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Morris

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[54] **APPARATUS FOR CRUSHING CANS**

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[51] **Int. Cl.** **B30b 7/04**

[58] **Field of Search** ..... 241/DIG. 22, 99, 241/155; 198/33 AA; 100/137, 138, 139, 176, 233, 216, 215, 53, DIG. 2

[56] **References Cited**

UNITED STATES PATENTS

610,122	8/1898	Cook	241/155
1,077,437	11/1913	Smith	100/233 X
1,582,820	4/1926	Hungerford	198/33 X
3,036,517	5/1962	Malarsky	100/233
2,619,150	11/1952	Smith	100/233 X
3,687,062	8/1972	Frank	100/233 X
3,066,600	12/1962	Couty et al.	100/176
3,659,520	5/1972	Garrett et al.	100/216
1,620,659	3/1927	Hodgkinson	100/233 UX

FOREIGN PATENTS OR APPLICATIONS

748,717	7/1933	France	241/155

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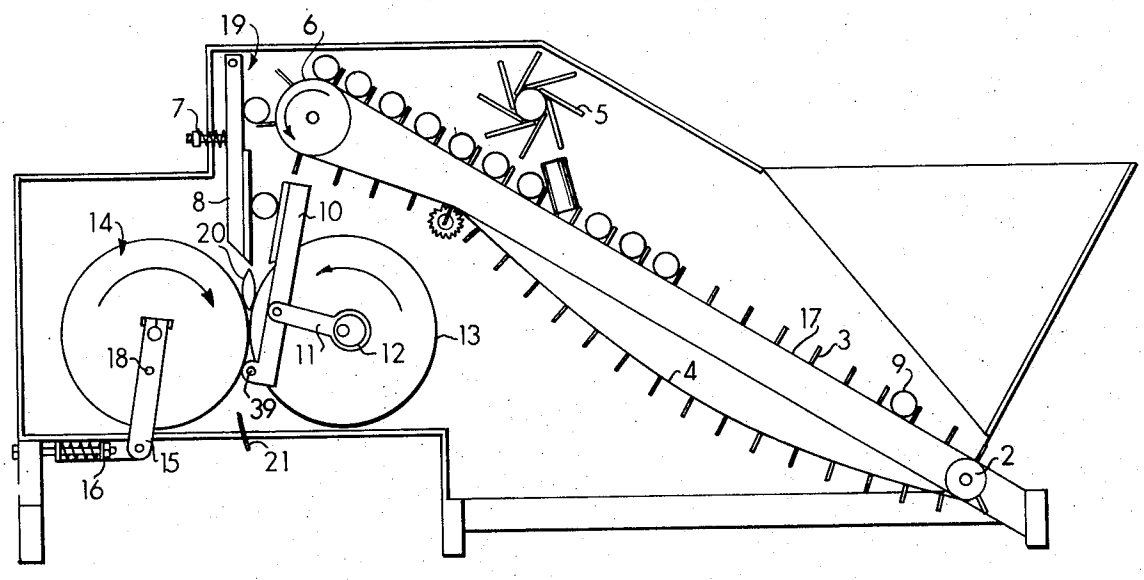
[57] **ABSTRACT**

An apparatus for crushing cans into flat plate-like form. The cans are inserted into a hopper where they are transported by a compartmented conveyor to a position where they are released into a jaw mechanism which operates in timed relation to the conveyor. The cans are partially collapsed in the jaw mechanism and then are fed into a pair of counter-rotating rollers which further compress them. Synchronization is maintained by use of timing belts and a common power source.

7 Claims, 4 Drawing Figures



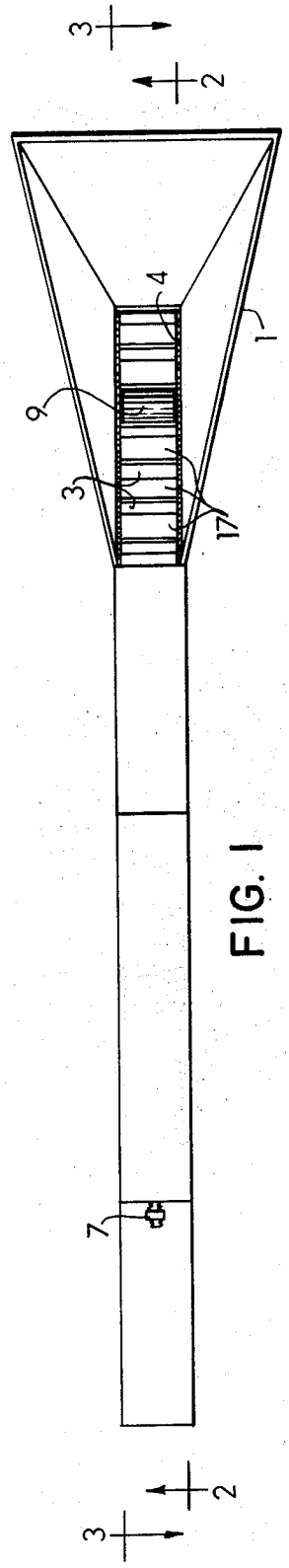


FIG. 1

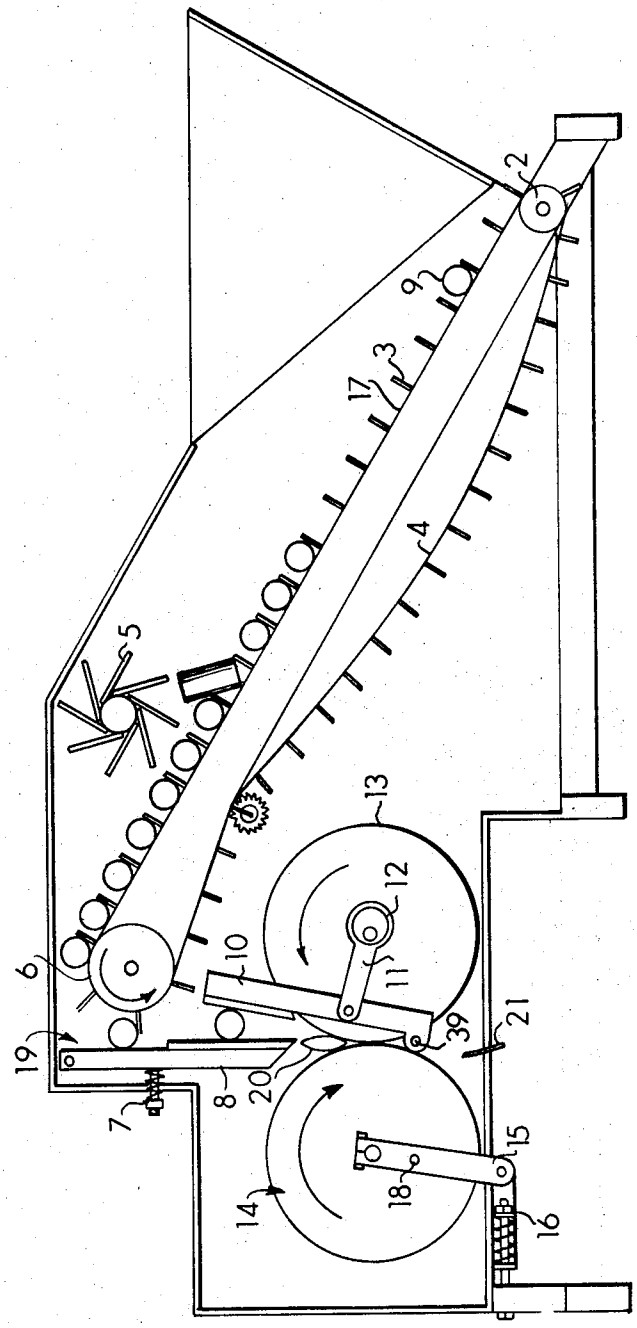


FIG. 2A

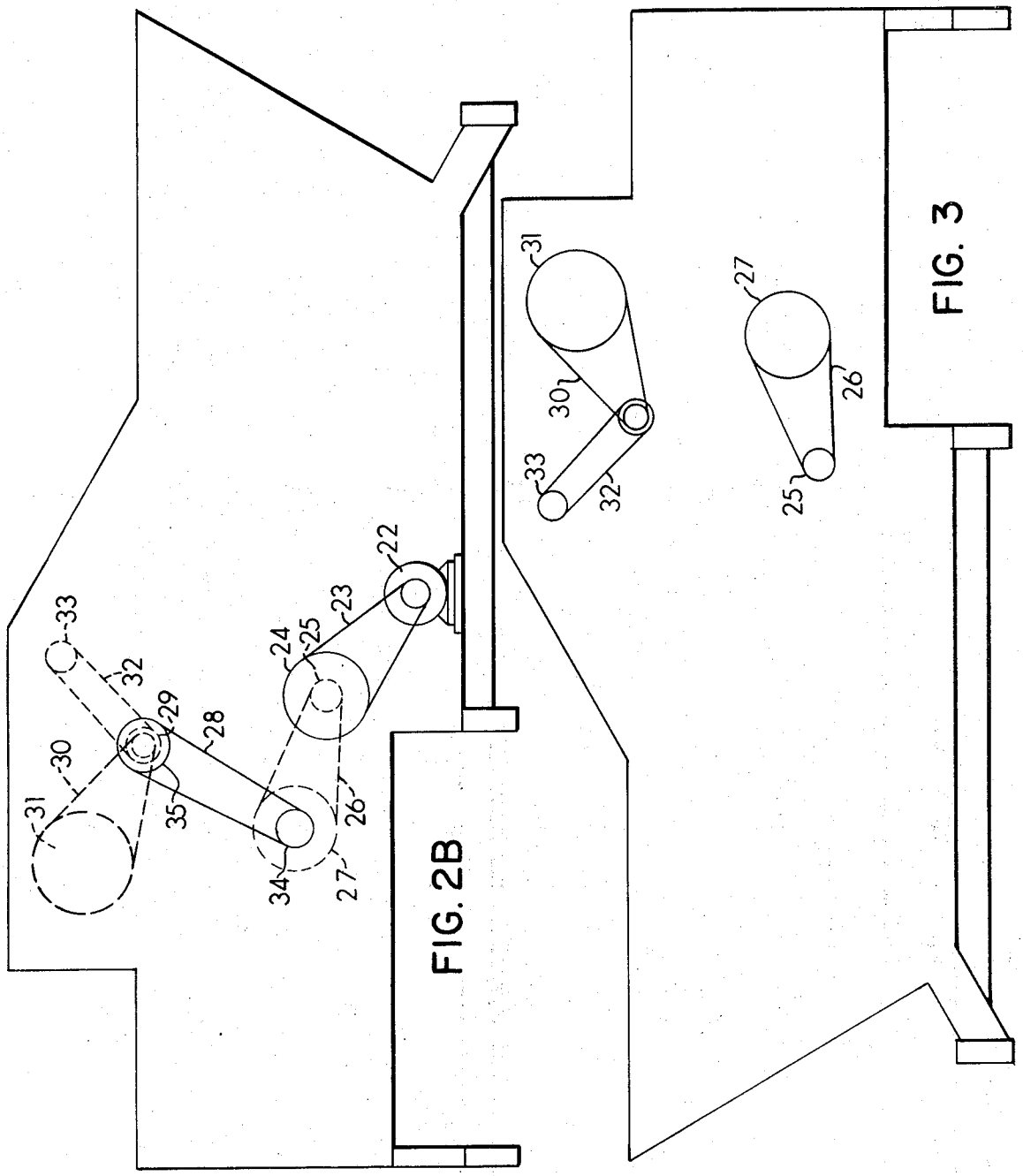


FIG. 2B

FIG. 3

APPARATUS FOR CRUSHING CANS

FIELD OF THE INVENTION

This invention relates in general to recycling and recovery systems and more particularly to an apparatus for crushing and compacting used aluminum cans.

BACKGROUND OF THE INVENTION

In the embodiment of non-biodegradable packaging materials, such as aluminum, it has been recognized that a serious problem arises in disposing of the package after use. With respect to aluminum cans, it is ecologically desirable that they be recycled and reused. From a storage and transportation perspective, it is more economical to decrease the volume of the used and empty can than it is to transport and store it in its original shape. A machine for accomplishing this reliably, cheaply and easily can be located wherever used cans are collected for transportation to recycling and recovery systems.

Available hydraulic crushing mechanisms are cumbersome and expensive. Rolling and pressing mechanisms normally require that an object be forced into them to crush it, which results in a slow feeding operation and decreased system efficiency.

It is, therefore, desirable to have a machine that is relatively inexpensive, reliable, efficient and simple to operate, for crushing and collapsing cans. of

BRIEF SUMMARY OF THE INVENTION

Broadly speaking, this invention provides an aluminum can crushing apparatus which operates in the following manner. Used cans are dumped randomly into a bin. Buckets, attached to a conveyor belt, pick up one can each at the bottom of the bin. A paddle wheel, located further along the belt, dislodges any cans that are improperly oriented in the bucket and lets the cans that are properly oriented, pass. The conveyor dumps one can at a time, in a timed relation and in the proper orientation, into the opening of a jaw mechanism. The jaw mechanism closes on a can and crushes it. This mechanism is formed of a pair pf pivoted jaw crushers, one of which is positioned against a compression spring. The other, movable jaw is operated by a cam attached to one of a pair of counter-rotating rollers below it to swing once each cycle into substantially closed relation with the fixed jaw. This action is timed to coincide with the arrival of a bucket at the discharge point of the conveyor thereby avoiding insertion of a can onto closed or partially closed jaws. The partially crushed can drops between the rollers, where the crushing action is completed, the flattened plate-like can then being discharged into a suitable receiving volume. The crushing mechanism is designed so that it will not jam if fed incompressible objects. All the moving parts operate from a single power source, in this case an electric motor, through drive belts and timing chains that insure proper synchronization of the various parts.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connnection with the accompanying drawing, in which:

FIG. 1 is a top view of an overall design in accordance with the invention;

FIG. 2A is a front sectional view, taken along section line 2, showing only the various moving parts that act on the cans, of an overall design in accordance with this invention;

FIG. 2B is also a front sectional view, taken along section line 2, showing only a complete drive system for powering a design in accordance with this invention; and

FIG. 3 is a rear sectional view taken along section line 3, showing only the portions of the drive system appearing at the rear side of a design in accordance with this invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1 a can crushing apparatus is shown with a bin 1, in which cans 9 are deposited, and a conveyor 17, formed out of angle irons 3 and connecting chain 4, running along its bottom. Referring to FIG. 2A, the conveyor 17 runs at an upward slant to the left, travels around sprocket 6 at the top end and sprocket 2 at the other end. A paddle wheel 5, is located above the conveyor, between both sprockets. One jaw 8 of the crushing mechanism is located to one side and below the top end of the conveyor. Jaw 8 is pivoted on a pin 19 slightly above the uppermost portion of the conveyor 17. A compressive shock absorber 7 is attached to jaw 8 on one side between it and the outside wall of the apparatus. Two rollers 13 and 14, meet at a point approximately directly below jaw 8. The other jaw 10, of the crushing mechanism is located to the opposite side of jaw 8 and is supported by a pin 39 located below jaw 8, which is attached to the wall of the apparatus. An arm 11 is pinned to jaw 10 and is connected to a cam 12 attached to the center of roller 13. Roller 14 is supported by an arm 15 which is in turn supported from below by pin 18 and attached below pin 18 to flexible tension member 16.

Referring to FIG. 2B, the complete drive system is shown. Portions of the drive system appearing in the front of the apparatus appear in solid lines and the rear portions appear in dashed lines. A motor 22 is located at the base of the apparatus beneath the conveyor 17. The motor 22 is connected by a belt 23, on the front side, to a pulley 24 which is located above and to its left. Pulley 25 on the rear side, is directly opposite pulley 24 which is connected by a belt 26 to pulley 27, which is to the left of pulley 25. Pulley 27 is connected to the center of roller 13. Gear 34 is connected to the center of roller 13, on the front side opposite pulley 27. Timing chain 28 connects gear 35 to gear 34, which is located slightly to the right and above gear 34. On the rear side, opposite gear 35, is a pulley-gear combination 29. The gear portion, of the pulley-gear combination 29, is connected by a timing chain 30 to a gear 31 located to the left and above the gear and pulley combination 29. Gear 31 is connected to the center of sprocket 6. Belt 32 connects pulley 33 to gear pulley combination 29, Which is below it and to its left. Pulley 33 is connected to the shaft of paddle wheel 5. The belts, chains and pulleys on both sides of the drive system are located outwardly of the parts of the apparatus shown in FIG. 2A, which they might otherwise appear to be intersecting.

Referring to FIG. 2A, used cans are dumped randomly into the bin 1. The angle irons 3 form buckets which are sized so that they will pick up only one can 9 at a time. If a can 9 should be picked up and assume

an orientation other than one of laying against the base of a bucket 3; a rotating paddle wheel 5 will strike it and thereby return it to the bin 1. The conveyor 17 is formed of a series of buckets made from right angle pieces 3 attached to a chain 4, which is driven by sprocket 6 and which passes over sprocket 2. With sprocket 6 rotating counterclockwise, the cans 9 are removed from the bin 1, and proceed in the direction of sprocket 6.

As each bucket 3 passes around sprocket 6, it discharges its can. Sprocket 6 is driven in a timed manner such that each can arrives at the jaws 8 and 10 of the crushing mechanism, when they are in a position to receive it.

As roller 13 rotates, it turns a cam 12, which in turn drives arm 11. Arm 11 is attached through a pin to jaw 10 and pivoted about point 39. As arm 11 reciprocates the jaw 10 moves towards and away from jaw 8. When it proceeds towards jaw 8 with a can between it and jaw 8, the can is partially collapsed and as the jaw 10 moves away again, the can, as indicated at 20, falls through. When a can 20, has been partially collapsed it can pass more easily into the counter-rotating rollers 13 and 14.

Jaw 8 is pivoted about point 19 and attached to a compressive shock absorber 7. In this manner the shock of the jaw 10 slamming against jaw 8, to the structure is reduced. Also if an incompressible object is placed between jaw 8 and 10, there is enough travel available in the shock absorber 7, to allow jaw 10 to complete its normal cycle before the object is discharged.

Roller 14 is pressed against roller 13 by means of a flexible tension member 16, and is supported by an arm 15 which is pivoted about point 18. As roller 13 rotates it causes roller 14 to counter-rotate against it. As a partially collapsed can 20 passes between the counter-rotating rollers 13 and 14, it is finally and substantially completely collapsed. After passing through the rollers it falls, as indicated at 21, into some sort of collecting means.

Should an incompressible object pass between the counterrotating rollers 13 and 14, roller 14 can separate from roller 13 by pivoting about point 18. Tension member 16 will exert a restoring moment about point 18.

Referring to FIG. 2B, the portion of the drive system appearing in the front of this apparatus is shown in solid lines and the rear portion of the drive system, in dashed lines. FIG. 3 illustrates the rear portion of the drive system only. The source of power is an electric motor 22, which through belt 23 drives pulley 24. Pulley 24 is directly connected, through a shaft, to pulley 25, which drives pulley 27 by means of belt 26. Pulley 27 is directly connected to and drives roller 13. Gear 34 is directly connected to roller 13, and it in turn drives gear 35 through timing belt 28. Gear 35 is connected by means of a shaft to a combination gear and pulley 29, on the rear side. The gear portion of the gear and pulley combination 29 drives gear 31 through timing belt 30. Gear 31 is directly connected to sprocket 6 which drives the conveyor 17 through chain 4. The pulley portion of the gear and pulley combination 29, drives pulley 33 through belt 32. Pulley 33 is, in turn, directly connected to and drives the paddle wheel 5.

As described above, the jaw 10 is driven by a cam 12 connected to a roller 13. Roller 13 is connected through gears 34, 35, 29 and 31 by direct shaft connections and timing chains 28 and 30, to sprocket 6 which drives conveyor 17. As roller 13 turns, jaw 10 and conveyor 17 moves in a fixed and related manner. By proper selection of gear and cam ratios, each time the crushing mechanism has completed a cycle and is ready to receive a can, the conveyor 17 drops a can in proper orientation into it. This system of gears, pulleys, timing chains and drive belts, driven by a single power source, is thus able to operate in a synchronized fashion.

While the above description relates to an operation for crushing one can at a time, it is obvious that a system with a wider conveyor would be able to handle a plurality of cans simultaneously. Also, the force exerted by the crushing mechanism, itself could be great enough to completely collapse a can. Furthermore, while this system is designed for crushing cans, it has application to any field where it is necessary to collapse malleable shells.

It will thus be seen that the objectives of this invention among those made apparent from the preceding description, are reliably and efficiently attained and, since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not interpreted in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and desired secured by Letter Patent is:

1. An apparatus for crushing empty cans comprising:
   a cam operated crushing mechanism for reducing the initial volume of said cans, said crushing mechanism operating in a repetitive cycle having an initial stage during which it is able to receive said cans;
   feeding means for supplying cans to said crushing mechanism in a timed relation such that, said cans arrive at said crushing mechanism during the portion of the cycle when it is able to receive them;
   a pair of counter-rotating rollers for further compressing said cans; and
   a single power source operably connected to said feeding means, said crushing mechanism and said counter-rotating rollers for driving these devices in a timed relationship with each other.

2. The apparatus according to claim 1, wherein said cans can be added in random orientation to said feeding means and further including means for eliminating cans from said feeding means that are improperly oriented.

3. The apparatus according to claim 2, wherein said means for eliminating cans from said feeding means comprises a paddle wheel for dislodging improperly oriented cans.

4. The apparatus according to claim 1, wherein said feeding means is a conveyor with buckets for carrying said cans.

5. The apparatus according to claim 4, wherein each said bucket is designed to carry only a single can.

6. The apparatus, according to claim 1, wherein said crushing mechanism comprises a pair of opposed jaws and further comprising forcing means connected to a first jaw for allowing said first jaw to move away from

its opposing jaw when the compressive force, exerted by said opposing jaw on said first jaw, exceeds the opposing force applied by said forcing means on said first jaw.

7. The apparatus according to claim 1 further comprising forcing means connected to a first roller, of said pair of counter-rotating rollers, for allowing said first roller to move away from its opposing roller when the compressive force, exerted by said opposing roller on said first roller, exceeds the opposing force applied by said forcing means on said first roller.

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