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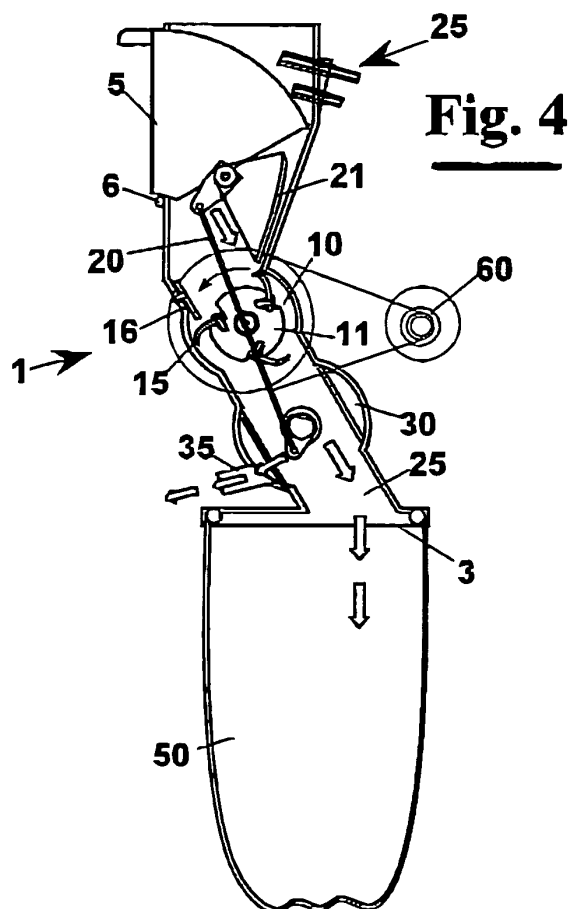
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(54) Unit for grinding organic material

(57) Unit (1) for treatment of organic waste having a waste sorting means comprising a sieve (21) movable between a first position, where it allows the passage of only a waste liquid fraction, and A second position, where it allows the passage also of a waste solid fraction. The sieve (21) is operatively connected by a rod (20) to a control valve (30), arranged downstream of a grinding chamber (10), in order to synchronize its movements. The valve (30) has a diaphragm (31) having holes (32) and a dividing wall (33) parallel to it. In a first position of the sieve (21) the valve (30) has the pierced diaphragm (31) arranged at the base of the grinding chamber (10) and the dividing wall (33) faces the outlet (35). This way, in a first step of organic waste treatment, the waste liquid fraction can outflow up to a water drain, which is in hydraulic connection with the unit (1) by a duct (35). A second step of organic waste treatment provides the arrangement of the the sieve (21) in the second position in order to cause the solid fraction of the waste processed to reach the grinding chamber (10), where it is finely ground. In particular, in the grinding chamber knives (15) are arranged on the boundary of a rotating drum (11) that cooperate with a stationary knife (16) connected to the wall of the chamber (10) in order to provide a substantially "comb-shaped" structure. [FIGURE 8].



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Description

Field of the invention

[0001] The present invention relates to an organic waste treatment unit for waste of many kinds, such as vegetables, fruit, and other food of various type, which carries out a fine fragmentation of the waste before disposal and subsequent collection by a public disposal centre, in order to reduce the volume of the waste, to limit the generation of bacteria in the ground waste, to reduce its environmental impact, and then to be of practical use for a separate waste collection.

Description of the prior art

[0002] As well known, organic waste cannot be left for a long time in common bins for household use suited for separate waste collection, because it is bulky and can produce bad smell for the action of bacteria. Therefore, to limit these problems, organic waste should be processed in suitable machines for reducing its size and limiting the action of bacteria.

[0003] Machines for treatment of organic waste exist that grind the material before disposal and collection by a public disposal centre, so that the waste has a low environmental impact. However, the existing machines cannot make an effective fragmentation of the organic waste and cannot avoid that the ground waste has still a high level of humidity, which enhances multiplication of bacteria in the mass of waste.

[0004] Furthermore, the known machines for waste treatment have a complex grinding unit. A problem of existing grinding units is that they have a cutting mechanism that during operation is subject to jam owing to particularly resistant bodies; in this case, if the machine is not stopped promptly, the cutting mechanism could be damaged.

Summary of the invention

[0005] It is therefore a feature of the invention to provide an organic waste treatment unit that achieves the above described objects, and furthermore, carries out a much more effective grinding of the waste material with respect to the devices of prior art.

[0006] It is another feature of the invention to provide an organic waste treatment unit that is structurally easy and cheap with respect to apparatus of prior art.

[0007] It is a further feature of the invention to provide a grinding unit that can be integrated in a modular element for kitchen units for separate waste collection.

[0008] These and other features are accomplished with one exemplary organic waste treatment unit, according to the invention, comprising:

- an inlet for introducing the waste to treat;
- a grinding chamber provided with grinding means

for the waste coming from said inlet;

- an outlet for liquid residues percolating from said waste through said chamber;
- a waste collecting container, for collecting the waste that has been ground in said chamber;
- flow sorting means, suitable for causing selectively the liquid residues of said waste to pass towards said outlet or also a solid part.

[0009] Advantageously, the grinding means comprise at least one knife rotating about an axis suitable for co-operating with a stationary knife connected to the wall of the grinding chamber, in order to grind the waste coming from said inlet.

[0010] Preferably, the knives have a curved profile suitable to assist the outflow of a washing liquid downstream of said grinding chamber.

[0011] In an exemplary embodiment of the invention, the or each knife is mounted on the boundary of a rotating drum.

[0012] Advantageously, knives are arranged in rows longitudinally to the drum. In particular, the knives of the different longitudinal rows can be arranged radially on the drum. Alternatively, the knives of the different longitudinal rows can be shifted in the many transversal planes of the drum.

[0013] In particular, said grinding means can be operated by motor means associated to a control circuit that in determined operative conditions operates inversion of the speed of rotation of the grinding means up to a determined angular position, for then causing another inversion of the speed of rotation up to cutting again the waste. This step can be repeated a predetermined number of times. This avoids jamming problems to the machine due to the presence of waste, or parts of waste, particularly resistant to the cutting action operated by the grinding means.

[0014] Advantageously, the control circuit measures the electrical power absorption of the motor and operates the inversion of speed of rotation of the grinding means when a measured value of said power absorption is different from a predetermined value.

[0015] Advantageously, the flow sorting means of the waste comprises:

- a sieve, arranged between the inlet and the waste grinding chamber, movable between a first position, where it allows the passage of only liquid residues percolating from the waste, and a second position, where it allows the passage also of the waste same, said sieve being operatively connected to
- a control valve arranged downstream of the grinding chamber, suitable for preventing from/allowing the access of the waste towards the waste collecting container even if allowing the percolation of liquid residues.

[0016] In particular, the control valve provides:

- a pierced diaphragm that when the sieve is at said first position faces the grinding chamber to allow the outflow of the liquid waste keeping the waste solid fraction, whereas at the second position it faces the outlet,
- a dividing wall substantially parallel to the pierced diaphragm, suitable for blocking an access towards said waste collecting container when the sieve is at said first position and to allow an access towards said waste collecting container when the sieve is at said second position.

[0017] In particular, the control valve is operated by motor means mounted on a frame of the waste treatment unit.

[0018] Advantageously, between the inlet and the grinding chamber means are provided for feeding a disinfecting solution suitable for preventing fermentation of the ground organic waste.

[0019] Furthermore, washing means can be provided suitable for sending a certain amount of water in the unit for removing any residues from the grinding means and from the inner walls of the unit same at the end of a cycle of operation.

[0020] Advantageously, the grinding chamber and the control valve are enclosed in a carter of protection, which can be released by the user after stopping the motor means. This way, the motor means can be reached by the user, who can thus carry out an inversion of the speed to release possible objects that, during operation, have reached the moving parts in the unit, in particular the grinding means, causing it to jam.

[0021] In particular, the inlet has side walls of flexible material suitable to assist the introduction of waste in the grinding unit.

[0022] According to another aspect of the invention, a modular element for kitchen units comprises a grinding unit as above described, said modular element comprising a piece of furniture having a height, depth and width of standard size for kitchen units.

Brief description of the drawings

[0023] The invention will now be shown with the following description of an exemplary embodiment thereof, exemplifying but not limitative, with reference to the attached drawings wherein:

- figures from 1 to 4 show diagrammatically a possible succession of steps of a cycle of operation of an organic waste treatment unit, according to the invention;
- figure 5 shows in detail a cross sectional view of a grinding chamber of the unit of figures 1-4;
- figure 6 shows diagrammatically the flow sorting means of organic waste of the unit of figures 1-4;

- figures from 7A to 8 show diagrammatically an elevational side elevational front view of a carter of protection of the grinding chamber and of a control valve in a blocking position and in the position allowing an access to inner mechanical parts;
- figure 9 shows diagrammatically a perspective view of the grinding unit of figure 1 integrated in an element for kitchen units;
- figure 10 shows graphically a qualitative diagram of angular speed (V) versus time (t) of the knives of the unit of figure 1 during a possible clearing procedure of the machine.

Description of a preferred exemplary embodiment

[0024] With reference to figures from 1 to 4, a possible succession of steps of a working cycle in an organic waste treatment unit 1 begins with the introduction of the waste through an inlet 5 (figure 1).

[0025] Normally a ground organic waste has a liquid fraction and a solid fraction. Therefore, for reducing the volume of the waste to dispose of, in order to be easily collected by a public disposal centre, and for avoiding conditions favourable to the multiplication of bacteria, in the first step of the organic waste treatment process a relevant portion of the waste liquid fraction is separated from the solid fraction. This step is made through waste sorting means 20, 21 and 30, shown in detail in figure 6.

[0026] In particular, the waste sorting means 20, 21 and 30 comprise a sieve 21 movable between a first position, where it allows the passage of only the waste liquid fraction (figures 1 and 2), and a second position, where it allows the passage also of the waste solid fraction (figures 3 and 4). The sieve 21 is operatively connected by a rod 20 to a control valve 30, which is arranged downstream of a grinding chamber 10, in order to synchronize its movements.

[0027] More in detail, the valve 30 has a diaphragm 31 having holes 32 and a dividing wall 33 parallel to the diaphragm (figure 6). At the first position of the sieve 21, valve 30 with the pierced diaphragm 31 is located at the base of grinding chamber 10, and dividing wall 33 faces outlet 35. This way, in the first step of the organic waste treatment carried out by unit 1, the waste liquid fraction can outflow up to the water drain, which is in hydraulic connection with unit 1 by a duct 35.

[0028] The second step of the organic waste treatment provides the arrangement of sieve 21 in the second position, in order to cause the solid fraction of the waste processed to reach grinding chamber 10, where it is finely chopped. In particular, in the grinding chamber knives 15 are arranged on the boundary of a rotating drum 11 and cooperate with a stationary knife 16 connected to the walls of chamber 10, in order to provide a substantially "comb-shaped" structure.

[0029] More in detail, while rotating each knife 15 meets repeatedly a stationary knife 16, thus cutting repeatedly the organic waste, which eventually reaches a

waste-collecting container 50. In particular, control valve 30 has dividing wall 33 in a position that does not block the path of the waste towards the waste-collecting container 50; diaphragm 31 faces outlet 35 to allow the outflow of a residual waste liquid fraction, along with an amount of washing fluid sprayed for removing any organic residues.

[0030] Knives 15 can be arranged along drum 11 according to longitudinal rows, for example three at 120° from one another, and also arranged radially (figure 5). In an alternative exemplary embodiment, not shown in the figures, knives 15 can be arranged shifted from one another. Furthermore, knives 15 are provided shaped with a curved profile in order to direct a washing liquid in a desired direction.

[0031] In figures 7A, 7B and 8, a carter of protection 80 is diagrammatically shown that covers grinding chamber 10 and control valve 30, so that moving parts existing in the unit cannot be reached by the user, when the machine is in normal running conditions. Carter 80 can be turned into two halves 81 and 82, in order to access the chamber from a closed position (figure 7A), for example by a closure handle 85 when the machine is off. This way the mechanical moving parts, and in particular the motor that operates the grinding knives, can be reached by the user in order to manually reverse the rotation and to remove possible undesired objects.

[0032] Knives 15 are operated by a motor 60 that can be associated to a control circuit, not shown in the figures. The control circuit has the function of operating an inversion of the speed of rotation of knives 15 at particular operative conditions.

[0033] Especially, when the control circuit detects a stop of the rotation of knives 15, for example owing to the presence of hard material, it causes the motor to carry out an inversion of the speed of rotation of knives 15, up to reaching a determined angular position. Then, the speed of rotation is again inverted of knives 15 that start again to rotate forwards, thus cutting further the waste.

[0034] The situation is graphically shown in figure 10, where a qualitative diagram is shown of the angular speed (V) of knives 15 versus time (t). More in detail, starting from starting time t_0 , knives 15 proceed grinding regularly at speed V for a certain time. However, if at an instant t_1 the knives are braked by the opposition caused by hard waste, for example a hazel, a bone, another hard object or in any case resistant to cutting, such a resistance would cause the knives 15 to be blocked, whereby the control circuit at instant t_1 operates an inversion of the speed of rotation up to an instant t_2 , bringing the knives to a withdrawn angular position. Then, the knives 15 are moved again at forward speed and cut again the waste impacting the waste at a speed V. This step of inversion is repeated for example three times, by inverting the speed repeatedly back and forward at following times t_3 , t_4 , t_5 , t_6 , for then starting again after the last inversion, to run continuatively at speed V. If the knives block again, the cycle is repeated, even if with organic

waste of normal hardness an inversion back and forward for three times and impact at a certain speed is enough to obtain the full grinding of the harder parts.

[0035] Finally, as diagrammatically shown in figure 9, the grinding unit 1 above described can be integrated in a modular element 100 for kitchen units, having for example a size (width and depth) 30*60 or 45*60 or 60*60 cm; in the second and third size it is possible to associate said grinding unit and a compacting unit, so that a complete module for separate waste collection is obtained.

[0036] The foregoing description of a specific embodiment will so fully reveal the invention according to the conceptual point of view, so that others, by applying current knowledge, will be able to modify and/or adapt for various applications such an embodiment without further research and without parting from the invention, and it is therefore to be understood that such adaptations and modifications will have to be considered as equivalent to the specific embodiment. The means and the materials to realise the different functions described herein could have a different nature without, for this reason, departing from the field of the invention. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Claims

1. Organic waste treatment unit **characterised in that** it comprises:
 - an inlet for introducing the waste to treat;
 - a grinding chamber provided with grinding means for the waste coming from said inlet;
 - an outlet for liquid residues percolating from said waste through said chamber;
 - a waste collecting container, for collecting the waste that has been ground in said chamber;
 - flow sorting means suitable for causing selectively only the liquid residues of said waste to pass towards said outlet or also a solid part.
2. Organic waste treatment unit, according to claim 1, wherein said grinding means comprise at least one knife rotating about an axis of rotation and suitable for cooperating with a stationary knife, which is connected to a wall of said grinding chamber in order to grind the waste coming from said inlet, said or each knife being, in particular, mounted on the boundary of a rotating drum.
3. Organic waste treatment unit, according to claim 2, wherein said knives have a curved profile suitable to assist the outflow of a washing liquid downstream of said grinding chamber.
4. Organic waste treatment unit, according to claim 3, wherein said knives are arranged in a way selected

from the group comprised of: in rows arranged longitudinally on said drum; arranged radially on said drum; shifted in different planes transversal to said drum.

5. Organic waste treatment unit, according to claim 1, wherein said flow sorting means of the waste comprise, in combination or separately:

- a sieve, arranged between said inlet and said waste grinding chamber, movable between a first position, where it allows the passage of only liquid residues percolating from the waste, and a second position, where it allows the passage also of the waste same, said sieve being operatively connected to
- a control valve arranged downstream of the grinding chamber, suitable for preventing from/allowing the access of the waste towards the waste collecting container even if allowing the percolation of liquid residues.

6. Organic waste treatment unit, according to claim 4, wherein said control valve comprises, in combination or separately:

- a pierced diaphragm that when the sieve is at said first position faces the grinding chamber to allow the outflow of the liquid waste keeping the waste solid fraction, whereas at the second position it faces the outlet,
- a dividing wall substantially parallel to said pierced diaphragm, suitable for blocking an access towards said waste collecting container when the sieve is at said first position and to allow an access towards said waste collecting container when the sieve is at said second position.

7. Organic waste treatment unit, according to claim 1, wherein between said inlet and said grinding chamber means are provided for feeding a disinfecting solution suitable for preventing fermentation of the ground organic waste.

8. Organic waste treatment unit, according to claim 1, wherein washing means are provided suitable for sending a certain amount of water in the unit for removing any residues from the grinding means and from inner walls of the unit same at the end of a cycle of operation.

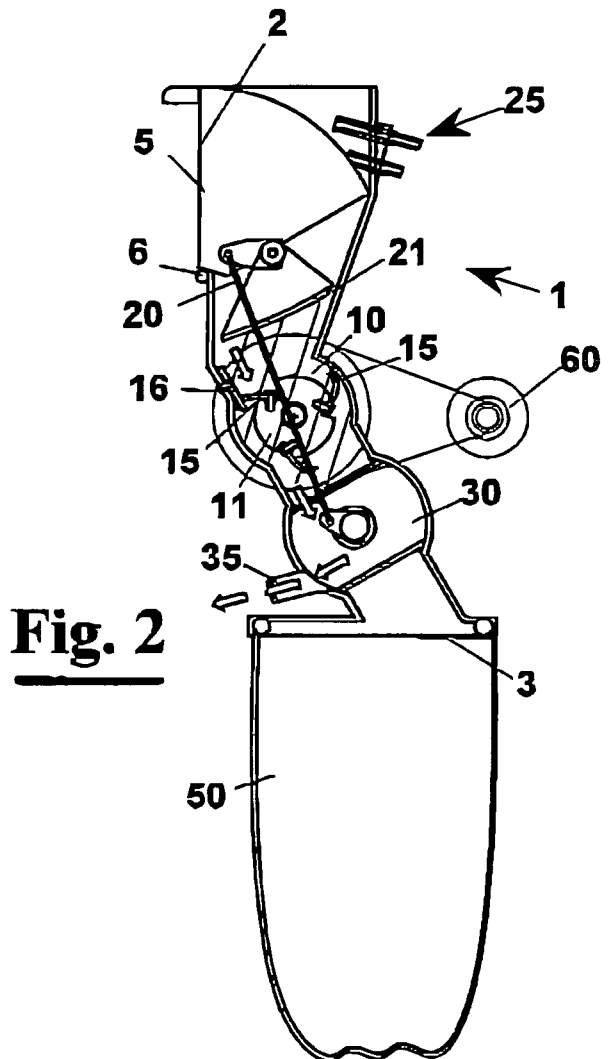
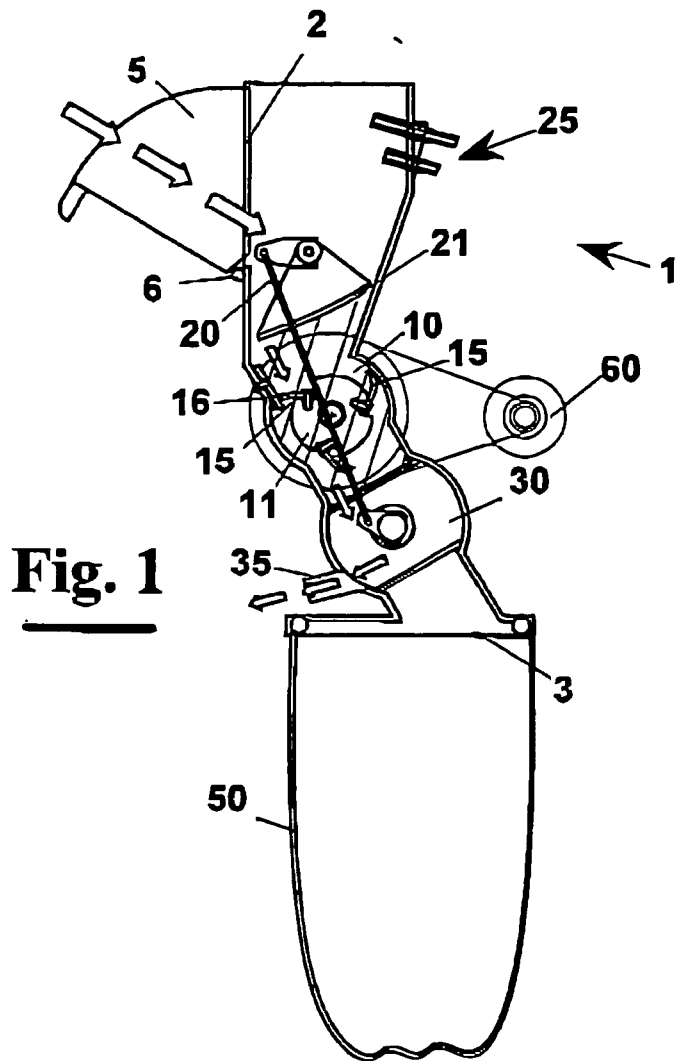
9. Organic waste treatment unit, according to claim 1, wherein said inlet has side walls of flexible material suitable to assist the introduction of waste in the grinding unit.

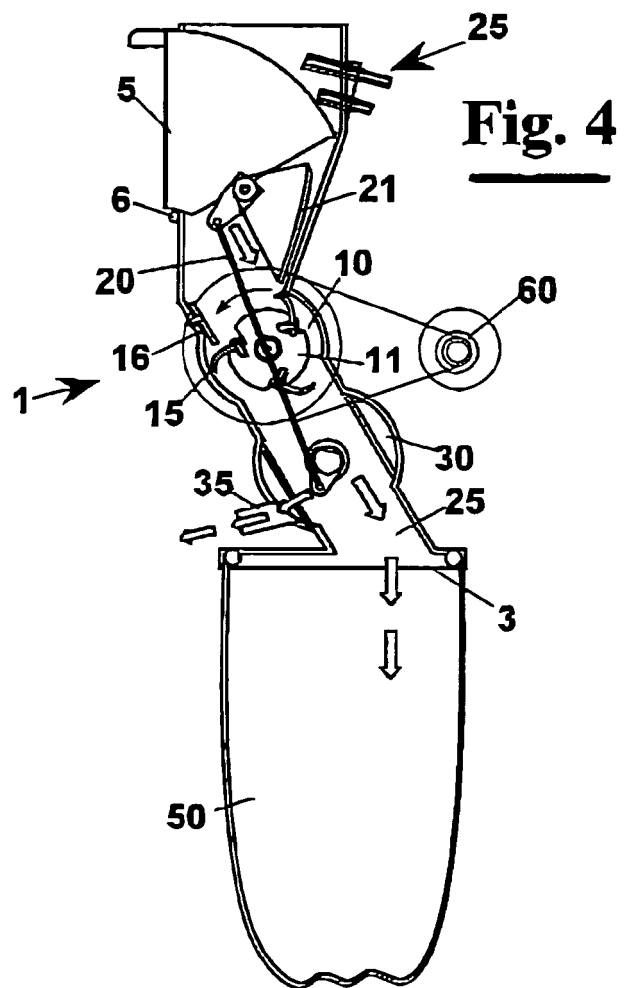
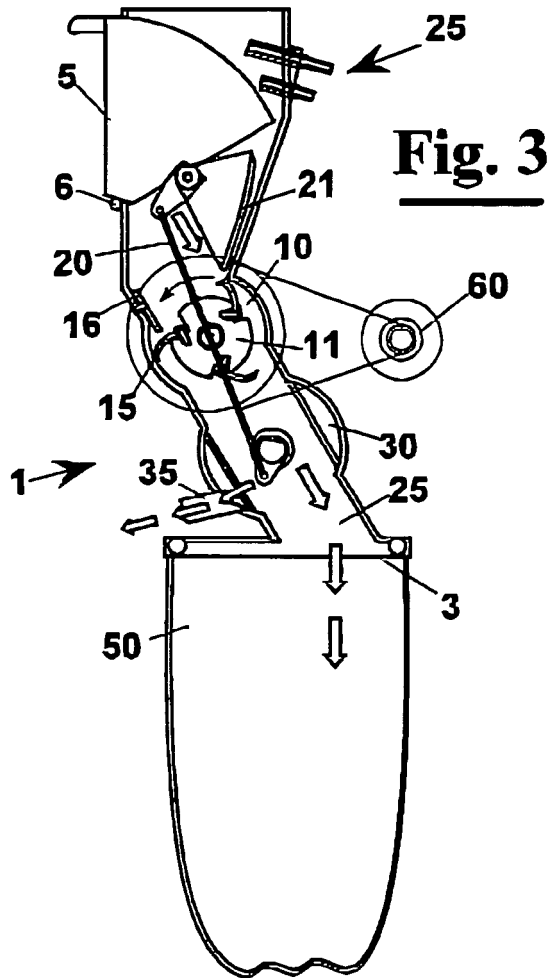
10. Organic waste treatment unit, according to claim 1,

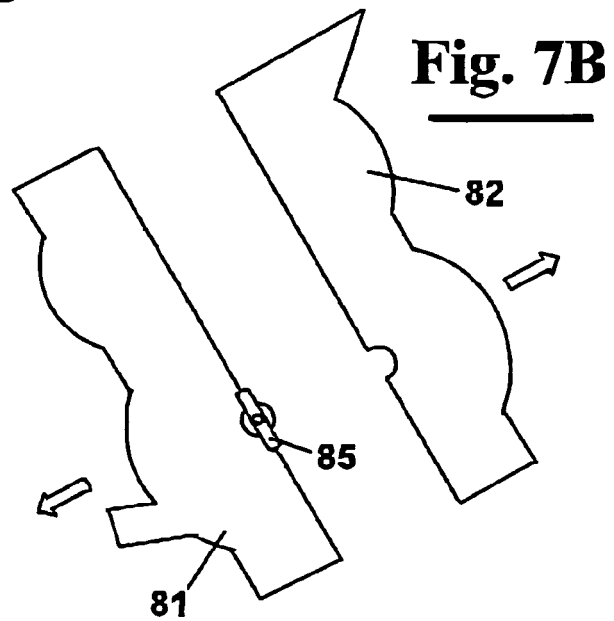
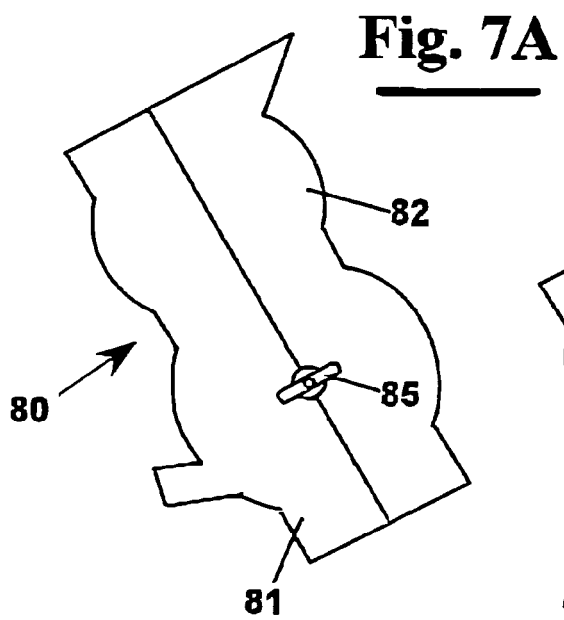
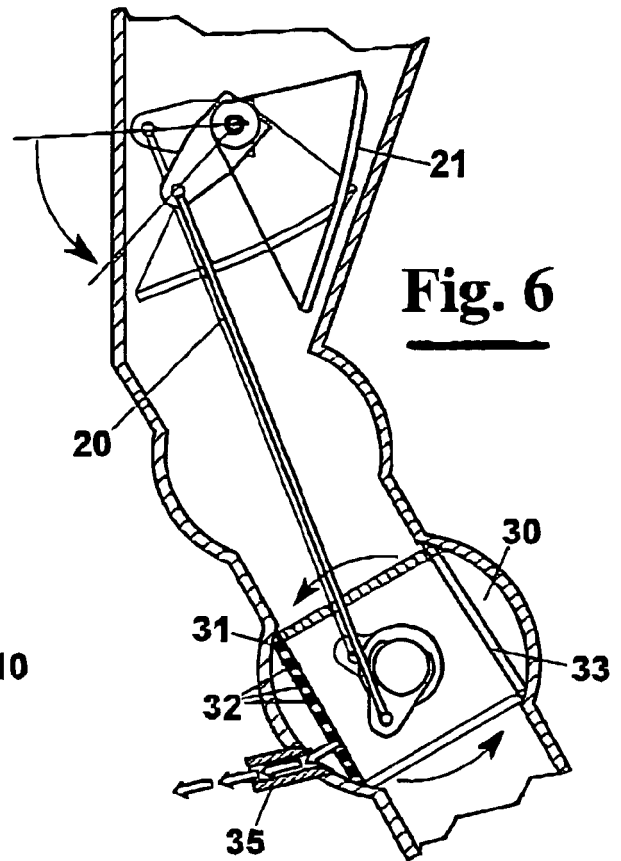
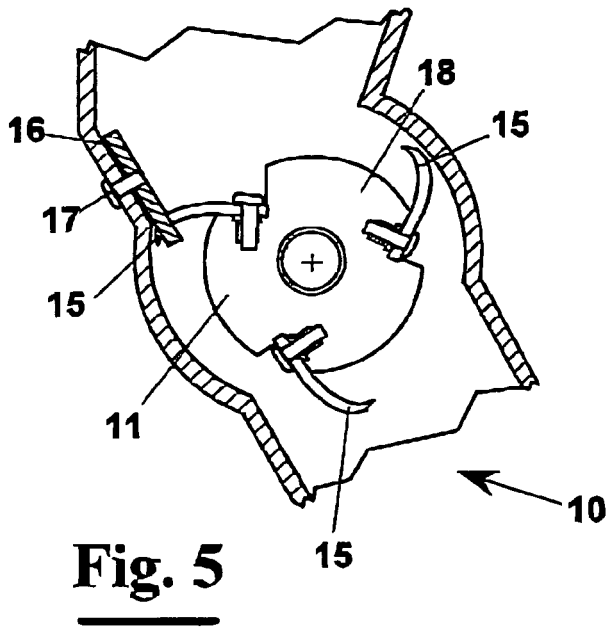
wherein said grinding means are operated by motor means associated to a control circuit that in determined operative conditions operates inversion of the speed of rotation of said grinding means up to a determined angular position, for then causing another inversion of the speed of rotation up to cutting again the waste.

11. Organic waste treatment unit, according to claim 1, wherein said control circuit measures the electrical power absorption of the motor and operates said inversion of speed of rotation of said grinding means when a measured value of said power absorption is different from a determined value.

12. Modular element for kitchen units **characterised in that** it comprises a grinding unit according to the previous claims, said modular element comprising a piece of furniture having a height, depth and width of standard size for kitchen units.







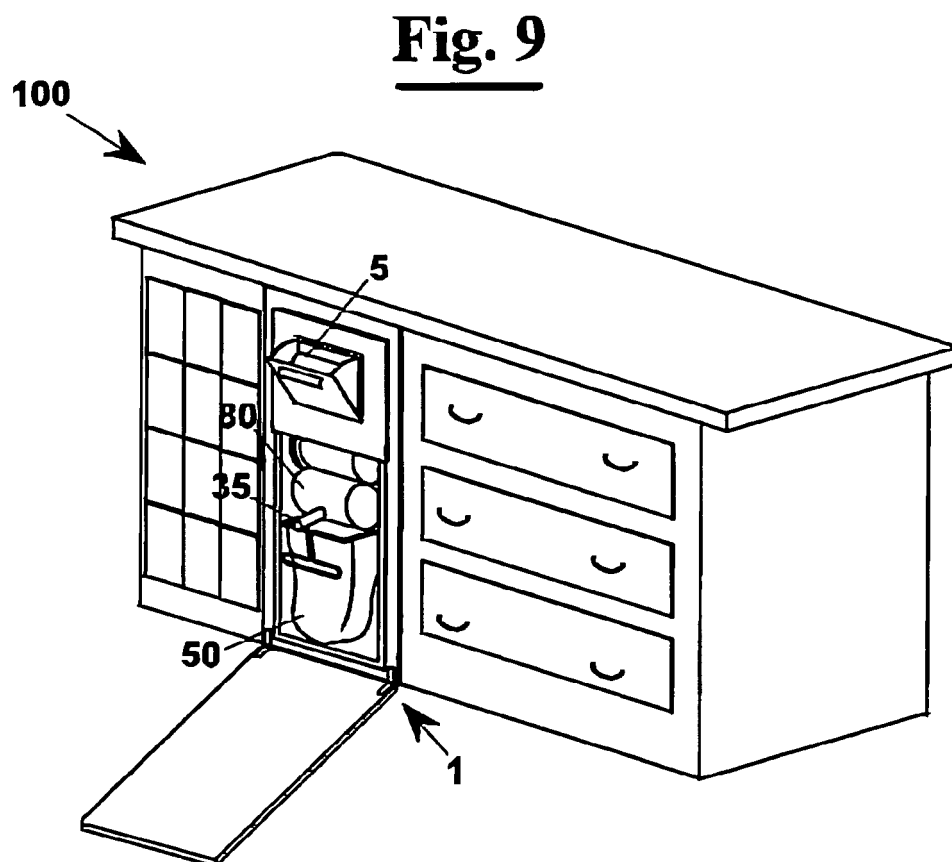
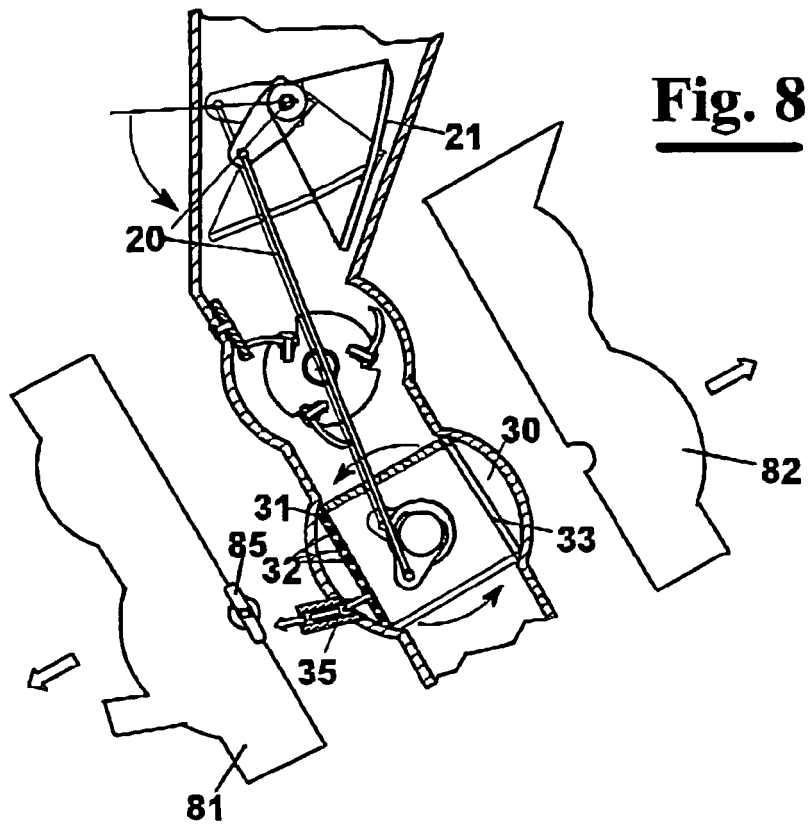
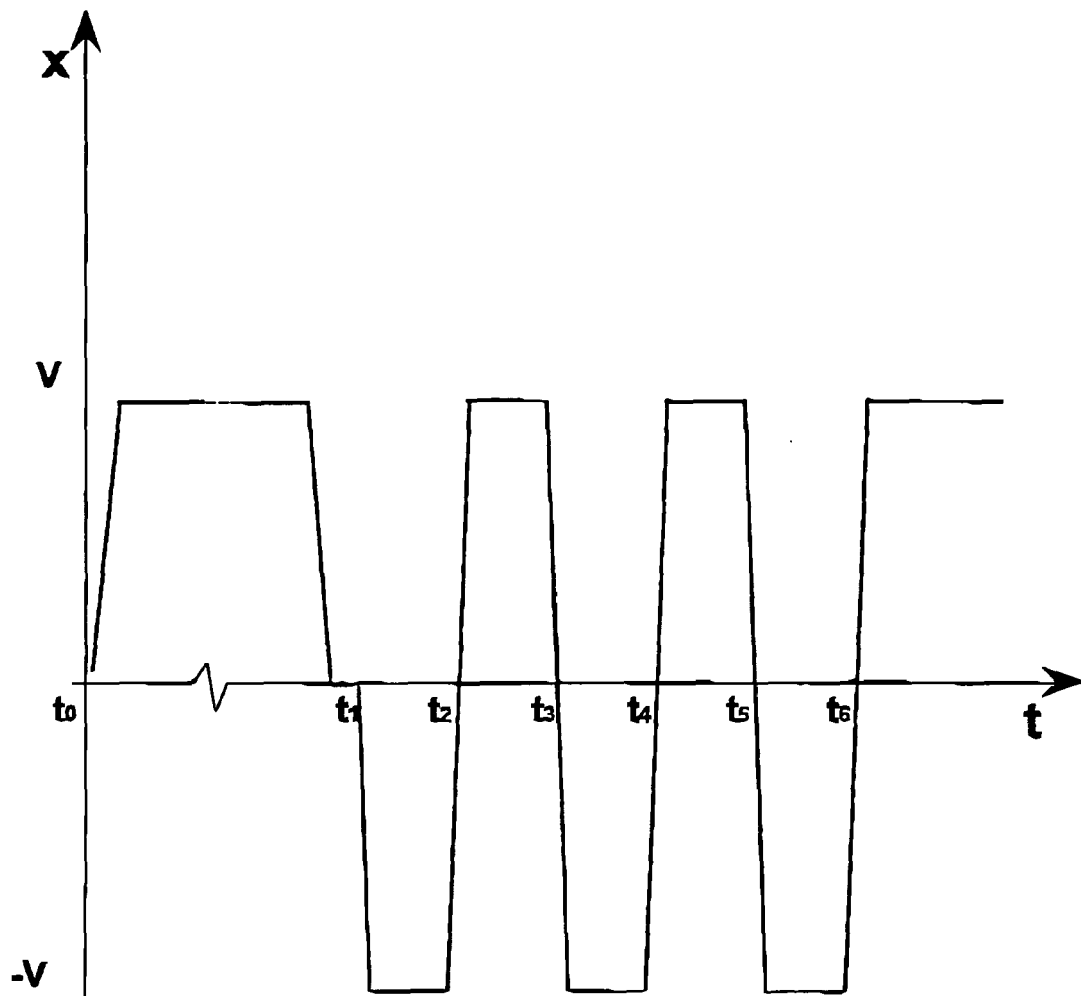


Fig. 10





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 05 01 3416

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 26 June 2006	Examiner Redelsperger, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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