United States Patent

Frank

[15] **3,687,062**

[45] **Aug. 29, 1972**

[54] **APPARATUS FOR CRUSHING AND DISPOSING OF CANS AND GLASS CONTAINERS**

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[22] Filed: **March 13, 1970**

[21] Appl. No.: **19,222**

[52] **U.S. Cl.** **100/91,** 100/49, 100/139, 100/DIG. 2, 100/176, 100/233, 209/38, 241/79.1, 241/99, 241/155, 241/DIG. 22

[51] **Int. Cl.** **B30b 9/00**

[58] **Field of Search**.....100/DIG. 2, 49, 91, 137, 138, 100/139, 176, 233; 241/99, 79, 79.1, 14, 155, DIG. 22; 209/38

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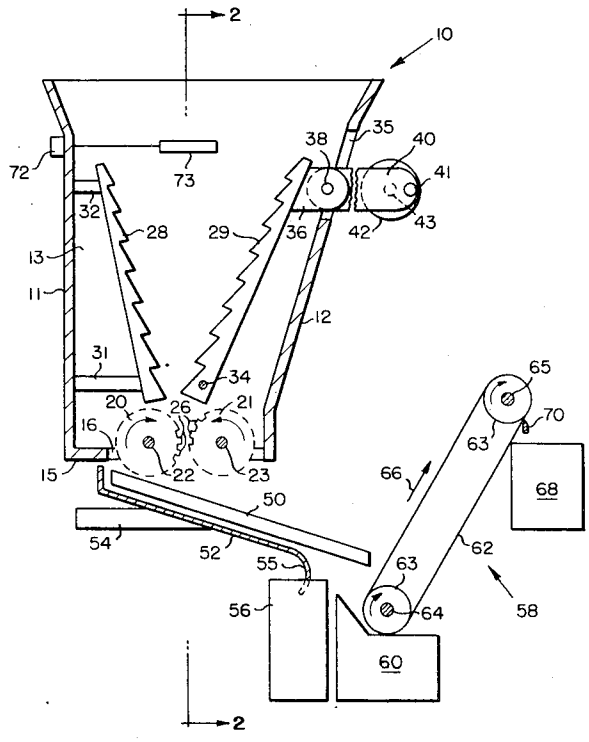
[57] **ABSTRACT**

Discarded glass containers and cans are dumped into a hopper containing a crushing mechanism which flattens the cans and pulverizes the glass containers. A vibrating grid beneath the crushing mechanism causes the pulverized glass pieces to drop into a first container, but guides the flattened cans onto a nearly vertical conveyor, by which magnetizable cans are conveyed upwardly to a second container, while non-magnetizable cans fall by gravity to a third container.

2 Claims, 3 Drawing Figures



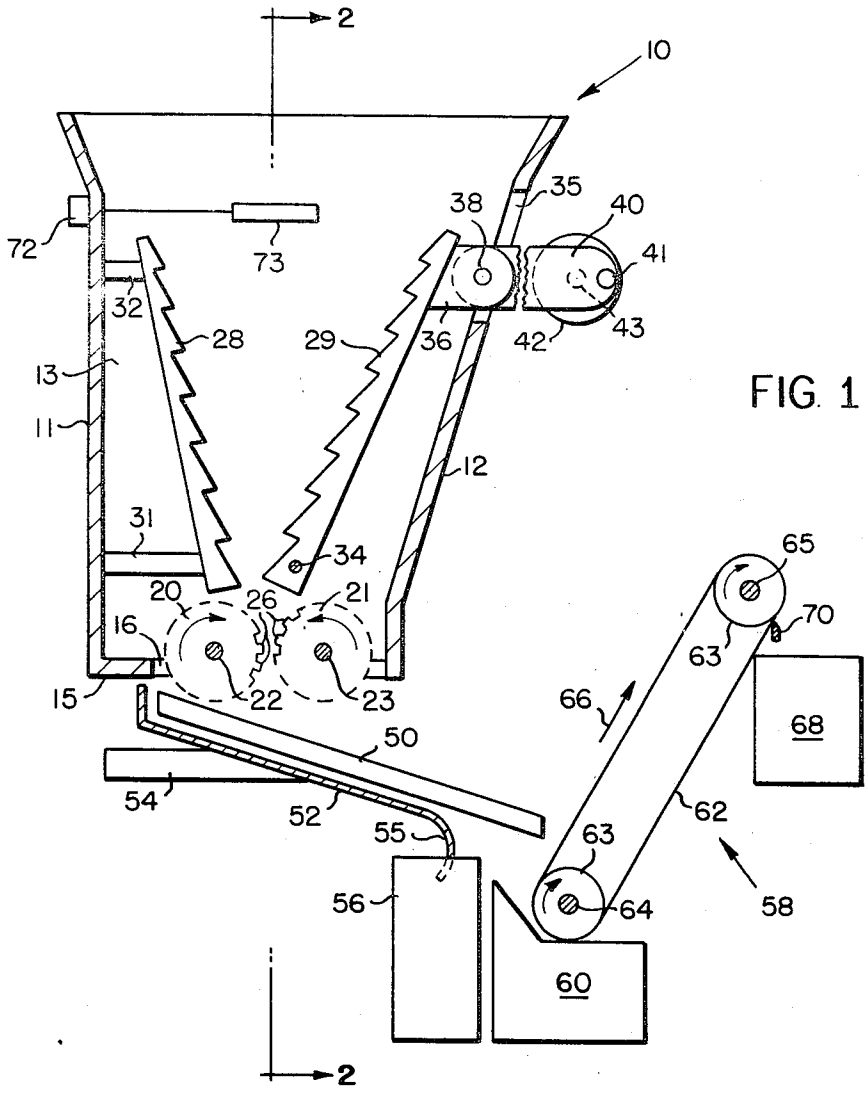


FIG. 1

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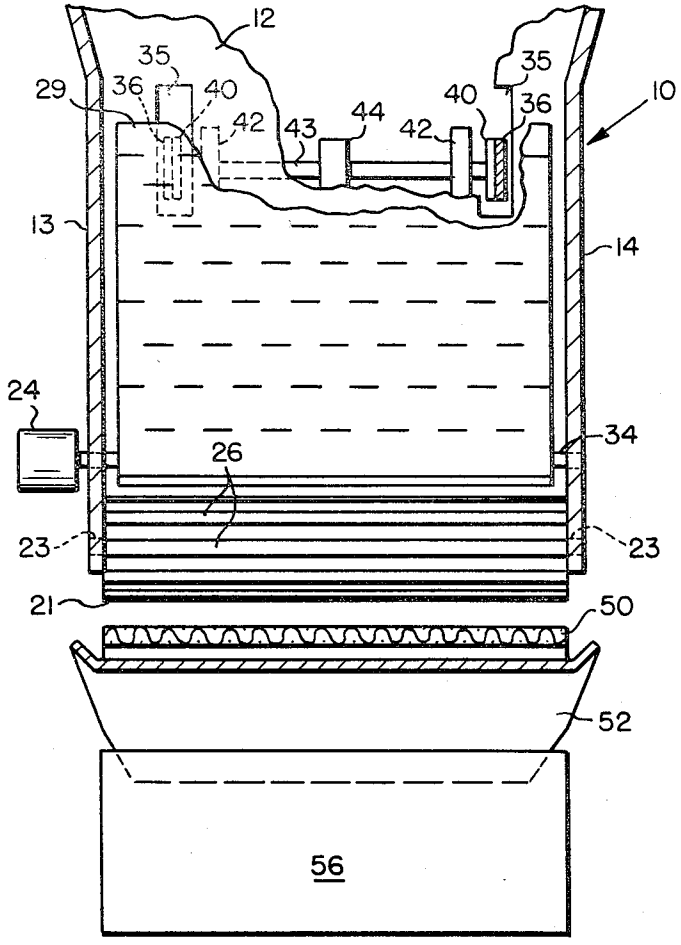

FIG. 2

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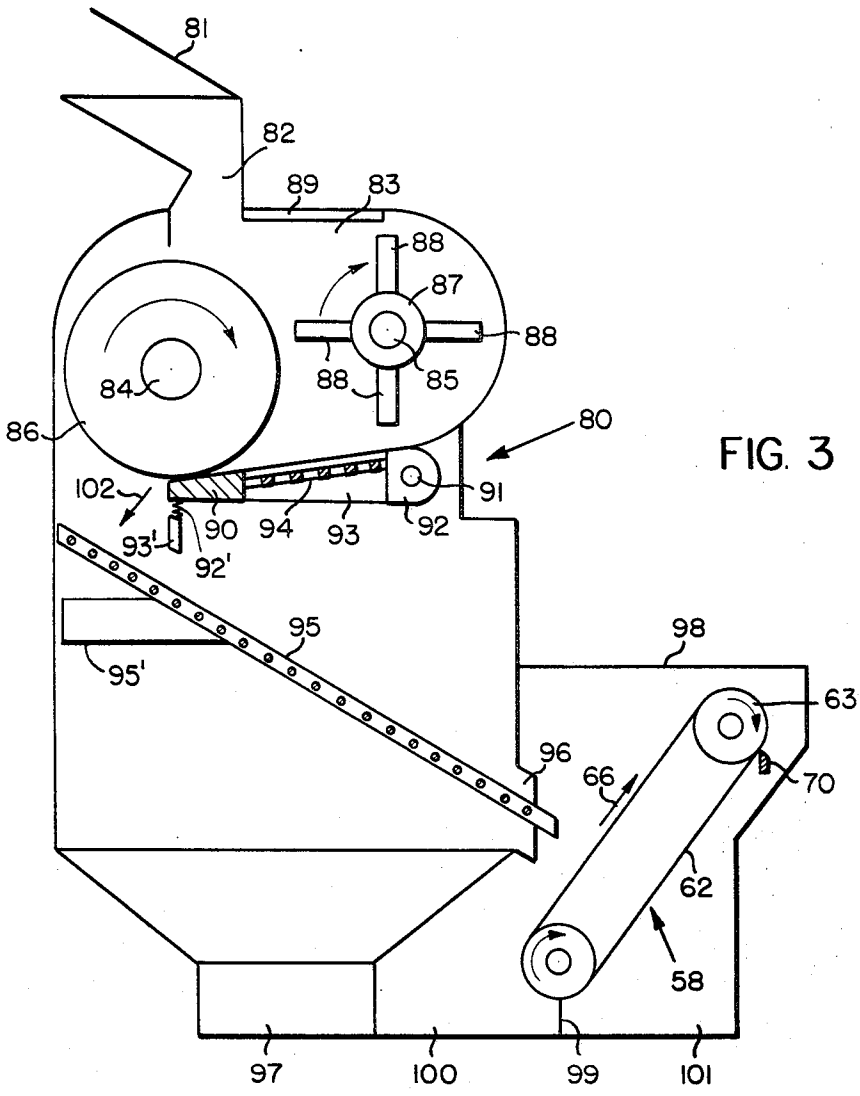

FIG. 3

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APPARATUS FOR CRUSHING AND DISPOSING OF CANS AND GLASS CONTAINERS

This invention relates to apparatus for disposing of empty glass containers and cans. The apparatus of this invention is for homes, restaurants, stores, and any establishments where food and drink are dispensed, creating a problem of disposing of empty glass containers and cans.

In recent years the disposal of trash has become an ever more pressing and urgent problem. A high percentage of processed foods are distributed in metal cans and/or glass containers. These are bulky and when empty take up a lot of room in a trash barrel.

It is an object of this invention to alleviate the problem of disposing of sanitary waste by eliminating bulky, non-combustible materials from the waste. To this end it is an object of this invention to provide apparatus for pulverizing glass containers. To this end, also, it is an object of the invention to provide apparatus for flattening empty cans.

A further object of this invention is to provide apparatus for pulverizing empty glass containers and separating discarded metal and glass containers from one another.

A more specific object of this invention is to provide apparatus of the type described, which is capable of pulverizing glass containers and flattening metal cans and of separating the pulverized glass from flattened metal containers, and of separating flattened magnetic from non-magnetic metallic containers.

Other objects of the invention will be apparent hereinafter from the specification and from the recital of the appended claims, particularly when read in conjunction with the accompanying drawings.

In the drawings:

FIG. 1 is a fragmentary elevational view of container processing apparatus made in accordance with one embodiment of this invention, portions of the apparatus being cut away and shown in section;

FIG. 2 is a fragmentary sectional view taken along the line 2—2 in FIG. 1 looking in the direction of the arrows; and

FIG. 3 is an elevational view illustrating schematically, and partly in section, container processing apparatus made in accordance with a second embodiment of this invention.

Referring now to the drawings by numerals of reference, and first to the embodiment illustrated in FIGS. 1 and 2, 10 denotes a hopper having a pair of spaced side walls 11 and 12, a pair of spaced end walls 13 and 14, and a bottom wall 15 containing an elongate opening 16.

Mounted to rotate in the opening 16 in spaced, parallel relation to one another are two crushing rolls 20 and 21. These rolls are fixed to shafts 22 and 23, respectively, which are rotatably journaled at opposite ends in end walls 13 and 14 of the hopper. The shafts 22 and 23 are geared or otherwise operatively connected to one another to be driven in unison, and in opposite directions, by a conventional electric motor 24 (FIG. 2) or the like. In its peripheral surface each roll 20 and 21 has a plurality of longitudinally extending grooves, which form parallel ribs or teeth 26 for pulverizing purposes.

Mounted in the hopper above the pulverizing rolls 20 and 21 are two crushing jaws 28 and 29 whose confronting faces are serrated or saw-toothed. Jaw 28 is fixed to the hopper side wall 11 by a pair of spaced brackets 31 and 32, which support this jaw in a positioned inclined slightly to the vertical, and with its lower edge positioned slightly above the crushing roll 20. The jaw 29 is pivoted at its lower end on a shaft 34, which is fixed at opposite ends in the hopper end walls 13 and 14 slightly above roll 21.

Projecting from the back of jaw 29 adjacent its upper end, and into a pair of spaced slots 35 in the hopper wall 12, are two, spaced arms 36. The arms 36 are pivotally connected by pins 38 (only one of which is illustrated in FIG. 1) to the inner ends of a pair of links or crank arms 40, which also extend into the slots 35. At its opposite end each link 40 is pivotally connected by a crank pin 41 (FIG. 1) to one of two eccentrics 42, which are fixed to opposite ends of a common drive shaft 43 for rotation thereby. Shaft 43 is journaled intermediate its ends in a block 44 (FIG. 2) for rotation by a conventional motor (not illustrated).

When the shaft 43 is rotated, the crank pins 41 cause the arms 40 to pivot the jaw 29 toward and away from the jaw 28 about the axis of shaft 34.

Mounted beneath the hopper 10 to register adjacent its upper end with a nip formed between the pulverizing rolls 20 and 21 is a conventional, inclined bar screen 50. Mounted beneath the screen 50 is a metal chute 52, which is supported on a conventional vibrator device 54. When the device 54 is energized, it operates to vibrate both the chute 52 and the screen 50 in a conventional manner.

As shown more clearly in FIG. 1, the lower end 55 of the chute 52 curves downwardly and into the upper end of a trash container 56, which is adapted to collect pulverized waste glass. The lower end of the screen 50 projects beyond the lower end 55 of the chute 52 and overlies the lower end of an upwardly inclined conveyor 58, and a further trash receptacle 60, which is mounted beneath the lower end of conveyor 58.

Conveyor 58 comprises a flexible, magnetic belt 62, which is mounted in conventional manner to travel about spaced, parallel pulleys 63. These pulleys are mounted on spaced, parallel shafts 64 and 65, at least one of which is adapted to be driven by conventional means (not illustrated in a direction to cause the upper run of the conveyor belt to travel upwardly in the direction indicated by arrow 66 in FIG. 1.

Mounted beneath the upper end of the conveyor 58 is a further trash container 68. Mounted above this container with its edge positioned adjacent the upper end of the lower reach of the belt 62 is a scraper blade 70.

To control the operation of the motor 24 and the motors (not illustrated) for the vibrator 54 and conveyor 58, the several motors are connected in conventional manner to a common, normally open switch 72 (FIG. 1), which is mounted, for example, on the outside of the hopper 10 adjacent its upper end. The switch is controlled by an elongate operating arm or whisker 73, which projects from the switch into the center of the hopper above the upper ends of the jaws 28 and 29 to be struck and triggered by any trash that is dumped into the top of the hopper. When the arm 73 is triggered, it closes switch 72, which in turn actuates the motor 24 and them motors for the vibrator 54 and conveyor 58.

A conventional time-delay device may be employed to maintain the motors energized for a predetermined period of time necessary to assure that the load of trash that triggered the switch **72**, will be completely pulverized or crushed and separated before the several motors once again become deenergized.

Alternatively, of course, or in addition to the whisker-operated switch **72**, a conventional, manually-operated On-Off switch may be employed to control the operation of these motors.

In use, empty glass containers and cans are dumped or fed into the top of hopper **10**, so that as they fall, they strike the actuating arm **73**, and energize the associated drive motors. The jaw **29** then begins to oscillate about the shaft **34** toward and away from the jaw **28** so that glass containers disposed between these jaws are broken and metal containers are crushed and compacted. The shattered bottles and crushed cans then drop downwardly into the nip between the pulverizing rolls **20** and **21**, where the glass fragments are pulverized, and the crushed cans are pressed into flat shapes as they pass downwardly between the rolls, and onto the vibrating mesh or screen **50**. The pulverized glass fragments pass through screen **50** and onto the vibrating chute **52**, which guides the glass downwardly into the upper end of the container **56**. The compressed, flat cans, on the other hand, slide downwardly over screen **50**, and onto the lower end of the travelling belt **62** of the conveyor **58**. The belt **58** is made of magnetic or electromagnetic material. Non-magnetic cans, such as those made from aluminum, slide downwardly off the lower end of conveyor **58** and into the container **60**. Tin cans and other containers made of magnetic materials, on the other hand, are magnetically attracted to the upwardly travelling run of the belt **62**, and are thus conveyed by the belt upwardly in the direction of arrow **66** toward the container **68**. After they travel over the pulley **63**, the magnetizable cans on the belt **62** are scraped therefrom by the scraper bar **70**, and fall into container **68**.

Through operation of the described apparatus, pulverized glass is automatically fed into container **56**, non-magnetic crushed cans drop into container **60**, and magnetic cans or containers are carried upwardly and into container **68**.

Referring now to the embodiment illustrated in FIG. **3**, wherein like numerals are employed to designate elements similar to those used in the embodiment of FIGS. **1** and **2**, **80** denotes generally a hopper having a hinged cover **81** on its upper end. Beneath the cover **81** the hopper has a narrow throat **82** through which cans and glass containers may be dropped into a crushing chamber **83**. Mounted to rotate about spaced, parallel shafts **84** and **85** in the chamber **83** are a crushing roll **86** and an impingement-type disintegrator **87**. This disintegrator has four, equi-angularly spaced, axially extending bars **88** that project radially from the peripheral surface of its hub.

Secured to the hopper at the top of chamber **83** between the crushing roll **86** and the disintegrator **87** is a breaker plate **89**, against which the metal and glass containers are thrust by the rotating blades **88** on the disintegrator **87**, as described in more detail below.

Pivotally mounted adjacent one end thereof on a shaft **91**, which is mounted in the bottom of chamber **83** beneath and parallel to the shaft **85**, is a pivotal breaker arm **92**. The arm **92** has a shoe portion **90** which is urged by an adjustable spring **92'** into engagement with the underside of the crusher roll **86** tangentially thereof. Spring **92'** is interposed between a block **93'** and shoe **90** which is secured to one side wall of hopper **80**. Mounted in an opening **93** in the breaker arm **92** is a rigid screen or grizzly **94**.

Mounted in hopper **80** beneath chamber **83** is an inclined grizzly or screen **95**, which is adapted to be vibrated by a conventional vibrating device **95'**, which may be similar to that employed in the first embodiment. The grizzly **95** extends from a point adjacent and beneath the roll **86**, downwardly and through a lateral opening or discharge port **96** formed in the side of the hopper **80** adjacent its lower end. Immediately beneath the grizzly **95** a first bin **97** is formed in the bottom of the hopper to collect crushed glass that filters downwardly through the grizzly **95**.

Mounted in a second compartment **98** formed at the lower end of hopper **80** exteriorly of the discharge opening **96** is an inclined conveyor **58**, which, as in the first embodiment, has a magnetic belt **62**, the upper run of which is located just beneath the lower or discharge end of grizzly **95**. The conveyor **58**, and a partition **99** located in the compartment **98** beneath the conveyor **58**, operate to divide the compartment **98** into two sections **100** and **101**, respectively.

Any conventional drive means may be employed for rotating the shafts **84** and **85** in unison, and, for example, clockwise about their axes as illustrated in FIG. **3**. Similarly, a further drive mechanism or motor can be employed for driving the belt **62** so that its upper run travels upwardly in the direction indicated by arrow **66**, when in use. These several drive mechanisms may be connected to a common manually operable On-Off switch for operation thereby. Alternatively, or in addition to the manually operable switch, a switch can be mounted on the hopper **80** to be closed by the cover **81**, when the latter is moved down to its closed position, thereby automatically to cause the several drive mechanisms to operate for a predetermined period after loading a quantity of refuse into the chamber **82**.

In use, empty containers are dumped into the upper end of the hopper **80**; the cover is then closed, closing an electric switch to close the electric circuits to actuate the several drive mechanisms. Upon actuation, the impingement type disintegrator **87** drives its radial bars **88** into the mass of containers. This forceful action serves to fragmentize the glass containers through the rapid sequence of multiple impacts which occur between the radial bars **88** and the breaker plate **89**. The high speed rotary action also tends to crush the metal containers and to force them into the nip angle formed by the crusher roller **86** and the crushing shoe **90** of the breaker arm. The surface of the crusher roller **86** may be textured or otherwise provided with a plurality of spaced pyramidal teeth so that the roll surface will have a better "bite" on the smooth surfaces of the metallic cans or containers that are being processed.

After fragmentation, the preponderance of the broken glass falls through the grizzly type separator **94** which forms the central or principal section of the breaker arm **92**, thereby effectively preventing its entrainment with or entrapment in the metal containers,

which are flattened and consolidated by being drawn under pressure between the crushing roller **86** and the shoe **90** prior to ejection onto the top of the vibrating grizzly.

The degree of flattening and consolidation of the metal scrap is controlled by varying the tension or stress applied to the breaker arm; the more pressure applied by this means, the greater the degree of flattening or consolidation.

The fragmentized glass falling through the apertures of the breaker arm grizzly **94** drops upon the vibrating grizzly **95** and passes through the openings between the grizzly bars into the processed glass bin **97**. The apertures of the vibratory grizzly **95** are preferably made of the same size as the apertures between the bars of thegrizzly **94**. The relatively small proportion of the fractured glass that is too large to pass through the apertures of the breaker arm grizzly **94** is carried through the single roll breaker type crusher **86** with the crushed metals and ejected therewith upon the vibrating grizzly, and falls directly into the processed glass bin **97**. The teeth on the crusher roll **86** draw the crushed cans off of the free end of arm **92**, simultaneously flattening the cans and causing them to drop in the direction of arrow **102** onto the vibrating grizzly **95**. The flattened cans then are discharged by the screen out of the opening **96** and onto the magnetic belt **62** of the conveyor **68**, so that as in the case of the first embodiment, the non-magnetic cans (e.g., aluminum cans) slide down off of the lower end of the conveyor into the processed aluminum bin **100**, while the magnetizable ferrous cans are conveyed by the belt **62** upwardly over the top pulley **63** of the conveyor and into the path of the scraper **70**, which separates the magnetizable cans from the belt **62**. These cans then drop into the processed metal bin **101**.

The flexible belt **62** employed in the conveyor **58** may be of the extruded permanent magnet type sold by B. F. Goodrich under the trademark "Koroseal."

From the foregoing it will be apparent that applicant has developed a very efficient and reliable means for compacting and separating discarded glass and metal containers one from the other. Moreover this apparatus has the further advantage that it automatically flattens and separates magnetizable and non-magnetizable metal cans or containers from each other. Since most present-day non-magnetic cans are made from aluminum; and since discarded aluminum cans may be reprocessed, and hence are valuable, this apparatus also eliminates the needless waste of these salvageable items. The pulverized glass and the flattened magnetic metal type cans are also salvagable.

Having thus described my invention, what I claim is:

1. Apparatus for crushing and selectively disposing of discarded glass containers and cans, comprising

a vertically disposed hopper having an inlet in its upper end,

a first pair of spaced crushing members mounted in said hopper beneath said inlet in downwardly converging relation, one of said members being movable relative to the other to crush the glass containers and cans inserted through said inlet,

means for effecting reciprocating movement of said one member,

a second pair of crushing members mounted in said hopper beneath said first pair to rotate on spaced parallel axes to receive containers and cans crushed by said first pair of members and dropping through the space between said first pair into the nip between said second pair of members, means for rotating said second pair of members to crush and drive the material received from said first pair of members downwardly through said nip between said second pair of members,

a foraminous, vibratable grid inclined downwardly to the vertical and having its upper end positioned beneath said second pair of members to receive crushed material from said nip,

means for vibrating said grid thereby to cause particles of glass in the crushed material to pass through the grid, but to cause crushed cans to slide downwardly on the grid toward its lower end,

a downwardly inclined chute positioned beneath said grid to be vibratable with said grid,

a first container mounted beneath the lower end of said chute to receive the glass dropped onto said chute,

a magnetic conveyor inclined to the vertical, and having its lower end mounted beneath and adjacent the lower end of said grid but in spaced relation to the lower end of said chute, to attract magnetically to the conveyor for movement therewith cans containing magnetic material, said lower end of said conveyor being spaced form the lower end of said grid a sufficient distance that non-magnetizable cans drop by gravity off said conveyor through the space between said conveyor and said grid, and

two further containers positioned adjacent opposite ends, respectively, of said conveyor to collect said non-magnetizable and said magnetizable cans, respectively, said lower end of said conveyor overlying one of said two further containers so that the non-magnetizable cans slide into said one container, the upper end of said conveyor overlying the other of said two further containers to carry magnetizable cans into said other container.

2. Apparatus as defined in claim 1, wherein

said first pair of members comprises a stationary jaw, and a movable jaw pivotally mounted adjacent its lower end to swing about a fixed axis into and out of operative relation to said stationary jaw, said jaws having serrated, confronting surfaces, and

said second pair of members comprises a pair of rollers mounted to rotate in opposite directions about said spaced parallel axes, said rollers having serrated peripheries.

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