United States Patent

Pratt et al.

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[54] REFUSE COMPACTOR

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[52] **U.S. Cl.**.....**100/52,** 100/45, 100/53, 100/71, 100/229 A, 100/269 R

[51] **Int. Cl.**.....**B30b 15/16**

[58] **Field of Search**.....100/45, 53, 52, 229, 269, 256, 100/71

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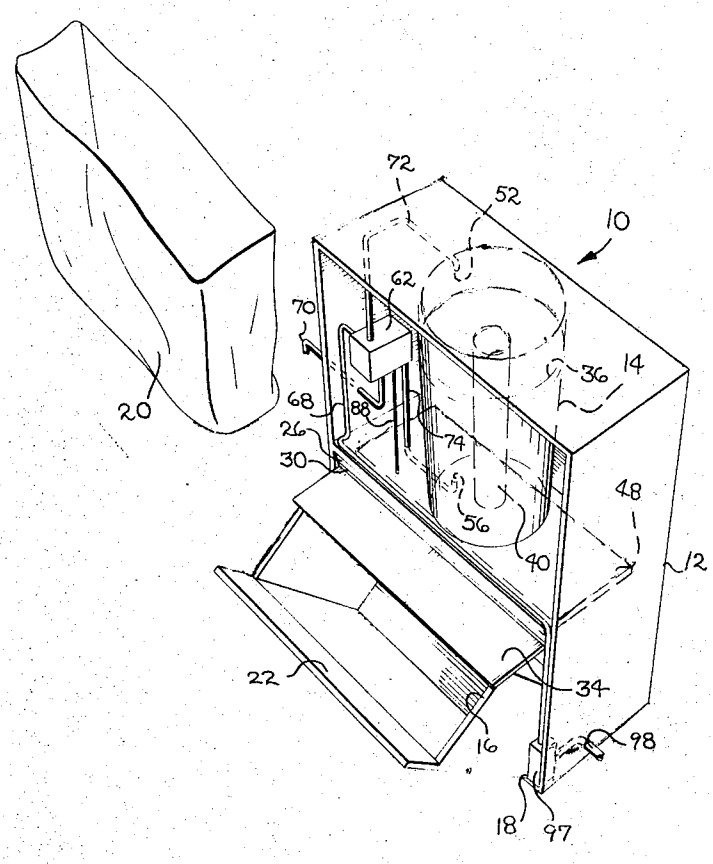
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[57] **ABSTRACT**

This invention provides a refuse compactor which compresses household trash and garbage into odor and moisture-proof bags and seals the bags to prevent re-expansion or leakage. This device utilizes hydraulic pressure from a home water pressure system to actuate a double-action piston which is controlled by means of a four-way valve. The double-action piston is connected to actuate a compression plate to compact the trash and garbage into the bag within a compaction chamber and to retract the compression plate to thereby allow the user to remove the compacted load. The compaction chamber is hinged to tilt outwardly to allow removal of the bag filled with the compressed trash and garbage.

1 Claim, 4 Drawing Figures



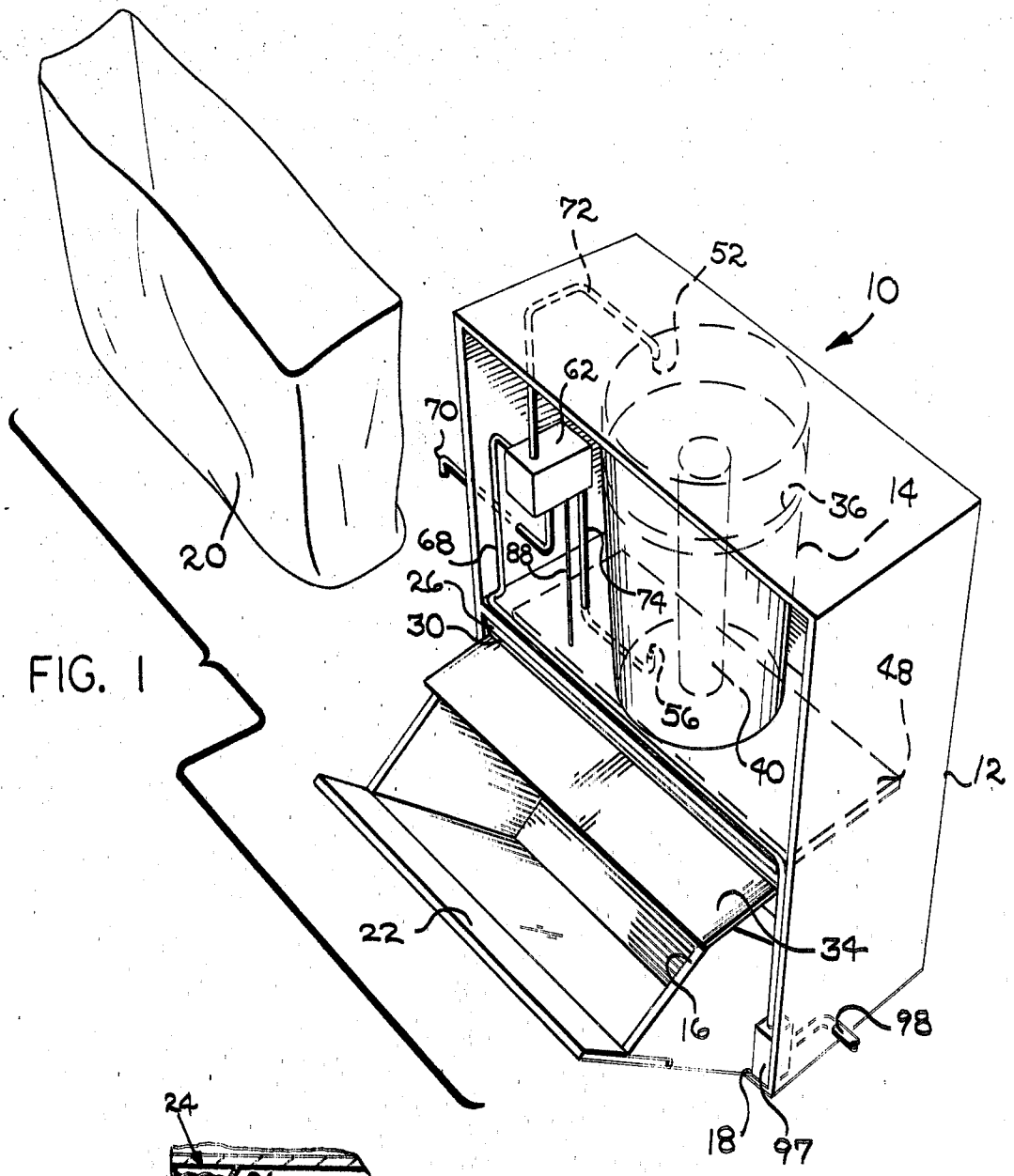


FIG. 1

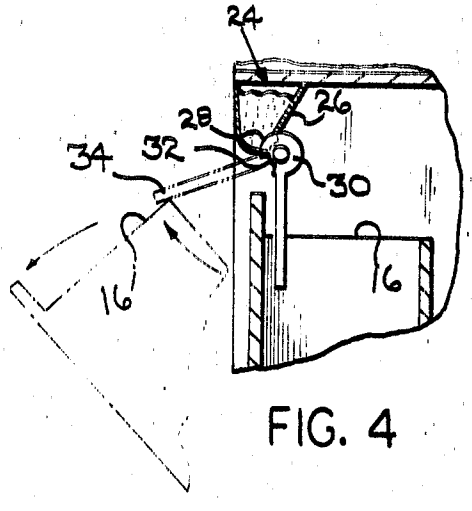


FIG. 4

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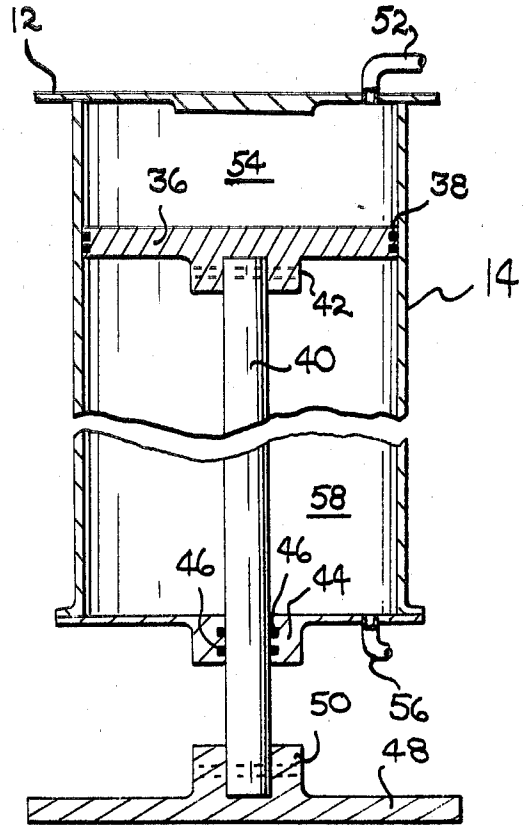


FIG. 2

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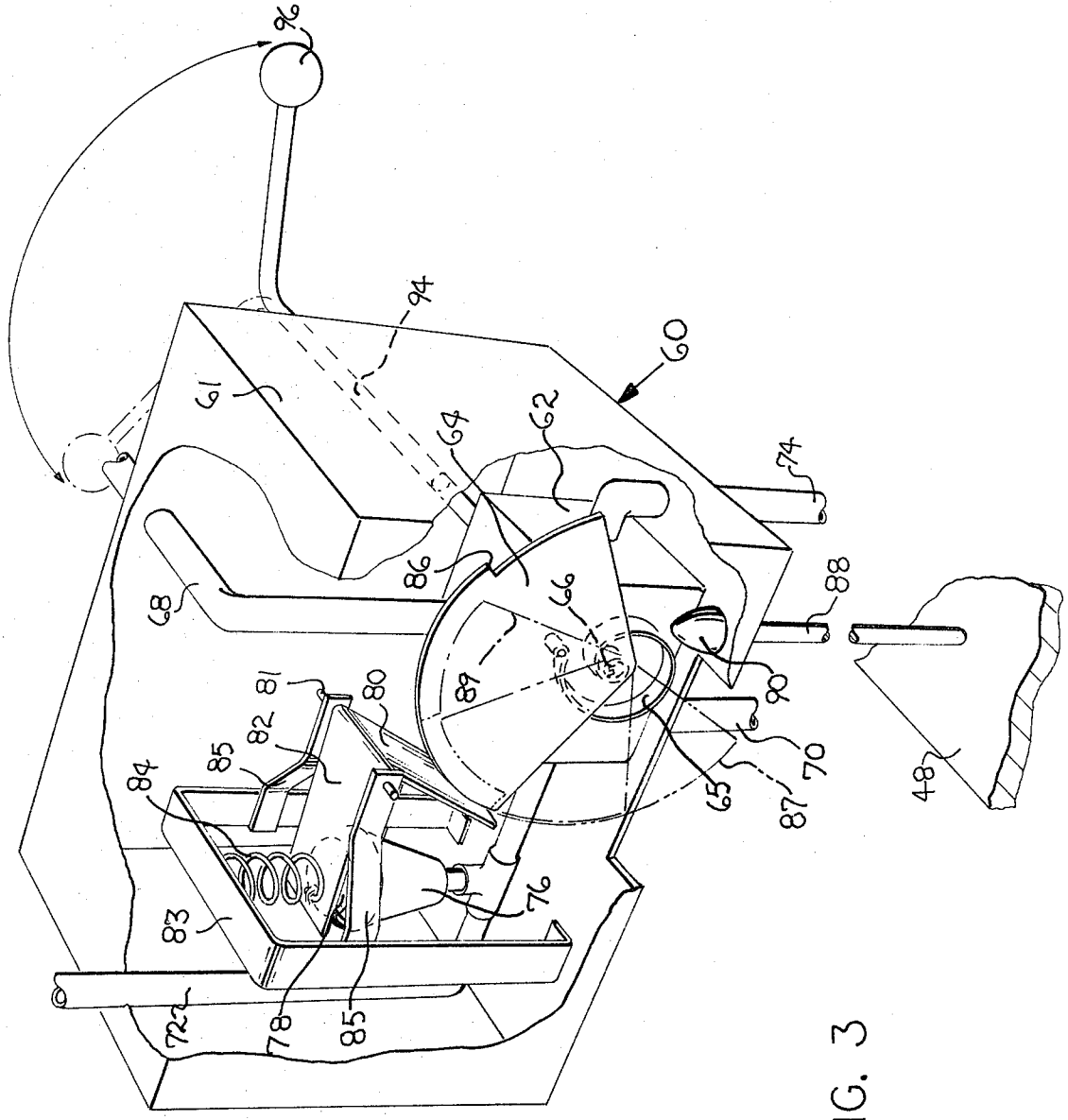


FIG. 3

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REFUSE COMPACTOR

BACKGROUND OF THE INVENTION

This invention relates to a refuse compactor which compresses household trash and garbage into odor and moisture-proof bags. More specifically, this invention relates to a relatively compact device for compressing household trash and garbage which utilizes hydraulic pressure from a home water system to actuate the compression mechanism.

As the population continues to increase, the problem of disposal of municipal refuse has become one of major importance. The volume of trash and garbage generated in our major metropolitan areas is increasing daily so that collection and disposal of this municipal refuse is becoming extremely difficult.

The composition of a typical municipal refuse is as follows:

Physical		Chemical	
Cardboard	7%	Moisture	28%
Newspaper	14%	Carbon	25%
Misc. Paper	23%	Hydrogen	3.3%
Garbage (organic)	12%	Oxygen	21.1%
Grass and Dirt	10%	Glass, Ceramics	9.3%
Wood	7%	Metals	7.2%
Glass, Ceramics	10%	Ash	5.5%
Metallics	8%	Other	.6%
Other	7%		
	100%		100.0%

(All percentages by weight)

Typically, the food waste or garbage portion of municipal refuse is placed in metal or plastic containers for periodic collection by a local garbage collection agency. Trash, such as bottles, cans, paper, etc., is also usually placed in similar containers for pick-up by a municipal trash collection agency. In many areas garbage and trash may be combined and deposited in the same collection containers. This trash and garbage usually remains stored in such collection containers until pick-up by the appropriate collection agency. Due to the size of many of our municipal areas, the volume of this trash and garbage which must be stored between collections is quite large and results in sanitary and odor problems.

For some time, solutions have been sought for the problem of reducing the volume and handling problems associated with such refuse collection. One widely used solution to this problem is the utilization of collection vehicles which feature a large compaction unit to reduce the volume of the trash and garbage being collected. However, this solution does not reduce the handling problem of collecting the trash and garbage within the home, storing it for collection, and transporting it from the home to the collection vehicle. Thus, there has been a long-felt need for a device which would provide a means for reducing the volume of the trash and garbage before it leaves the home and which also provides a very convenient and sanitary means for storing trash and garbage in the home and for transporting it to the collection vehicles.

SUMMARY OF THE INVENTION

It is, therefore, an object of this invention to provide a unique refuse compactor which is adapted to compress household trash and garbage to a volume considerably smaller than its original uncompressed volume within an odor and moisture-proof bag for storage within the home and for carrying to the collection vehicle. The unique device of this invention features a double-action piston which is actuated for movement in both directions by means of hydraulic pressure from a home water system. The double-action piston is connected to actuate a compression plate to compact the trash and garbage within a bag in a compaction chamber and to retract the compression plate to allow the user to remove the compacted load. The compaction device of this invention uses

only the home water pressure system as an actuating mechanism thereby eliminating any necessity for utilizing electric motors or hydraulic pumps as actuating means. The compaction device of this invention is capable of reducing the volume of typical household trash and garbage to a volume only one-fifth of its original size. Because the device of this invention does not necessitate electric motors or hydraulic pumps, it is a very quiet unit in operation and is well suited to be either built in or used as a portable model in the household kitchen. This unit also features a disinfectant spray system which eliminates odors and reduces the possibility of an anaerobic action within the compacted bag.

Other objects, features, and advantages of this invention will become obvious upon reference to the following detailed description and the drawings illustrating the preferred embodiment thereof.

In the drawings:

FIG. **1** is a schematic perspective view of the refuse compactor incorporating the novel features of this invention.

FIG. **2** is a sectional view of the actuating system for the refuse compaction device of the refuse compactor of FIG. **1**.

FIG. **3** is a schematic perspective view of the control system which controls the movement of the actuation means of FIG. **2**.

FIG. **4** is a sectional view of the disinfectant dispensing system of the refuse compactor of FIG. **1**.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawings, a refuse compaction device incorporating the features of this invention is shown schematically in FIG. **1** and is indicated generally by the numeral **10**. The refuse compactor **10** includes an outer housing **12** which surrounds a hydraulic actuating cylinder **14** and a compaction chamber **16**.

The compaction chamber **16** is mounted within the housing **12** and pivotable with respect to the housing **12** at its lower corner **18**. The compaction chamber **16**, therefore, is adapted to be tilted outwardly with respect to the housing **12** to facilitate loading it with trash and garbage. A suitable refuse receiving bag **20** is provided to be inserted within the compaction chamber **16**. The bag **20** may be of any construction suitable for receiving the garbage and trash to be compacted therein. In practice, a laminated bag having a paper layer outside to give strength and tear resistance and a plastic layer inside to stop moisture leakage was found to be very satisfactory for this device. The compaction chamber **16** has a front access door **22** which comprises a panel hingedly mounted along the front upper lip of the chamber **16**. This front access door **22** pivots downwardly to provide for easy insertion of a bag **20** within the chamber **16**. In practice, the bag **20** is inserted in the chamber **16** and the upper lip of the bag **20** is then folded over the upper edge of the chamber **16** so as to lie adjacent to the outer surface of the chamber's four sides. To facilitate this fold-over of the upper lip of the bag **20**, the front access door **22** on the chamber **16** is pivoted forward and then returned into contact with the lip of the plastic bag folded therebehind. It should be noted that the compaction chamber **16** must be formed of a material sufficient in strength to withstand the forces built up during compaction of trash and garbage within the chamber.

A suitable disinfectant dispensing device **24** is positioned within the housing **12** above the location of the compaction chamber **16**. This disinfectant dispensing device **24** comprises a trough **26** having an opening **28** in the bottom thereof which connects to a cylinder **30** positioned therebelow. The cylinder **30** has a disinfectant receiving groove **32** formed therein to receive a predetermined amount of disinfectant from the trough **26**. A spillage prevention door **34** is connected to the cylinder **30** and rotates therewith. As can be seen in FIG. **1**, the spillage prevention door **34** slides across the top surface of the compaction chamber **16** when the compaction chamber

16 is tilted outwardly. In so doing, the spillage prevention door 34 pivots to a location where the groove 32 in the cylinder 30 is adjacent to the opening 28 in the bottom of the trough 26 so as to receive disinfectant therefrom. The compaction chamber 16 is then in the position shown in FIG. 1, which is well suited for loading the bag 20 with trash and garbage. Then, as the chamber 16 is tilted back into the housing 12, the spillage prevention door 34 slides across the upper surface of the rear wall of chamber 16 thereby falling back to a somewhat vertical position and in so doing, the disinfectant contained within the groove 32 is dumped into the bag 20 on the trash and garbage placed therein. Thus, the spillage prevention door 34 serves a two-fold purpose in that it prevents trash from falling in behind the compaction chamber 16 as it is tilted to the open position and it also rotates the cylinder 30 to dispense a metered quantity of disinfectant from the disinfectant dispensing device 24 onto the trash and garbage contained within the bag 20 as it is tilted to the closed position. It should be noted that any suitable disinfectant material may be contained within the disinfectant dispensing device 24 and that the system would be very well suited for the use of a powder-type disinfectant.

The details of the actuating cylinder 14 can best be understood by reference to both FIGS. 1 and 2. A suitable double-action piston 36 is mounted for reciprocating movement within the cylinder 14. The piston 36 sealingly engages the cylinder 14 by means of O-ring seals 38. A piston rod 40 is connected to the piston 36 by means of a support member 42 and passes through a sleeve 44 in the bottom of the cylinder 14. The rod 40 reciprocates within sleeve 44 and the opening formed therebetween is sealed by means of 0-ring seals 46. A compression plate 48 is mounted at the opposite end of the rod 40 and attached thereto by means of a suitable support member 50.

The cylinder 14 incorporates an opening 52 which connects to the chamber 54 which is positioned above the piston 36 within the cylinder 14 and an opening 56 which connects to the chamber 58 which is positioned below the piston 36 within the cylinder 14. Thus, it can be seen that when hydraulic fluid is introduced into the chamber 54 through opening 52 the piston 36 will move downwardly within cylinder 14 so as to move the compression plate 48 downwardly into the compaction chamber 16. Similarly, when fluid is introduced into chamber 58 through opening 56 the piston 36 is forced upwardly within the cylinder 16 so as to retract the compression plate 48 from the compaction chamber 16.

The control system to regulate the flow of fluid to control the movement of piston 36 within cylinder 14 is shown in FIG. 3 and indicated generally by the numeral 60. First of all, it should be understood that the control system 60 is well suited to utilize a normal household water supply system as its source of hydraulic fluid under pressure. Therefore, this system does not necessitate the use of electric motors or hydraulic pumps. The control system 60 includes an outer cover 61, a four-way valve 62 and a cam plate 64 which is mounted for rotation on a valve shaft 66. The cam plate 64 is spring biased to the position shown in solid lines in FIG. 3 by means of spring 65. The four-way valve 62 may be of any suitable type which is adapted to interconnect various pairs of four separate conduits and also to shut off flow between any of the four conduits depending on its position. The four conduits in this case are as follows: Conduit 68 is the water inlet and is connected to a source of household water supply under pressure; conduit 70 serves as a drain and may be connected to any suitable waste water system; conduit 72 connects to the opening 52 leading into the chamber 54 at the top of cylinder 14; and conduit 74 connects to opening 56 in chamber 58 at the bottom of cylinder 14. Conduit 72, which connects to the top chamber 54 within cylinder 14, is also connected to an enlarged pipe fitting 76 which has an expandable diaphragm member 78 positioned thereover. A latch means 80 is pivotally mounted on pin 81 for movement relative to the pipe fitting 76 by means of a lever arm 82 which is biased to the position shown in FIG. 3 by means of a coil spring 84. The latch mechanism 80 is positioned relative to cover 61 by means of U-shaped clamp 83 and flanges 85. The purpose and function of the expandable diaphragm 78 and latch mechanism 80 will be better understood after reviewing the succeeding description relating to the operation of the four-way valve 62. The cam plate 64 has a cam detent 86 formed therein which is adapted to be engaged by the latch mechanism 80 upon rotation of the cam plate 64 to the position shown in dash-dot-dot lines 87 in FIG. 3.

The control system 60 also includes a connecting rod 88 which terminates at its upper end in an enlarged head portion 90 and is mounted for free sliding movement within a flange 92 on the control system 60. This connecting rod 88 is positioned in the same vertical plane as the cam plate 64 so that as the compression plate 48 moves upwardly it is engaged thereby and forced into contact with the cam plate 64 to pivot it from the position shown in solid lines to that shown in dash-dot lines 89. The control system 60 further includes a manual lever 94 which terminates in an actuating handle 96 on the exterior of the housing 12 which is manually connected by means of a suitable ratchet device (not shown) to the four-way valve shaft 66 for rotation of the cam plate 64 from the position shown in dash-dot lines 89 to the position shown in dash-dot-dot lines 87 at which position the latch 80 engages the cam detent 86. It should be noted further that the inlet conduit 68 includes a shut-off valve 97 positioned at the inlet 98 for the household water at the base of the housing 12 which is actuated by the tilting movement of the compaction chamber 16 so as to completely shut off the flow of incoming water to the control system 60 when the compaction chamber 16 is in the open position. This shut-off valve 97 serves as a safety feature to completely eliminate the possibility of the compression plate 48 being actuated while the compaction chamber 16 is in the open position.

The operation of this unique refuse compactor 10, which is adapted to operate completely on household water supply, should be understood after reference to the following description thereof. When the cam plate 64 is in the position shown in solid lines in FIG. 3, the inlet water is flowing from conduit 68 through the valve 62 into the conduit 74 which directs it to the chamber 58 in the bottom of cylinder 14. The introduction of this water pressure into chamber 58 forces the piston 36 to travel upwardly within the cylinder 14 thereby retracting the compression plate from within the compaction chamber 16. As the compression plate 48 reaches the upper portion of its travel, it contacts connecting rod 88 which by means of its plunger 90 pivots cam plate 64 against the force of spring 65 from the position shown in solid lines to that shown in dash-dot lines 89 in FIG. 3. In this position (dash-dot lines 89) the four-way valve 62 completely shuts off the flow of water between any of the conduits connected thereto. It should be noted that as the piston 36 moved upwardly within cylinder 14 the fluid within the top chamber 54 was forced out through conduit 72 which at that time was connected to drain conduit 70. With the unit in the neutral position (dash-dot lines 89), the compaction chamber 16 may be tilted outwardly as many times as desired to deposit trash and garbage within the bag 20 contained therein. Each time that the compaction chamber 16 is moved to the open position it actuates shut-off valve 97 in the inlet line 68 to completely eliminate the possibility of water entering the control system 60. Also, each time the compaction chamber 16 is pivoted back to the closed position the spillage prevention plate 34 is pivoted to cause a quantity of disinfectant to be spilled into the compaction chamber 16. This disinfectant thereby eliminates odor or germs and reduces the possibility of an anaerobic action during the time that the garbage and trash is contained within the bag 20.

When it is desired to actuate the refuse compaction device of this invention the external handle 96 is pivoted from the position shown in solid lines to that shown at dash lines in FIG. 3 so that the cam plate 64 is rotated to the dash-dot-dot position 87 at which the latch 80 engages the cam plate detent 86. In this position the valve 62 connects inlet conduit 68 with

conduit 72 to direct the flow of water to the top chamber 54 so as to move the piston 36 downwardly within the cylinder 14 and likewise to drive the compression plate 48 down into the compaction chamber 16. As this action takes place, the piston 36 causes the water within the chamber 58 to exit through conduit 74 which is connected by valve 62 to drain conduit 70 at this time. When the compression plate 48 approaches the downward extent of its travel and has successfully compressed the trash and garbage contained within compaction chamber 16 the water pressure within the chamber 54 beings to build to a level which is sensed by means of the expanding diaphragm 78. The diaphragm 78 then expands to a predetermined point where it overcomes the effect of spring 84 to thereby pivot latch 80 out of engagement with detent 86 on cam plate 64. The cam plate 64 then quickly returns under the action of spring 65 from the position shown in dash-dot-dot lines 87 to that shown in full lines in FIG. 3 at which time the pressurized water entering through conduit 68 is again connected to the bottom chamber 58 by means of conduit 74 and the piston 36 and compression plate 48 are retracted in an upwardly direction. Again, as was the case when this cycle started, the compression plate 48 has moved upwardly far enough to contact connecting rod 88 which in turn moves cam plate 64 to the neutral position (dash-dot lines 89). The compactor unit 10 is again in position for the addition of more trash and garbage to the bag 20 or, if the bag 20 has become full, it may be removed from the compaction chamber 16 by merely tilting the chamber forward and lifting out the bag. It is suggested that the bag 20 containing a full compacted load may easily be sealed by means of suitable tape. The compacted refuse bag 20 is then in condition for sanitary odorless storage until pick-up by suitable means.

Thus, it should be apparent from the preceding description that the unique refuse compaction unit of this device, which operates completely on pressure derived from a home water system, is well suited to compact household trash and garbage into a sanitary odor-free bag. This device does not require the use of any expensive maintenance items such as electric motors and hydraulic pumps. Tests with a variety of samples of household trash indicate that the volume of an average sample of household trash may be reduced by as much as five times from its original volume. Thus, the volume of the trash generated by a given household and subsequently removed by municipal refuse collection agency would be one-fifth as large as it is with normal garbage and trash collection means. In addition, the problem of storing trash and garbage in unsanitary containers is completely eliminated by the unique device of this invention.

We claim:

1. A refuse compactor unit for compressing and substantially reducing the volume of refuse which is adapted to utilize a household water pressure as a hydraulic power source comprising, in combination:

compaction chamber means;

removable refuse receiving means positioned within said compaction chamber means for receiving said refuse to be compacted; said compaction chamber means being tiltable relative to said unit for insertion and removal of said removable refuse receiving means and for depositing refuse in said refuse receiving means;

reciprocating compaction means movable into and out of said compaction chamber means for compressing said refuse within said removable refuse receiving means;

hydraulically responsive actuation means for controlling the movement of said reciprocating compaction means;

valve means connecting said hydraulically responsive actuation means to said source of household water pressure, said hydraulically responsive actuation means including a cylinder having hydraulic fluid openings at the top and bottom connected to said valve means, a double-action piston positioned for sliding movement within said cylinder between said top and bottom hydraulic openings in said cylinder, and a piston rod connecting said piston to said reciprocating compaction means and said valve means including a four-way valve member adapted to interconnect said source of household water pressure, the hydraulic opening in the top of said cylinder, the hydraulic opening in the bottom of said cylinder, and a drain line;

and control means for said valve means responsive to said reciprocating compaction means reaching both the top and bottom of its stroke to adjust the position of said valve to thereby control the flow of water to said hydraulically responsive actuation means, said control means including a spring-biased cam plate directly connected to said four-way valve member and including a cam detent, a freely sliding rod positioned to be moved upwardly into engagement with said cam plate by said reciprocating compaction means when said reciprocating compaction means approaches the top of its stroke to thereby rotate said cam plate and four-way valve means to a position which blocks all water flow through said four-way valve means, a latch means actuatable to engage the cam detent on said cam plate when said cam plate and four-way valve are rotated to a position which connects said source of household water pressure to said hydraulic opening in the top of said cylinder and said hydraulic opening in the bottom of said cylinder to said drain line to thereby force said piston downwardly and said compaction means into said compaction chamber means, a manual lever means connected to said cam plate and four-way valve means for manually rotating said cam plate to the position where said latch engages said detent in said cam plate, and an expandable diaphragm means responsive to increased water pressure within the top portion of said cylinder as said reciprocating compaction means reaches the bottom of its compaction stroke to remove said latch means from engagement with the detent on said cam plate to thereby release said spring-biased cam plate so that it rotates said four-way valve to a position which connects said source of household water pressure to said hydraulic opening in the bottom of said cylinder and said hydraulic opening in the top of said cylinder to said drain line to thereby force said piston upwardly to retract said compaction means from said compaction chamber.

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