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[54] **WASTE DISPOSAL SYSTEM**


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[52] **U.S. Cl.** ..... **100/45,** 53/124 B, 100/49, 100/50, 100/99, 100/209, 100/215, 100/229 A, 100/269 R, 141/73, 141/248, 193/31 A

[51] **Int. Cl.** ..... **B30b 15/26**

[58] **Field of Search** ..... 141/73, 248; 100/43, 45, 100/49, 50, 99, 186, 221, 215, 229 A, 209, 269 R; 53/124 B; 193/31, 31 A



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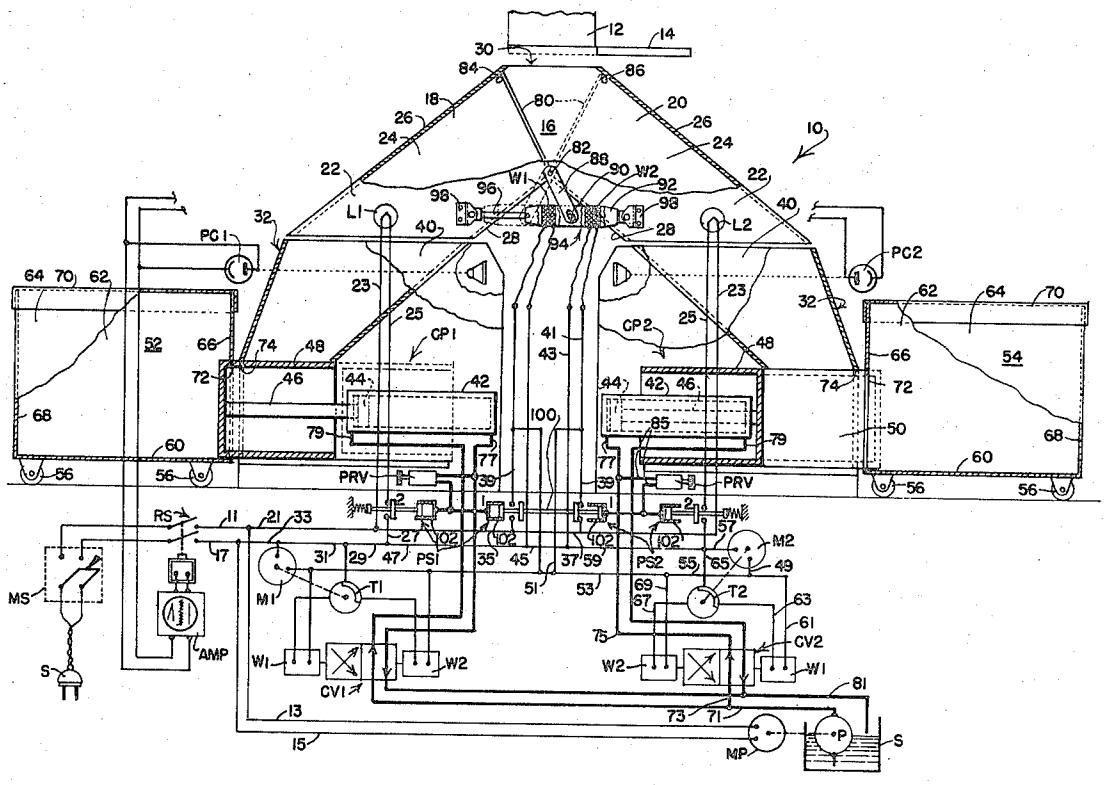
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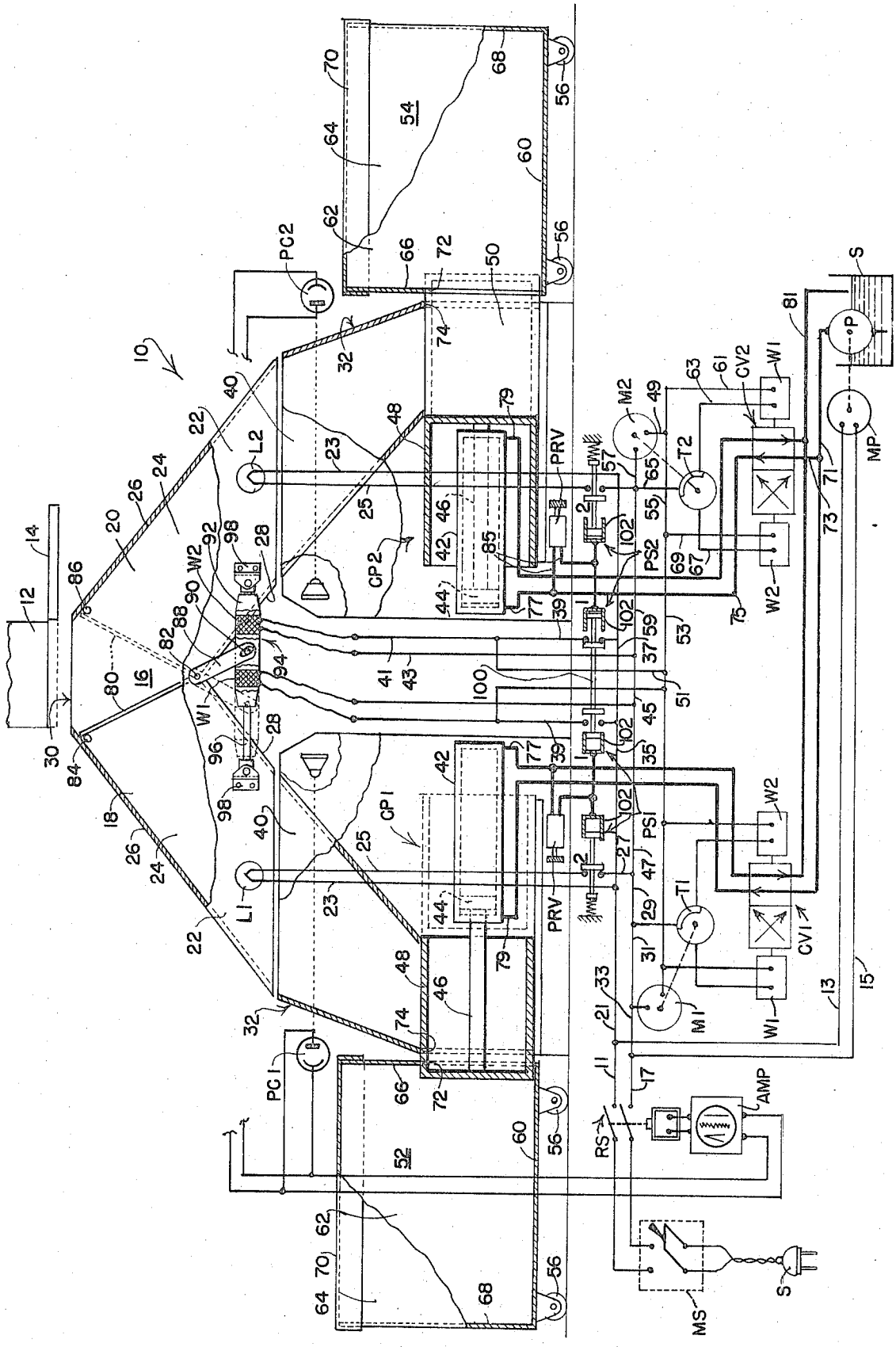


[57] **ABSTRACT**

A fully automatic refuse disposal system embodying a pair of trash compactors, each of which operates to compress waste material into a container. A trash diverter positioned in the path of oncoming waste material is selectively operable to direct such material to either compactor and functions automatically when the container of either compactor becomes filled to direct the material to the other compactor and render a signal which is indicative of the filled condition of such container. Reception of material by either compactor is effective to initiate operation of such compactor and to disable the operation of the other compactor.


**4 Claims, 1 Drawing Figure**




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# WASTE DISPOSAL SYSTEM

The present invention relates to a refuse collecting system and has particular reference to a fully automatic trash-compacting and baling arrangement whereby trash issuing from a chute is selectively directed to a pair of trash compactors, each of which functions to receive the loose material and repeatedly eject the same directly into an associated mobile container to produce a compressed bale. More specifically, the invention is concerned with such a refuse collecting system wherein means are provided whereby, when the container which is associated with either trash compactor has received its full quota of compressed material, the loose material issuing from the chute is automatically diverted to the other trash compactor to the end that the filled container may be withdrawn, emptied and replaced so that when such other container has become filled the material may again be diverted to the first compactor, the operation being continuous.

In large buildings, as for example inhabitable apartment houses, office buildings, restaurants and the like, it has long been the practice to bale trash such as waste paper, kitchen residue commonly referred to as garbage, and other material by compacting the same in a baling press or compactor in order to reduce the volume thereof and thus permit easier handling thereof for purposes of removal. Obviously, where a single baling press or compactor is employed, the size and capacity of such compactor will be commensurate with the size or population of the building. The use of large compacting equipment consumes considerable space, is relatively expensive, and presents difficulties in connection with removal of the compacted trash bales, extremely large bales requiring special hoisting or propelling mechanism.

In an effort to reduce the size of the trash bales, where extremely large buildings are concerned, plural trash compactors have been employed, these operating independently of one another and thus requiring frequent attention on the part of an operator. Alternatively, dual-acting compactors which simultaneously form two continuous bales have been employed, thus decreasing the size of the bales for ease of handling, but such arrangements also present difficulties in that equal distribution of the waste material into the twin compacting chambers cannot always be attained. Thus, in the event that one compacting chamber becomes filled prior to the filling of the other chamber, continued feeding of trash to the filled chamber results in clogging of the system. Additionally, with such dual-acting compactors, periodic emptying of both compacting chambers simultaneously, as well as simultaneous replacement of the bale containers is required, and, during such time as these emptying and replacement operations are in progress, the dual compactor must remain idle. Thus, if for example the operator is interrupted in his duties so that the bale containers are not promptly returned to the compactor equipment, and in the interim a large deposit of trash is made, there is danger of clogging of the equipment.

The present invention is designed to overcome the above noted limitations that are attendant upon the construction and use of present day refuse collecting systems employing compacting or trash baling equipment and, toward this end, the invention contemplates the provision of a fully automatic system by means of which trash which is deposited in a trash chute is initially directed to a first baling compactor which functions to receive the loose material and compact the same by forcing it progressively into a removable container to produce a continuous compressed bale. At such time as the container becomes filled to capacity with the compacted material, operation of such first compactor is automatically terminated and a second trash compactor is set into operation while at the same time trash issuing from the chute is diverted to such second compactor until such time as the container associated therewith also becomes filled to capacity. At this time the operation of the second compactor is automatically terminated. Upon filling of either container, a signal is rendered and remains effective until such time as such container is emptied. Thus, during operation of the second compactor the signal associated with the first compactor remains effective providing that the container associated therewith has not been emptied. The operator is thus given a prolonged period in which to attend to emptying such container and, during this period the second compactor continues to function so that there is no idle time involved. On the other hand if, during the time that the second compactor is operating, the operator attends to the emptying of the filled container which is associated with the first compactor, the second compactor will continue its compacting and container-filling operation and, at such time as its associated container becomes filled a signal will be rendered and the oncoming trash issuing from the chute will be diverted back to the first trash compactor for container filling purposes. The same relationship with respect to emptying of the container which is associated with the second compactor will then exist so that after each switch-over of the diverter mechanism the operator is afforded a prolonged time within which to attend to emptying of a container before both signals become effective and both compactors become disabled.

The provision of a refuse removal system such as has briefly been outlined above and possessing the stated advantages constitutes the principal object of the invention.

The provision of a trash compacting arrangement which is extremely simple in its construction and which therefore may be manufactured and installed at a low cost; one in which the functional components thereof are comprised largely of commercially available units or assemblies, thereby further contributing to low cost; one which is comprised of a minimum number of parts, particularly moving parts, and which therefore is unlikely to get out of order; one which is rugged and durable and which therefore will withstand rough usage; one which may be manufactured and sold as original equipment or which may be installed as an adjunct to existing equipment; and one which otherwise is well adapted to perform the services required of it, are further desirable features which have been borne in mind in the production and development of the present invention.

Other objects and advantages of the invention, not at this time enumerated, will readily suggest themselves as the nature of the invention is better understood.

In the accompanying sheet of drawings forming a part of this specification the single FIGURE is a side elevational view, largely schematic in its representation and partly in section, showing a refuse removal system constructed in accordance with the present invention

and also embodying a combined schematic hydraulic and electrical circuit diagram of the functional components of the system.

Referring now to the drawing in detail, the trash compacting, refuse removal system of the present invention is designated in its entirety by the reference numeral **10** and it is shown as being operatively associated with a vertically disposed trash chute **12** which may be considered to extend from the various floor levels of a multistory building and which has associated therewith the usual fire door **14.** The system involves in its general organization a trash diverter **16** which, in effect, constitutes a manifold chute extension defining a pair of branch trash-conducting passages **18** and **20.** The passages **18** and **20** are established by the provision of front and rear walls **22** and **24,** downwardly and outwardly diverging slanting top walls **26,** and similarly slanting bottom walls **28.** These walls define therebetween a central trash-receiving opening **30** which is disposed immediately beneath the chute **12** and which is common to the two trash-conducting passages **18** and **20.** The open lower ends of the trash-conducting passages **18** and **20** communicate with respective funnel-like hoppers **32** which are associated with a pair of trash-baling compactors units CP1 and CP2 respectively.

The two compactor units CP1 and CP2 are substantially identical in their construction and therefore, in order to avoid needless repetition of description, a description of one of them will suffice for them both. Each compactor unit includes a casing **40** which serves to support an hydraulic cylinder **42** having a piston **44** therein and a plunger **46,** the outer end of which carries a cup-shaped ram **48.** The cylinder **42** is so disposed with respect to the associated hopper **32** that when the plunger **46** and ram **48** are in their retracted position, as shown in connection with the compactor unit CP2, the lower open end of the hopper is uncovered so that trash issuing therefrom may fall by gravity into a trash-compaction chamber **50** which is defined by the compactor casing **40.** Upon movement of the ram **48** toward its fully extended position as shown in connection with the compactor CP1, the ram passes beneath the hopper **32** and forces the material which is contained within the compaction chamber **50** longitudinally outwardly of the compactor and into an associated mobile trash-receiving receptacle or container, the container which is associated with the compactor CP1 being designated by the reference numeral **52** and the container which is associated with the compactor unit CP2 being designated by the numeral **54.**

The two containers **52** and **54** are substantially identical and each container is tractionally supported by suitable wheels **56** and includes a bottom wall **60,** upstanding side walls **62** and **64,** a front end wall **66** and a rear end wall **68,** together with a removable cover **70** which closes the otherwise open upper end of the container.

The front wall **66** of each container is provided with a rectangular trash inlet opening **72** therein, such opening being designed for register with a similar trash outlet opening **74** which is provided in the outer wall of the compaction chamber **50** when the container is moved into operative trash-receiving relationship with respect to an associated compactor unit. From the above description it will be apparent that during each outward stroke of the ram **48** such trash material as may have collected within the compaction chamber **50** will be forced outwardly from the opening **74** and caused to enter the opening **72,** thus conducting such material out of the compactor unit and into the container **52** and **54** (as the case may be), successive loads of the material serving to progressively fill the container and becoming compacted therein against the rear wall **68** of the container which serves as a reaction bulkhead to assimilate the thrust of the ram **48.** According to the present invention, and as will be described in greater detail presently, means are provided whereby when either container **52** or **54** becomes completely filled with the thus compacted trash material, a pressure switch which is associated with the hydraulic system by means of which the compactor is actuated becomes effective to terminate the operation of the compactor while at the same time means are provided for switching or diverting the flow of trash from the chute **12** to the other compactor.

Accordingly, the trash diverter assembly **16** is provided with a swinging diverter gate **80,** the lower proximate edge of which is hingedly connected as indicated at **82** to the juncture region between the two slanting bottom walls of the branch passages **18** and **20,** and the distal edge region of which is designed for selective engagement with a pair of abutments **84** and **86** which extend transversely across the assembly **16** between the walls **22** and **24** thereof. When the gate **80** is in contact with the abutment **84** as shown in full lines in the drawing, loose trash material issuing from the chute **12** will be directed into the branch passage **20.** When the gate **80** is in contact with the abutment **86** as shown in dotted lines, such loose trash material will be directed into the branch passage **18.**

An actuating lever **88** has its upper end fixedly secured to the diverter gate **80** and its lower end is pivotally connected by a pin and slot connection **90** to the medial region of a horizontally shiftable cylinder **92** which is associated with a dual-acting solenoid-actuated gate control unit **94,** the latter also including a fixed plunger or guide rod **96** on which the casing **92** is longitudinally shiftable between the full line position wherein the diverter gate **80** bears against the abutment **84** and the dotted line position wherein such gate bears against the abutment **86.** The opposite ends of the guide rod **96** may be anchored to the front wall **22** of the trash diverter assembly **16** by suitable supporting brackets **98.**

The fixed guide rod **96** functions in the manner of a solenoid core or armature for a pair of solenoid windings W1 and W2 which are carried on the shiftable casing **92.** Upon energization of the winding W2 the cylinder **92** is constrained to shift to its right hand position as shown in full lines in the drawings, thus swinging the diverter gate **80** against the stop **84** and causing loose trash issuing from the chute **12** to flow through the passage **20** so as to be operated upon by the compactor CP1. Upon energization of the solenoid winding W1, the cylinder **92** is constrained to shift to its left hand dotted line position against the stop **86** and causing the loose trash to flow through the passage **18.**

The operation of the herein described trash compacing refuse collecting system of the present invention may best be set forth by reference to the combined electric and hydraulic circuit diagram which has been imposed upon the structural disclosure of the drawing. In such diagram, the hydraulic fluid conduits or pas-

sages are shown in heavy lines, while the electrical circuit wires or leads are shown in light lines. The hydraulic components, in addition to the two cylinders 42, further include a pump for supplying fluid to the cylinders 42 of the compactor unit cP1, and a similar control valve CV2 for reversing the flow of fluid to the cylinder 42 of the compactor unit CP2. The electrical components include a motor MP for driving the pump P, a timer T1 for selectively energizing the solenoid windings of the valve V1, a timer T2 for selectively energizing the solenoid windings of the valve V2, a motor M1 for driving the timer T1, a motor M2 for driving the timer T2, a photocell arrangement PC1 which is effective across the hopper 32 of the compactor CP1, a similar photocell arrangement PC2 which is effective across the hopper 32 of the compactor CP2, an amplifier AMP which is common to both photocell arrangements PC1 and PC2, a relay actuated switch RS which is operable under the control of the amplifier AMP and its associated relay magnet RM, a pressure switch PS1 which senses the back pressure in the cylinder 42 of the compactor unit CP1, and a pressure switch PS2 which senses the back pressure in the cylinder 42 of the compactor unit CP2. Preferably, but not essentially, a mechanical crossover 100 is provided between the two pressure switches PS1 and PS2 and serves a purpose that will be made clear presently.

The electrical components further include a signal lamp L1 which is suitably disposed on the casing 40 of the compactor unit CP1 and a signal lamp L2 similarly disposed on the casing of the compactor unit CP2. Each pressure switch PS1 and PS2 is of the dual contact type and is provided with No. 1 and No. 2 contacts, the No. 1 contacts of the pressure switches serving to control the energization of the solenoid windings w1 and w2 respectively of the gate control unit 94 and the No. 2 contacts of such switches serving to control the energization of the signal lamps L1 and L2 respectively. A master switch MS is effective upon closing thereof to supply electric current from a suitable source S which may be a commercial power line to the electrical system for energizing the various components thereof.

Assuming now for purposes of discussion that the container 52 of the compactor unit CP1 is filled, that the container 54 of the compactor CP2 is empty, and that the master switch MS is closed, the presence of back-up trash material in the hopper 22 of the compactor CP1 will excite the photocell arrangement PC1 so that the switch RS will be closed through the medium of the amplifier AMP and its associated relay magnet, a circuit will then extend from the source S, through the master switch MS and relay magnet RM, through leads 11, 13, pump motor MP, and leads 15, 17 back to the source S. At this time, and for reasons that will be described presently, back-up pressure in the hydraulic lines leading to the compactor CP1 will function to maintain the No. 1 contacts of the pressure switch PS1 open and the normally open spring biased No. 2 contacts thereof closed so that a signal circuit will extend through leads 11, 21, 23, signal lamp L1, leads 25, No. 2 contacts of the switch PS1, and leads 27, 29, 31, 33 and 17 back to the source S. Illumination of the signal lamp L1 will indicate to the operator that the container 52 is filled and requires emptying.

With the pressure switch PS1 in the condition set forth above, the crossover 100 will cause the No. 1 contacts of the pressure switch PS2 to become closed and the No. 2 contacts thereof to become open. Thus a circuit will extend from the source through leads 11, 21, 35, 37, No. 1 contacts of the pressure switch PS2 (now closed), leads 39, 41, winding W2 of the cylinder 92 and leads 43, 45, 47, 29, 31, 33 and 17 back to the source. Such energization of the winding W2 serves to shift the cylinder 92 to the right as previously described, thus maintaining the diverter gate 80 in its full line position so that material issuing from the chute 12 will be directed to the hopper 32 of the compactor CP2.

Closure of the No. 1 contacts of the pressure switch PS2 also establishes a circuit which extends from the source S through leads 11, 21, 35, 37, No. 1 contacts of the switch PS2, leads 39, 51, 53, 55, 49 timer motor M2, leads 57, 59, 45, 47, 29, 31, 33 and 17 back to the source S. Actuation of the timer motor M2 serves to drive the timer T2 for alternate energization of the windings w1 and w2 of the control valve CV2. Rotation of the timer T2 effects intermittent energization of the winding w1 of the valve CV2 through a circuit which extends from the source through leads 11, 21, 35, 37, 39, 51, 53, 55, 61 winding w1 of the valve CV2, lead 63, timer T2, leads 65, 59, 45, 47, 29, 31, 33 and 17 back to the source. Such rotation of the timer T2 also effects intermittent energization of the winding w2 of the valve CV2 through a similar circuit but involving leads 67 and 69 instead of leads 61 and 63.

Such alternate energization of the windings w1 and w2 of the valve CV2 serves to shift the position of the valve CV2 in order to alternately direct fluid to the opposite ends of the cylinder 42 of the compactor CP2 in the usual manner of compactor operation. The flow circuit for the cylinder 42 to and from the pump P extends through fluid lines 71, 73, valve CV2, lines 75, 77, cylinder 42, line 79, valve CV2, and line 81 back to the sump S.

It is to be noted at this point that the fluid lines 75 and 77 which extend between the pump P and the cylinder 42 of the compactor CP2 are connected to the high pressure side of the cylinder, i.e. they lead to the side of the piston 44 which requires high pressure to compact the waste material within the container 54. The fluid line 79 which leads to the sump S is a low pressure return line. The pressure switch PS2 is responsive to the back-up pressure in the fluid line 75 to open the No. 1 contacts thereof when such back-up pressure exceeds a predetermined maximum, and also to close the spring-biased No. 2 contacts thereof. Small piston cups 102 which are responsive to the pressure in the line 75 serve to control the opening and closing movements of the No. 1 and No. 2 contacts of the pressure switch PS2, and an adjustable pressure relief valve PRV is interposed in a fluid line 85 which extends between the line 75 and the piston cups 102.

The compactor CP1 has associated therewith a local timer circuit for the timer T1 which is substantially identical to the previously described circuit for the timer T2 and which therefore will not be described in detail herein. Similarly, the compactor CP2 has a signal circuit for the signal lamp L2 similar to that which has been described in connection with the lamp L1, and also a circuit for the winding W1 of the solenoid-actuated cylinder and plunger assembly 94. Additionally, the hydraulic circuitry for the cylinder 42 and control valve CV1 of the compactor CP1 is substantially

identical to the previously described hydraulic circuitry for the corresponding hydraulic components of the compactor CP2 and need not be described in detail herein.

Still considering the condition which becomes effective when the container 52 is filled and the container 54 is empty, as long as the No. 1 contacts of the pressure switch PS2 remain closed, the timer T2 will continue to effect alternate shifting of the position of the control valve CV2, thus reciprocating the ram 48 of the compactor unit CP2 so as to force the trash material in the compaction chamber 50 into the container 54 as previously described. Assuming now for the purpose of discussion that prior to filling of the container 54, the operator has emptied the container 52, such emptying thereof will relieve the reaction pressure on the ram 48 of the compactor unit CP1 and also the back-up pressure in the fluid line which actuates the pressure switch PS1. At this time the spring-biased No. 1 contacts of the switch PS1 will become open so as to extinguish the signal lamp L1 and the piston cup pressure on the No. 2 contacts will be relieved. As trash continues to flow to the compaction chamber 50 of the compactor CP2, it will be periodically ejected into the container 54 and compressed therein until such time as the maximum pressure setting of the pressure switch is exceeded, at which time the pressure switch PS2 will be actuated to close the spring-biased No. 1 contacts thereof and open the No. 2 contacts. Closure of the No. 1 contacts will energize the signal lamp L1, while opening of the No. 2 contacts terminate the operation of the timer T2 and cause the ram 48 to remain in its pressurized position against the compacted bale of material in the container 54, thereby maintaining back-up pressure in the fluid line leading to the cylinder 42. Opening of the No. 2 contacts also functions through the medium of the crossover 100 to reverse the position of the pressure switch PS1 which is at this time free to become reversed inasmuch as the container 52 has been emptied so that there is no back pressure in the piston cups 102 associated with such switch. Such reversal of both pressure switches PS1 and PS2 effects reversal of the position of the diverter gate 80 in the manner previously described so as to bring such gate to its dotted line position and otherwise disabling the compactor unit CP2 and setting the compactor unit CP1 into operation in precisely the same manner as that described in connection with the operation of the unit CP2.

In the event that the operator fails to empty the container 52 prior to the time that the container 54 becomes filled, the back-up pressure of the cylinder 42 of the compactor CP1 will prevent reversal of the position of either pressure switch PS1 or PS2, although it will not prevent the back-up pressure of the cylinder 42 of the compactor CP2 from actuating the piston cup 102 which controls the movement of the spring-biased No. 2 contacts of the pressure switch PS2. Fluid pressure will cause these latter contacts to close so that both signal lamps L1 and L2 will become energized while both rams 48 will remain in a condition of stall against their respective bale loads. Removal of either containers 52 or 54, or of both containers, will condition the system for immediate operation at such time as either photocell arrangement PC1 or PC2 is intercepted by the passage of trash material through the associated chute 32.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawing or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit of the invention. For example, although the gate control unit 94 has in the interests of simplicity, been illustrated and described as embodying a horizontally shiftable solenoid actuated cylinder, various other gate actuators are contemplated as for example a pneumatically or hydraulically operable cylinder of the push-pull type, or an electric cylinder of the type which employs a worm and nut arrangement to produce linear push-pull motion. Additionally, although visible signal devices are shown herein for indicating the filled condition of the containers 52 and 54, audible signal devices may be employed if desired. Therefore, only insofar as the invention has particularly been pointed out in the accompanying claims is the same to be limited.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a waste disposal system, in combination, a pair of trash compactor units each having a hopper, a compaction chamber in communication with said hopper for receiving loose trash, a container for compacted trash, a reciprocable ram effective upon reciprocation to traverse said compaction chamber and repeatedly eject trash contained therein and compress the same within said container to produce a bale and means for reciprocating said ram, a trash diverter for selectively directing trash to said hoppers and embodying a casing defining a trash inlet and a pair of trash outlets in communication with said hoppers respectively, a movable two-position trash diverter gate effective in one position to direct trash from the inlet to one of said hoppers and in another position to direct trash from the trash inlet to the other hopper, and means responsive to a predetermined maximum pressure of trash in either container for disabling the ram-reciprocating means of the compactor unit which is associated with such container, for actuating the ram-reciprocating means of the compactor unit which is associated with the other container, and for shifting the position of said trash diverter gate to establish communication between said trash inlet and the hopper of said other compactor unit.

2. In a waste disposal system, the combination set forth in claim 1, wherein said ram-reciprocating means for each compacting unit comprises an hydraulic cylinder, and a fluid supply line leading to said cylinder, and said pressure-responsive means is responsive to the incidence of back-up pressure in said supply line when the pressure of trash in either container attains said predetermined maximum.

3. In a waste disposal system, in combination, a pair of hydraulically operable trash compactor units each of which is effective upon actuation to receive loose trash and compress the same into the form of a bale, electrically operable valve means effective when energized to supply fluid to each compactor unit to actuate the latter, a pressure switch for each valve means and effective upon closure thereof to energize the latter, a trash diverter for selectively directing trash to said compactor units, said diverter including a casing defining a trash inlet and a pair of trash outlets leading to said compactor units respectively, a movable two-position trash diverter gate effective in one position to direct trash from said inlet to one of the compactor units and in another position to direct trash from said inlet to the other compactor unit, and electrically operable control

means for shifting the position of said gate, one of said pressure switches being effective upon closure thereof to actuate said control means and move said gate to one of its positions and the other pressure switch being effective upon closure thereof to actuate the control means and move the gate to its other position, said pressure switches each being responsive to the incidence of back-up pressure of fluid supplied to its respective compactor unit by its associated valve means.

4. In a waste disposal system, the combination set forth in claim 3 including, additionally, signal rendering means effective upon closure of each pressure switch.

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