# United States Patent [19]

**Hennells et al.**

[11] **3,918,359**

[45] **Nov. 11, 1975**


[54] **WASTE COMPACTOR WITH ADJUSTABLE BAG FILL CONTROL**


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[73] Assignee: **Compactor Company, Inc.,** Belleville, Mich.



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[21] Appl. No.: **480,585**

[52] **U.S. Cl.** ..... **100/52;** 100/99; 100/229 A; 100/269 R

[51] **Int. Cl.²** ..... **B30B 15/22**

[58] **Field of Search**..... 100/48, 52, 229 A, 269 R, 100/53, 99, 50, 51



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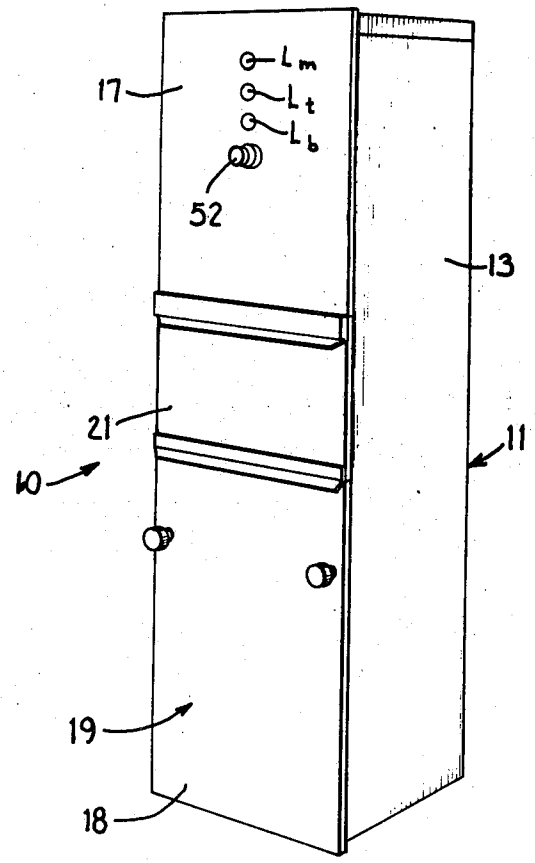
*Attorney, Agent, or Firm*—Woodhams, Blanchard and Flynn



[57] **ABSTRACT**

A waste compactor comprising a cabinet and a ram assembly mounted thereon and having a ram extendible downwardly for compacting waste within a receptacle. The ram assembly includes a fluid pressure cylinder activated by a fluid circuit containing a pump and a shiftable valve. The fluid circuit is controlled by an electrical control circuit which includes control means for automatically returning the ram to its retracted position when the bag is filled with waste to a preselected height. The control means includes an electrical timer which is set to correspond to a preselected extension of the ram for determining the maximum fill height of the bag. If the pressure in the cylinder exceeds a preselected magnitude prior to timing out of the timer, then this indicates that the receptacle is filled to the desired height and results in activation of a pressure switch which returns the ram to its retracted position.


**9 Claims, 7 Drawing Figures**



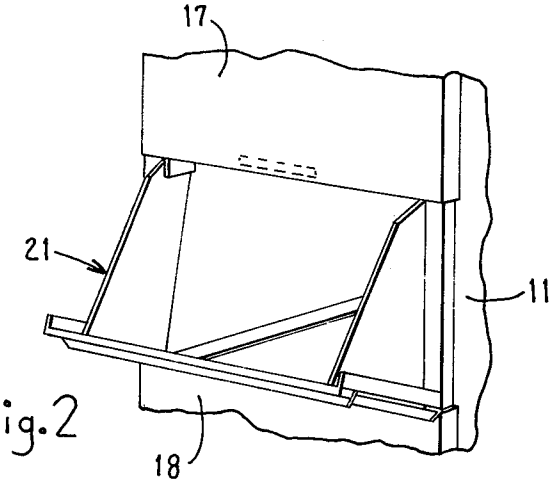



Fig. 2

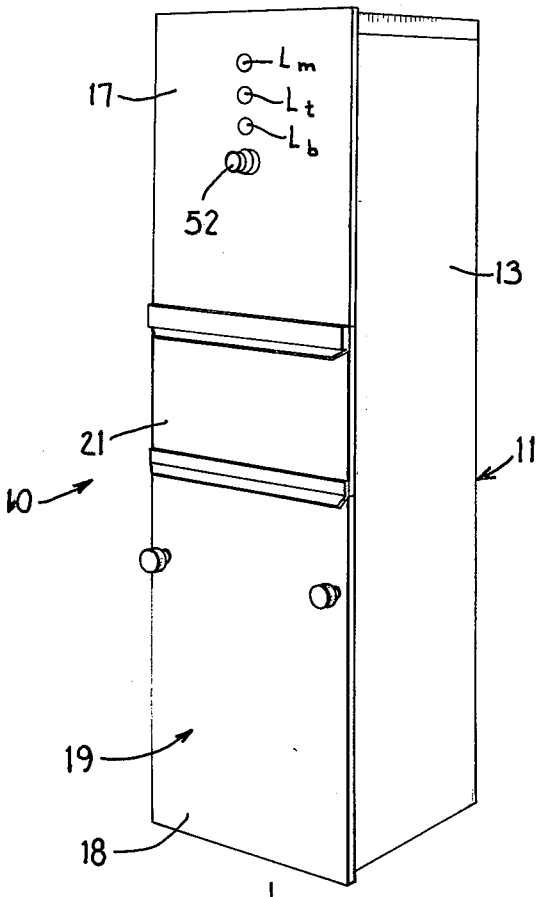



Fig. 1

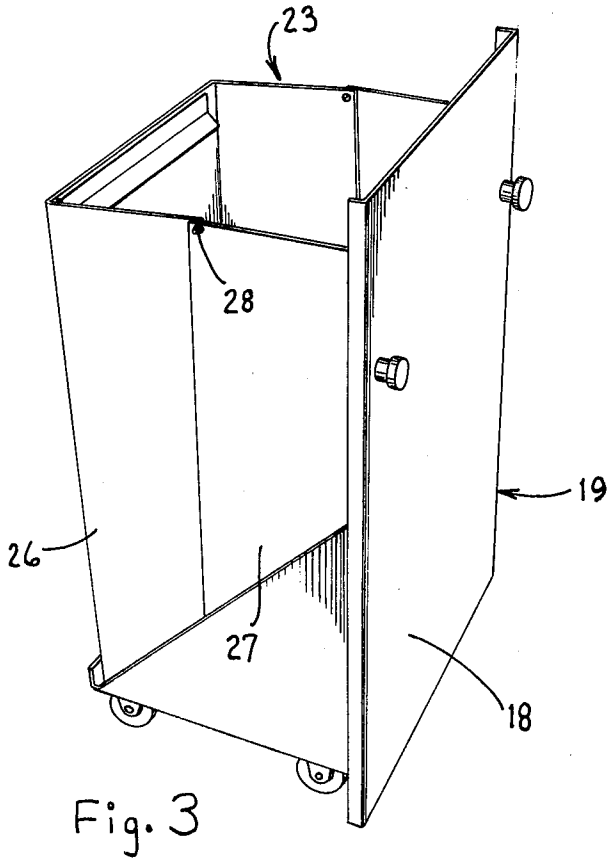



Fig. 3

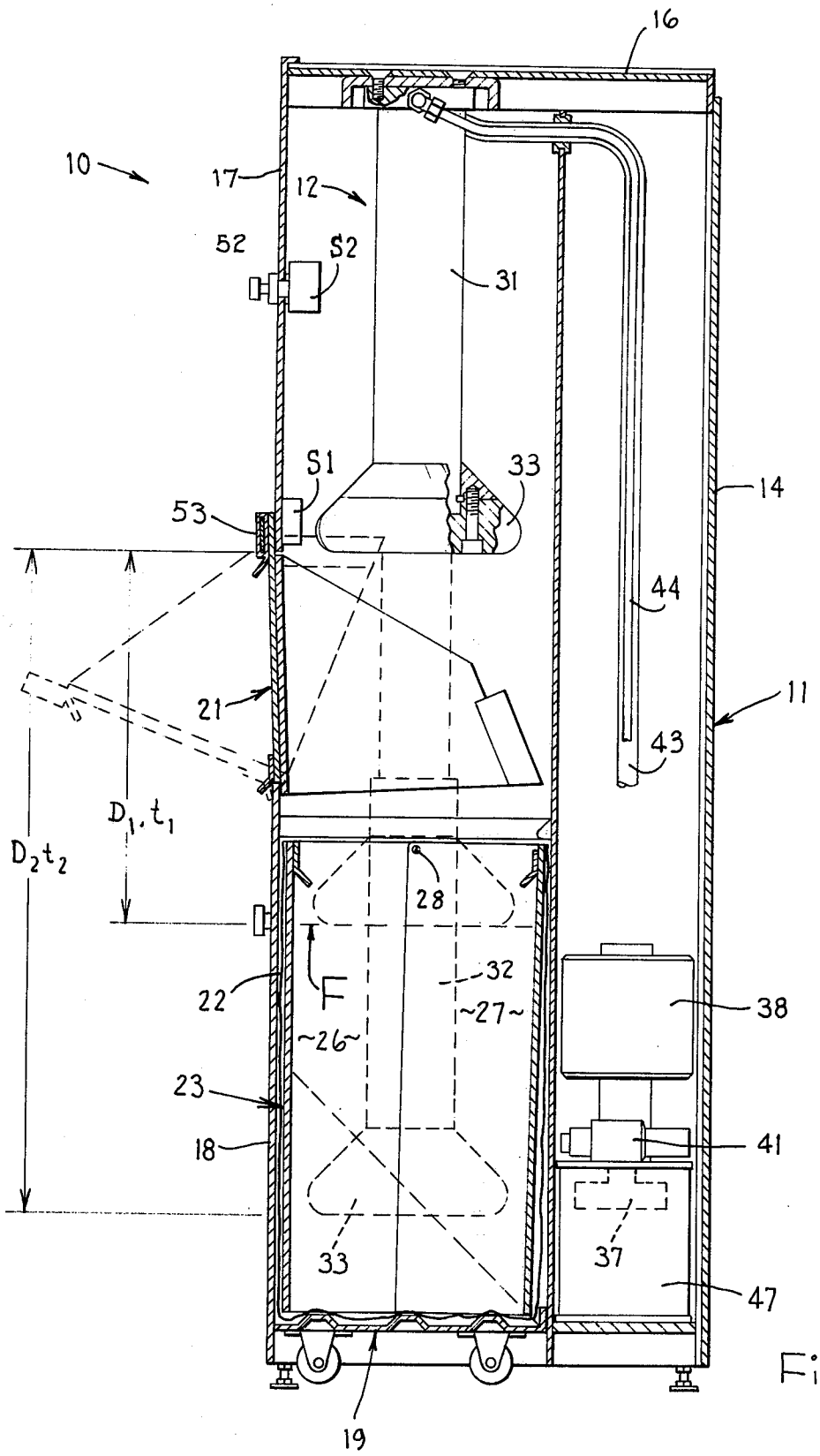

16
10
17
12
52
S2
31
S1
33
53
14
44
11
21
43
$D_1, t_1$
$D_2 t_2$
28
F
32
22
~27~
~26~
38
23
41
18
33
37
47
19

Fig. 4

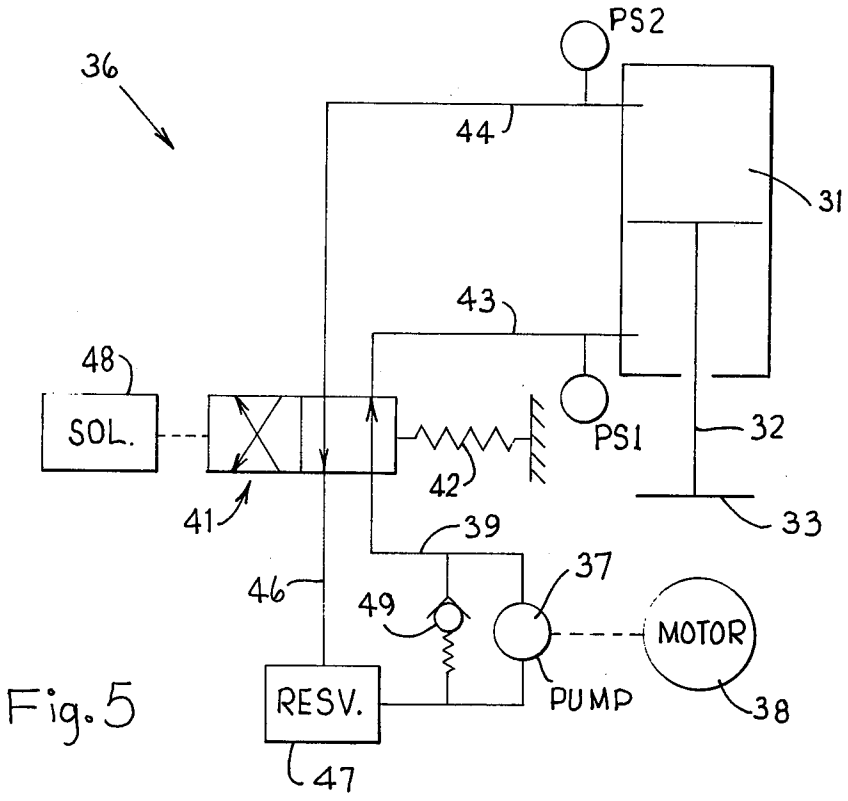

PS2
36
44
31
43
48
SOL.
PS1
32
42
41
33
39
37
46
49
MOTOR
RESV.
PUMP
38
47

Fig. 5

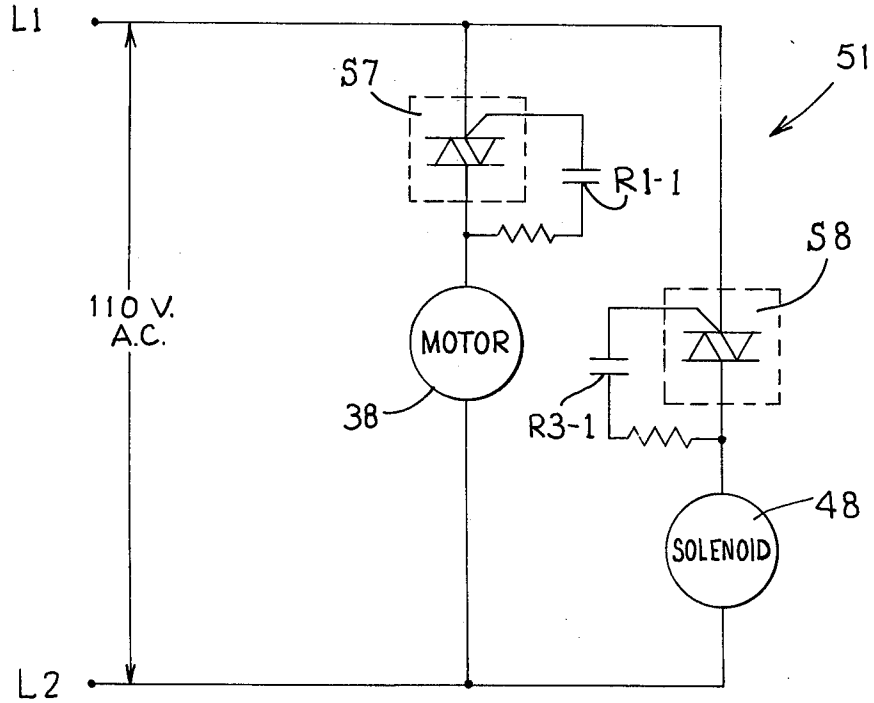

L1
S7
51
R1-1
S8
110 V.
A.C.
MOTOR
38
R3-1
48
SOLENOID
L2

Fig. 6

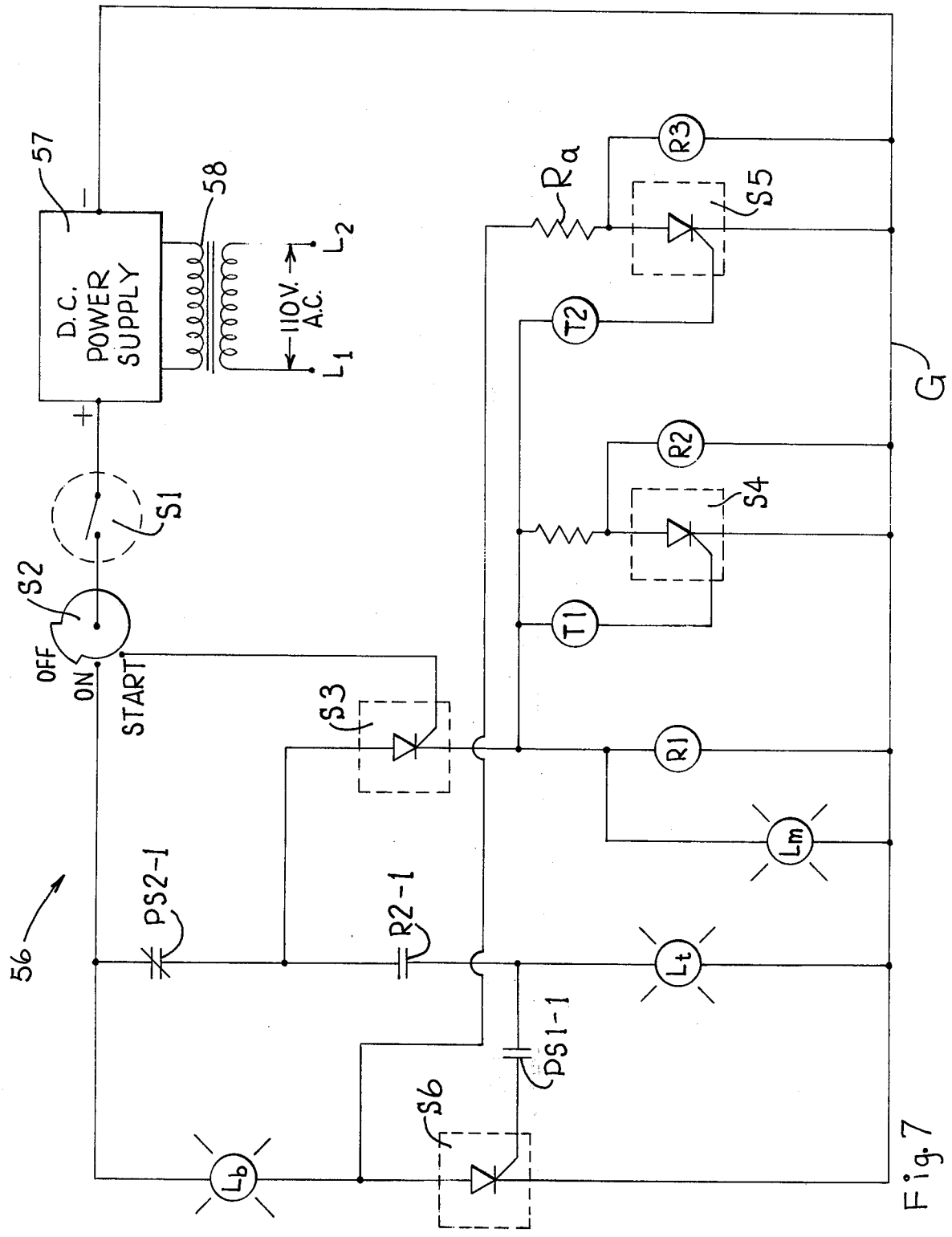

57
58
D.C. POWER SUPPLY
110V. A.C.
L2
L1
Ra
R3
S5
T2
G
R2
S4
T1
S1
S2
OFF
ON
START
S3
R1
Lm
56
PS2-1
R2-1
Lt
PS1-1
S6
Lb

Fig. 7

# WASTE COMPACTOR WITH ADJUSTABLE BAG FILL CONTROL

## FIELD OF THE INVENTION

This invention relates to a waste disposal device for compacting paper and related compressable products and, in particular, relates to an improved waste compacting device which includes control means associated therewith for permitting precise control over the extent to which waste is compacted within a disposable receptacle.

## BACKGROUND OF THE INVENTION

Copending application Ser. No. **297,822,** filed Oct. **16, 1972,** discloses therein a waste compacting device which has proven highly desirable and successful due to its ability to efficiently compact substantial quantities of waste, while being of compact size, and while providing maximum operator safety. However, in a continuing effort to improve both the waste compacting device and the performance thereof, still further developments and improvements have been made on said device which are believed to still further increase the efficient and optimum utilization of same.

One of the problems which has existed for a substantial period of time with respect to waste compactors of this general type is the problem of how to determine when the receptacle, such as a disposable bag or box, is filled with compacted trash. Since the housing of the compactor is normally closed during the compacting operation in order to provide optimum safety of the operating personnel, it is substantially impossible to visually inspect the receptacle to determine the extent to which it is filled with waste. While many of the known compacting devices have permitted visual inspection of the receptacle during those time intervals when the machine is not being used for compacting, nevertheless such visual inspection has been rather inconvenient to perform, either due to the complexity of the overall machine, or due to the necessity of having to remove suitable panels or the like. Due to the difficulty of making a visual inspection of the receptacle, it has been common practice for operating personnel to overfill the receptacle, thus resulting in spillage of the waste either within the machine or onto the ground upon removal of the receptacle from the machine. This obviously results in inefficient usage of the machine and also results in undesirable unsanitary conditions.

To overcome the problem of overfilling of the receptacle, attempts have been made to utilize a sensing device for determining the extent to which the receptacle is filled. These prior devices, to the best of my knowledge, have generally involved the use of a mechanical limit switch system disposed for coaction with the compacting ram for determining when the receptacle has been filled to the desired height. However, these systems have not proven totally acceptable or successful since the limit switches are often not readily accessible and are difficult to adjust when variation in the fill height is desired. Also, these limit switches are often disposed in positions wherein they are subject to severe damage or disturbance.

Accordingly, it is an object of the present invention to provide an improved waste compactor which overcomes the above-mentioned problems. Specifically, it is an object of the present invention to provide:



**1.** An improved waste compactor, as aforesaid, which includes control means associated therewith for permitting a receptacle to be filled with waste to a preselected height for preventing overfilling of the receptacle and without requiring visual inspection of the receptacle.

**2.** A waste compactor, as aforesaid, wherein the control means permits the fill height of the receptacle to be selectively adjusted in a simple manner without requiring disassembly of the machine.

**3.** A waste compactor, as aforesaid, wherein the control system results in automatic shutdown of the machine when the receptacle is filled to the preselected height.

**4.** A waste compactor, as aforesaid, which includes a visual indicator located externally of the machine and which is energized only when the receptacle is filled to the desired height so as to clearly indicate to the operator that the filled receptacle must be removed from the machine prior to further compacting of waste therein.

**5.** A waste compactor, as aforesaid, wherein the control means includes an adjustable electrical timer for determining the fill height of the receptacle, which timer is preset to a desired time interval which corresponds to a desired magnitude of ram extension.

**6.** A waste compactor, as aforesaid, wherein the control means also includes means for sensing a pressure buildup within the fluid pressure cylinder associated with the ram assembly for causing reversal of the ram assembly in those instances where the pressure exceeds a preselected level prior to expiration of the preselected time, thus indicating that the receptacle is filled to the desired height, which pressure sensing control is inactivated in those instances where the pressure does not exceed said preselected level prior to expiration of said preset time, so that after said preset time the pressure level within the cylinder may substantially exceed said preset level for causing effective compacting of waste within said receptacle.

**7.** A waste compactor, as aforesaid, wherein the control means is reliable in operation, is relatively inexpensive to manufacture and assemble, and is relatively simple to adjust so as to provide the desired compacting cycle.

Other objects and purposes of the present invention will be apparent to persons acquainted with devices of this general type upon reading the following specification and inspecting the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a compacting device incorporating therein the improvements of the present invention.

FIG. **2** is a fragmentary, perspective view illustrating the loading chute of the compacting device in its open position.

FIG. **3** is a perspective view of the dolly structure usable with the compacting device, same having a bag support device mounted thereon.

FIG. **4** is a side, central sectional view of the compacting device, same being illustrated in its closed position and with the ram assembly in its upwardly retracted position.

FIG. **5** diagrammatically illustrates the fluid circuit associated with the machine for controlling the extension and retraction of the ram assembly.

FIG. 6 schematically illustrates the main electrical power system of the machine.

FIG. 7 diagrammatically illustrates the electrical control circuit for the machine.

Certain terminology will be used in the following description for convenience in reference only and will not be limiting. For example, the words "upwardly", "downwardly", "rightwardly" and "leftwardly" will refer to directions in the drawings to which reference is made. The words "inwardly" and "outwardly" will refer to the geometric center of the machine and designated parts thereof. The word "front" will refer to the front side of the machine, same being the left side as appearing in FIG. 4. Said terminology will include the words above specifically mentioned, derivatives thereof and words of similar import.

## SUMMARY OF THE INVENTION

The objects and purposes of the present invention are met by providing a waste compactor comprising a housing having a fluid pressure-operated extendible ram assembly mounted thereon for compacting waste within a receptacle, such as a disposable flexible bag. A control system is associated with the ram assembly for permitting the receptacle to be filled only to a preselected height. The control system includes a timer operative during the compacting stroke of the ram assembly and adjusted to a preselected time which represents the desired fill height of the bag. The control system also includes a sensing element, particularly a pressure sensor, which causes automatic retraction of the ram assembly and energization of a warning device when the sensor is activated during said preset time, as by a substantial increase in the pressure within the fluid cylinder, thereby indicating that the receptacle is filled to the desired height.

## DETAILED DESCRIPTION

FIGS. 1–4 illustrate therein a waste compactor **10** which includes a boxlike housing or cabinet **11** containing therein a ram assembly **12** (FIG. 4) for permitting waste to be compacted within a disposable receptacle, such as a flexible plastic bag. The housing **11** includes a pair of opposed and substantially parallel sidewalls **13** fixedly connected by a backwall **14** and a top wall **16.** The upper portion of the front side of the housing **11** is closed by a removable upper panel **17.** The lower front side of the housing **11** is closed by a lower panel **18** which constitutes a portion of a removable cart or dolly **19.** A removable loading chute **21,** which is of a substantially U-shape, is disposed between the panels **17** and **18** for enabling waste to be loaded into the device. The chute **21,** when in the closed position illustrated in FIGS. **1** and **4,** results in the front side of the housing **11** being totally closed. However, the chute **21** is swingably movable into an open position, as illustrated in FIG. **2,** to enable trash to be deposited into the device. To receive the trash which is deposited through the chute **21,** the dolly **19** is adapted to have a flexible bag **22** supported thereon in an open upright position by means of a removable support device **23.**

The support device **27** comprises a clamshell device and includes elongated channel-like elements **26** and **27** which are disposed in opposed relationship to one another to form a substantially vertically elongated and upwardly extending tubelike structure having a substantially rectangular cross section. The elements **26** and **27** are telescopically slidably received one within the other, and have their upper adjacent ends pivotally connected by a pivot pin or rivet **28.** The device **27** is adapted to be disposed in the interior of the empty bag **22,** whereupon the friction between the device and the bag results in the bag being maintained in an open upright condition. The device **23,** which is adapted to be positioned on the floor of the dolly **19** in a self-supporting manner, thus maintains the bag in an open upright position and also functions as a liner for protecting the bag during the compacting of waste therein.

With respect to the ram assembly **12,** same includes a conventional double-acting fluid pressure cylinder **31** which is preferably hydraulically actuated. The upper end of the cylinder housing is fixedly mounted to the top wall **16** in the illustrated embodiment. The cylinder **31** has a piston rod **32** which slidably extends from the lower end thereof, which piston rod in the illustrated embodiment is of telescopic type. The free end of the piston rod has a compacting shoe or ram **33** fixedly secured thereto. The compacting ram **33** is movable between an uppermost retracted position as illustrated by solid lines in FIG. **4** and a lowermost extended position as illustrated by dotted lines in FIG. **4.**

The structure of the compactor **10** as described above is explained in greater detail in copending application Ser. No. **297,822.** Thus, a more detailed description of same is not believed necessary.

Considering now the hydraulic control system **36** associated with the waste compactor, same is diagrammatically illustrated in FIG. **5** and includes a conventional rotary pump **37,** such as a gear pump, driven by a motor **38.** The pump supplies pressurized fluid through a conduit **39** to a conventional four-way valve **41,** which in turn controls the flow of pressure fluid to and from the opposite ends of the cylinder **31.** The valve **41** is urged by a spring **42** into a position so that the pump normally supplies pressure fluid to the lower end of the cylinder through the conduit **43** for normally maintaining the piston rod **32** in its upper retracted position. When in this position, a further conduit **44** extends between the valve **41** and the upper end of the cylinder **31** to provide communication with a discharge conduit **46** which communicates with a reservoir or tank **47.** The valve **41** is shifted in opposition to the spring **42** by a conventional electrical solenoid **48** which, when energized, causes shifting of the valve **41** to connect the conduit **39** to the conduit **44,** and to connect the conduit **43** to the conduit **46,** thereby permitting downward extension of the piston rod **32.** The pump **37** also has a pressure relief valve **49** associated therewith for relieving the pressure within the system when the pressure exceeds a predetermined maximum, such as approximately **700** psi. The conduit **43** and **44** also have conventional pressure switches **PS1** and **PS2** associated therewith, such as in the vicinity of the ports to the cylinder **31,** for a purpose to be explained hereinafter.

The motor **38** and solenoid **48** are associated with the main power system **51** which, as illustrated in FIG. **6,** includes a pair of main electrical conduits or lines **L1** and **L2** having a conventional **110** volt AC current applied thereto. The motor **38** and solenoid **48** are connected in parallel across the lines **L1** and **L2.** Motor **38** is controlled by a switch **S7** and the solenoid **48** is controlled by a switch **S8,** which switches are conventional, such as Triacs. The switch **S7** has normally opened

relay contacts R1-1 associated therewith, and the switch S8 has normally opened relay contacts R3-1 associated therewith, which relay contacts when closed result in closure of the respective switch.

The waste compactor 10 is actuated by means of a main start switch S2 which, as illustrated in FIG. 4, is mounted adjacent the inner side of the upper panel 17. The start switch S2 is controlled by a rotary actuator 52 which extends outwardly through the upper panel 17 so as to be manually accessable exteriorly of the housing. If desired, the rotary actuator 52 can be key operated, such as in a conventional vehicle ignition switch. The waste compactor 10 also has a safety switch S1 associated therewith, which switch is mounted adjacent the inner surface of the upper panel 17 and is disposed closely adjacent the lower edge thereof. The safety switch S1 comprises a normally open, magnetically actuated switch and is moved into its closed position by means of a magnet 53 mounted on the chute 21 adjacent the upper edge thereof. The magnet 53 causes closure of the safety switch S1 only when the chute is moved into its closed position as illustrated by solid lines in FIG. 4. The upper panel 17 also has a plurality of warning devices, particularly lights, $L_m$, $L_t$ and $L_b$, positioned adjacent the front side thereof so as to be readily visible to the machine operator.

The above-mentioned switches and lights are associated with the main control circuit 56 which as illustrated in FIG. 7, includes a DC power supply 57 energized from a conventional 110V-AC power source. The DC power source 57 may comprise a conventional rectifier supplied with a stepped-down voltage due to the provision of a transformer 58.

The control system 56 includes therein the switches S1 and S2 connected in series with one another and in series with the power supply 57. The start switch S2 comprises a three-position switch and includes an OFF position, an ON position and a START position. The control system 56 also includes a plurality of normally open, electronic latching switches S3, S4, S5 and S6, which switches may each comprise a conventional silicon controlled rectifier (SCR). The switch S3 is moved into a latched closed position when the switch S2 is moved into the START position, with the switch S3 remaining in the latched position so long as the START switch S2 remains in the ON position and so long as the normally closed contacts PS2-2 associated with the pressure PS2 remain closed. The switch S4 is controlled by a first adjustable timer T1, which timer comprises a conventional electronic timer having a normally closed switch which is maintained in an open position during the timing out of a preselected time interval, so that upon expiration of the preset time interval the switch associated with the timer T1 closes to thus move the latching switch S4 into a closed position. In a similar manner, the latching switch S5 is controlled by a further adjustable electronic timer T2 which is substantially identical to the timer T1 but is normally adjusted so as to provide for a time interval greater than the timer T1. The remaining latching switch S6 is controlled by means of the normally open pressure switch contacts PS1-1 associated with the pressure switch PS1. Closure of the contacts PS1-1 results in closure of the latching switch S6.

The latching switch S3 has a relay coil R1 connected in series therewith, which coil when energized causes closure of the relay contacts R1-1 which control the motor start switch S7 (FIG. 6). Further, the light $L_m$ is connected in parallel with the relay coil R1 and is thus energized whenever the motor is energized. A further relay coil R2 is connected in parallel with the latching switch S4. Relay coil R2 is energized whenever the switch S4 is open so as to cause closing of the normally-open relay contacts R2-1, which contacts are connected in series with the light $L_t$ to cause energization thereof during the preset time interval controlled by the timer T1. When the timer T1 times out so as to cause closing of switch S4, then the relay coil R2 is effectively shorted out so that the contacts R2-2 open and thus de-energize the light $L_t$.

The latching switch S5 also has a relay coil R3 connected in parallel therewith, which relay coil is connected directly to the ON terminal of the start switch S2 so as to be energized at all times when the start switch S2 is not in its OFF position. The normally-open contacts R3-1 associated with the relay coil R3 are moved to a closed position upon energization of the relay coil R3 for thus closing the switch S8 (FIG. 6) associated with the solenoid 48, thus causing energization of solenoid 48 and shifting of the valve spool 41 (which shifting occurs rightwardly in FIG. 5) to provide communication between the pump 37 and the upper end of the cylinder 31. The relay coil R3 is also shorted out when the latching switch S5 closes due to the timing out of the timer T2, thus permitting the contacts R3 to open so that solenoid 48 is de-energized, whereby the spring 42 returns the solenoid valve 41 into its normal position as illustrated in FIG. 5.

The remaining latching switch S6 as illustrated in FIG. 7 is controlled by the contacts PS1-1 associated with the pressure switch PS1, which contacts are normally open and are connected in series with the relay contacts R2-1. The latching switch S6 is moved into a close position only when the pressure switch contacts PS1-1 are closed. The latching switch S6 is also connected in series with the remaining light $L_b$ so that same is fully energized and will glow brightly only when the latching switch S6 is closed.

In the control circuit 56, the timer T1 in conjunction with the switch S4, the relay R2 and the pressure switch PS1 constitute a bag-fill control so as to limit the height of trash which is compacted within the disposable bag 22. On the other hand, the timer T2, the switch S5 and the relay R3 constitutes a maximum stroke control for the ram assembly to thus control the compacting of the trash within the bag. The operation of the control circuit 56, and its relationship to the hydraulic control system 36 and the main electrical power system 51, will be explained in detail hereinafter.

## OPERATION

The ram 33 associated with the compactor 10 has a maximum extension stroke designated by the distance $D_2$ in FIG. 4, so as to enable waste to be effectively compacted within the bag 22, which bag contains therein the clamshell support device 23. However, when the bag 22 is filled with compacted waste to the desired height, such as indicated by the fill line F in FIG. 4, then the ram 33 will have a permissable stroke of only $D_1$ prior to engaging the compacted waste. Since the ram moves at a relatively uniform rate during its extension stroke when not subjected to an external load, it will thus require an approximate time interval $t_1$ for the ram to move through the stroke $D_1$, and it will

likewise require a longer time interval $t_2$ for the ram to move through the maximum stroke $D_2$. Accordingly, prior to utilization of the waste compactor **10**, the timer $T_1$ which is used for controlling the fill height of the bag is adjusted to measure the time interval $t_1$, and similarly the timer T2 which is used for controlling the complete extension stroke of the ram will be set to a time interval $t_3$ which is approximately equal to or slightly greater than the time interval $t_2$. Assuming that the dolly **19** containing thereon the bag **22** and the support device **23** is positioned within the machine directly under the ram assembly, then the machine is in condition so as to enable waste to be deposited into the bag and compacted therein.

To utilize the machine, and assuming that the bag **22** is at least partially empty, the operator will swing the chute **21** outwardly into its open position as illustrated in FIG. **2.** This results in movement of the magnet **53** away from the switch **S1,** whereby switch S1 is opened to prevent energization of the machine. While the start switch S2 will normally be in the OFF position, nevertheless movement of the start switch to the ON position will have no effect so long as the safety switch S1 is open. The operator will then deposit the desired amount of trash through the chute **21** into the bag **22,** as lined by the support device **23.** After a sufficient quantity of trash has been loosely deposited into the bag, chute **21** will be swung upwardly into its closed position, whereupon the magnet **53** will cause closure of the safety switch **S1.** When in this position, the machine is now in position to permit compacting of waste within the bag. However, the hydraulic control system **36,** the main electrical power system **51** and the control circuit **56** are still in their inactive positions (as illustrated in FIGS. **5–7**) due to the start switch S2 being in the OFF position.

To initiate a compacting cycle, the operator rotates the actuator **52** from the OFF to the ON position, whereupon electrical energy flows through the normally closed contacts **PS2-1** to the relay coil **R3,** thereby energizing same and closing the contacts **R3-1** so that the switch **S8** also closes. This thus energizes solenoid **48** and causes shifting of valve **41** (rightwardly in FIG. **5**) so that the conduit **39** communicates with conduit **44,** and likewise the conduit **43** communicates with conduit **46** to release any pressure fluid which may be trapped in the lower end of the cylinder **31.** The operator will continue to rotate the actuator **52** into the START position, whereupon electrical energy will be momentarily supplied to the latching switch S3, causing same to close. Since closure of the switch S3 occurs almost instantaneously, the operator will move the switch S2 into the START position only momentarily, and then will return same so that it is exclusively in the ON position.

The movement of the start switch S2 to its ON position results in the light $L_b$ being connected in series with the latching switch **S5,** which in turn is connected to the grounded side G of the electrical circuit. However, since the latching switch S5 has a large resistance $R_a$ connected in series therewith, the potential drop across the light $L_b$ is extremely small so that the light is only slightly energized, the level of energization of the light $L_b$ being so low that it does not cause any appreciable glowing of the light.

With the start switch in the ON position and the latching switch S3 closed, the relay coil **R1** is immediately energized causing closure of its respective contacts **R1-1,** whereby the motor start switch **S7** is likewise closed so that the motor **38** is energized. Energization of motor **38** results in immediate rotation of pump **37** so that pressure fluid is supplied through conduits **39** and **44** to the upper end of the cylinder **31,** thereby initiating a downward extension of the ram **33.** Immediately upon energization of relay coil **R1,** the light $L_m$ is also energized so that the operator can readily determine whenever the motor is energized.

Immediately upon closure of the latching switch S3, the timers T1 and T2 are both activated so as to initiate their respective timing cycles, and the relay coil R2 is also energized to close the relay contacts **R2-1,** whereupon the timing light $L_t$ is also immediately energized.

Assuming that the bag **22** is only partially filled with compacted trash, then the ram **33** will freely move downwardly into the bag. As the ram moves downwardly through the distance $D_1$, no external resistance of sufficient magnitude is imposed on the ram so as to restrict the downward movement thereof, whereupon the timer T1 times out. This results in closing of the latching switch **S4,** which immediately results in effectively short circuiting the relay coil R2 so that the contacts **R2-1** thereof immediately return to their normally open position. This immediately de-energizes the light $L_t$, thus indicating to the operator that the ram has moved downwardly into the bag and that the bag is not yet filled with trash. The opening of the relay contacts **R2-1** also results in the pressure switch contacts **PS1-1** being totally disconnected from the power source **57.**

After the time interval $t_1$ as controlled by the timer T1 has timed out, the ram **33** will continue to move downwardly and/or will continue to exert a compacting force on the waste contained within the bag **22** to compress same. However, after the time interval $t_3$ as set by the timer T2 times out, then the switch S5 immediately closes whereupon the relay coil R3 is effectively shorted out so that the contacts **R3-1** associated therewith open, thereby opening the switch **S8.** This causes solenoid **48** to be de-energized and valve **41** to be returned by the spring **42** into its original position wherein conduit **39** is again connected to conduit **43,** and conduit **46** is again connected to conduit **44.**

Immediately upon shifting of the valve **41** as described above, the pressure fluid contained in the upper end of the cylinder is discharged back to the reservoir **47,** whereas the pump **37** supplies pressure fluid through the conduit **43** into the lower end of the cylinder to cause the ram assembly to retract upwardly. Since there is no appreciable external force imposed on the ram assembly preventing upward movement thereof, a relatively low pressure level is sufficient for moving the ram upwardly. However, when the ram reaches its uppermost position, the ram is effectively prevented from moving any further so that the pressure level of the fluid contained within the lower end of the cylinder rapidly increases, thereby causing the contacts **PS2-1** associated with the pressure switch PS2 to open. The opening of the pressure switch contacts **PS2-1** also causes the latching switches S3 and S4 to open. However, the latching switch S5 remains in its closed position and thus prevents the initiation of a new compacting cycle due to the inability to re-energize the relay R3. Accordingly, the latching switch S5 can be de-energized and opened only by returning the start switch S2 to its OFF position, or alternately by opening the

chute 21 so as to open the safety switch S1. This thus results in the control system being returned to its original position so as to be in condition to permit initiation of a further compacting cycle.

During the operation of the control system as described above, the latching switch S6 remains in a continuous open position so that the bag indicator light $L_b$ is never fully energized during a normal compacting cycle. Further, during this normal compacting cycle, the actual compaction of the waste within the bag occurs primarily after the timer T1 has timed out (that is, after the ram has moved beyond the distance $D_1$). However, since the timing out of the timer T1 disconnects the pressure switch contacts PS1-1 from the power supply and since the pressure switch PS2 is associated with the discharge or upper end of the cylinder during the compacting stroke, the ram assembly is thus able to apply to develop a large pressure within the cylinder 31 so as to effectively compact the waste, which pressure within the cylinder is controlled solely by the pressure relief valve 49, which valve is normally set at a relatively high pressure, such as in the order of 700 psi.

If the bag 22 becomes filled with compacted waste to the desired height, such as indicated by the level F, and if an attempt is made to compact further waste within the bag, the control system 56 effectively prevents any further waste from being compacted within the bag. In this instance, the operator again actuates the machine by closing the loading chute 21 to actuate the safety switch S1 and by rotating the start switch S2 to the ON and START positions in the same manner as described above. As the ram 33 moves downwardly through the distance $D_1$, it engages the compactor waste which is disposed substantially at the level F, which waste results in application of a force of substantial magnitude on the ram tending to resist further downward movement thereof. This external force as developed by the compacted waste is imposed on the ram just prior to the timing out of the time interval $t_1$ by the timer T1, and thus results in the pressure of the fluid contained within the upper end of the cylinder 31 being substantially increased to an extent sufficient to cause closing of the pressure switch contacts PS1-1, which contacts are set to close at a relative low pressure level such as from 100 to 300 psi. This results in immediate closing of the latching switch S6 so that the bag fill light $L_b$ is directly connected to the grounded side G of the circuit and is immediately fully energized and glows brightly, thus warning the operator that the bag is filled with waste. Since the switch S6 is connected in parallel with the relay R3, the closing of switch S6 effectively results in short circuiting of the relay R3 due to the presence of the large resistance $R_a$ in series therewith. Closing of latching switch S6 thus results in the current flow to relay coil R3 being substantially decreased to the point whereby same is substantially de-energized so that its contacts R3-1 open and cause de-energization of the solenoid 48. The spring 42 then returns the valve 41 to its original position so that conduit 43 again communicates with conduit 39, and conduit 44 again communicates with the discharge conduit 46 so that the pump supplies pressure fluid to the lower end of the cylinder 31, causing the ram to be retracted upwardly into its original position. The pressure switch contacts PS2-1 are again opened when the ram reaches its uppermost position. This opening of the pressure switch contacts PS2-1 de-energizes the relay coil R1 so that its contacts R1-1 return to the normally open position, thereby de-energizing the motor 38. However, the bag-fill light $L_b$ remains fully energized so long as safety switch S1 remains closed and start switch S2 remains in its ON position. However, movement of start switch S2 to its OFF position or movement of safety switch S1 to its open position results in de-energization of latching switch S6, thereby effectively de-energizing light $L_b$ and restoring the control circuit 56 to its original position, in which position the light $L_b$ is not energized to a level sufficient to cause it to glow.

After the bag-fill light $L_b$ has been fully energized, as described above, the operator will remove the loading chute 21 and then move the dolly 19 outwardly from the housing. The operator can then lift the clamshell support device 23 upwardly out of the bag, whereon the bag can then be tied and wheeled to a suitable location for disposal. A new bag is then slidably positioned over the support device 23, with the bag and support device again being positioned on the dolly, whereupon the dolly is again inserted into the housing to permit further waste to be deposited into and compacted within the bag.

The control system of the present invention, as described above, is highly desirable since it prevents further waste from being compacted into the bag after the bag contains therein a predetermined quantity of compacted waste. At the same time, the control system also provides an indication to the operator as to the filled condition of the bag so as to permit emptying of the machine. While the present invention discloses the use of an indicator light for indicating the bag-fill condition, it will be appreciated that numerous other types of indicators, such as a bell or other audible indicator, could be utilized if desired.

While the control system 53 as described above has been disclosed in relationship to a compactor of the type disclosed in copending application Ser. No. 297,822, it will be readily apparent that the control system is equally applicable to compacting devices which are structurally different from the compacting device disclosed in this application. The control system could, for example, also be utilized on the compacting machine disclosed in copending application Ser. No. 297,822.

Although a particular preferred embodiment of the invention has been disclosed in detail for illustrative purposes, it will be recognized that variations or modifications of the disclosed apparatus, including the rearrangement of parts, lie within the scope of the present invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a waste compactor having a housing, means coacting with the housing for supporting thereon a receptacle, and extendible ram means mounted on the housing for permitting compacting of waste within said receptacle, and control means for permitting waste to be compacted into said receptacle only to a preselected depth, comprising the improvement wherein said control means includes timer means actuated in correspondence with the movement of said ram assembly in the compacting direction for controlling said depth, said timer means being preset to a preselected time interval which corresponds to the time required to move the ram assembly from an inactive retracted position to a

partially extended position which corresponds to the receptacle being filled with trash to the preselected depth, reversing means operatively associated with said ram assembly for automatically retracting same when said ram assembly encounters a first external resistance of a first predetermined magnitude prior to timing out of said preselected time interval, and override means for permitting continued extension of said ram assembly and imposition thereon of a second resistance having a second magnitude substantially greater than said first magnitude when said timer means times out without said ram assembly having encountered a resistance greater than said first magnitude, whereby the resistance of said second magnitude is effective for compacting the waste within said receptacle.

**2.** A waste compactor according to claim **1**, further including second timer means connected in parallel with said first-mentioned timer means and set for a second preselected time interval which is greater than said first-mentioned preselected time interval, said first and second time intervals both being activated simultaneously whereby said first-mentioned timer means times out prior to said second timer means, whereby said second timer permits compacting of waste within said receptacle after said first timer means times out, and return means activated by said second timer means after same has timed out for causing said ram assembly to be automatically retracted to its original position.

**3.** A compactor according to claim **2**, wherein said first-mentioned timer means and said second timer means are both adjustable electronic timers.

**4.** A compactor according to claim **1**, further including energizable indicator means positioned externally of said housing and energized whenever said ram assembly is reversed prior to timing out of said timer means, whereby said indicator means indicates that the receptacle is filled to the desired depth.

**5.** In a waste compactor having a housing, a ram assembly mounted on said housing for permitting compacting of waste within a receptacle, said ram assembly including a double-acting fluid pressure cylinder and a ram activated by said fluid pressure cylinder for movement into said receptacle for compacting waste therein to a preselected depth, a motor-pump unit for supplying pressurized fluid to said pressure cylinder, and shiftable valve means for controlling the flow of pressure fluid to and from said cylinder, said valve means being shiftable between a first position enabling flow of pressure fluid from said pump to one end of said cylinder for causing said ram to be moved toward said receptacle for compacting waste and a second position wherein said pump communicates with the other end of said cylinder for causing said ram to be moved away from said receptacle, said valve means including means associated therewith for normally maintaining the valve means in said second position and actuator means for moving said valve means from said second position to said first position, and control means for permitting the compacting of trash within said receptacle only to a preselected depth, comprising the improvement wherein said control means includes:

first means for controlling the normal compacting stroke of said ram, said first means maintaining said valve means in said first position for a first preselected time interval to permit waste to be compacted within said receptacle;

second means activated upon movement of said valve means into said first position for causing said ram during movement thereof in the compacting direction to be automatically reversed if the receptacle is filled with compacted waste to said preselected depth, said second means including timer means activated upon movement of said valve means to said first position and set to a second preselected time interval which is substantially less than said first time interval;

said second means also including reversing means responsive to the presence of compacted trash within said receptacle to said preselected depth for causing said valve means to be shifted to said second position so as to automatically retract said ram means, said reversing means being activated only during said second time interval; and

means for deactivating said reversing means upon expiration of said second time interval to prevent shifting of said valve means into said first position until expiration of said first time interval.

**6.** In a waste compactor according to claim **5**, wherein said reversing means includes pressure sensing means responsive to a pressure level of a first magnitude as experienced within said fluid pressure cylinder for causing said valve means to be shifted into said first position prior to expiration of said second time interval; and

pressure control means associated with said cylinder means for limiting the pressure level of the fluid as supplied to said cylinder to a second magnitude which is substantially greater than said first magnitude, whereupon said cylinder is capable of developing a large compacting force which can be applied to the waste for compacting same after expiration of said second time interval but prior to expiration of said first time interval.

**7.** A waste compactor according to claim **6**, wherein said second means also includes pressure sensing means including a pressure switch for sensing the pressure level of the fluid supplied to said one end of said cylinder, and electrical switch means operatively associated with said timer means and said pressure switch for activating said pressure switch only during said second time interval, said switch means deactivating said pressure switch upon expiration of said second time interval.

**8.** A waste compactor according to claim **7**, further including indicator means actuated by said sensing means for indicating to an operator when the receptacle is filled with trash to said preselected depth.

**9.** A compactor according to claim **8**, wherein said indicating means includes an indicator light positioned externally of the housing and energized only when said sensing means senses that the receptacle is filled with compacted waste to said preselected depth.

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