APPARATUS FOR CRUSHING AND DISPOSING OF CANS AND GLASS CONTAINERS

Inventor: William J. Frank, 45 Exchange St., Rochester, N.Y. 14614

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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
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 fronting 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. 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, 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.

Pivotaly 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 roll 86 and the crushing shoe 90 of the breaker arm. The surface of the crusher roll 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 entrapment 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 fragmented 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 the grizzly 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 roller 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 roller shoe 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 30 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. a vertically disposed hopper having an inlet in its upper end,
   b. a first pair of spaced crushing members mounted in said hopper beneath said inlet in downwardly con-
   verging relation, one of said members being mova-
   ble relative to the other to crush the glass con-
   tainers and cans inserted through said inlet,
   means for effecting reciprocating movement of said
   one member,
   a. 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. 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 parti-
   cles 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. a downwardly inclined chute positioned beneath said
   grid to be vibratable with said grid,
   a. a first container mounted beneath the lower end of
   said chute to receive the glass dropped onto said
   chute,
   a. a magnetic conveyor inclined to the vertical, and
   having its lower end mounted beneath and adja-
   cent the lower end of said grid but in spaced rela-
   tion to the lower end of said chute, to attract mag-
   netically 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-mag-
   netizable cans drop by gravity off said conveyor
   through the space between said conveyor and said
   grid, and
   a. two further containers positioned adjacent opposite
   ends, respectively, of said conveyor to collect said
   non-magnetizable and said magnetizable cans, respec-
   tively, said lower end of said conveyor over-
   lying one of said two further containers so that the
   non-magnetizable cans slide into said one con-
   tainer, 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 rol-
   lers mounted to rotate in opposite directions about
   said spaced parallel axes, said rollers having ser-
   rated peripheries.

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