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C. P. GALAS

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CAN AND BOTTLE CRUSHER

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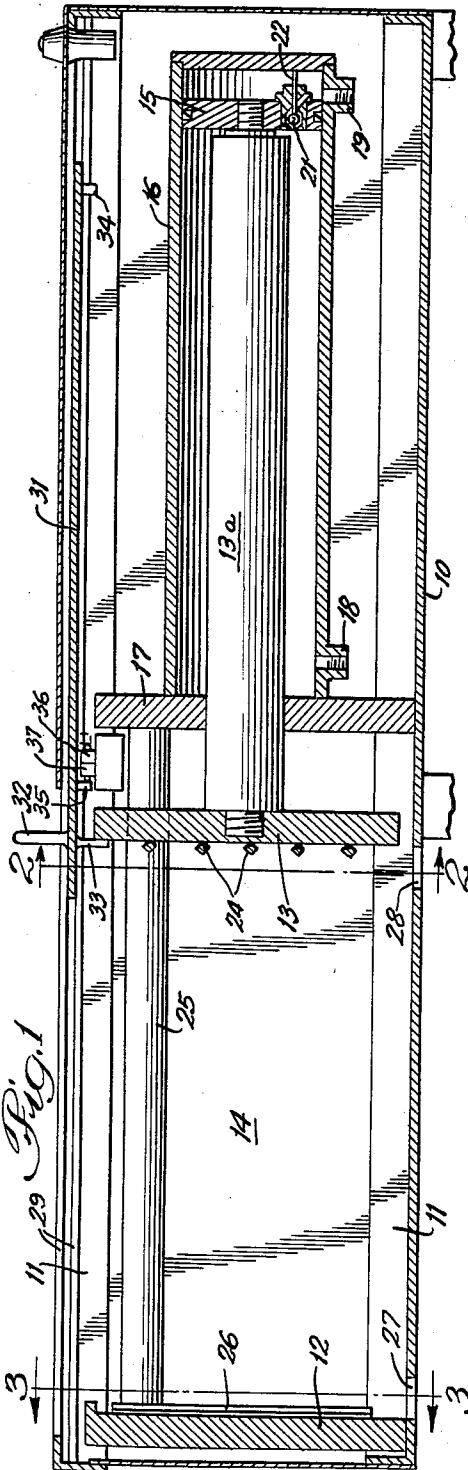


Fig. 1

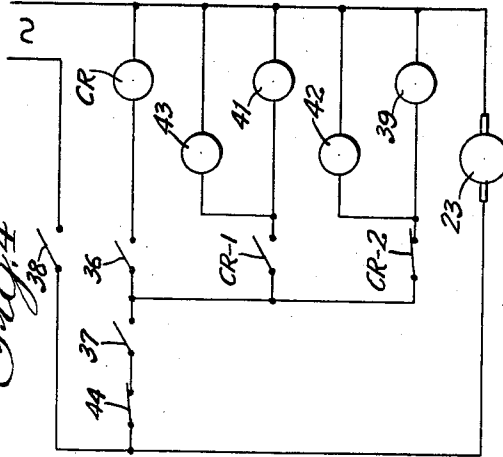


Fig. 2

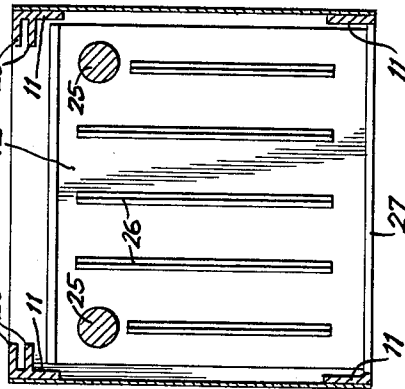


Fig. 3

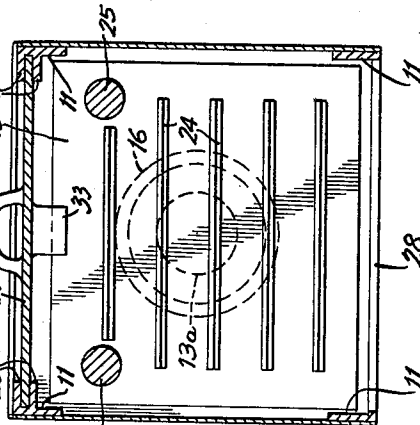


Fig. 4

INVENTOR:
Charles P. Galas,
BY
Eric Freeman & Molinari
ATTORNEYS.

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CAN AND BOTTLE CRUSHER

Charles P. Galas, Chicago, Ill., assignor, by mesne assignments, to G. S. Blakeslee & Co., Cicero, Ill., a corporation of Illinois

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1 Claim. (Cl. 100—53)

This invention relates to apparatus for crushing cans and bottles and more particularly to a device for compressing cans into flat, easily disposable masses, for breaking bottles into relatively small pieces and for similarly crushing or breaking other types of hollow containers.

In the operation of hotels, restaurants, and the like, the disposal of empty containers and principally metal cans and glass bottles raises very serious problems. If such containers are merely collected in barrels, or the like, for hauling away the volume of material per pound becomes so high as to create serious storage and handling problems. It therefore becomes desirable, almost to the point of necessity, to crush unbreakable containers, such as metal cans, to a flattened condition and to break fragile containers, such as glass bottles, into small pieces for storage and handling. Furthermore, such crushing or breaking presents the material in a form in which it is more readily salvagable for remelting and reuse.

It has heretofore been proposed to break or crush containers of the character referred to by utilizing a power operated press in which a flat ended plunger is movable toward the flat end of a casing to crush the material between them. It has been found, however, that extremely large amounts of power are required for this operation and particularly for the initial breakdown of the containers. Furthermore, the operation of such presses is hazardous due to the possibility of flying particles or to users getting their hands caught in the presses.

It is accordingly one object of the present invention to provide a can and bottle crusher in which cans, bottles, and the like, are crushed or broken quickly and with a minimum of power consumption and which is safe in use.

According to a feature of the invention, the surfaces between the articles which are crushed or broken are formed with spaced, relatively sharp projections which localize stresses in the articles and assist in breakdown thereof to minimize the power requirements. In a preferred construction, the surfaces carry spaced parallel sharp edged bars with the bars on different surfaces lying at different angles so that they cross each other.

According to another feature of the invention, the crushing compartment is closed by a movable closure and controls for the plunger are operated by the closure to prevent advancing of the plunger when the closure is open.

The above and other objects and features of the invention will be more readily apparent from the following description when read in connection with the accompanying drawing, in which:

FIGURE 1 is a section with parts in elevation through the crushing head of a can and bottle crusher embodying the invention;

FIGURES 2 and 3 are respectively sections on the lines 2—2 and 3—3 of FIGURE 1; and

FIGURE 4 is a wiring diagram of the control system.

The crusher, according to the present invention, comprises a housing, indicated generally at 10, which may be formed of sheet metal and which is preferably reinforced at its corners by angle bars or strips 11. The angle bars or strips extend the full length of the housing and constitute the principal load carrying elements thereof, with the side walls of the housing being made of relatively thin material, as shown in FIGURES 2 and 3, if desired. The housing carries an end plate 12 which is preferably heavy and which is rigidly supported by the angle bars 11 at

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right angles to the length thereof. The end plate 12 constitutes an anvil against which the material is crushed and is required to be relatively heavy and to be securely anchored for this purpose.

The material is crushed against the end plate or anvil 12 by a flat plunger plate 13 which is movable into a crushing compartment 14 at one end of the housing. For moving the plunger 13 it is preferably carried by a piston rod 13a carrying a piston 15 which is slidable in an elongated cylinder 16, supported in the housing by a support plate 17, secured to the angle bars 11. Operating fluid may be supplied to the forward end of the cylinder through a connection 18 to retract the plunger and similarly operating fluid may be supplied to the rear end of the cylinder through the connection 19 to advance the plunger during a crushing operation.

The piston 15 preferably carries a valve 21 controlling a passage through the piston and which is operated by an elongated valve rod 22. Normally, the valve 21 is seated on a valve seat to the right thereof, but is unseated when the rod 22 engages the closed end of the cylinder during a plunger retracting stroke to limit retracting movement of the plunger. Opening of the valve 21 will bypass operating fluid through the piston so that the pump or compressor utilized to supply actuating fluid will not be overloaded. It will be understood that the operating fluid may be either air or a liquid, but is preferably a liquid supplied by a suitable conventional type of pump, not shown, which is driven by a motor 23, as seen in FIGURE 4. According to a principal feature of the present invention, the facing surfaces of the end plate 12 and the plunger 13 are formed with spaced, relatively sharp projections which will localize the stresses in the material to be crushed or broken to facilitate the crushing or breaking thereof. In the preferred form, as shown, such projections are defined by a plurality of spaced parallel rectangular rods 26 secured to the inner face of the end plate 12 with diagonals through the rod sections lying normal to the plane of the end face. Such rods are preferably formed by lengths of square section stripping and welded or otherwise suitably secured to the end plate, as shown. The rods near the sides of the end plate preferably terminate short of tie bars 25 secured to the end plate near the upper corners thereof and extending through openings in the plunger 13 to be secured to the head plate 17 of the fluid motor. These tie bars not only take a part of the strain, but also assist in holding the plunger in proper alignment for linear movement.

The face of the plunger 13 carries a similar series of spaced parallel bars 24 which may be formed in the same way as the bars 26 and similarly welded to the face of the plunger. The two sets of bars 24 and 26 lie at different angles so that they cross each other. As shown, the bars 24 extend horizontally and the bars 26 extend vertically, although this arrangement could be reversed or the bars could be positioned at different angles, as desired.

Due to the use of the projections 24 and 26, it has been found that when articles are to be crushed or broken the projections create localized stresses in the articles which enable them to be crushed or broken with the expenditure of less force and less power than would be otherwise required. In crushing cans, for example, assuming a single large can in the crushing compartment with its axis aligned therewith the bars create spots of localized stress in the heads of the can which tend to cause its side walls to buckle more readily and in a lesser degree of force than would be required if the end plate and the plunger were smooth. Also in breaking articles, such as bottles, the localized stresses created by the projecting bars will cause the bottles to shatter and to break up with a much lesser degree of forces than would be required if the end plate and

plunger surfaces were smooth. Therefore, by the use of such bars the power consumed is reduced substantially as compared to a device with smooth crushing surfaces and the entire structure may be made lighter.

The material to be crushed is inserted into the crushing compartment 14 through the top thereof and which is open between the upper angle bars 11 and may be discharged from the crushing chamber through openings 27 and 28 formed in the bottom thereof. Preferably the openings 27 and 28 extend the full width of the casing with the opening 27 being adjacent to the end plate 12 so that the material can drop therethrough after being crushed and with the opening 28 being adjacent to the retracted position of the plunger so that any material carried backward by the plunger during its retracting stroke will be discharged therethrough.

According to a feature of the invention, the top of the crushing compartment is closed at all times during an actual crushing operation. For this purpose, the upper angle bars 11 are provided with parallel guide flanges 29 between which a closure 31 is slidable longitudinally of the crushing compartment. The closure is preferably provided at its upper surface with a handle 32 by which it may be gripped and has at its forward end a downwardly projecting lug or tongue 33 engageable with the front face of the plunger 13. In this way, if the plunger should, through some accident, be advanced when the closure is open the latter will be moved to closed position by the plunger.

The closure 31 additionally carries an operating button or lug 34 adjacent to its rearward end and a similar operating button or lug 35 adjacent to its forward end to cooperate with control switches 36 and 37 fixedly mounted in the casing. The switch 37 is normally closed and is opened by the lug 35 only when the closure is moved to its fully retracted position, as shown. The switch 36 is normally open and is closed by the lug 34 only when the closure is in its fully closed position.

As shown in FIGURE 4, operation of the device is controlled by a main switch 38 which is manually closed whenever it is desired to operate the device and which when closed energizes the motor 23 which drives the fluid pump for supplying actuating fluid. Supply of fluid to the connection 18 to retract the plunger is controlled by a reverse of the solenoid 39 which when energized opens a valve connected to the connection 18. Similarly actuating fluid for advancing the plunger is controlled by a solenoid 41 which is connected to the connection 19. Signal lights 42 and 43 may be connected in parallel with the valve solenoids 39 and 41, respectively, to indicate the condition of operation of the apparatus.

The valve solenoids 39 and 41 are respectively controlled by switches CR-1 and CR-2 which are controlled by a relay CR. The switch CR-1 is normally open and is closed when the relay CR is energized while the switch CR-2 is normally closed and is opened when the relay CR is energized. A pressure switch 44, which is normally closed and which will open if the actuating pressure supplied to the cylinder 16 exceeds a predetermined value, is connected in series with the switch 37 and all of the power for operating the relay and the valves is supplied to these two switches, as shown.

Assuming the parts to be in the condition shown in FIGURE 4, with the closure 31 fully open the switch 37 will be open so that none of the valves or the relay can be energized. The parts will remain in this condition during loading of the device and until the closure is moved partially toward its closed position. During initial movement of the closure toward its closed position, the

switch 37 will close to energize the valve solenoid 39 and signal light 42 to indicate that the plunger is retracted. As soon as the closure is moved to its fully closed position, the switch 36 will be closed to energize the relay CR. This will open the switch CR-2 to de-energize the valve solenoid 39 and close the switch CR-1 to energize the valve solenoid 41 and its signal light 43. As soon as the valve solenoid 41 is energized fluid will be supplied to the connection 19 to the back side of the piston 15 to advance the plunger 13 toward the end plate 12, thereby crushing or breaking any material in the crushing compartment 14. If at any time during the advancing movement of the plunger the closure 31 should be fully or partially open, the switch 36 will immediately open to re-energize the relay CR, thereby closing the switch CR-2 to energize the valve solenoid 39 to retract the plunger. This eliminates any possibility of an operator being damaged by getting his hands in the crushing compartment when the plunger is advancing.

If the plunger makes its complete crushing stroke, it will crush or break the material between the plunger and the end plate 12 with the maximum force for which the device is adjusted. As soon as the crushing stroke is completed the door may be opened to cause the plunger to retract allowing the crushed material to drop through the openings 27 and 28 and readying the device for a subsequent crushing operation.

While one embodiment of the invention has been shown and described herein, it will be understood that it is illustrative only and not to be taken as a definition of the scope of the invention, reference being had for this purpose to the appended claim.

What is claimed is:

A can and bottle crusher comprising a casing open at its top to receive cans and bottles to be crushed and having a fixed closure plate at one end, a plunger movable in said casing toward and away from said closure plate to crush material against said closure plate, a slidable closure for the open top of said casing slidable toward said fixed closure plate to its closed position in which it completely covers the open top of said casing, power means for advancing and retracting the plunger, and control means for said power means including a switch operated by final closing movement of said closure to cause said power means to advance said plunger when said closure is fully closed and by initial opening movement of said closure to retract said plunger when said closure is partially or fully open, said control means including a projection on said closure engaging the face of said plunger whereby accidental movement of said plunger will close said closure.

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