

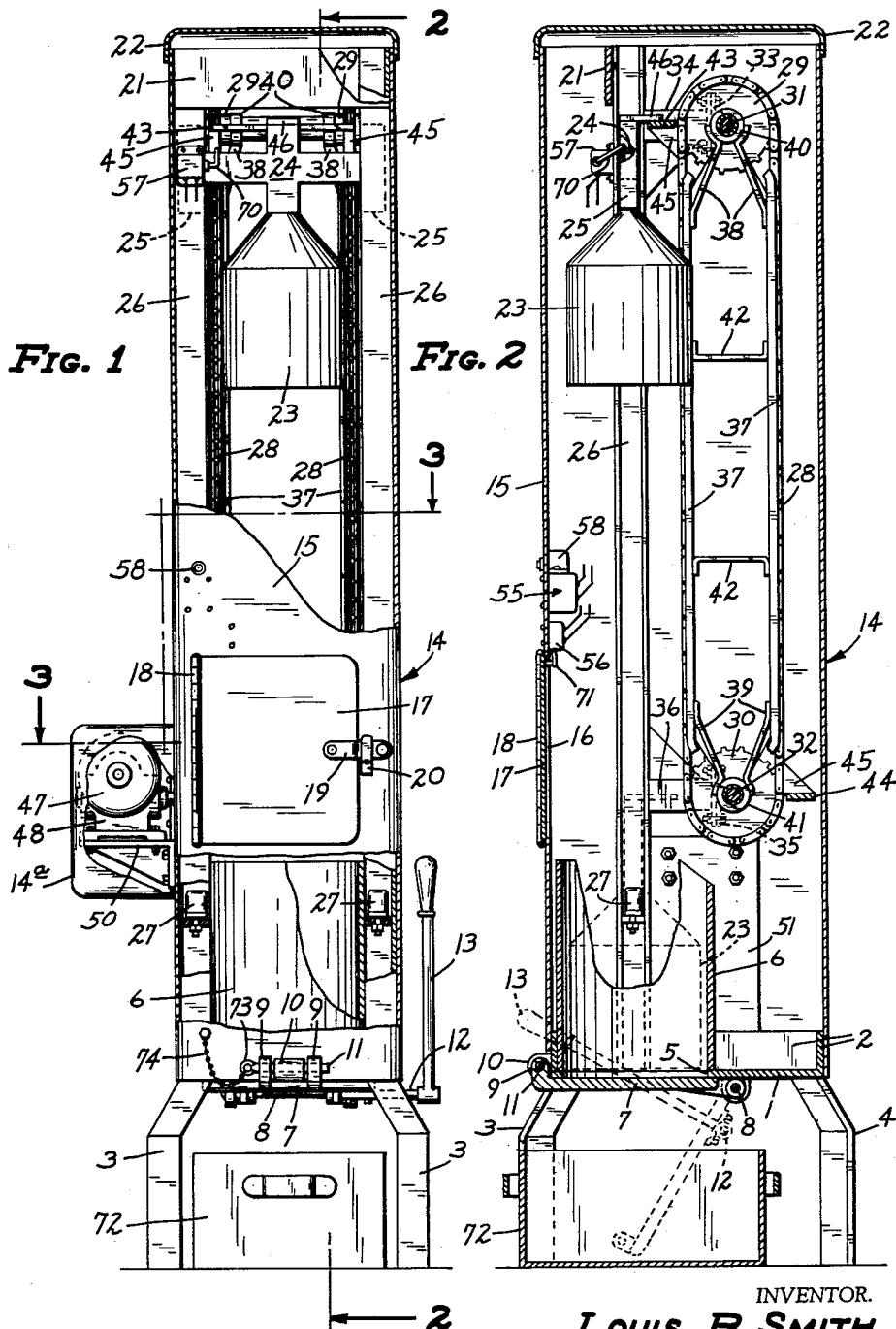
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2 Sheets-Sheet 1



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FIG. 3

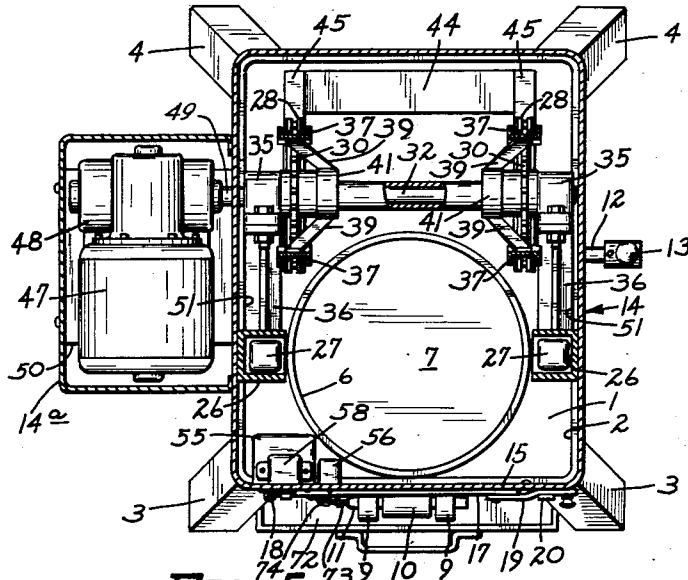


FIG. 5

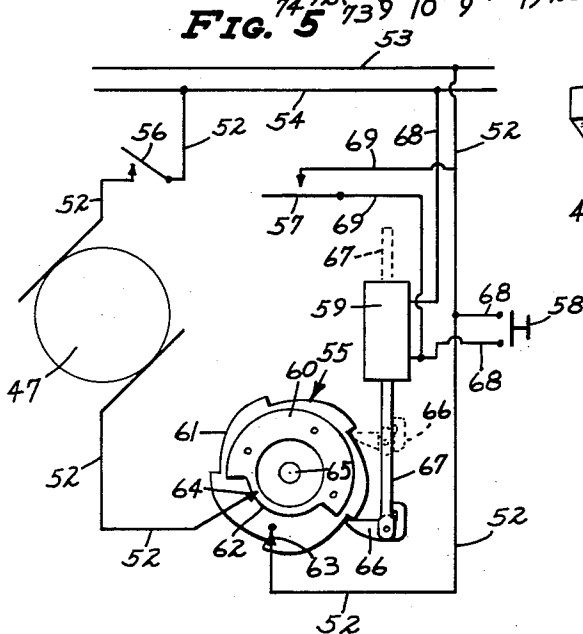
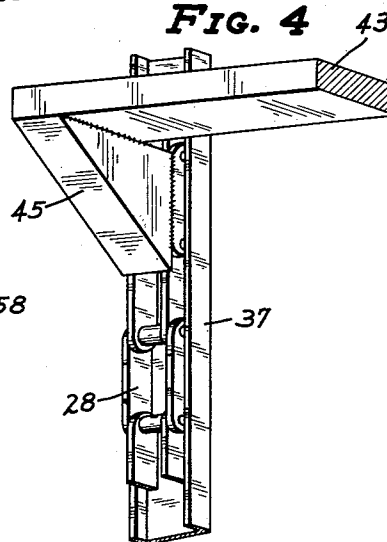


FIG. 4



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My invention relates generally to crushing devices, and more particularly to such devices especially adapted for use in reducing the volume or bulk of bottles, tin cans and other rubbish.

An important object of my invention is the provision of a reducer or crushing device comprising novel construction which permits easy loading of material to the crusher and quick and easy unloading of the crushed material therefrom, without the necessity of the user's hands contacting the crushed material. To this end, I provide an open-topped receptacle for reception of the material to be crushed, a drop hammer mounted for movements into and out of the receptacle, an anvil cooperating with said drop hammer and forming the bottom of said receptacle, and means mounting the anvil for movements between a closed bottom forming position and an open dumping position, whereby the crushed material may be discharged into a suitable container therefore for ultimate disposal.

Another object of my invention is the provision of a crushing device as set forth, having novel means for raising the drop hammer thereof and control means for the drop hammer raising means, whereby the material in the receptacle is subjected to repeated blows by the drop hammer during a given cycle of operation of the device.

Another object of my invention is the provision of control means for a crushing device of the above type, which will automatically terminate a cycle of operation with the drop hammer held in an elevated position above the rubbish receptacle, whereby to permit loading of the receptacle.

Still another object of my invention is the provision of a crushing device, the mechanism of which is totally enclosed in a housing having a loading door above the level of the material receiving receptacle; and of a safety control element associated with the loading door and actuated by opening of the door to positively prevent operation of the crushing mechanism when the loading door is open.

Another object of my invention is the provision of resilient stop means for the drop hammer of my device, operative to prevent said drop hammer from striking the anvil, when the device is energized in the absence of material in the receptacle, whereby to prevent damage to the hammer or anvil, whether said anvil is in its closed operative position or in its open dumping position.

Another object of my invention is the provision of a rubbish reducer or crushing device which is simple and inexpensive to produce, which is highly efficient in operation, which is sufficiently compact to occupy a minimum of floor space, and which is rugged in construction and durable in use.

The above, and still further highly important objects and advantages of my invention will become apparent from the following detailed specification, appended claims and attached drawings.

Referring to the drawings, which illustrate the invention, and in which like reference characters indicate like parts throughout the several views:

FIG. 1 is a view in front elevation of a rubbish reducer or crushing device made in accordance with my invention, some parts being broken away and some parts being shown in section;

FIG. 2 is a vertical section taken substantially on the line 2-2 of FIG. 1, some parts being broken away;

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FIG. 3 is a horizontal section taken on the line 3-3 of FIG. 1;

FIG. 4 is a fragmentary detail and perspective of a portion of the drop hammer raising mechanism of my invention; and

FIG. 5 is a wiring diagram.

In the preferred embodiment of the invention illustrated, a horizontally disposed base member 1 is provided with an upstanding peripheral flange 2, the base 1 being supported in upwardly spaced relation to the floor by front and rear pairs of legs 3 and 4 respectively. At its front end portion, the base member 1 is provided with a circular opening 5, concentric with a vertically extending open ended cylindrical receptacle 6 that is welded or otherwise rigidly secured to the base member 1. The opening 5 and lower end of the receptacle 6 are normally closed by a relatively thick heavy closure-forming anvil member 7 that is hingedly mounted to the undersurface of the base member 1 for swinging movements on a horizontal axis, by means of a hinge pin or the like 8. Opposite the hinge pin 8, and adjacent the front portion of the base 1, the anvil member 7 is provided with a pair of upstanding lugs 9, each disposed laterally outwardly of a different end of a cooperating transversely extending locking lug 10 extending forwardly of the front end of the base member 1. A releasable locking pin 11 normally extends through suitable aligned apertures in the lugs 9 and 10 to releasably lock the anvil member 7 in its closure forming operative position shown in FIG. 1 and by full lines in FIG. 2. A rigid shaft 12 extends transversely outwardly from the anvil member 7 and has rigidly secured thereto a normally upstanding handle lever 13, by means of which the anvil member 7 may be conveniently lowered to its open dumping position shown by dotted lines in FIG. 2, when the locking pin 11 is withdrawn from the lugs 9 and 10, and to easily move the anvil member 7 back to its operative closure-forming position of FIG. 1, and as shown by full lines in FIG. 2.

A generally rectangular housing 14 is welded or otherwise rigidly secured to the base member 1, and extends vertically upwardly therefrom, the front wall 15 of the housing 14 being formed to provide an opening 16 above the level of the open top of the receptacle 6. A loading door 17 is mounted on the front wall 15 by hinge means 18, and normally closes the opening 16, the door 17 being provided with a pivotally mounted latch bar 19 that cooperates with a latch hook 20 on the front wall 15 to releasably lock the loading door 17 in a closed position. The upper end of the housing 14 is reinforced by a cross member 21, said housing further including a top closure member 22.

A generally cylindrical drop hammer 23 is mounted within the housing 14 in axial alignment with the receptacle 6, for vertical movements into and out of the receptacle 6. At its upper end, the drop hammer 23 is provided with a cross head 24 that extends transversely of the housing 14, and which, at its opposite ends, is formed to provide a pair of slide members or shoes 25, each of which are contained in a different one of a pair of opposed cross-sectionally channel-shaped guide rails 26. The guide rails 26 are rigidly secured at their upper ends to opposite ends of the cross member 21, and at their lower ends to opposite side portions of the flange 2 of the base member 1. As shown, the guide rails 26 guide the drop hammer 23 concentrically into the receptacle 6, the drop hammer 23 being movable between an upward position near the top of the housing 14, and a material crushing position within the receptacle 6. The drop hammer 23 is limited in its downward movement in the receptacle 6 by material within the receptacle or, in the absence of material therein, by a pair of rubber-like resilient bumpers

one each rigidly mounted in a different one of the guide rails 26 for engagement with the bottoms of the shoes 25. As shown by dotted lines in FIG. 2, when the shoes 25 are in engagement with the bumpers 27, the bottom of the drop hammer 23 is disposed in closely spaced relation to the anvil member 7. With this arrangement, should the machine be operated without material in the receptacle 6, direct impact between the drop hammer 23 and the anvil member 7 is avoided. Further, should the machine be operated with the anvil member 7 in its open dumping position, the drop hammer 23 is prevented from dropping through the open bottom of the receptacle 6.

For the purpose of alternately raising and releasing the drop hammer 23 to permit the drop hammer to drop repeatedly into the receptacle 6 to crush the material therein, I provide novel raising or elevating mechanism now to be described. A pair of laterally spaced endless link chains 28 are entrained over upper and lower pairs of sprocket wheels 29 and 30 respectively that are keyed or otherwise rigidly secured to horizontally disposed parallel upper and lower shafts 31 and 32. The upper shaft 31 is journaled in suitable bearings one of which is shown by dotted lines in FIG. 2 and indicated at 33, said bearings being mounted in bearing brackets 34, one of which is shown. The lower shaft 32 is journaled in bearings 35 that are bolted or otherwise secured to bearing brackets 36. See FIGS. 2 and 3, the bearing brackets 34 and 36 being welded or otherwise rigidly secured to adjacent ones of the guide rails 26. The endless link chains 28 are guided between their respective sprocket wheels 29 and 30 by elongated guide members 37 that are supported from the shafts 31 and 32 by upper and lower bracket members 38 and 39 respectively, the bracket members 38 being welded or otherwise rigidly secured to a tubular member 40 encompassing the upper shaft 31, and the bracket members 39 being similarly rigidly secured to a tubular member 41 rotatively encompassing the lower shaft 32. The guide members 37 are further reinforced between their ends by brace members 42. A pair of opposed elongated lifting lugs or bars 43 and 44 are supported from the link chains 28 by means of brackets 45, and are adapted to alternately engage an ear 46 that projects rearwardly from the upper end of the drop hammer crosshead 24, upon movement of the chains 28 in a clockwise direction with respect to FIG. 2. As shown, during rotation of the sprocket wheels 29 and 30, with resultant movement of the chains 28, the lifting lugs 43 and 44 move into the path of travel of the ear 46 to engage the same for lifting movements as the lifting lugs travel around the sprocket wheels 30, and move out of the path of travel of the ear 46 during movement about the upper sprocket wheels 29, whereby to release the drop hammer 23 for gravity impartment movement downwardly into the receptacle 6.

Means for imparting rotary movement to the lower shaft 32 comprises a conventional electric motor 47 that is preferably equipped with speed reduction gearing not shown, but which may assume to be contained within a housing portion 48, the output shaft 49 thereof being operatively coupled to the lower sprocket wheel shaft 32. The motor 47 is mounted on a bracket 50 that is bolted or otherwise rigidly secured through the housing 14 to a reinforcing plate 51 that is welded or otherwise rigidly secured to the flange 2 of the base member 1. The motor 47 is preferably concealed within a portion of the housing 14, indicated at 14a.

The motor 47 is contained in an electrical circuit comprising a power lead 52, the opposite ends of which are connected to opposite ones of a pair of power conductors 53 and 54. Operation of the motor 47 is controlled by a stepping switch 55 that is interposed in the lead 52, a normally open safety switch 56 also interposed in the lead 52 in series with the motor 47 and stepping switch 55, a normally open mechanically operated switch 57,

and a manually operated normally open push-button switch 58. The stepping switch 55 is preferably operated by a solenoid 59 and, for the purpose of the present example is shown as comprising an annular plate-like contact element 60 that is mounted on a toothed ratchet 61, a segmental portion of the contact element being cut away, as indicated at 62. The lead 52 includes a pair of contact elements 63 and 64 that are spaced apart radially and circumferentially with respect to the contact element 60, the contact element 64 being permanently in sliding engagement with the contact element 60, and said contact element 60 moving into and out of engagement with the contact element 63 during rotation of the ratchet member 61. As shown in FIG. 5, the ratchet member 61 is mounted for rotation on a shaft 65, and step by step rotation is imparted thereto by means of a pawl 66 pivotally secured to the lower end of an armature 67 of the solenoid 59.

The solenoid 59 is interposed in a lead 68 in series with the push button switch 58, one end of the lead 68 being connected to the power conductor 54, the other end of the lead 68 being connected to the power lead 52 intermediate the conductor 53 and the stepping switch 55. The mechanically operated switch 57 is interposed in a lead 69 which provides a shunt circuit for the solenoid 59, in parallel arrangement with the push button switch 58, one end of the lead 69 being connected to the lead 68 intermediate the solenoid 59 and push button switch 58, the other end of the lead 69 being connected to the power lead 52 intermediate the conductor 53 and stepping switch 55. The mechanically operated switch 57 is mounted within the housing 14 adjacent the upper limit of movement of the drop hammer 23, and is provided with an actuator arm 70 that is adapted to be engaged and moved by the crosshead 24 to close the switch 57 as the drop hammer 23 approaches its upper limit of vertical movement. The safety switch 56 is preferably mounted within the front wall 15 of the housing 14 adjacent the door opening 16, and is provided with an actuator member 71 that is engaged by the door 17 during final closing movements thereof to close the switch 56 when the door 17 is closed, the switch 56 automatically opening to break the circuit to the motor 47 when the door 17 is opened. The stepping switch 55 and solenoid 59 may be disposed in any convenient location within the housing 14.

A cycle of operation of the crushing device begins with the drop hammer 23 in its full line position of FIGS. 1 and 2. The operator opens the loading door 17 and fills the receptacle 6 with bottles, cans or other rubbish to be broken or compressed, the switch 56 being automatically opened to prevent accidental energization of the motor 47. The door 17 is then closed and latched, and the push button switch 58 closed to energize the solenoid 59. Energization of the solenoid 59 causes the pawl 66 to rotate the ratchet 61 to a point where both contact elements 63 and 64 engage the contact element 60 thereby energizing the motor 47 to impart rotation to the shaft 32 and sprockets 30 mounted thereon, in a clockwise direction with respect to FIG. 2. Resultant movement of the chains 28 causes the lug 43 to move circumferentially out of engagement with the ear 46 of the drop hammer 23, permitting the drop hammer 23 to descend under the action of gravity into engagement with the material in the receptacle 6 to at least partially crush the same. During this time, the opposite lug 44 moves circumferentially about the axis of the lower shaft 32 and engages the ear 46 to raise the drop hammer 23 from its lowered position to its raised position and trip the switch 57 to energize the solenoid 59, causing the stepping switch 55 to be again operated. The drop hammer 23 will be raised and dropped as long as both contact elements 63 and 64 are in engagement with the circular contact element 60, each raising movement of the drop hammer 23 causing the stepping switch 55 to be advanced a predetermined distance. Although the ratchet member 61 is shown as

having five teeth, the same may be provided with any given number of teeth, depending upon the number of crushing strokes desired to be made by the drop hammer 23 during a given cycle of operation. After the drop hammer 23 has been raised a predetermined number of times, in this case four times, closing of the switch 57 by the crosshead 24 will cause the solenoid 59 to be energized to rotate the ratchet member 61 to its position of FIG. 5 whereby to deenergize the motor 47 with the drop hammer 23 in its raised position. Thereafter, the operator grasps the handle lever 13 to hold the anvil member 7 in its closed position, and at the same time remove the locking pin 11 from engagement with the lugs 9 and 10. The operator then permits the handle lever 13 to swing forwardly and downwardly to swing the closure forming anvil member 7 downwardly to its open dumping position shown by dotted lines in FIG. 2, whereby the crushed contents of the receptacle 6 are dumped into a suitable open topped container 72. The anvil member 7 is then returned to its closure-forming operative position and the locking pin 11 re-inserted through the lugs 9 and 10. It will be noted that the locking pin 11 is formed to provide an eye 73 whereby the pin 11 may be loosely anchored to the housing 14 by means of a length of link chain or the like 74.

It will be further noted, that at the end of each operating cycle of the machine, the drop hammer 23 is disposed above the level of the loading door 17, to permit easy loading of the receptacle 6 during idle periods of the machine. Further, when the loading door 17 is open, the motor 17 cannot be energized through accidental closing of the push button switch 58.

My novel rubbish reducer or crusher is particularly adapted for use in the home as well as in restaurants and cafes where the accumulation of tin cans, bottles and the like occurs and disposal thereof becomes a problem. By crushing or otherwise reducing the volume of such rubbish, the problem of storage thereof before transport to a point of disposal is materially lessened.

While I have shown and described a preferred form of my rubbish reducer, it will be understood that the same is capable of modification, and that modification may be made without departure from the spirit and scope of the invention as defined in the claims.

What I claim is:

1. In a crushing device for rubbish and the like, means defining an open-topped receptacle for material to be crushed, an anvil defining the bottom of said receptacle, means mounting said anvil for movements between a generally horizontal closed bottom forming operative position and an angularly displaced material dumping open position, a drop hammer, means mounting and guiding said drop hammer for vertical movements toward and away from said anvil, means for raising said drop hammer a predetermined distance above said receptacle and including a lifting element movable toward operative lifting engagement with said drop hammer at the lower end of movement thereof and away from engagement with the drop hammer at the upper limit of movement thereof, whereby to release said drop hammer for free dropping movement toward said anvil, and stop means operatively engaging said drop hammer at the lower end of dropping movement thereof to support said drop hammer in closely upwardly spaced relation to said anvil.

2. In a crushing device for rubbish and the like, means

defining an open-topped receptacle for material to be crushed, an anvil defining the bottom of said receptacle, means mounting said anvil for movements between a generally horizontal closed bottom forming operative position and an angularly displaced material dumping open position, a drop hammer, means mounting and guiding said drop hammer for vertical movements toward and away from said anvil, power operated mechanism for raising said drop hammer a predetermined distance above said receptacle and including a lifting element movable toward operative lifting engagement with said drop hammer at the lower end of movement thereof and away from engagement with the drop hammer at the upper limit of movement thereof, whereby to release said drop hammer for free dropping movement toward said anvil, and control means for said power operated mechanism operative to cause said drop hammer to be lifted and released a predetermined number of times during a given cycle of operation of said device.

3. In a crushing device for dry rubbish and the like, means defining an open-topped receptacle for material to be crushed, an anvil defining the bottom of said receptacle, means mounting said anvil for movements between a generally horizontal closed bottom forming operative position and an angularly displaced material dumping open position, a drop hammer, means mounting and guiding said drop hammer for vertical movements toward and away from said anvil, upper and lower sprocket wheels journaled on vertically spaced parallel horizontal axes, an endless link chain entrained over said wheels, a hammer engaging lifting lug on said chain and movable around the lower one of said sprocket wheels into the path of travel of said drop hammer adjacent the lower limit of travel of said drop hammer, said lifting lug being movable around the upper one of said sprocket wheels out of the path of travel at the upper limit of movement of said drop hammer, motor means for imparting rotary movement to one of said sprocket wheels in a direction to raise said lifting lug when in the path of travel of the drop hammer, and control means for said motor, said control means comprising a switch and a switch operating device responsive to a predetermined number of lifting movements imparted to said drop hammer by said chain to deenergize said motor when the drop hammer approaches the limit of its upward movement.

4. The structure defined in claim 3 in further combination with a housing enclosing said drop hammer, guide rails and chain, said housing including a loading door above said receptacle, said control means including a normally open cut-off switch operatively engaging said loading door when said door is closed, whereby to close a circuit to said motor, said cut-off switch automatically opening the motor circuit to prevent operation of the motor to release the drop hammer when said loading door is open.

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