United States Patent [19]

Lassiter

[11] **3,871,291**

[45] **Mar. 18, 1975**

[54] **APPARATUS FOR PROCESSING GARBAGE**

[75] Inventor: **Rush E. Lassiter,** Hammond, La.

[73] Assignee: **Floyd Rush Corporation,** Baton Rouge, La.

[22] Filed: **Apr. 6, 1973**

[21] Appl. No.: **348,616**

Related U.S. Application Data

[62] Division of Ser. No. 213,378, Dec. 29, 1971, abandoned.

[52] **U.S. Cl.** ..... **100/93 P,** 100/38, 100/39, 100/96, 100/112, 23/259.1, 241/23, 34/14

[51] **Int. Cl.** **B02c 11/08,** B30b 9/00, B30b 13/00

[58] **Field of Search** ..... 23/259.3, 259.1; 219/243, 219/94–98, 112, 93 P, 38, 39; 99/484, 483, 646; 241/23; 34/12, 14, 60; 426/335

[56] **References Cited**

UNITED STATES PATENTS

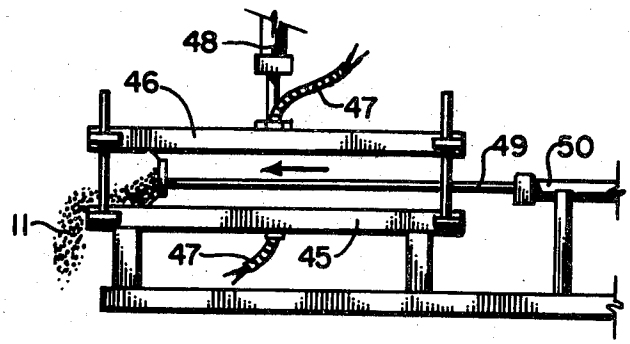
603,945	5/1898	Edgerton	100/38 X
994,047	5/1911	Wiselogel	23/259.3
1,210,408	1/1917	Brockhausen	99/483 X
2,977,214	3/1961	McLellan	23/259.1 X
3,477,649	11/1969	Dalberg et al.	241/24
3,478,192	11/1969	Fink	219/243
3,651,755	3/1972	Gati	100/98 R

Primary Examiner—Peter Feldman

[57] **ABSTRACT**

Apparatus for processing garbage according to the present invention includes a conveyor belt to convey the garbage to a grinder that comminutes the raw garbage. A hopper receives the comminuted raw garbage from the grinder and supplies it to feed screws feeding the raw comminuted garbage onto heated metal platens that compress and dry the garbage. A scraper is provided for removing adhered garbage from the platens, and a second hopper is disposed to receive the compressed and dried garbage scraped from the metal platens and to deposit it into a second grinder where it is comminuted for final disposition in containers.

19 Claims, 7 Drawing Figures



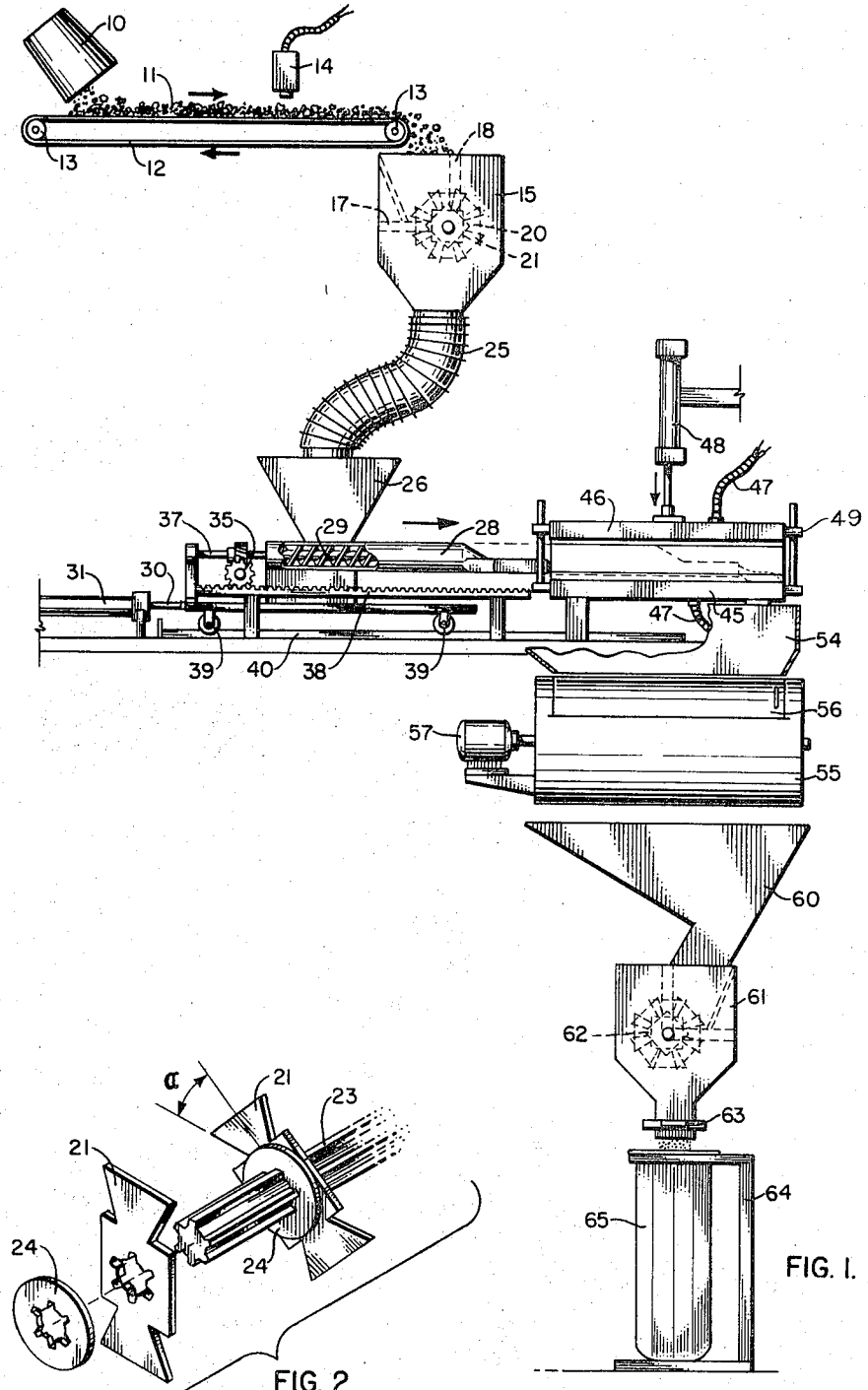

10
11
14
13
18
13
12
17
15
20
21
25
48
47
26
46
49
37
35
29
28
31
30
47
45
54
39
40
38
39
56
57
55
60
61
62
63
64
65

FIG. 1.

α
21
23
21
24
24

FIG. 2.

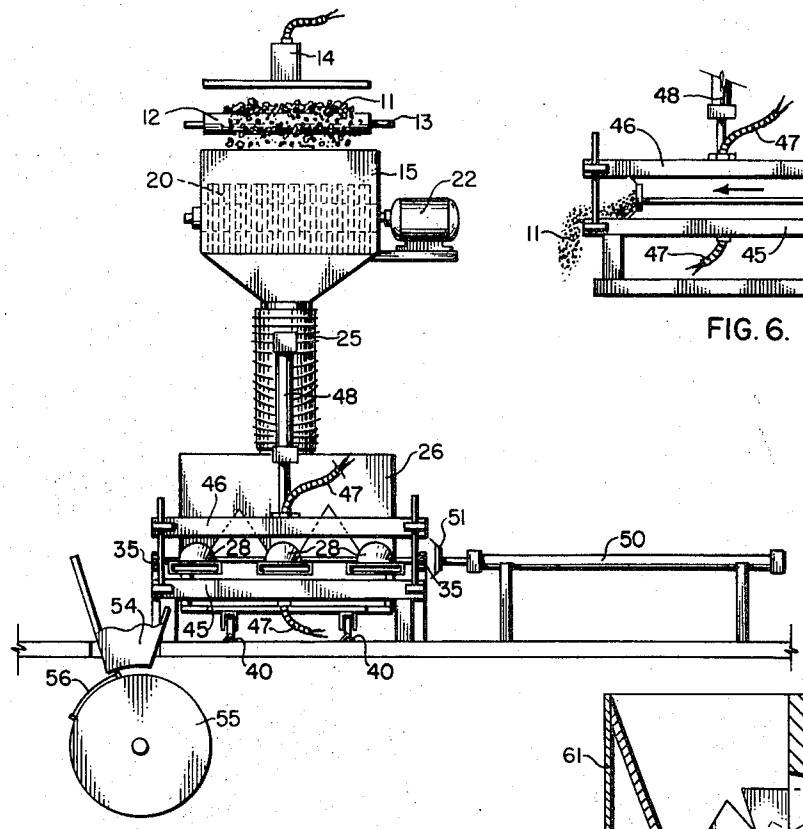


FIG. 6.

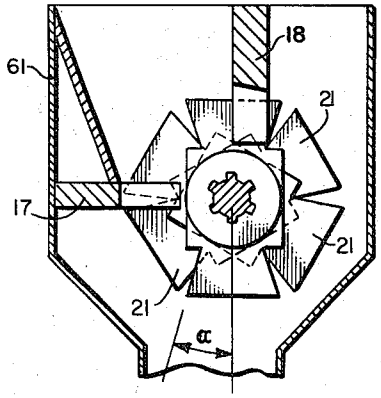


FIG. 4.

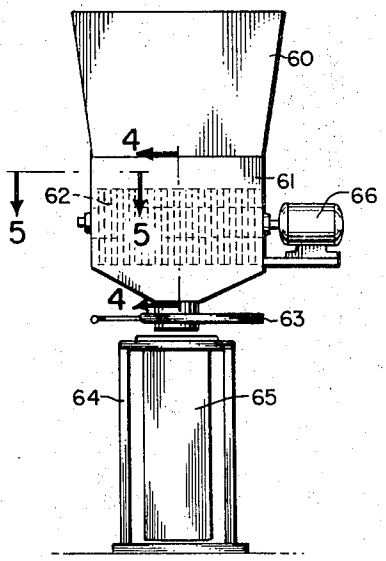


FIG. 3.

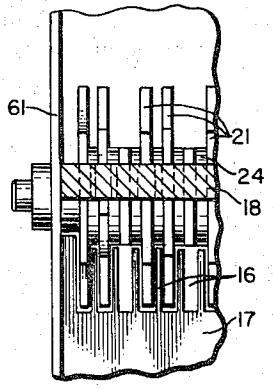


FIG. 5.

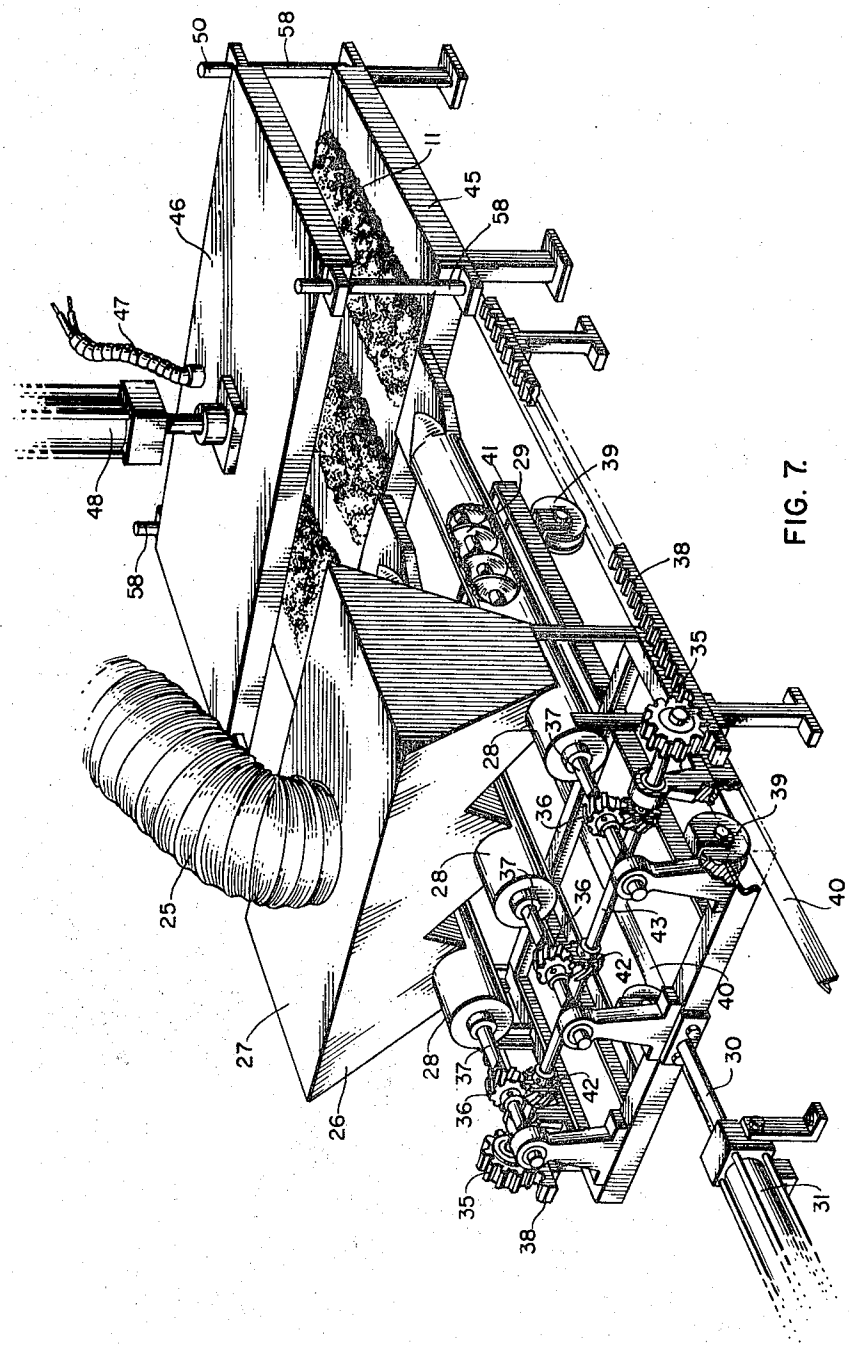

50
58
11
45
58
46
47
48
58
41
29
39
38
35
37
28
36
39
28
37
36
40
43
42
40
28
37
42
30
36
35
38
31
25
27
26

FIG. 7.

APPARATUS FOR PROCESSING GARBAGE

This application is a divisional of application Ser. No. 213,378 filed Dec. 29, 1971, now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to an improved apparatus for comminuting and drying various types of garbage and refuse. More particularly, the invention relates to an improved apparatus for comminuting and drying garbage composed primarily of food waste produced by dining establishments such as restaurants, cafeterias, and the like.

U.S. Pat. No. 1,101,129, issued June 23, 1914, U.S. Pat. N. 1.493,335, issued May 6, 1924, and U.S. Pat. No. 2,089,978, issued Aug. 17, 1937, disclose various processes and apparatus for treating and handling material such as garbage. U.S. Pat. No. 1,493,335 discloses a process whereby garbage is dried by pressing the garbage between a roller and the surface of a heated plate, thereby accomplishing heating and disintegration simultaneously. U.S. Pat. No. 1,101,129 teaches drying garbage by heating the garbage in an oven. U.S. Pat. No. 2,089,978 teaches drying the garbage by passing it on a conveyor through an oven.

Garbage discarded from dining establishments contains a high degree of nutrients since such garbage is primarily food waste. Such garbage is typically discarded by burning or dumping in a refuse dump. No benefit is usually realized from the various nutrients contained in the garbage.

It is an object of the present invention to provide apparatus for grinding and drying garbage.

It is another object of the present invention to provide apparatus for grinding and drying food waste.

It is still another object of the present invention to provide apparatus for producing fertilizer and animal food from disposed food.

The present invention provides apparatus for grinding and drying disposed food garbage and for processing the garbage into a comminuted material that may be used for fertilizer or for animal or poultry feed. The apparatus utilized in processing the garbage includes conveyor means for transporting unprocessed or raw garbage to the processing apparatus and comminuting the same to render it suitable for subsequent drying. Apparatus is also utilized to convey the comminuted raw garbage from the grinding apparatus to an upper and lower heated platen assembly and to deposit it in relatively thin layer form on the lower platen. The heated platens are then moved together, compressing and causing heating of the garbage layer. The pressure created by the platens on the garbage layer may be varied during the heating and compression process if desired or it may be continuously varied during the heating process depending upon the character of the garbage being processed or upon the results intended. After the garbage layer or layers have been suitably dried, the platens are moved apart and the garbage is removed in any suitable manner. The dried garbage then is comminuted and placed into containers for ultimate disposal.

BRIEF DESCRIPTION OF THE DRAWINGS

So that the manner in which the recited features, advantages and objects of the present invention as well as others, which will become apparent, are obtained and can be understood in detail, more particular description of the invention briefly summarized above may be had by reference to the embodiment thereof which is illustrated in the appended drawings, which drawings form a part of this specification.

It is to be noted, however, that the appended drawings illustrate only a single representative embodiment of this invention and such embodiment is not to be considered limiting of the scope of the invention, for the invention may admit to other equally effective embodiments without departing from the spirit and the scope hereof. In the Drawings:

FIG. **1** - is a side elevational view of the garbage processing system of the present invention;

FIG. **2** - is an exploded perspective view of grinding blades utilized in the grinding apparatus;

FIG. **3** is a front elevational view of the garbage processing system of the present invention;

FIG. **4** - is a fragmentary sectional view of FIG. **3** taken along lines **4—4**;

FIG. **5** - is a fragmentary sectional view of FIG. **3** taken along lines **5—5**;

FIG. **6** - is a fragmentary elevational view of the scraper structure of FIG. **1** showing the operation of the refuse scraper; and

FIG. **7** - is a perspective view of the apparatus for feeding garbage to the heated metal plates and having part thereof broken away and illustrating the raw garbage feed mechanism in detail.

DESCRIPTION OF THE PREFERRED EMBODMIMENT

Referring now to the drawings, in FIG. **1** is shown garbage container **10** which holds the raw garbage to be processed. The raw garbage is classified residual food product garbage from which most non-food product garbage has been removed. Container **10** may be a hopper or any other mechanism that provides raw garbage at an optimum quantity rate for efficient comminution. The raw garbage **11** is poured from container **10** onto endless conveyor belt **12** which revolves on rollers **13.** The raw garbage travels along conveyor belt **12** beneath a metal scanner **14** which detects any ferrous or non-ferrous metal in the garbage and stops conveyor belt **12** by actuating an electrical relay or by any other conventional means. The metal thus detected may be removed manually in the case of non-ferrous metal or by a magnet devise if ferrous metal is detected. Any other metal removal mechanism may be employed within the spirit and scope of the present invention. Metal scanner **14** can be any conventional metal-scanning device known in the art such as those used in airports to detect metal objects that might be carried by airline passengers boarding an aircraft.

The garbage **11** is dumped from conveyor belt **12** into an upper hopper **15** between anvil **17** and anvil **18** where it is contacted by an upper grinder **20.**

Food waste type garbage frequently contains small quantities of non-food material such as various plastic wrapping materials, paper, wood, glass, string, bone and the like. Grinding mechanisms capable of properly grinding most food wastes are incapable of properly comminuting such non-food materials. The grinding mechanism of the present invention is particularly designed to achieve proper grinding or comminuting of both food wastes and most non metal material that is of non-food character.

It is very important that upper grinder **20** be capable of grinding the raw garbage into fine particles for rapid drying. Upper grinder **20** may be any conventional grinder well known in the art that is suitable for comminuting both food waste and the non-food materials ordinarily accumulated with food wasts. It is preferred, however, that a grinder as shown in FIG. **2** be employed. The grinder shown in FIG. **2** has a series of blades **21** mounted on a splined shaft **23** and spaced apart by spacers **24.**

Upper grinder **20** and lower grinder **62,** shown in FIGS. **1** and **2,** may be identical. FIG. **5** shows a partly sectional view of grinder **62** in which blades **21** can be seen to rotate within slots **16** in cutting anvil **17.** Anvil **18,** as seen in FIG. **4,** is similar in design to anvil **17** and has slots (not shown) for receiving blades **21.** The blades **21** are preferably two trapezoids spaced 180° apart, as can be seen in FIG. **2.** The angle α of the sides of the trapezoidal blade may vary from about 0° to about 90°. Preferably the angle varies from about 30° to about 60° to achieve optimum comminution of both food waste and non-food waste material of the character described above. The angle between the center lines of each successive blade may vary from about 20° to about 90°, or more preferably from about 45° to about 90°. An angle of 60° is most preferred.

The grinder may be driven by an electric motor **22,** as indicated in FIG. **3.** After passing through the grinder the garbage falls down through the bottom of top hopper **15** and into flexible conduit **25** and is conducted by the conduit into hopper **26.** As can be seen in FIG. **7,** the flexible conduit **25** is attached to the top **27** of hopper **26** which prevents excess garbage from overflowing from the hopper.

The garbage falls downward into feed tubes **28,** as seen in FIG. **7,** and onto feed screws **29** contained in feed tubes. The feed tubes **28** are supported by a rolling table **41** having wheels **39** that are received by a track **40.** Movement of the reciprocating table **41** along track **40** is controlled by a piston rod **30** connected to a piston located in cylinder **31.** Cylinder **31** may be any conventional hydraulic or pneumatic cylinder well known in the art.

Feed screws **29** have shafts **37** extending from feed tubes **28** upon which a bevel gear **36** is mounted. Bevel gear **36** contacts bevel gear **42** which is aligned perpendicularly thereto. At each end of shaft **43** is disposed a pinion gear **35** which engages rack **38.** A one-way clutch (not shown) connects gear **35** to shaft **43.** The one-way clutch allows shaft **43** to turn only when table **41** is moving away from lower heating plate **45.** Such clutches are well known in the art and any conventional one-way clutch may be used. Therefore, feed screws **29** turn only when table **41** is moving away from plate **45.**

To deposit garbage on the lower heating platen **45,** rod **30** forces table **41** forward toward the lower heating plate or platen **45,** as indicated in FIG. **1.** After table **41** is fully driven toward lower heating plate **45,** as indicated by the dotted lines in FIG. **1,** rod **30** begins to retract and gear **35** begins to turn in a counterclockwise direction. The one-way clutch connecting gear **35** to drive shaft **43** is actuated and therefore shaft **43** is also rotated counterclockwise to drive feed screws **41.** As feed screws **41** turn garbage is forced out of feed tubes **28** onto hot plate **45** in broad layers of relatively even thickness. Comminuted garbage **11** is shown deposited on lower heating plate **45** in FIG. **7.**

After table **41** has been fully withdrawn and a full charge of garbage **11** has been deposited on lower heating plate **45,** upper heating plate or platen **46** is moved downward into contact with garbage **11** by piston rod **48** which may be identical to piston rod **30.** Upper heating plate **46** is guided down by guides **50.** Conduits **47,** shown in FIGS. **3** and **7,** attached to upper heating plate **46** and lower heating plate **45** contain electrical wiring for electrically heating the plates. The pressure on the garbage held between the two heating plates can be regulated by regulating the force applied to the piston rod **48** by the piston.

Depending upon the results intended, the heated platens may be brought into contact with the layer of comminuted garbage and a specific pressure may be maintained upon the garbage during the heating and drying cycle. If desired the platens may exert light or heavy pressure upon the comminuted garbage during the initial phase of the heating and drying process and the pressure may be increased or reduced in steps during other phases of the drying process. It may be appropriate to continuously vary the mechanical pressure applied by the platens to the garbage layer during the heating and drying process if such renders the product produced more acceptable for the intended use or if the garbage may be dried in a shorter period of time by employing such variations.

After the two heating plates have been in contact with the garbage for a period of time sufficient to dry the layers of comminuted garbage, the upper heating plate is withdrawn by rod **48.** A scraper **51,** as shown in FIG. **6,** may then be forced across lower heating plate **45** to scrape the dry, compressed garbage **11** from the lower heating plate. Scraper **51** is any conventional plate or scraper which will contact lower heating plate **45** and upper heating plate **46** when forced between the plates to remove garbage adhering to both plates **45** and **46.** The scraper **51** is actuated by piston rod **49** which may be identical to rod **30.** Plates **45** and **46** preferably have tapered edges (not shown) located on the side facing scraper **51** to enable scraper **51** to slide easily between the plates.

The dried garbage **11** scraped from heating plates **45** and **46** falls into upper garbage chute **54** and then gravitates from chute **54** into a rotatable receiving bin **55** through receiving bin opening **56.** Receiving bin **55** is rotated by an electric motor **57** to deposit the garbage into lower chute **60.** Lower chute **60** guides the garbage into lower hopper **61** which may be substantially identical in design to upper hopper **15** and contains a grinder that may, if desired, be substantially identical to upper grinder **20.**

After the dried garbage is ground it gravitates through the grinder onto closing device or valve **63.** The garbage may be further cooled, dried, and aereated by circulating drying air through the pulverant material. It is important to achieve drying of the material before it loses the heat applied during initial compression and drying to achieve efficient drying. Motor **66** may if desired be a combination motor and blower and may transport drying air into the grinding chamber to achieve final drying. Closing device **63** may consist of a flat plate or gate which can be moved laterally to open and close the bottom of hopper **61,** or may be any other conventional hopper closing device. When the bottom of hopper **61** is opened the processed garbage

falls into bag **65** held by bag stand **64.** The bag may then be sealed and removed.

In practicing the process of the present invention it is important that the temperature of lower heating plate **45** and upper heating plate **46** be maintained within a temperature range of from about 212°F to about 900°F. Upper plate **46** should be forced against the garbage for about 20 seconds to about 3 minutes, or more preferably from about 1 to about 3 minutes. Preferably the heating plates are maintained at a temperature of from about 300°F to about 600°F, or more preferably from about 400°F to about 550°F. The pressure applied on the garbage by the heating plates **45** and **46** ranges from about 20 to about 1000 pounds per square foot.

The pressure on the garbage may be applied by lowering upper plate **46** at a continuous rate, or upper plate **46** may be lowered in stages. Preferably, upper plate **46** is lowered until it barely touches the garbage and exerts no pressure thereon and is left in this position for a few seconds. Then upper plate **46** may be lowered until a pressure of 20 pounds per square foot is achieved and left in this position for a period of time. Further increases in pressure may be made as desired.

In all of the following examples the upper and lower heating plates were maintained at a temperature of about 300°F, the force on the garbage was about 550, and the total amount of time the garbage was held between the two heating plates was 1 minute.

The processed garbage was analyzed with the following results:

Sample Processed Garbage	pH	% Moisture	% Ash	% Ca	% P	% N	% K
1 — Dark	5.7	7.25	7.44	0.37	0.20	1.42	0.13
2 — Medium	5.5	7.74	7.20	0.37	0.22	1.53	0.13
3 — Light	4.9	8.51	4.31	0.25	0.23	2.22	0.21

As can be seen from the foregoing examples, the processed garbage is high in various mineral content which makes it suitable for use as a fertilizer or as animal and poultry feed.

The foregoing is considered as illustrative only of the principles of the invention, Further, since numerous modifications or changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed is:

1. An apparatus for drying and compressing garbage, comprising:
- lower hot platen means,
- upper hot platen means, means for moving said upper and lower hot platen means toward and away from one another,
- feed means for placing garbage on said lower hot platen, and
- scraper means for scraping garbage from said lower hot plate means and said upper hot platen means.

2. The apparatus of claim **1** wherein said lower hot platen means comprises a flat plate containing electrical wiring for heating said plate.

3. The apparatus of claim **1** wherein said upper hot platen means comprises a flat plate containing electrical wiring for heating said plate.

4. The apparatus of claim **1** wherein said scraper means comprises a scraper connected to a piston rod, said piston rod being aligned parallel to said upper and said lower hot platens means, said scraper being positioned to contact both interior surfaces of said upper hot platen and said lower hot platen to scrape said garbage therefrom.

5. The apparatus of claim **4** wherein said upper hot platen and said lower hot platen have tapered edge means located on the sides of said platens adjacent said scraper means to facilitate receipt of said scraper between said platens.

6. The apparatus of claim **1** wherein said feed means comprises feed tube means containing feed screw means.

7. The apparatus of claim **6** wherein said feed tube means is generally cylindrical in shape and is adapted to receive said garbage.

8. The apparatus of claim **7** wherein said feed screw means comprises a rotatable screw.

9. An apparatus for drying and compressing garbage, comprising:
- grinding means for grinding said garbage,
- lower hot platen means,
- upper hot platen means, means for moving at least one of said upper and lower hot platen means toward and away from the other of said hot platen means,
- feed means for placing garbage on said lower hot platen means,
- conduit means connecting said grinding means to said feed means, and
- scraper means for scraping garbage from said upper and said lower hot platen means.

10. The apparatus of claim **9** wherein each of said lower hot platen means and said upper hot platen means each comprise a flat plate containing electrical wiring for heating said plates.

11. The apparatus of claim **10** wherein said scraper means comprises a scraper connected to a piston rod, said piston rod being aligned parallel to said upper and said lower hot platens, said scraper being positioned to contact both interior surfaces of said upper hot platen and said lower hot platen to scrape garbage therefrom.

12. The apparatus of claim **9** wherein said feed means comprises feed tube means containing feed screw means, said feed tube means being generally cylindrical in shape and adapted to receive said garbage, said feed screw means comprising a rotatable screw.

13. The apparatus of claim **12** wherein said feed tube means is connected to rolling table means, said rolling table means being adapted to roll said feed tube means between said upper hot platen means and said lower hot platen means.

14. The apparatus of claim **13** wherein said feed means contains means for turning said feed screw means to deposit garbage on said lower hot platen means as said feed tube means is drawn over said upper hot platen means and said lower hot platen means.

15. The apparatus of claim 9 wherein said grinding means being generally in the shape of two trapezoids spaced 180° apart, the edge of said trapezoids forming an angle with the centerline of said trapezoids between 0° and 90°, the angle between the centerline of each successive blade of said grinder varying from about 20° to about 90°.

16. The apparatus of claim 9 wherein said apparatus includes conveyor belt means for conveying garbage to said grinder.

17. The apparatus of claim 16 wherein said apparatus includes metal detection means located sufficiently close to said conveyor belt means to detect any metal present in said garbage.

18. The apparatus of claim 9 wherein said apparatus includes second grinding means for grinding garbage scraped from said hot platens.

19. The apparatus of claim 9 wherein said apparatus includes means for placing said garbage in containers.

* * * * *