlet of the housing. An ejection water-supplying portion (42) for the rinse water is connected to the trap pipe. The crush water is supplied from just before the crushing process starts. The rinse water to be supplied to the trap pipe is supplied only for a predetermined period of time during crushing process as well as after the crushing process. When the rinse water is supplied to the trap pipe during the crushing process, suction acts thereon such that crushed particles flown down to the discharging outlet of the housing can be pushed out by a stream flown into the trap pipe. An action of such the suction allows the crushed particles to be discharged to a drain pipe side through the trap pipe all around during the crushing process, thereby increasing any discharge effect. The rinse water after the crushing process is supplied after a predetermined period of time has been lapsed from the completion of the crushing process, thereby discharging any particles left in the trap pipe and rinsing the trap pipe.

FIG. 1



Description

TECHNICAL FIELD

[0001] The present invention relates to a garbage disposal apparatus which is applicable to kitchen facilities. More specifically, it relates to the one that can prevent any crushed particles from being left in a trap pipe by supplying rinse water not only after crushing process but also during the crushing process, if the rinse water is supplied to the trap pipe which connects to a drain side of the garbage disposal apparatus main body, in addition to a water supply of crush water to the garbage disposal apparatus main body.

BACKGROUND ART

[0002] As the garbage disposal apparatus to crush garbage, which is used in general households, restaurants, etc., garbage disposal apparatuses of a hammer mill type and a grinder type have been known.

[0003] The garbage disposal apparatus of hammer mill type has a fixed hammer or a slidable hammer on a disk arranged at a bottom of a cylindrical hopper. Garbage thrown into the hopper has been pressed against an inner circumferential surface of the hopper by centrifugal force that occurs due to a revolution of the disk so that the garbage can be crushed by the hammer. The crushed garbage has then fallen down through grooves formed in a wall surface of the hopper or a gap between an outer edge of the disk and the inner circumferential surface of the hopper. The crushed garbage, which has fallen down, has, then, drained into a side of drain pipe thereof.

[0004] The garbage disposal apparatus of hammer mill type has been designed to drive the disk which installs the hammer for crushing the garbage in the hopper, at high speed of several thousands of revolutions (rpm) so that it produces any hideous noises and/or vibrations because the garbage collides with the hammer and the inner circumferential surface of the hopper so as to be crushed.

[0005] On the other hand, in the garbage disposal apparatus of grinder type, a crushing unit has been used in which a rotary blade and a fixed blade, each having comb-tooth shaped blades, have been laminated alternately. It has been configured so that these rotary blade and fixed blade constituting the crushing unit can be engaged with each other with small spacing held between them, thereby revolving the rotary blade to crush the garbage with the garbage being gripped by the rotary blade and fixed blade. Blades of the laminated rotary blade and fixed blade have finer pitches in proportion to the lower laminated layer. Thus, the garbage thrown into the hopper has first been crushed roughly by the rotary blade and fixed blade of higher layer, has then been crushed finely by the rotary blade and fixed blade of lower layer, and has been discharged downwardly.

[0006] This garbage disposal apparatus of grinder type having such a configuration that these rotary blades and

fixed blades are laminated has not required any centrifugal force, thereby allowing it to produce low noise by controlling number of revolutions.

[0007] On any of these garbage disposal apparatuses, tap water used as any processing water for enabling crushed particles of the garbage to fall down may be supplied under automatic control. In this case, the processing water (hereinafter, referred to as "crush water") is automatically supplied into a housing provided in the garbage disposal apparatus main body.

[0008] Further, if the garbage disposal apparatus of this type is disposed with it being installed in a kitchen sink, between the housing and a drain pipe, a trap pipe is generally connected to them. With a view of discharging any crushed particles left in the trap pipe therefrom and rinsing the inside thereof, rinse water may be supplied apart from the crush water.

[0009] However, in the above-mentioned garbage disposal apparatuses, in a case of combining the automatic water-supplying process and the rinsing process of the trap pipe, there has been a problem at what kind of timing the two processes, particularly, the rinsing process, are to be carried out. This is because in some timing of the rinsing process, any crushed particles may not be discharged successfully from the housing or a part of the discharged crushed particles may be left in the trap pipe. The rinse water could be wasted.

[0010] The present invention has thus solved such the conventional problem and has provided a garbage disposal apparatus that can prevent any crushed particles from being left in the trap pipe, when crushing process of the garbage and rinsing process of crushed particles are carried out using the rinse water in addition to the crush water, by particularly making the rinse water supply timing not only after the crushing process but also during the crushing process.

DISCLOSURE OF THE INVENTION

[0011] A garbage disposal apparatus according to the invention characterized in that the apparatus comprises:

a garbage disposal apparatus main body that is installed under a drain opening of a kitchen sink;
a housing that is configured so as to be attached into or detached from the garbage disposal apparatus main body and in which a crushing unit is installed;
a crush water open-and-close valve for supplying crush water to the housing, which is provided at a water-supply opening side of the housing;
a trap pipe that is connected to the housing;
a rinse water open-and-close valve for supplying rinse water to the trap pipe, which is connected to the trap pipe; and
a control means for controlling the crush water open-and-close valve and the rinse water open-and-close valve,

wherein the rinse water is supplied to the trap pipe during the crushing process and after completion of crushing.

[0012] According to the present invention, by supplying the rinse water to the trap pipe during the crushing process, it is possible to increase any discharge effect on the crushed particles and to prevent the crushed particles from being left in the trap pipe. Further, at the same time, it is possible to rinse inside of the trap pipe by a stream of water flown into the trap pipe.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

[FIG. 1] is a conception diagram for showing one embodiment of a garbage disposal apparatus according to the present invention.

[FIG. 2] is a sectional view of an important portion of the garbage disposal apparatus, to which the present invention is applicable, for illustrating one example thereof.

[FIG. 3] is a timing chart (part one) for showing a processing example of the garbage disposal apparatus according to the present invention; and

[FIG. 4] is a timing chart (part two) for showing a processing example of the garbage disposal apparatus according to the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0014] The following will describe a case where a garbage disposal apparatus according to the invention is applied to a tap water supply system for a garbage disposal apparatus that is installed in a kitchen sink.

[0015] FIG. 1 shows a conception diagram of a case where this invention is applied to a tap water supply system for the garbage disposal apparatus 1 that is installed in a kitchen sink for household use.

[0016] The garbage disposal apparatus 1 is fixed on and installed in a drain opening S_o provided in almost middle of a bottom of a kitchen sink S on its rear side of the bottom. The garbage disposal apparatus 1, which will be described later, has a tubular hopper 3 in which a crushing unit is provided. The crushing unit is rotatably driven by a motor 6.

[0017] As the crushing unit, the above-mentioned hammer mill typed one that crushes the garbage using a hammer mill, the grinder typed one that crushes the garbage using rotary blade and fixed blade, and the like can be used. The following embodiments relate to the garbage disposal apparatus using the latter (grinder type).

[0018] As shown in FIG. 1, to an upper circumferential surface of the hopper 3, a supply port 9 for the tap water and a connecting pipe 10 that is connected to this supply port 9 are respectively connected. On a lower circumferential surface of the hopper 3, a drain-pipe-connecting port 21 is provided, and through this drain-pipe-connect-

ing port 21, the crushed garbage, crush water (water for allowing the crushed particles to flow downward) used when crushing it and the like are discharged to a drain pipe 39.

[0019] Well-known trap pipe, for example, S trap pipe 40, is connected to the drain-pipe-connecting port 21 and the drain pipe 39. In this embodiment, between the S trap pipe 40 and the drain-pipe-connecting port 21, a branching pipe 41 is provided. The branching pipe 41 has around T-shape and a first branching pipe 41a is connected to the above-mentioned S trap pipe 40 as well as at a side of a second branching pipe 41b that is connected to the S trap pipe 40 on a vertical line, an ejection water-supplying portion 42 acting as ejection water-supplying means of the rinse water is connected. This ejection water-supplying portion 42 is provided for preventing any crushed particles from being left in the S trap pipe 40 and supplies the rinse water to the S trap pipe 40 to discharge the particles left in the pipe and to rinse inside of the trap pipe.

[0020] In the embodiment of FIG. 1, as the kitchen sink S , a sink in which a step portion 50 is provided at a one level lower hollowed portion than an upper flat surface (overflow edge) S_a is used. A tap 51 is mounted and fixed on the step portion 50 so that it can stand projecting thereon. By controlling a handle 52 of the tap 51, open and close (stop) of the tap for tap water is carried out.

[0021] Vacuum breaker 60 for the tap water to be supplied to the garbage disposal apparatus 1 is also provided on the step portion 50. The vacuum breaker 60 is provided for preventing the tap water and water (dirty water) at a side of the garbage disposal apparatus 1 from being directly mixed, and the tap water is once conducted to the vacuum breaker 60 and the tap water ejected from the vacuum breaker 60 is then conducted to the garbage disposal apparatus 1 and the S trap pipe 40.

[0022] Therefore, as the vacuum breaker 60, duplex one is used. A first branching pipe 53a branched from a water main 53 is connected to the tap 51. Second and third branching pipes 53b, 53c branched from the water main 53 are respectively connected to connecting ports (tap water ports) for the tap water, which are provided on the vacuum breaker 60.

[0023] A crush water open-and-close valve 55 and a rinse water open-and-close valve 57 are disposed on the second and third branching pipes 53b, 53c, by which water supply control thereof is performed. For the crush water open-and-close valve 55 and the rinse water open-and-close valve 57, for example, any electromagnetic valves are used. A water pipe 54 is connected to an ejection port relating to the second branching pipe 53b and the connecting pipe 10. It can be connected direct to the supply port 9 for the tap water, not through the connecting pipe 10.

[0024] Connecting such the water pipes and the like allows processed water (the crush water and the rinse water) to be supplied to sides of the supply port 9 for the tap water and the drain port 21 of the garbage disposal

apparatus 1 through the vacuum breaker 60 following their separate courses.

[0025] As the vacuum breaker 60, an air-open type one (atmospheric one) is used. Even if any negative pressure bringing a dirty water level to rise based on a water cutoff or the like acts on a side of the drain pipe, this vacuum breaker 60 can separate any tap water system from the dirty water system surely.

[0026] FIG. 2 shows an embodiment of the garbage disposal apparatus 1, to which the present invention is applicable. This garbage disposal apparatus 1 has the hopper 3. The hopper 3 into which any garbage and the like are thrown is mounted on a base frame 2 and an upper edge of the hopper 3 is fit into the drain opening So of the kitchen sink S.

[0027] Inside of the hopper 3, the crushing unit 4 is installed so as to be detachably from the hopper 3. In the crushing unit 4, a crushing rotary blade, which will be described later, is fit to a driving shaft 5a of a reduction unit 5 and the motor 6 installed in the base frame rotatively drives the crushing rotary blade of the crushing unit 4 through the reduction unit 5. A portion of the driving shaft 5a, which transmits any driving force to the crushing unit 4, the portion being fitted to the crushing unit 4, is formed so as to be square shaft like one, spline shaft like one or the like.

[0028] The hopper 3 is provided with a throwing opening portion 7 at its upper end and a cap body 8 is placed into the throwing opening portion 7 so as to be detachable or attachable. The throwing opening portion 7 is provided with the above-mentioned supply port 9. The tap water is supplied to the cap body 8 through the supply port 9 and then, supplied from the cap body 8 into the hopper 3, which is used as the crush water.

[0029] The cap body 8 is provided with an inner cap 8a and an upper cap 8b. The inner cap 8a has an opening at its upper portion and a cylinder shape with a bottom at its lower portion, so that a water-impinging portion 12 can be formed as to be projected from a bottom portion 11 and a plurality of water-supply ports 13 can be formed around the water-impinging portion 12. The water-impinging portion 12 and the water-supply ports 13 constitute water storage portion 11a.

[0030] The water-supply ports 13 are formed all over the bottom portion 11 of the water storage portion 11a with them extending from an inner circumferential side thereof to an outer circumferential side thereof. The water-supply ports 13 may be arranged, for example, in a radial manner.

[0031] The water storage portion 11a has a supply port 18 penetrating through a side portion of the inner cap 8a from its outer circumferential surface to its inner circumferential surface. Therefore, if the cap body 8 is fit into the throwing opening portion 7, the supply port 18 is formed so as to communicate with the supply port 9 of the hopper 3.

[0032] The water-impinging portion 12 is configured so that a surface of its wall which stands from the bottom

portion 11 can be formed at an opposite position to the supply port 18. The water-impinging portion 12 is disposed at a generally right angle to a water-discharging direction from the supply port 18 in its horizontal direction. A slant surface that is inclined towards a direction where its upper portion is positioned at an inner side is also formed in its vertical direction. This is because the water supplied into the cap body 8 is dispersed all over around it and fallen into the hopper 3.

[0033] Inside the hopper 3, a bottom plate 22 that is inclined towards the drain-pipe-connecting port 21 and an opening 22a, through which the driving shaft 5a of the reduction unit 5 is passed, is formed at a center of the bottom plate 22.

[0034] In this embodiment, by rotating the cap body 8 to a predetermined direction only by a predetermined angle with the cap body 8 being placed in the throwing opening portion 7, the cap body 8 achieves a locked state thereof. When achieving the locked state thereof, the cap body 8 is locked into the hopper 3. The garbage disposal apparatus 1 starts its operation state while the cap body 8 is locked. Such the locked state of the cap body 8 is detected by detection means 24 which is attached to an outer circumferential surface of the hopper 3. As the detection means 24, a magnetic sensor (proximity sensor) and the like are used so that magnet, not shown, is fit or fixed to a corresponding position in the cap body 8.

[0035] The garbage disposal apparatus 1 is provided with a control unit 25 (control means including CPU) that controls rotation driving of the motor 6. The control unit 25 controls the crush water open-and-close valve 55 and the rinse water open-and-close valve 57 to open or close, the motor 6 to start or stop, and the like, in response to any detection signals from the detection means 24, any control signals generated on the basis of internal clock, and the like. A buzzer 70 and/or a speaker 72 are/is driven in response to the open/close control of the crush water open-and-close valve 55 and the rinse water open-and-close valve 57 and it is so configured that any information of the course of crushing process by any buzzer sounds and any audio assists are performed under a control from the control unit 25.

[0036] As the crushing unit 4 installed in the housing 31, a crushing blade closely resemble to a configuration disclosed in Japanese Patent Application Publication No. 2004-29880 is used in this embodiment. Thus, the crushing unit 4 is used as a unit in which a first crushing rotary blade 26, a second crushing fixed blade 27, a third crushing rotary blade 28, a fourth crushing fixed blade 29, and a fifth crushing rotary blade 30 are laminated.

[0037] The housing 31 has a cylinder shape and it is so configured that an outer diameter thereof is almost the same as an inner diameter of the hopper 3. The crushing unit 4 is installed into the hopper 3 from a side of the throwing opening portion 7 thereof. The housing 31 is provided with a handle 31c for attaching and detaching, which is constituted of a metal rod having a circular shape. The handle 31c is fit to an upper side of the hous-

ing 31 with it extending along its diameter direction.

[0038] The first crushing rotary blade 26 is constituted of one stirring arm that extends horizontally from one side of a side portion of a bearing portion 32.

[0039] The second crushing fixed blade 27 has two plate-like arms which extend horizontally with 180 degrees angle to each other and their edges formed on both side surfaces thereof act as crushing blades.

[0040] The third crushing rotary blade 28 has three arms which extend from its center in a radial manner with 120 degrees angle to each other. In each of the arms, a comb-tooth section is formed with a predetermined pitch on their bottom side.

[0041] The fourth crushing fixed blade 29 has a shape such that eight arms extending radially from a center thereof in a tangential direction at regular intervals are encircled by a ring. On each of, for example, the six arms out of the eight arms thereof, a comb-tooth section that is mesh with the third crushing rotary blade 28 is formed on their upper surface and they mesh with the third crushing rotary blade 28. The comb-tooth section of the fourth crushing fixed blade 29 crushes the garbage sent out of the upper row crushing blades in co-operation with the comb-tooth section of the third crushing rotary blade 28.

[0042] On an outer circumference of the ring, tabs 29a projecting in a radial direction with 180 degree angle to each other are formed. The tabs 29a are respectively fit into vertical grooves 31b of the housing 31, thereby limiting the rotation of the fourth crushing fixed blade 29.

[0043] The fifth crushing rotary blade 30 has a disk shape and it is configured so that a plurality of slits is arranged over the entire thereof except for a center hub. In this embodiment, they are constituted of plural slit groups, and adjacent slit groups are disposed in nearly parallel with each other.

[0044] An upper surface of the fifth crushing rotary blade 30 is plane and rotates with it being connected with a bottom surface of each of the arms of the fourth crushing fixed blade 29. Further, the slits pierce through the fifth crushing rotary blade 30 from its front to its back so that sharp edges can be formed on their upper open edges of the slits. Therefore, the garbage, which is crushed with the comb-tooth section of the third crushing rotary blade 28 and the comb-tooth section of the fourth crushing fixed blade 29 and fallen down to the upper surface of the fifth crushing rotary blade 30, is caught by the slits, and then, by rotating the fifth crushing rotary blade 30, it is pushed against the slits and further crushed by the edge parts of the slits. The finely crushed garbage is fallen down together with the crush water passing through the slits, is passed onto the bottom plate 22 of the hopper 3, and is discharged through the drain-pipe-connecting port 21 to outside.

[0045] The crush water open-and-close valve 55 and the rinse water open-and-close valve 57 are respectively controlled in response to the open/close operation of the cap body 8 so that any supply control on the crush water and the rinse water can be performed. Such the supply

control on the water relates to any controls on the crush water into the housing 31 and the rinse water to the S trap pipe 40. The control unit 25 carries out such the supply control based on the detection signals from the detection means 24 and the like. It is assumed that the control unit 25 contains any timer functions (any counter functions).

[0046] The following will describe an embodiment of the water-supply control with reference to Fig. 3. When the crushing process is being performed, discharging process of the crushed particles is also performed at the same time. Crushing and discharging process time when such the crushing process and the discharging process coincidentally advance is set to T_b . A case where the crushing-and-discharging process is successively performed during predetermined time T_c even after the crushing process has completed, in order to increase any crushing effects, is illustrated. These process time and predetermined time may be expressed as a period of process time or a predetermined period of time, for purpose of description.

[0047] In this embodiment, pieces of the crushing-and-discharging process time T_b , T_c are set to almost the same time. This is because if these pieces of the process time T_b , T_c are set so as to be too short, the crushing process and the discharging process are insufficient while if they are set so as to be too long, the process time or power is wasted. Based on various kinds of experiments, it was clear that about 30 through 40 seconds were preferable for the process time T_b , T_c , and a total of about 60 through 70 seconds were preferable.

[0048] of course, it is possible to set the crushing-and-discharging process time T_b longer and the successive crushing-and-discharging process time T_c shorter so as to set the total of process time to be made equal. For example, if the total of process time is set to 60 seconds ($T_b + T_c = 60$ seconds), it follows that T_b is set to 40 ($T_b = 40$ seconds) and T_c is set to 20 ($T_c = 20$ seconds). In illustration of FIG. 3, a case where T_b is set to 30 ($T_b = 30$ seconds) and T_c is set to 30 ($T_c = 30$ seconds) is shown. The illustration will be made with reference to Fig. 3.

[0049] In a step where the garbage is thrown into the housing 31, the cap body 8 is attached to the opening portion 7. By rotating the cap body 8 to a predetermined direction only by a predetermined angle after attaching it, the cap body 8 is locked to the hopper 3 (at points of time t_1 through t_2 of A in Fig. 3 and B in Figs. 3). The detection means 24 is positioned at a lock position of the hopper 3 so that proximity and departure of the cap body 8 can be detected by the detection means 24.

[0050] The control unit 25 generates a lock-detecting signal (on the proximity of the cap body 8) and a lock-releasing signal (on the departure of the cap body 8) based on signals from this detection means 24 (at points of time t_2 and t_9 of C in Fig. 3).

[0051] If generating the lock-detecting signal, the crush water open-and-close valve 55 is first controlled so as to be opened on the basis of the control signal from

the control unit 25 (at point of time t_2 of D in Fig. 3). The crush water open-and-close valve 55 is controlled so as to be successively opened during a period of time (T_x) from the point of time t_2 to the point of time t_7 , which will be described later. When the crush water open-and-close valve 55 is opened, the crush water is supplied to the cap body 8 through the water supply port 9, so that the crush water is supplied into the housing 31 through the water-supply ports 13 provided on the bottom of the cap body 8 (see E in Fig. 3).

[0052] Since it is because surfaces of an inner wall of the housing 31 and a surface of the crushing unit 4 are easily wetted by the crush water to supply the water previously only by predetermined time T_a just before the crushing process starts, this may prevent the garbage from being adhered to these parts when the successive crushing process is performed. Thus, as the time T_a for the previous water supply, about 5 seconds may be set.

[0053] When this previous water supply time has elapsed, regular crushing process is carried out while the water supply is maintained (after a point of time t_3 of G in Fig. 3). Therefore, the driving motor 6 is turned on starting from point of time t_3 so that the crushing rotary blades 26, 28, 30 of the crushing unit 4 can be rotatively driven (see F in Fig. 3). By cooperating the crushing rotary blades and the crushing fixed blades, the crushing process on the garbage advances. Since the crush water is supplied during the crushing-and-discharging process (a period of time T_b) when the crushing process and the discharging process are performed at the same time, the garbage is easy to be further crushed by the crush water, thereby increasing the advance of the crushing process.

[0054] The crush is not enough advanced just after the crushing-and-discharging process starts, so that the crushed particles has been yet failed to fall to a side of the bottom plate 22 below the fifth crushing rotary blade 30. It was confirmed by the experiment that when the garbage was finely crushed to some extent, the finely crushed particles started falling to a side of the bottom plate 22 below the fifth crushing rotary blade 30. Therefore, during a first half of the period of crushing-and-discharging process time T_b (converted in time of about 10 through 15 seconds after the crush starts), only the crushing process is mostly performed and then, an almost certain amount of the crushed particles is gradually fallen into the side of the bottom plate 22 and discharged.

[0055] Thus, in this embodiment, starting from a point of time t_4 when a predetermined time Δt (for example, 15 seconds) has been elapsed after the crushing starts, it is shifted to a process for assisting the discharging process of the crushed particles. Namely, a supply of the rinse water to the S trap pipe 40 is started. Accordingly, the rinse water open-and-close valve 57 is controlled so as to be opened so that the rinse water can be supplied (see J in Fig. 3 and K in Fig. 3).

[0056] As a result thereof, the rinse water is then supplied to a side of the S trap pipe 40 and acts on the crushed particles which are fallen from the bottom plate

22 up to the first branching pipe 41a of the branching pipe 41 through the drain-pipe-connecting port 21. The rinse water in this moment assists in falling down the crushed particles, thereby causing the discharging process of the crushed particles to be further smoothly performed. The crushed particles are then discharged to a side of the drain pipe 39 through the S trap pipe 40.

[0057] A period of assisting time T_d for the discharging process may be set an optional time but, in this embodiment, it is set to time of about 10 seconds so that the assistance for the discharging process can be completed during a period of the crushing-and-discharging process time T_b ,

[0058] A crushing-and-discharging process (during a period of time T_c) is continued without any break even after the crushing-and-discharging process (during a period of time T_b) has been completed (see G in Fig. 3). Based on various kinds of experiments, it is clear that general crushing itself of the garbage thrown into inside of the hopper 3 has almost completed during a period of the crushing-and-discharging process time T_b . Accordingly, a distance where the driving motor 6 may stop during the period of crushing-and-discharging process time T_c and only draining process is performed only by supplying water from the crush water open-and-close valve 55 and the like may be selected.

[0059] Herein, by taking into consideration an assumption of a case where a large amount of the garbage that is difficult to be crushed such as fiber-rich particles or bone and shell is thrown as the garbage and all the crushes have been not yet completed during the crushing-and-discharging process (a period of time T_b), the driving motor 6 is continuously operated even after the crushing-and-discharging process (a period of time T_b) has been elapsed and the water supply from the crush water open-and-close valve 55 is performed, thereby setting the crushing-and-discharging process (a period of time T_c) (see F in Fig. 3). Shift to the discharging process is informed by the buzzer 70 (at a point of time t_6 of H in Fig. 3). In this embodiment, at the same time, any audio assists are performed (at point of time t_6 of I in Fig. 3). A simple message such as "This is the discharging process of crushed particles" is sufficient for the audio assists. Both of buzzer sounds and audio assists are not performed but either buzzer sounds or audio assists may be performed.

[0060] The crushing process is almost completed during a period of the crushing-and-discharging process time T_b , but a part of the crushed particles may be left in the housing 31 if the garbage is difficult to be crushed, as described above. Further, a part of the crushed particles may be adhered as they are to an inner wall of the housing 31 and the crushing unit 4 under the crushing process during a period of time T_b . Accordingly, by utilizing a second half of the period of time T_c , sedimentary process and rinsing process are performed at the same time. Therefore, the crush water is supplied even during the second half of the period of time T_c .

[0061] During the second half of the period of the crushing-and-discharging process time T_c , the crushing-and-discharging process goes on if the crushing process has not yet completed for the period of time T_b while process for the sedimentary that is kept on adhering to the inner wall of the housing 31 and the crushing unit 4 and the rinsing process for the inner wall of the housing 31 and the crushing unit 4 can be almost surely performed, if the crushing process has completed, by dispersing the supplied crush water to inside of the housing 31 with the crushing unit 4.

[0062] At a point of time t_7 when the period of the crushing-and-discharging process time T_c expires, the crush water open-and-close valve 55 is controlled so as to be closed, thereby stopping the supply of the crush water (see D, E, and G in Fig. 3). At the same time thereof, the rinse water open-and-close valve 57 is controlled so as to be opened, thereby supplying the rinse water to the side of the S trap pipe 40 only for some time T_e (for example, 5 seconds) from the point of time t_7 . The rinse water is ejected and supplied into the S trap pipe 40 (between points of time t_7 and t_8 of K in Fig. 3), so that the crushed particles left in the S trap pipe 40 can be discharged at once and at the same time, any rinse in the pipe can be done.

[0063] The buzzer 70 sounds again at almost the same time (point of time t_7) of the start of this rinsing process, and any audio assists are carried out. A simple message such as "The garbage disposal process has finished" is sufficient for the audio assists. Such the buzzer sounds and/or audio assists allow even a user who stays in a place away from a kitchen to surely confirm that the garbage disposal process is finished.

[0064] If the garbage disposal apparatus 1 is again used, at a point of optional time t_9 thereafter, the lock of cap body 8 may be released and the cap body 8 may be detached (at point of time t_{10} of A in Fig. 3 and B in Fig. 3) and then, attached.

[0065] Thus, during the crushing process, the crushed particles fall down together with the crush water to a side of the bottom plate 22 evenly and are discharged, and the crushed particles are discharged to a side of the drain pipe 39 without being left therein by means of the supply of the rinse water during the crushing process. Thus, by the even discharge of the crushed particles, there is no danger such that the drain pipe 39 gets stopped by the crushed particles.

[0066] The lock detection signal and the lock release signal, however, are respectively generated in the control unit 25 with them being synchronism with the detection of proximity and departure of the cap body 8 by the detection means 24, as shown in C of Fig. 3. Based on the lock detection signal, energization to the driving motor 6 starts and based on the lock release signal, the energization to the driving motor 6 ends.

[0067] An embodiment shown in Fig. 3 is an embodiment where the lock of the cap body 8 is released at a stage (point of time t_9) in which all the processes (the

crushing and discharging processes) have completed, so that the energization to the driving motor 6 has ended at a point of time before the lock release signal is given.

[0068] If the lock of the cap body 8 is forced to be released during the energization to the driving motor 6, for example, during a period of the crushing-and discharging time T_b when entering into the period of assisting time T_d , the lock release signal is generated in synchronization with the departure of the cap body 8 at this time, as shown in Fig. 4, so that the energization to the driving motor 6 is forced to end (see B, C, D and F in Fig. 4).

[0069] As a result thereof, even during the crushing-and-discharging process, the crushing-and-discharging process is forced to be finished (see G in Fig. 4). Only the rinse water open-and-close valve 57 is then opened and it is shifted to the discharging process only by the rinse water (see J in Fig. 4 and K in Fig. 4). This is because finely crushed particles, if any, that is a part of the crushed particles can be discharged.

[0070] When the garbage disposal is forced to be finished, the buzzer sounds and the audio assists are carried out (see H in Fig. 4 and I in Fig. 4). In this case, the audio assists such as "Forced termination of the garbage disposal is made" are done, so that process result when the cap body 8 is operated can be informed.

[0071] When the cap body 8 is again attached and locked, it is returned to its initial state and process shown in Fig.3 starts from its first routine, thereby advancing the crushing and discharging processes.

[0072] It is preferable that an amount of the above-mentioned crush water and rinse water to be supplied is around 8 liter/min. It is not necessary that an amount of the crush water for the previously water-supplying time (time T_a) or an amount of the rinse water discharging-and-rinsing process (time T_e) after the discharging process is kept to an amount of their water during crushing-and-discharging process. Thus, in this embodiment, taking water conservation into consideration, the crush water open-and-close valve 55 and the rinse water open-and-close valve 57 are controlled so that the amounts of the crush water and the rinse water can become an almost half of them during the crushing-and-discharging process.

[0073] It is to be noted that on a supply of the rinse water from the ejection water-supplying portion 42, the rinse water may be ejected as it is or as waterjet.

INDUSTRIAL APPLICABILITY

[0074] The garbage disposal apparatus according to this invention is very preferably-applied to a garbage disposal apparatus that is used for a kitchen sink for household use or the like.

Claims

1. A garbage disposal apparatus characterized in

that the apparatus comprises:

a garbage disposal apparatus main body that is installed under a drain opening of a kitchen sink;
 a housing that is configured so as to be attached 5
 into or detached from the garbage disposal apparatus main body and in which a crushing unit is installed;
 a crush water open-and-close valve for supplying 10
 crush water to the housing, which is provided at a water-supply opening side of said housing;
 a trap pipe that is connected to said housing;
 a rinse water open-and-close valve for supplying 15
 rinse water to the trap pipe, which is connected to said trap pipe; and
 a control means for controlling said crush water open-and-close valve and said rinse water open-and-close valve,

wherein said rinse water is supplied to said trap pipe 20
 during crushing process and after completion of crushing.

2. The garbage disposal apparatus according to claim 1, **characterized in that** the crushing process is 25
 controlled in response to a cap body that closes opening of said housing.
3. The garbage disposal apparatus according to claim 1, **characterized in that** said crush water is supplied 30
 from just before said crushing process starts.
4. The garbage disposal apparatus according to claim 2, **characterized in that** said crushing process is 35
 performed in response to attaching and removing said cap body.
5. The garbage disposal apparatus according to claim 1, **characterized in that** the crush water is supplied 40
 successively during the crushing process and the rinse water is supplied only in a part of a period of crushing process time.

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FIG. 1

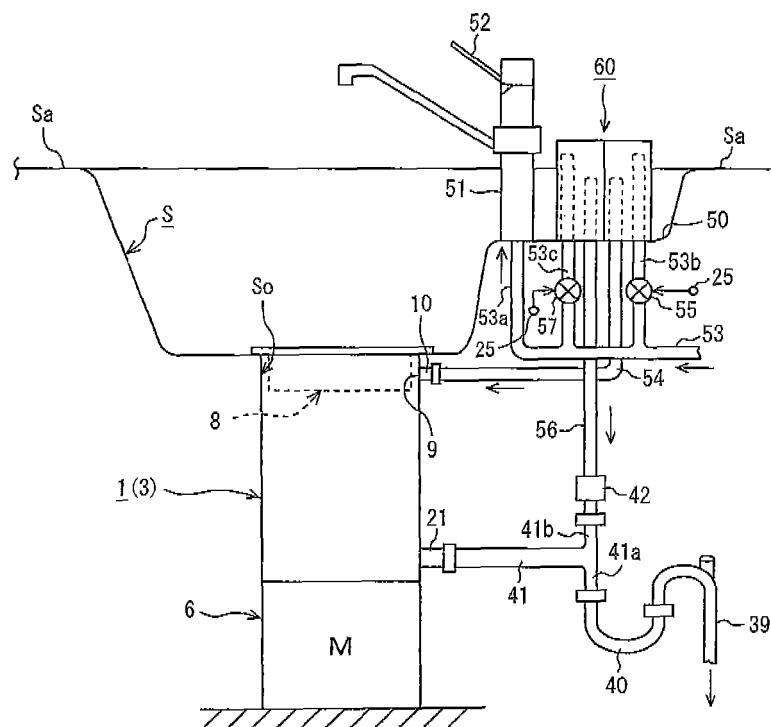
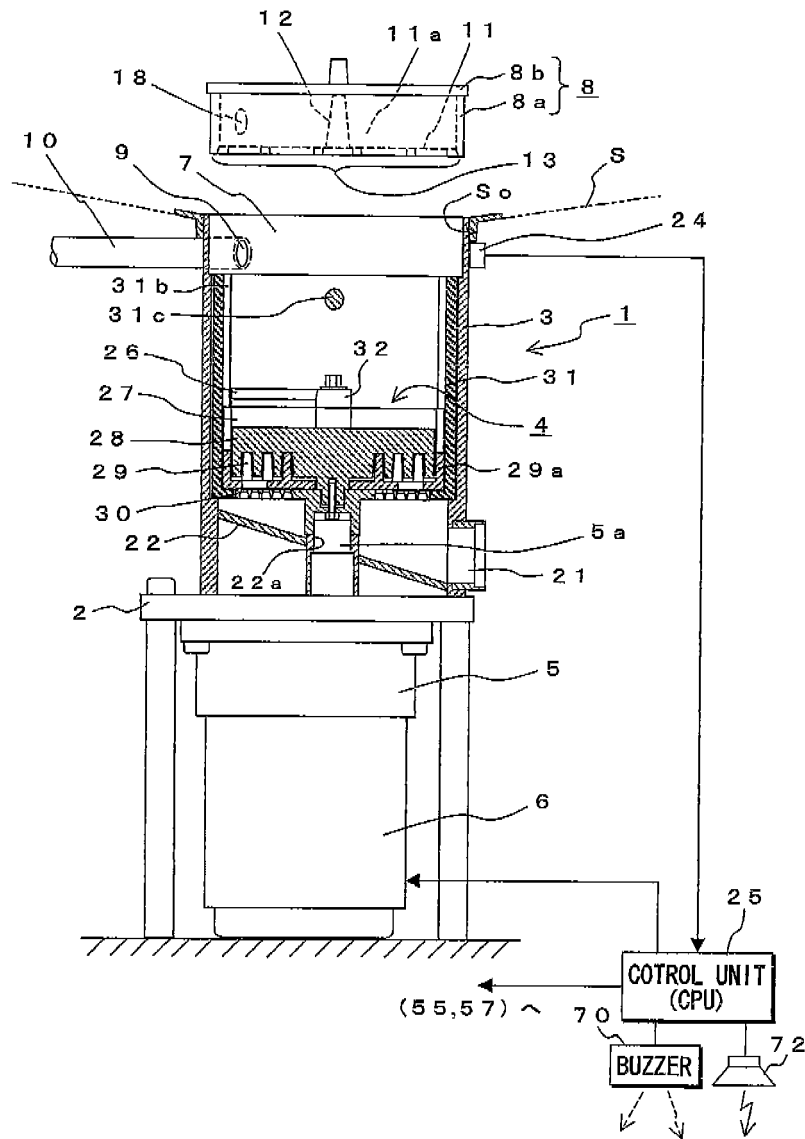


FIG. 2



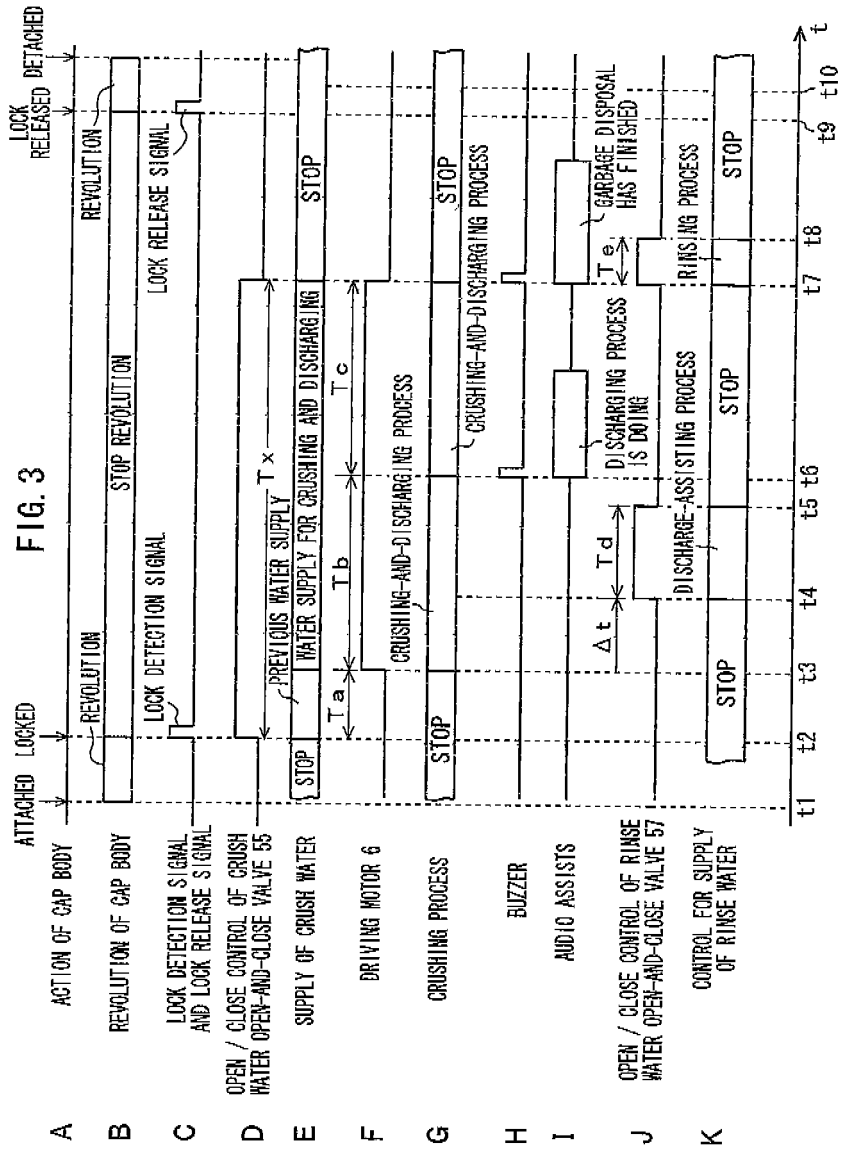
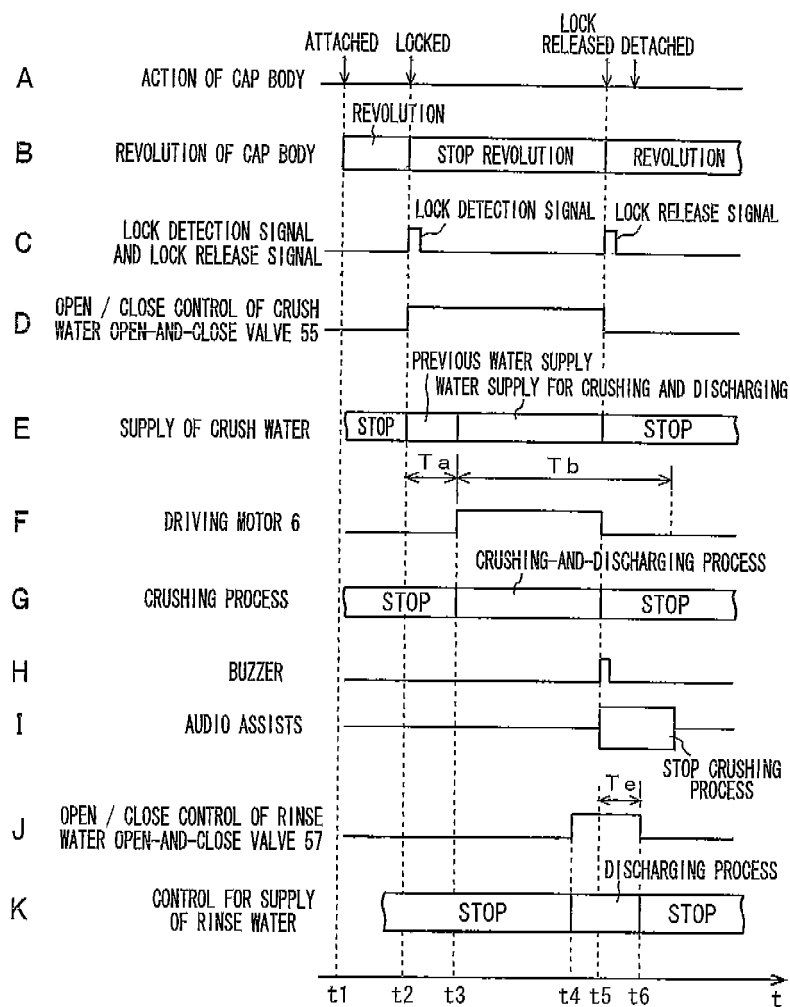


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/324954

A. CLASSIFICATION OF SUBJECT MATTER

B09B3/00(2006.01)i, B02C18/00(2006.01)i, E03C1/266(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B09B3/00, B02C18/00, E03C1/266

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2007
Kokai Jitsuyo Shinan Koho	1971-2007	Toroku Jitsuyo Shinan Koho	1994-2007

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2001-200564 A (Toto Ltd.), 27 July, 2001 (27.07.01), Claims; column 4, line 48 to column 6, line 5 (Family: none)	1-5
Y	JP 2003-24813 A (Inax Corp.), 28 January, 2003 (28.01.03), Claims; column 4, lines 31 to 34 (Family: none)	1-5
Y	JP 2002-336722 A (ShinMaywa Industries, Ltd.), 26 November, 2002 (26.11.02), Claims; column 3, lines 10 to 16; Fig. 1 (Family: none)	1-5

☒ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search
13 March, 2007 (13.03.07)Date of mailing of the international search report
20 March, 2007 (20.03.07)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/324954

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2004-8942 A (Inax Corp.), 15 January, 2004 (15.01.04), Claims (Family: none)	2, 4
A	JP 2001-115519 A (Toto Ltd.), 24 April, 2001 (24.04.01), Full text (Family: none)	1-5

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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