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CAN CRUSHING MACHINE
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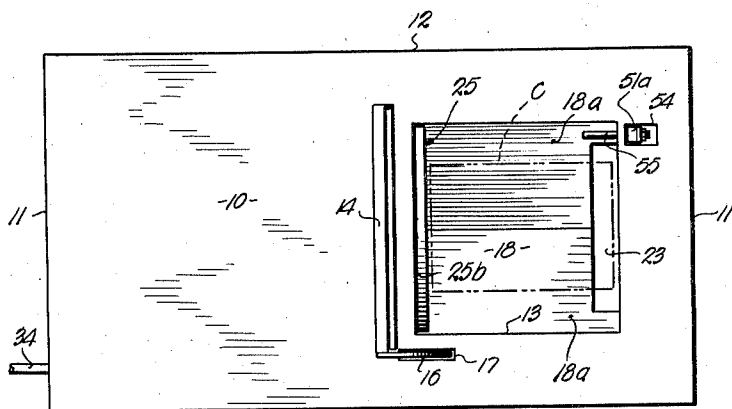


Fig. 1.

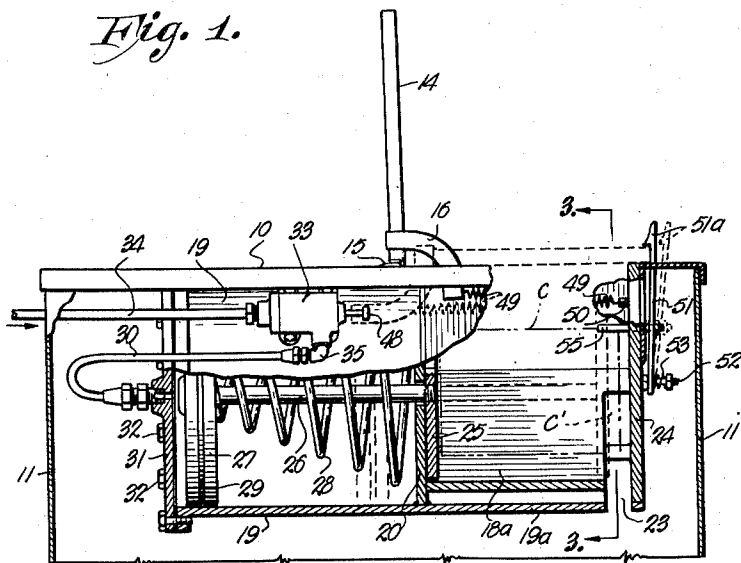


Fig. 2.

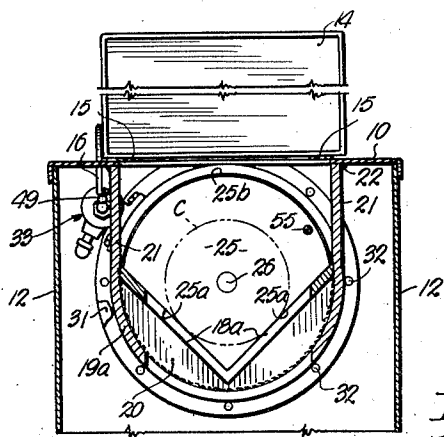


Fig. 3.

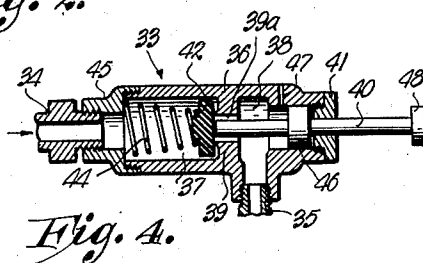


Fig. 4.

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CAN CRUSHING MACHINE

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4 Claims. (Cl. 153—10.5)

This invention relates to apparatus for crushing and flattening cans or like containers, and refers more particularly to an improved apparatus in which the operation of the crushing mechanism is automatic and in which the operator is protected from accidental injury during the crushing phase of operation.

In automobile service stations, repair shops, and wherever else a large quantity of metal containers or can are emptied of their contents during the course of the business day, attention has been given to devising suitable mechanisms for flattening or crushing the empty containers to facilitate in their storage and disposal. Various types of units have been proposed, such as hydraulic and mechanical presses, but for a number of reasons, including lack of safety from injury and the necessity of constant supervision, they have not met with commercial acceptance. Most of the can crushing mechanisms known to the art involve the use of relatively movable exposed crushing plates or members between which the can is received, and a hydraulic power system which is controlled through manually operable valves to effect movement of at least one of the crushing members. Since the crushing members are exposed, numerous incidents of accidental crushing of the hands or fingers of the operator have occurred. Moreover, the use of manually operated valves has necessitated the presence of the operator at the unit while crushing is taking place so that when the can has been flattened, the crushing members can be separated again to receive the next can.

While it will be recognized that the prevention of accidental injury to the operator of such a unit is desirable in itself, it will also be realized that of equal, if not greater, importance is the provision of a unit which cannot be accidentally tripped by tampering children or adults. Since crushing units find particular employment in filling stations, there is always present the possibility that curious patrons will be attracted to them and if openly displayed, meddle with valves or other control units which set the crusher in action. The danger in having such a unit on the premises is self-evident.

It is a primary object of my invention to overcome or eliminate the above problems by providing a can flattener or crusher in which the crushing members can be actuated only after they are shielded from view and inaccessible to the fingers of the operator or others. In the preferred embodiment of the invention, this is accomplished by providing a movable cover for the crushing members which trips the power mechanism for the crusher when the cover is moved to its closed position. In this connection, it is also an object of the invention to provide an arrangement whereby the cover serves as the manually operable member through which the power system is controlled.

Another object of my invention is to provide a crushing or flattening apparatus of the character described in which the cover is latched in its closed position during

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the crushing operation, but which is released for return to its open position at the termination of crushing. Means also are provided for yieldably maintaining the cover in its open position.

A further object of my invention is to provide apparatus of this type in which the source of power for crushing can be a conventional air compressor of the type found in universal use in service stations and garages.

Still another object is to provide a can flattening unit in which discharge from between the crushing members is accomplished automatically at the end of the crushing stroke, and in which a return stroke of the crushing member is initiated automatically when crushing is completed.

A further object is to provide a unit of the character described which is simple and economical to manufacture; which is foolproof in operation; and which affords complete safety from accidental injury.

Other and further objects, together with the features of novelty appurtenant thereto, will appear in the course of the following description:

In the accompanying drawing, which forms a part of the instant specification and is to be read in conjunction therewith, and in which like reference numerals indicate like parts in the various views:

Fig. 1 is a top plan view of a preferred form of the invention, showing the cover in open position;

Fig. 2 is a side elevational view of the invention, parts being shown in section and part broken away for purposes of illustration;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 2 in the direction of the arrows; and

Fig. 4 is an enlarged longitudinal section through the control valve assembly for the power system.

Referring to the drawing, reference numeral 10 indicates the top of a box-like casing, preferably constructed of sheet metal, having end walls 11 and side walls 12. A rectangular aperture 13 is provided in the forward portion of the casing top 10, and adapted to register therewith is a lid or cover 14 which is hinged to top 10 by hinge 15. An arcuate arm 16 is secured to one side of cover 14, and extends through the top 10 of the casing in a slot 17 provided therein. As will be described in detail hereinafter, arm 16 serves to actuate the control valve for the crushing mechanism when cover 14 is opened and closed.

The crushing apparatus is located inside the casing, and comprises in general a V-shaped can receiving trough 18 which is positioned below aperture 13, and a pressure cylinder 19 extending rearwardly thereof. In the preferred form of the invention, these two portions of the apparatus are connected rigidly with one another, and the entire unit is slung from the top 10 of the casing in any suitable fashion.

The V-shaped trough 18 is formed by two intersecting, angularly disposed plates 18a which are secured at one end to the adjacent end 20 of cylinder 19, preferably by welding. The upper portion of the trough is confined by side plates 21 which are coterminous with plates 18a, being welded thereto along the abutting edges thereof, and which extend upwardly to abut against the top 10 of the casing. Weld seams 22 are provided for securing plates 21 to the casing. The cylinder 19 is provided with a forward extension 19a which is semi-cylindrical in form (the lower half of the cylinder) and which underlies the trough 18, being coterminous therewith. A vertically disposed head plate 24 is welded or otherwise rigidly secured to the outer ends of side plates 21, inclined plates 18a, and the cylinder extension 19a, to close off the outer end of the trough 18.

It will be noted from Figs. 2 and 3 that the outer

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ends of plates 18a are cut away from head plate 24 through a substantial portion of their widths to provide a passageway 23 therethrough. This is also true of the cylinder extension 19a, the opening therein being of equal width (or slightly greater) with the width of passageway 23. As will be made clear presently, the purpose of this passageway or opening is to allow the cans, when crushed, to be discharged from the trough 18.

Disposed transversely within trough 18, and normally positioned at the rearward end thereof against the end 20 of cylinder 19, is a crushing plate or member 25 which is attached to the end of a piston shaft or plunger 26 extending into the cylinder 19. Plunger 26 is secured at its other end inside the cylinder to a piston 27 which is yieldably maintained at the rearward end of the cylinder by a tapered coil spring 28. Piston 27 is provided around its periphery with a sealing ring 29, and an air line 30 communicates with the interior of the cylinder through the cylinder head 31 which is removably secured to the cylinder by bolts 32.

As is particularly evident from Figs. 2 and 3, the crushing plate 25 fits within the trough 18, its lower edges 25a being cut at an angle to conform with the U-shape of the trough. The upper edge 25b of plate 25 is semi-circular.

Mounted one side of the cylinder 19 (the same side as the arm 16 on cover 14) is a control valve 33 connected by a line 34 to a source of compressed air, such as a compressor (not shown). The cylinder line 30 is also connected with valve 33 through a suitable elbow fitting 35.

Referring particularly to Fig. 4, wherein the valve 33 is shown in detail, the valve is formed as a generally cylindrical casing 36 divided into two chambers 37 and 38 by a partition 39. A valve plunger or stem 40 extends through chamber 38, being slidably received in a plug 41 threadedly connected with the end of the valve body, and its inner end extends through an enlarged aperture 39a in partition 39 to bear against a valve head 42. As is evident from the drawing, valve head 42 is yieldably maintained in its seated position against partition 39 by a coil spring 44 which bears at its other end against a hollow fitting 45 threadedly connected with the valve body 36. The diameter of valve head 42 is materially less than the inside diameter of chamber 37 so that when unseated, air can pass freely therearound.

It will be noted that in the reduced portion of chamber 38 the valve stem 40 is fitted with an enlarged piston 46 which is adapted upon movement of the stem to register with and close off a lateral passageway or port 47 communicating with the atmosphere. The outer end of the stem 40 is provided with an enlarged head 48, and the whole valve assembly is so positioned that head 48 lies in the path of the free end of arm 16 when cover 14 is closed, as shown by the broken lines in Fig. 2. However, the cover is normally maintained in its open position by means of a spring 49 which is connected at one end to arm 16 and at its other to a bracket 50 of any suitable design secured to the head member 24 on the outside of trough 18. (See Fig. 2.)

The hold-down latch for cover 14 is shown in Figs. 1 and 2, and comprises an arm 51 yieldably secured at its lower end to the head plate 24 by means of a bolt 52 and spring 53. The arm 51 extends upwardly through a slot 54 in the top 10 of the casing, and is provided at its upper end with a barbed head 51a which engages the cover 14 when the latter is in its down or closed position, as shown by the broken lines in Fig. 2. A pin 55 is secured to arm 51 midway of its length, and extends into the trough 18 through a suitable aperture in the head plate 24. It will be understood pin 55 is adjustable with respect to the latch arm 51 so that the distance which it projects into the trough may be varied as desired.

It is important to note that the disposition of the latch

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member 51 is such that the pin 55 extends into the trough at one side thereof. Care must be taken to insure that the pin 55 is positioned at a point where there will be no interference with the crushed can, and where the only longitudinal force applied will be by the advancing crushing plate 25.

The operation of the unit is as follows: With cover 14 in its open position, the can C is placed within the trough 18 with its axis paralleling the bottom of the trough. The operator then grasps the cover 14, and swings it forwardly and downwardly to its closed position where it is engaged by the latch head 51a. At the same time, the free end of arm 16 engages the end 48 of the valve stem 40 to force the stem longitudinally of the valve 33 and cause the valve head 42 to unseat. The incoming air from line 34 is thus free to pass through chamber 37, around the valve head 42 and through aperture 39a into chamber 38 whence it is delivered through fitting 35 to the cylinder line 34 and to the cylinder 19. The lateral passageway or port 47 is closed when the valve is opened by the surface of the piston 46 on stem 40.

As the pressurized air is supplied to cylinder 19, the piston 27 is caused to advance against the compression of spring 28 and to drive the crushing plate 25 forwardly against the end of the can C. As the pressure continues to be applied, the wall of the can fold and crumple until the can assumes the disk-like conformation indicated at C' in Fig. 2.

When the crushing plate or member 25 reaches the point indicated by the broken lines in Fig. 2, that is, at the termination of the crushing stroke, it engages the end of pin 55 and causes the latch arm 51 to be sprung outwardly to release the cover 14. Under the influence of spring 49, the cover flies open, thereby allowing the valve stem 40 to return to its original position with the valve head 42 again seated against partition 39. Since the lateral passageway 47 is opened upon return of the valve stem 40 and its piston 46, the pressure within the cylinder 19 is relieved to the atmosphere, and under the influence of spring 28, the drive piston 27 returns to the far end of the cylinder carrying with it the crushing plate 25. The flattened can C' is thus released, and falls by gravity through the passageway 23 to be collected in a suitable receptacle (not shown). As will be evident, the unit is now ready to receive a new can, and the entire operation is repeated by simply closing cover 14 after the can has been dropped into trough 18.

From the foregoing, it will be seen that I have accomplished all of the objects hereinbefore set forth. The crushing mechanism is only set in operation by the closing of the cover 14. With the unit installed in a suitable casing or cabinet, valve 33 is inaccessible and cannot be accidentally tripped. Once the cover is closed, there is no chance of the operator inadvertently placing his hands between the crushing plates. Moreover, the complete operation is fully automatic; once the cover is closed, the can is crushed, released and the crushing member returned to its initial position, all without necessitating any further steps to be taken by the operator.

I have found that with a piston and cylinder diameter of approximately 7 inches, a force in excess of 5500 pounds can be applied to the ends of the can utilizing an air pressure from the compressor of 150 pounds per square inch. Since this is well within the range of the conventional compressor employed in most service stations and repair shops, it will be evident that the unit can be used universally with little or no extra cost of operation.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown

in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. Apparatus of the character described comprising a power operated can crushing mechanism including a crushing member having a crushing stroke and a return stroke, means for supporting a can in the path of said crushing member and including a crushing head against which said crushing member acts, movable means for shielding said crushing head and plate, said last-named means having an open and closed position with respect to said crushing head and plate, yieldable means continually urging said movable means toward its open position, control means connected with said crushing mechanism for causing said crushing and return strokes, cooperating means on said movable means and said control means causing said crushing stroke to begin when said movable means is moved to its closed position, latch means retaining said movable means in its closed position during the crushing stroke, and means actuated responsive to the travel of said crushing member past a predetermined point to cause said movable means to open and to initiate the return stroke of said crushing plate.

2. Can crushing apparatus of the character described comprising a can receiving trough, a crushing member disposed within said trough and movable longitudinally therein, said member being yieldably maintained at one end of said trough, a power mechanism connected with said crushing member and operable to advance same in said trough toward the other end thereof to effect a crushing of the can, a hinged cover for said trough having an open and closed position with respect thereto, means continually urging said cover toward its open position, control means for said power mechanism actuated responsive to the closing of the cover to initiate the advancement of said crushing member, latch means releasably latching said cover in its closed position, and trip means for said latch means operated responsive to the travel of said crushing member past a predetermined point to effect the release of said latch means from said cover to effect opening of said cover and the return of said crushing member to its normal position.

3. Can crushing apparatus of the character described comprising a casing having a top and side walls, the top of said casing being provided with a can opening, a can receiving trough supported below said top and registering with said opening, said trough having a crushing head at one end thereof and a longitudinally movable crushing member at the other end, power means supported in said casing and connected with said crushing member, said means being operable to cause said member to advance toward said crushing head to effect a crushing stroke and

to retract therefrom in a return stroke, control mechanism for said power means also supported within said casing, a movable cover for said can opening having an open and closed position with respect thereto, yieldable means continually urging said cover toward its open position, means actuated responsive to the closing of said cover to actuate said control means to cause in turn the operation of said power means to effect the crushing stroke, and independent means holding said cover closed but released upon the travel of said crushing member past a predetermined point in said trough to cause the cover to open under the influence of said yieldable means, said control means being actuated responsive to the opening of the cover to initiate the return stroke of said crushing member.

4. In a can crushing apparatus, a pressure cylinder fitted with a piston, can receiving means positioned at one end of said cylinder and aligned therewith, said means including a crushing head spaced outwardly from the end of the cylinder, a can crushing member connected with said piston and movable longitudinally in said receiving means, said member being located between said head and the end of said cylinder, yieldable means resiliently urging said piston away from said one end of said cylinder thereby to yieldably maintain said crushing member spaced from said crushing head, a source of pressurized fluid connected with said cylinder, a control valve interposed between said source and said cylinder and operative to selectively introduce and exhaust pressure fluid from said cylinder whereby to define a crushing stroke and a retraction stroke for said piston and movable crushing member, a cover for said can receiving means movable between open and closed positions with respect thereto, yieldable means continually urging said cover toward said open position, means actuated by movement of said cover to operate said control valve, said last named means causing introduction of fluid to the cylinder upon closing of said cover and the exhaust of fluid from said cylinder upon opening of the cover, means for releasably latching said cover in its closed position during the crushing stroke, and mechanism for releasing said latch means responsive to the travel of the crushing member past a predetermined point in the crushing stroke.

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