

[54] AUTOMATIC REFUSE COMPACTION SYSTEM

[72] Inventors: John P. Cleary, Valley Cottage; Abraham Schulkin, Mamroneck, both of N.Y.

[73] Assignee: International Pollution Controls Corporation, East Paterson, N.J.

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[58] Field of Search 100/45, 49, 98, 256, 269 B, 100/269, 215, 218, 53, 99, 232

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Primary Examiner—Billy J. Wilhite

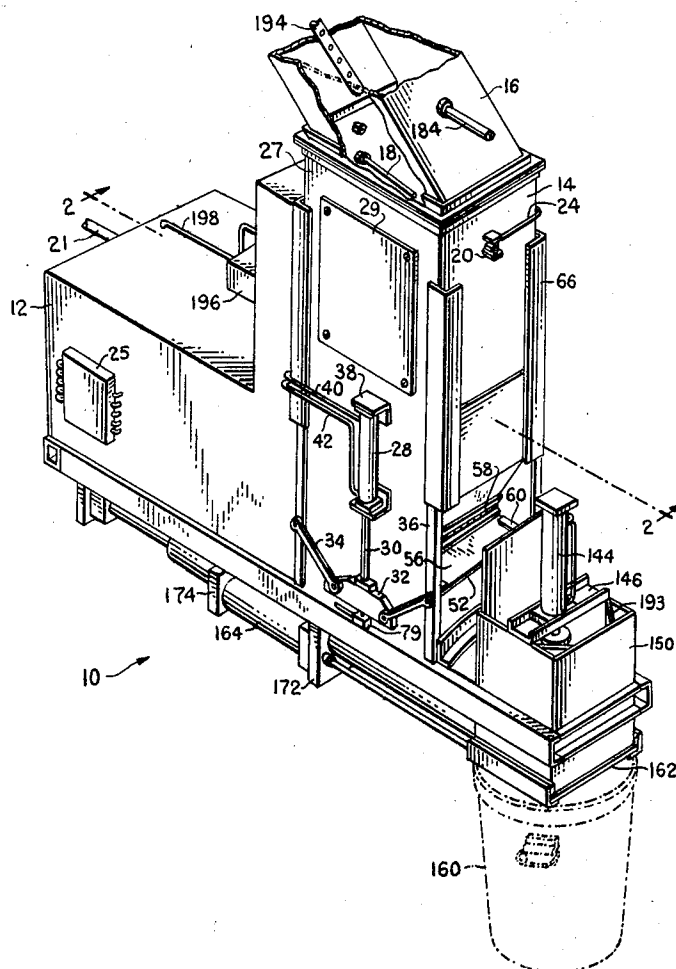
Attorney—Jacob B. Burke

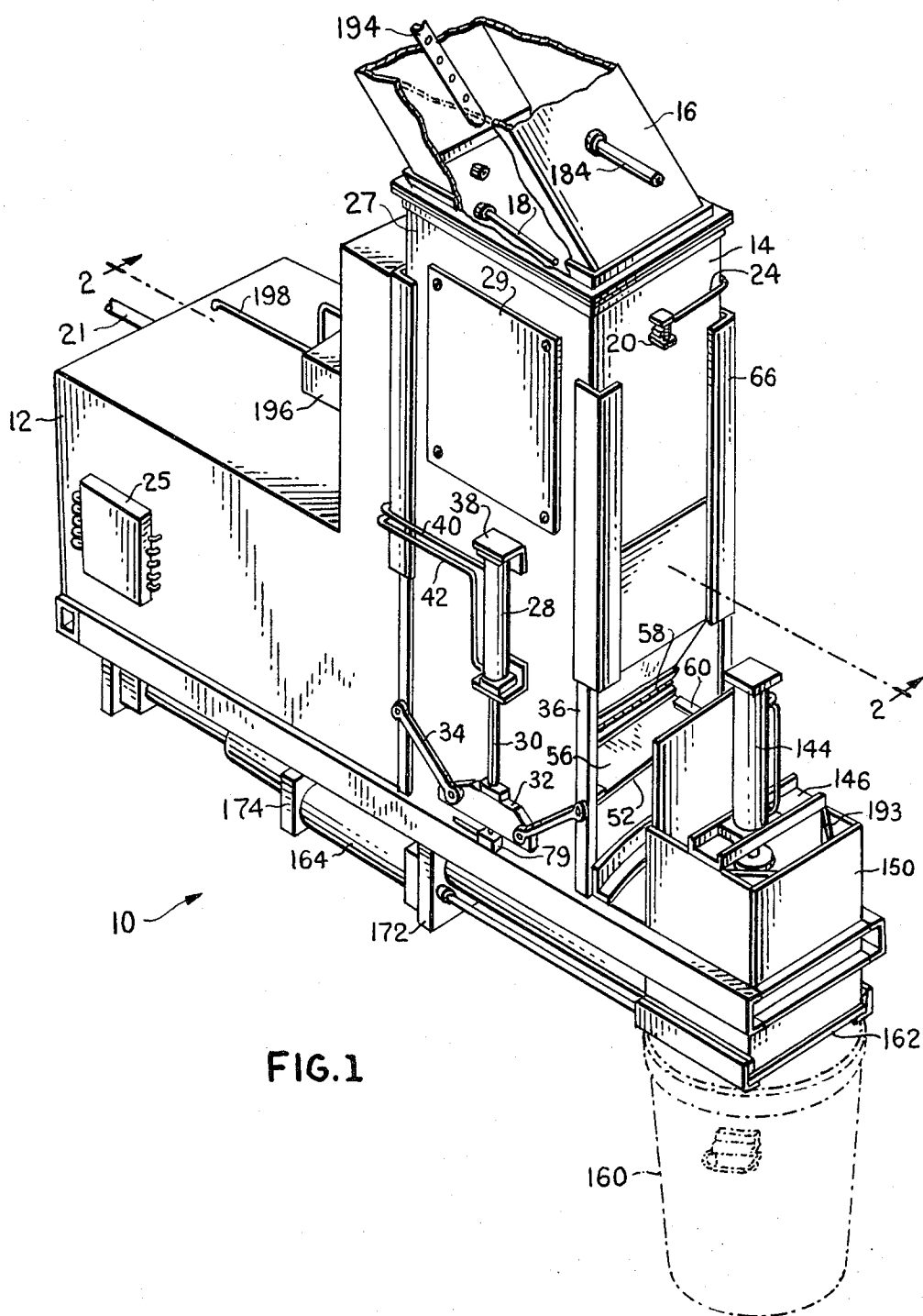
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ABSTRACT

An automatic refuse compaction system includes a compactor unit having first and second stages of refuse compaction operating respectively vertically and horizontally in sequence. Refuse is compacted in a compaction chamber from which it is discharged automatically into a receptacle. The refuse compaction stages and discharge means are all pneumatically controlled. Automatic means for increasing compaction pressure in the second stage of compaction is provided. Pneumatically operated devices for discharging deodorant, insecticide and fire extinguishing fluid on the refuse are also provided. A plurality of compactor units can be connected in a pneumatic circuit with a single source of compressed air and programmed selector means for delivering air under pressure to each compactor unit in turn requiring compressed air.

11 Claims, 7 Drawing Figures





INVENTORS:
JOHN P. CLEARY
BY ABRAHAM SCHULKIN
J. B. Burke
ATTORNEY.

FIG. 3

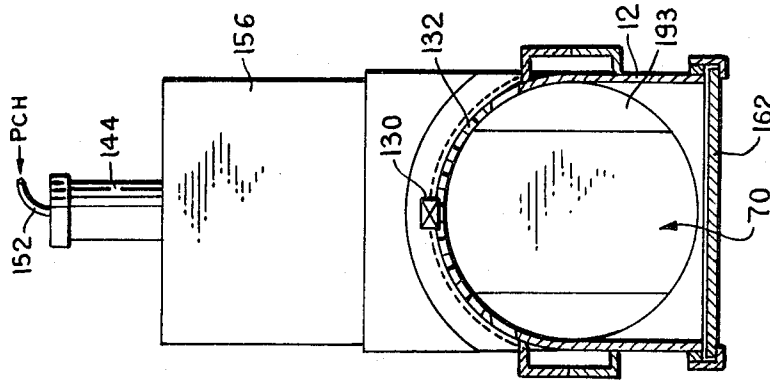


FIG. 2

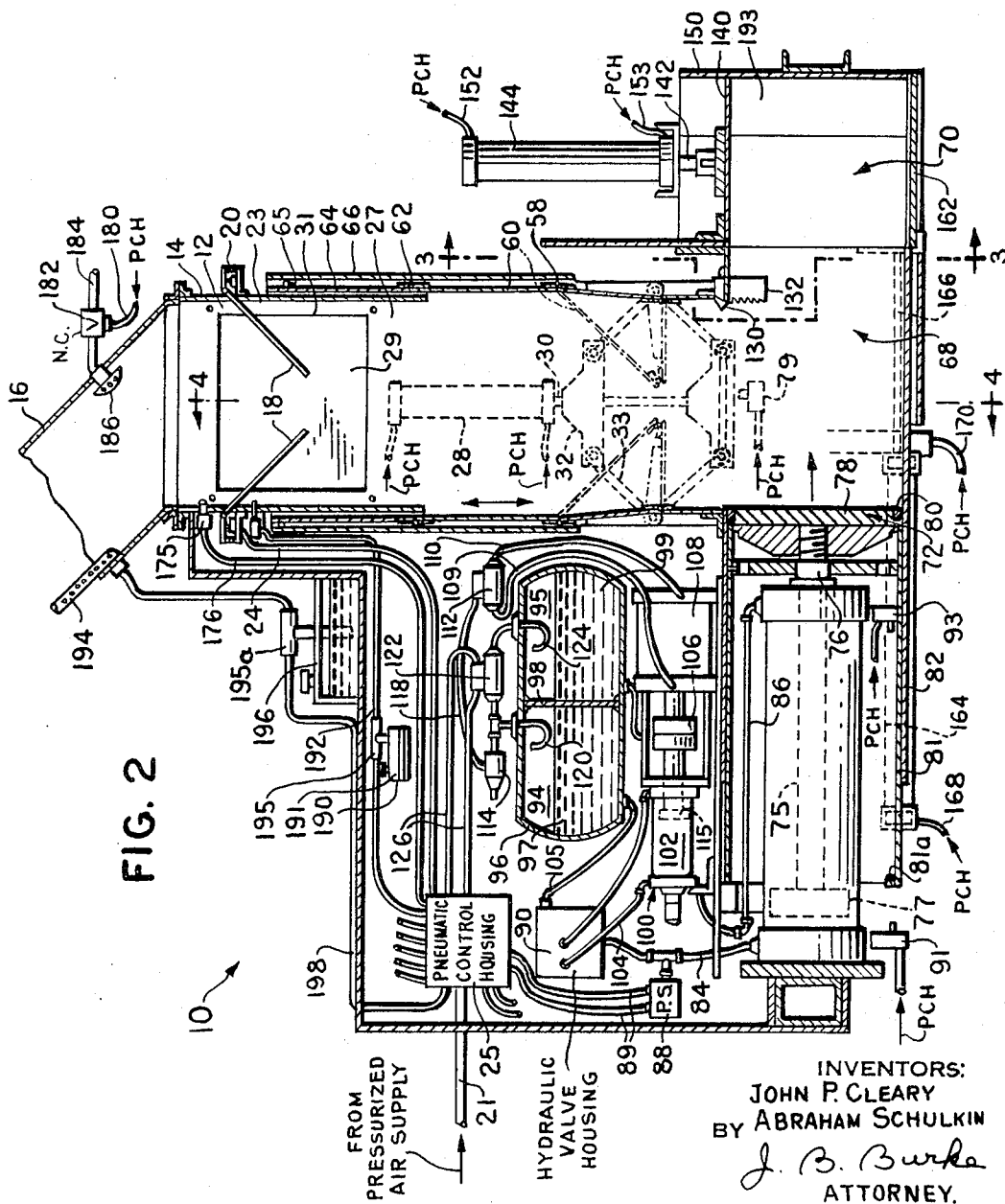
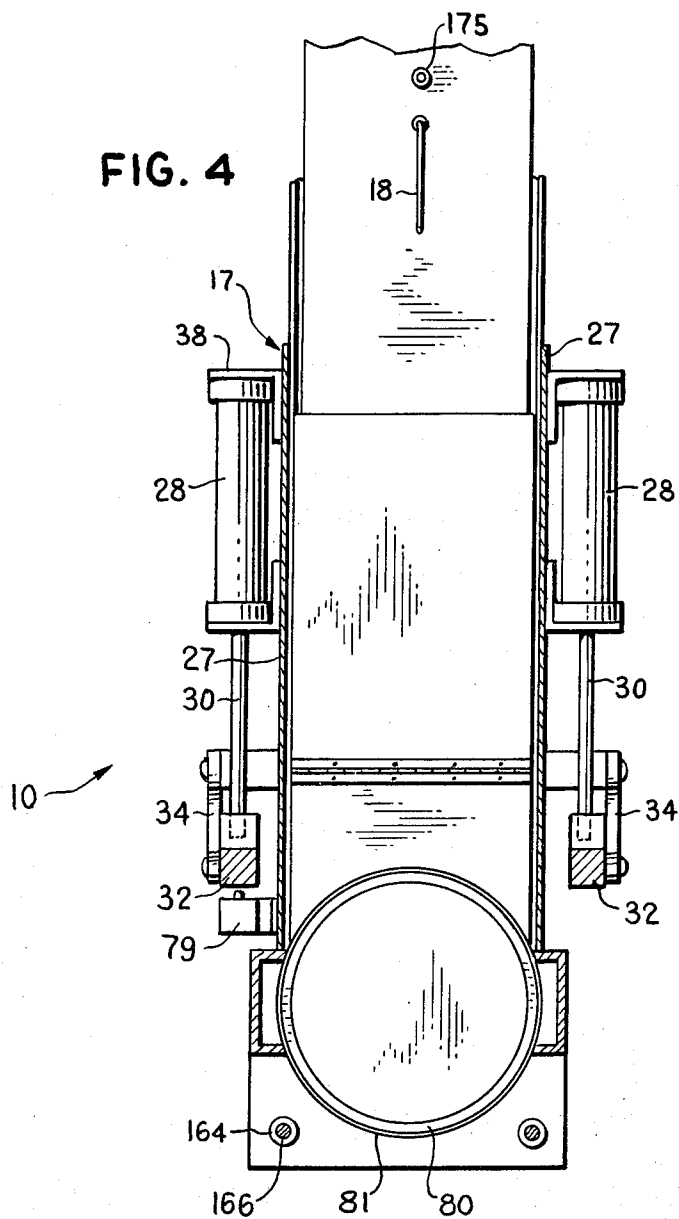
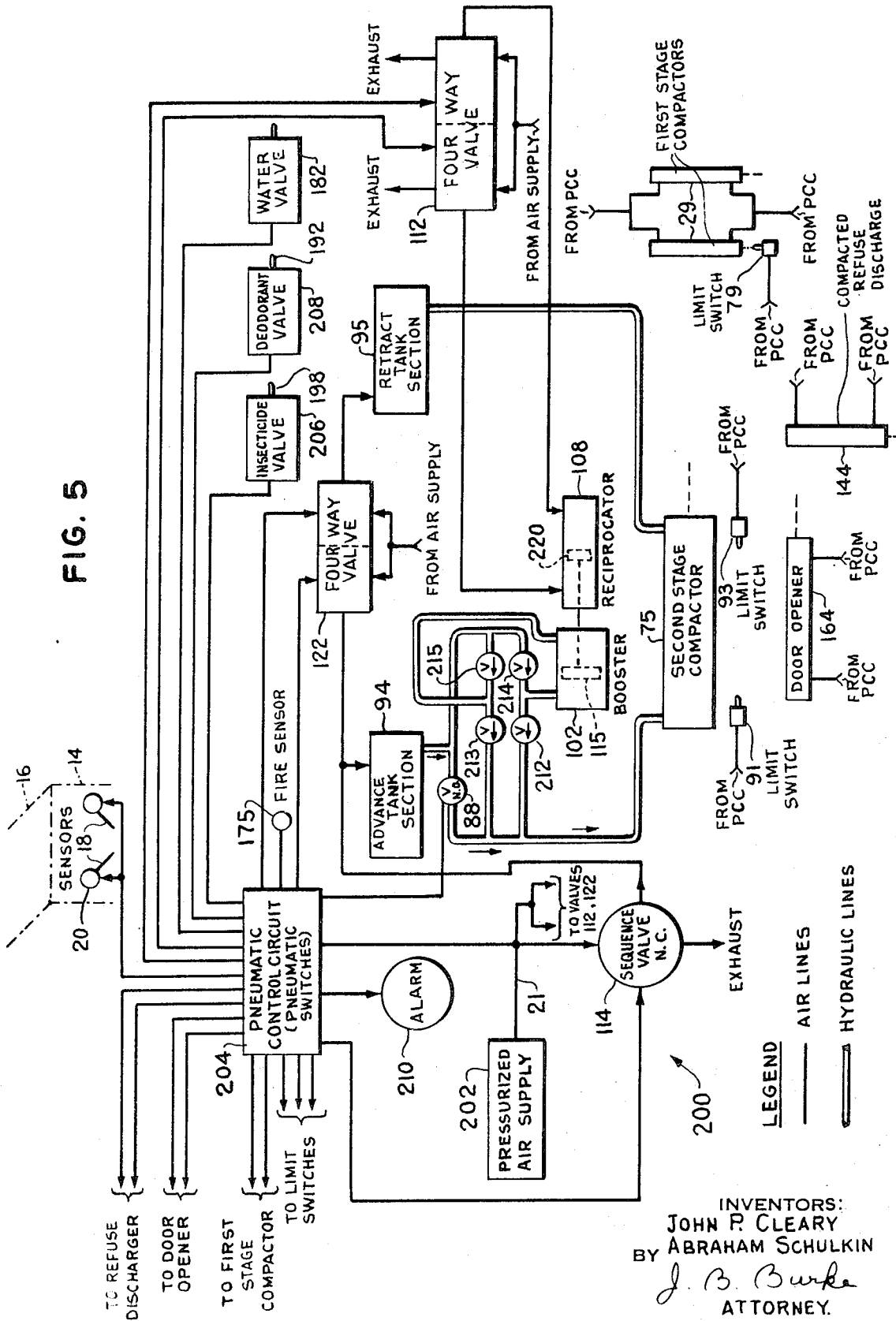


FIG. 4

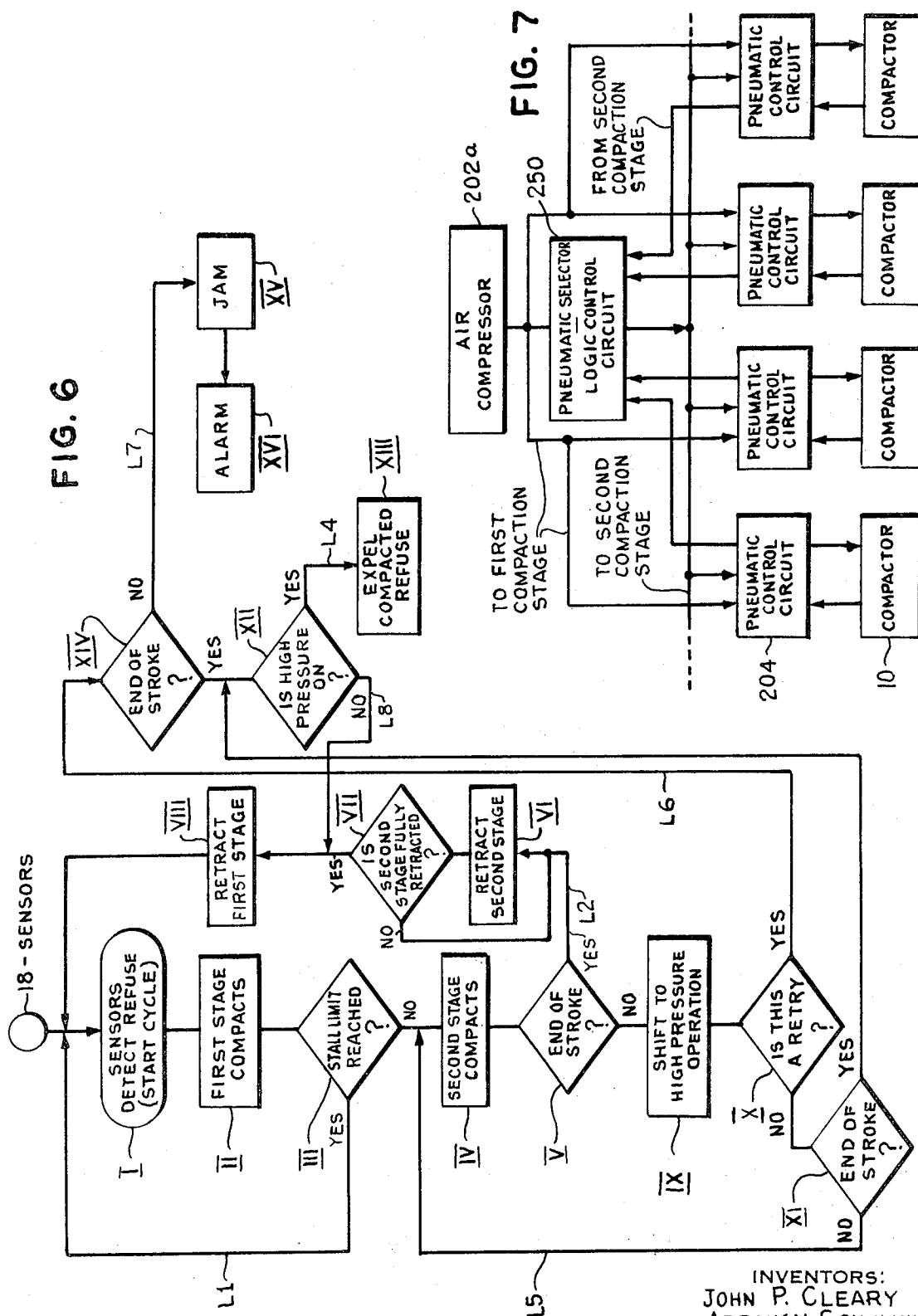


INVENTORS:
JOHN P. CLEARY
ABRAHAM SCHULKIN
BY *J. B. Burke*
ATTORNEY.

FIG. 5



INVENTORS:
JOHN P. CLEARY
ABRAHAM SCHULKIN
BY *J. B. Burke*
ATTORNEY.



INVENTORS:
JOHN P. CLEARY
BY ABRAHAM SCHULKIN
J. B. Burke
ATTORNEY.

AUTOMATIC REFUSE COMPACTION SYSTEM

This invention concerns an automatic refuse compaction system.

Refuse compactors heretofore proposed for use in apartment houses, hospitals, and the like have had a number of objections which precluded or limited their use. A principal objection has been their use of an individual air compressor at each refuse compaction site to operate a hydraulic press for compacting the refuse. This arrangement was objectionably noisy in operation, expensive to install, and occupied an excessive amount of operating space. Other difficulties arose from use of electrical switches and other electrical components. These electrical components frequently became clogged by refuse and debris rendering the compaction system inoperative and requiring frequent cleaning and servicing while system remained out of operation. Another objection was the very high cost of making electrical installations which would meet stringent fire prevention regulations and strict building codes. Sometimes electrical fires were caused by short circuiting of the electrical components. These were serious hazards. Among other objections, the prior systems had no facilities or inadequate facilities for sanitizing and deodorizing the refuse compactor and for extinguishing fires in the compactor caused by deposition of lighted matches and cigarettes with the refuse to be compacted. Such conventional refuse compactors have heretofore presented so many health and fire hazards and have been so complex and prohibitively expensive that their use in apartment houses, hospitals, restaurants, food markets, etc., has been very limited.

The present invention is directed at overcoming the above and other difficulties and disadvantages of prior refuse and garbage compaction systems by provision of an improved automatic compaction system which makes it practical to compact refuse at the place of generation such as in an apartment house.

According to the invention, the automatic compaction system employs one or more individual refuse compactors, each one being located at the bottom of a refuse disposal shaft or chute. Each compactor is controlled by pneumatic means. No electrical components are employed by the compactor. The only electrical component in the entire system may be an electric motor to drive an air compressor which will be located remotely from the compactor in a fireproof installation, properly soundproof so that it does disturb occupants of the building where it is installed.

Each individual compactor in the system, according to the invention includes two stages of refuse compaction. The first stage has compactor plates operating in a downward direction in a refuse receiving duct or chute. These plates are actuated by pneumatic cylinders which tend to pull refuse down and then compact it in a pile at the bottom of the duct or chute. These pneumatic cylinders are operated by a pneumatic control circuit in response to pneumatic pulses received from refuse detection feelers disposed in the duct and actuating pneumatic switches connected pneumatically to the control circuit. The second stage has hydraulically operated compaction cylinder operating horizontally to compact the refuse at the bottom of the duct while pushing the refuse into a compaction and discharge chamber. The cycle of first and second stage

compaction and discharge of the compacted refuse proceeds automatically under control of the pneumatic control circuit according to a predetermined time program. A pneumatically controlled booster cylinder is provided for automatically increasing the pressure applied (by the hydraulic cylinder in the second stage by ten or more times, if the refuse being compacted in the second stage resists compaction at lower pressure. A pulsing or reciprocating device which is pneumatically operated can be coupled to the booster to that the increased pressure is applied with a repeated tamping action for more effective refuse compaction. Sanitizing, deodorizing and fire extinguishing facilities may also be provided for automatic operation. The compactor will successfully compact refuse containing heavy or bulky articles which would clog or deactivate conventional refuse compactors.

Other and further features, objects and advantages of the invention will become apparent from the following detailed description and drawings, wherein:

FIG. 1 is a perspective view of a refuse collector embodying the invention.

FIG. 2 is a vertical sectional view taken on line 2—2 of FIG. 1.

FIGS. 3 and 4 are vertical sectional views taken on lines 3—3 and 4—4 respectively of FIG. 2.

FIG. 5 is a diagram of the pneumatic and hydraulic circuitry of the compactor.

FIG. 6 is a functional block diagram or flow chart used in explaining the invention.

FIG. 7 is a block diagram of an automatic refuse compaction system employing a plurality of compactors in accordance with the invention, with a single compressed air supply source for all compactors.

The term "refuse" as used herein refers to loose rubbish and garbage which can be compacted into a solid unitary mass or block.

Referring first to FIGS. 1—4, there is shown a compactor unit 10 including a generally rectangular housing or cabinet 12. The housing is formed with a rectangular duct 14 which extends vertically. A chute 16 is joined to the open top of the duct 14 for receiving refuse to be compacted in compactor 10. Chute 16 can be installed inside a vertical shaft (not shown) having vertically spaced openings at the several floors of a building for deposition of refuse therein. Located just below the open top of duct 14 under chute 16 are two sensing rods or wires 18 used to detect the presence of refuse passing down duct 14. The sensing rods are connected to pneumatic switches 20 on end walls 22, 23 of the duct. These switches are connected via pneumatic lines 24 to a pneumatically operated control circuit 204 in pneumatic control housing 25. Circuit 204 is shown schematically in FIG. 5 and forms part of the pneumatic and hydraulic system 200 explained below in connection with FIG. 5.

An air supply pipe 21 is used to supply compressed air from a remote source thereof. The air pipe 21 is connected to housing 25. Emergency door panels 29 are removably mounted at openings 31 in side walls 27 of duct 14. Also mounted on these opposed side walls 27 are pneumatically operated axially vertical cylinders 28. Piston shafts 30 of these cylinders are connected to plates 32 supported by pivotable links 34 on angle bars 36 at side corners of the duct 14. Cylinders 28 are sup-

ported by brackets 38 at side walls of the duct. The cylinders are connected via air lines or conduits 40, 42 to the pneumatic control circuit 204 in housing 25. Links 34 are connected at their upper ends to axially horizontal shafts 52. These shafts carry and rotate compactor or ram plates 56 between vertical and horizontal positions. When the plates 56 are vertical refuse can pass freely down the duct. Plates 56 are connected by hinges 58 to slide plates 60. Slide plates 60 are connected by hinges 62 to vertically slidable slide panels 64. Panels 64 aided by rollers 65 move vertically between angle bars 66 and both end walls 22, 23 of duct 14. When cylinders 28 are operated, piston shafts 30 move down as air is forced into the cylinders via air lines 40 to lower the panels 64 and plates 60 and 56. Plates 56 then assume the horizontal position shown in FIG. 1 of the drawings, while plates 60 assume downwardly and inwardly inclined positions shown by dotted lines in FIG. 2. When air is forced into cylinders 28 via lines 42, the piston shafts move vertically upward and the plates and panels return to the solid line position shown in FIG. 2. Cylinders 28 and compactor plates 56 serve to perform first stage compaction of refuse accumulated in compactor chamber 68 at the bottom of the housing 12 between compaction and discharge chamber 70 and the retracted head of axially horizontal hydraulic cylinder 75. Head 72 and cylinder 75 serve to perform second stage compaction of the refuse in chamber 70, while plates 56 remain in horizontal position and serve to hold down refuse at the top of chamber 68. A limit switch 79 is disposed under one of plates 32. This switch is connected by a pneumatic line to the pneumatic control circuit in housing 25. This pneumatic switch serves to signal the circuit that the plates 56 are fully lowered to horizontal position.

Cylinder 75 has a piston 77 driving piston shaft 76 connected to head 72. This head includes a circular metal plate 78 provided with a peripheral groove or rabbet in which is set a hardened steel ring 80. The compactor head 72 further includes an attached cylindrical skirt 81 which is slidably axially within a cylindrical guide cylinder 82 secured in place in the housing 12. Hydraulic fluid lines or conduits 84, 86 are connected to opposite ends of cylinder 75. Fluid line 84 at the inlet end of cylinder 75 is connected to a pneumatic pressure actuated fluid switch 88 connected by air lines 98 to valves in housing 25. Fluid line 84 is also connected via hydraulic valve housing 90 and fluid line 92 to section 94 of a tank 96. This closed tank is divided by partition 98 into advance and retract chambers or sections 94, 95. The retract section 95 of tank 96 is connected via fluid line 86 to the outlet or retraction end of cylinder 75. The compactor head 72 is advanced to the right as viewed in FIG. 2 when fluid 97 is forced into cylinder 75 via line 84 and is retracted when fluid 99 is forced into the cylinder via line 86. Limit switches 91, 93 at opposite ends of cylinder 75 are connected to the circuit in housing 25 and are respectively closed by finger 81a at one end of skirt 81. Switches 91, 93 are pneumatic switches.

A hydraulic, reciprocating pressure booster assembly 100 is provided for increasing the pressure applied by compactor head 72 in compacting refuse in chambers 68 and 70. Assembly 100 includes a hydraulic cylinder

102 which drives fluid under very high pressure into cylinder 75 via fluid lines 104 and 84 connected to valves in hydraulic valve housing 90. The valves are shown and described in connection with FIG. 5. The hydraulic booster cylinder 102 is connected by coupling 106 to pneumatically operated drive cylinder 108 connected via pneumatic lines 109, 110 to valve 112. Valve 112 in turn is connected to a spring return spool valve which serves as sequence valve 114. The drive cylinder 108 imparts reciprocating motion to piston 115 in cylinder 102 via coupling 106. Fluid line 105 receives fluid from tank chamber or section 94 via valves in valve housing 90 for advancing piston 115. The piston is retracted when fluid passes out of cylinder 75 during retraction of piston 77.

Sequence valve 114 is connected by air line 118 to valve 112. It is also connected to air tube 120 in chamber 94 of tank 96. Another valve 122 is connected between air tubes 120 and 124 located in air spaces above fluid in chambers 94, 95 of tank 96. Valve 122 is connected via pneumatic lines 126 to valves in housing 125. Valves 112 and 122 are four-way pneumatic valves whose operation is explained in connection with FIG. 5.

At the entrance to compression chamber 70 is a tapered fixed guide member 130 which engages the top of compactor head 72 and prevents it from being deflected upwardly when exerting high pressure on a mass of refuse in chamber 70. Just behind guide member 130 is a cylindrically curved shear plate 132 with serrated sharpened arcuate edge which cooperates with the hardened ring 80 on head 72 to shear off and to sever a plug of compressed refuse from the mass pushed forward into chamber 70 when head 72 reaches plate 132.

At the open top of chamber 70 is a horizontal pressure plate 140 disposed for discharging or pushing a mass of compressed refuse out of chamber 70. This plate is driven by piston shaft 142 of an axially vertical pneumatically operated cylinder 144 supported by transverse beam 146 at the top of walls 150 of chamber 70. Pneumatic lines 152, 153 are connected from the cylinder to valves in housing 25. When air is forced into cylinder 144 via line 152 the piston shaft 142 and plate 140 move down. When air is forced into the cylinder via line 153 the piston shaft and plate 140 are retracted upwardly. Plate 140 carries a vertical plate 156 (FIG. 3) which is slidably disposed at the entrance of chamber 70. This plate serves to clear away any debris which may tend to stick to plate 78 of head 72 when the head is advanced to compact refuse in chamber 70. The bottom of chamber 70 is open so that compacted refuse can be deposited in can 160 or other receptacle disposed under the discharge end of unit 10 as shown in FIG. 1. The open bottom of chamber 70 is provided with a horizontally sliding trap door 162 operated by axially horizontal pneumatically operated cylinders 164. Rods 166 are connected between door 162 and pistons in the two cylinders 164. The cylinders are connected by pneumatic lines 168, 170 to valves in housing 25. The cylinders are carried by mounting blocks or plates 172, 174 at the underside of housing 12.

The unit is provided with a fire extinguishing system including pneumatically operated temperature responsive switch 175 located inside duct 14 near the top of

wall 22. This switch is connected via pneumatic line 176 to valves in housing 25. Also connected to valves in housing 25 is a pneumatic line 180 which terminates at a pneumatically operated normally closed water valve 182. This valve is connected between water supply pipe 184 and a sprinkler head 186 located inside of chute 16 at the top of duct 14. When pneumatic switch 175 is actuated in response to the head of combustion of refuse in duct 14, valve 182 is automatically opened to discharge water into the duct for extinguishing the fire. In addition the compactor plates 56 are automatically moved down to horizontal position to cut off the air supply to the burning material and to confine the burning material below the compactor plates in chamber 68. At the same time head 72 is automatically advanced to push the burning material into chamber 70 where the material is compressed and the fire is extinguished as its air supply is cut off.

A disinfectant spray unit is also provided. This device includes a tank 190 containing disinfectant fluid 191. The tank is mounted inside housing 12 and is connected via pneumatic line 192 and T-fitting 195 to an atomizing spray nozzle 194 located near the top of duct 14 on wall 22. The T-fitting 195 is located at the top of the tank. An pneumatic line 192 is connected between the T-fitting and a valve in housing 25. The atomizing spray is actuated each time sensing rods 18 are deflected by passage of refuse down the chute and into duct 14.

A perforated pipe 194 in chute 16 may be arranged to extend all the way up the shaft in which the chute is installed. Pipe 194 is secured in the chute and is connected to an atomizer 195a on a container 196 of fluid insecticide 197. This container is shown mounted on the top of cabinet 12. The atomizer 195a is connected via pneumatic line 198 to a pneumatic control valve in housing 25. Air is passed periodically to atomizer 195a for discharging a spray of insecticide into duct 16 via pipe 194.

At the right end of chamber 70 as clearly shown in FIGS. 1, 2 and 3, is a pair of angularly disposed vertical corner plates 193. These plates serve to shape the mass of refuse compacted in chamber 70, and to guide the compacted mass into container 160 under chamber 70.

FIG. 5 shows diagrammatically the arrangement of essential parts of the pneumatic and hydraulic circuitry 200 of the compactor 10. A pressurized air supply 202 such as an air compressor remotely located from the compactor will supply air under pressure via line 21. Air is supplied directly to pneumatic logic circuit 204, valves 112, 122 and sequence valve 114. The pneumatic logic circuit is an assemblage of pneumatically operated switches controlled by timing devices (not shown). The circuit is programmed so that the system effect compaction of refuse in a prescribed program according to the logic function diagram of FIG. 6.

Connected to the pneumatic logic circuit via pneumatic lines are the first stage compactor cylinders 28, limit switch 79, door opener cylinder 164, refuse discharge cylinder 144, limit switches 91, 93 at the second stage compactor cylinder, pressure sensing valve 88, four-way valves 112, 122, sequence valve 114, insecticide discharge control valve 206, deodorant discharge control valve 208, water discharge control valve 182, fire sensor 175, and jam alarm device 210.

Fluid conducting conduits connect advance tank section or chamber 94 with the advance side of second stage compactor cylinder 75 via valve 88. Fluid pressure booster cylinder 102 is connected to the second stage compactor via one-way check valves 212-215. The booster piston 115 is reciprocated by pneumatically driven piston 220 in reciprocator cylinder 108. Cylinder 108 is connected via pneumatic lines to opposite sections of four-way valve 112.

Operation of the apparatus will be further explained with particular reference to the logic function diagram of FIG. 6 as well as to the circuitry of FIG. 5, and the unit as shown in FIGS. 1-4. As indicated in FIG. 6, sensors 18 detect the passage of refuse in duct 14 and start the automatic compaction cycle. This is step I. The first stage of compaction then takes place. This is step II and is done by operation of compactor cylinders 28 by air supplied under pressure from air supply source 202 via pneumatic valves in circuit 204. Each time the plates 56 assume the horizontal position shown by dotted lines in FIG. 2, limit switch 79 is actuated and a pneumatic pulse is sent to logic circuit 204 to indicate completion of the first stage of compaction. Each time the limit switch is actuated the logic circuit resets as indicated by function line L1 in FIG. 6, so that sensors 18 can send another pulse to actuate the first stage compactors again. This is a cycle which occurs repeatedly until chamber 68 is full. Operation of switch 79 occurs at step III shown in FIG. 6.

When chamber 68 becomes filled with refuse to such an extent that compactor plates 56 cannot assume the horizontal position which results in actuation of pneumatic switch 79, the required pneumatic pulse will not be passed to circuit 204. After a short prescribed time the logic circuit 204 will send a pulse to valve 122 to start the second stage of compaction prescribed after stalling of plates 56. This starts the second stage of compaction indicated as step IV in FIG. 6. Air will then pass via valve 122 from air supply 202 to advance tank chamber 94. This will force fluid 97 in this tank via normally open valve 88 into the second stage compactor cylinder 75 to advance piston 77. Compactor head 72 will move to the right as viewed in FIG. 2 to push the refuse from chamber 68 into chamber 70 which is smaller than chamber 68. The compactor plates 56 will remain in lowered position at the top of the pile of refuse in chamber 68 to keep the refuse from being extruded upwardly as head 72 moves to the right. When compactor head 72 reaches the end of its stroke at sheer plate 132, limit switch 93 is actuated and sends a pneumatic pulse to circuit 204. This occurs at the end of step V. The program then follows function line L2 shown in FIG. 6. Head 72 and piston 77 are then retracted automatically at step VI. Piston 77 is retracted by passage of fluid from retract chamber 95 to compactor cylinder 75. This occurs by passage of air from the air supply 202 via valve 122 when this valve is opened by air pressure applied from pneumatic circuit 204. When piston 77 and head 72 are fully retracted limit switch 91 is actuated at step VII to signal this condition to circuit 204. At this time cylinders 28 are actuated by air pressure from the pneumatic circuit to elevate compactor plates 56 for clearing the entrance to chamber 68 to receive refuse. This is step VIII.

If the mass of refuse in chamber 70 cannot be fully compacted under the relatively low pressure applied by cylinder 75 actuated by fluid fed directly from tank chamber 94, a shift to high pressure operation will occur automatically as indicated by step IX in FIG. 6. The shift to high pressure operation occurs a predetermined time after head 72 starts advancing or it occurs if limit switch 93 is not operated a predetermined time after head 72 is advanced under normal low pressure. The circuit 204 can be programmed so that head 72 will be retracted if switch 93 is not actuated after a predetermined time and then cylinder 75 will be operated again. In other words, steps IV and V may be repeated at least once. Finally if switch 93 is not actuated, the shift to high pressure occurs at step IX. Fluid is passed into cylinder 102 at its right end from tank chamber 94 via valve 215 as viewed in FIG. 5. Fluid passes from booster cylinder 102 via valve 212 to compactor cylinder 75 where very high pressure is applied. This pressure may be ten or more times as large as the pressure normally applied in cylinder 75. The piston 115 is advanced with a slightly reciprocating action due to operation of reciprocator cylinder 108 via valve 112 from timed pneumatic pulses received from pneumatic control circuit 204. The left end of cylinder 102 as viewed in FIG. 5 is refilled via valve 214. Fluid is returned to tank chamber 94 via valve 88.

The very high pressure applied by the booster to cylinder 75 will generally be effective the first time it is applied to compress the refuse in chamber 70 until head 72 reaches the end of its stroke and limit switch 93 is actuated. The circuit 204 is notified by a pneumatic pulse via the sequence valve the first time high pressure is applied. This is step IX in FIG. 6. Then if the advancing stroke of head 72 is completed on the first try switch 93 is actuated at step XI. The pneumatic circuit is notified and the program proceeds as indicated by line L3 to step XII when operation of the booster 102 and reciprocator 108 are stopped, while head 72 remains at the extended end of its stroke. Step XIII then takes place as indicated by program line L4 with opening of door 162 and discharge of the mass of compacted refuse by operation of cylinder 144. Then retraction of head 72 occurs, cylinders 164 operate to close door 162 and cylinder 144 operates to elevate plates 146, 156. Also step VIII is repeated via program line L8 to retract the first stage compactor plates 56.

Circuit 204 can be programmed to cause a shift to high pressure during the latter part of each advancing stroke of head 72 at step IV. This will insure maximum compaction of refuse in chamber 70. At the end of the stroke, switch 93 will be closed and steps VI, VII and VIII will occur as above mentioned. When high pressure is applied at step IV, then steps VI, VII and VIII and steps I-IV can be repeated in sequence several times to force a maximum amount of refuse into chamber 70. Finally the cycle will proceed to steps X-XIII to discharge the refuse.

If an obstacle is encountered during application of high pressure at any time, switch 93 will not be actuated after a predetermined time. This is detected at step XI, whereupon the high pressure application is repeated. The cycle of second stage compaction is repeated as indicated by program line L5. High pressure is reapplied to cylinder 75 after head 72 is completely

retracted to close switch 91 and then the head is advanced again. Upon repeated application of high pressure to cylinder 75 by booster 102, the program proceeds along line L6 from repeated step X to step XIV. At this point switch 93 will be actuated if head 72 reaches the end of its stroke. Steps XII and XIII will then take place with opening of door 162, expulsion of the compacted mass of refuse, retraction of head 72 and elevation of compactor plates 56. If switch 93 is not actuated after a predetermined time then program line L7 will be followed to set the pneumatic circuit at step XV for a jammed condition of the compactor. Alarm 210 will be actuated at step XVI. This will signal and alert an operator or attendant to the jammed or blocked condition of the compactor. Doors 29 and 162 can then be opened manually to remove the object which is obstructing the apparatus.

The apparatus includes other facilities shown in FIGS. 1, 2 and 5. The pneumatic circuit 204 can be programmed to open insecticide control valve 206 at periodic intervals, for example every hour or so. This will permit discharge of insecticide into duct 14 as well as chute 16 and the shaft in which it is installed. The discharge of insecticide will be effected by air pressure passed through pneumatic circuit 204, valve 206 and line 198 from air supply 202.

The pneumatic circuit 204 can further be programmed so that deodorant discharge control valve 208 is operated each time refuse is passed down duct 14 as sensed by sensors 18. The deodorant will be discharged by air pressure supplied through the pneumatic circuit, valve 208 and line 192 from air supply 202.

Pneumatic circuit 204 can be further programmed to actuate water control valve 182 in the event that a fire occurs in the compactor. In that event, fire sensor 175 sends a pneumatic signal or pulse to circuit 204. Water will then be discharged via valve 182 and sprinkler head 186. It can also be arranged in the programming of circuit 204 that both the first and second stage compaction stages will be operated to smother the fire by compacting the burning refuse in chamber 70 and cutting off its air supply. The programming of the pneumatic circuit will be such that steps II-XV will be performed automatically as soon as fire sensor 175 detects a fire in the compactor. Operation of alarm 210 can also be performed under control of circuit 204 as soon as the fire is detected.

Circuit 204 and its mode of operation have been shown only schematically in the drawings since it will be understood that it is possible to program a conventional computer arranged to effect opening and closing of appropriate pneumatic switches at predetermined times, depending on the occurrence of pulses received from the pneumatic switches, valves and other components of the apparatus.

It will be apparent that the apparatus is programmed to operate automatically and normally requires no personal attention other than occasional cleaning and removal of filled containers 160.

As an economy measure it is possible to use a single air compressor to serve a plurality of compactors 10 in a large building such as an apartment house, hospital or the like. This is indicated in FIG. 7 where a single air compressor 202a is provided. The pneumatic control

circuit 204 of each compactor is connected directly to the air compressor for operating the first stage of compaction whenever required. This stage draws a relatively small amount of air from the compressor as compared with the second stage of compaction. The second stage of compaction of each compactor is connected to a pneumatic selector 250 to which the air compressor 202a is coupled. This pneumatic selector is a properly programmed logic control circuit or computer which will selectively pass compressed air to the second stage of only one of the several compactors 10 at a time. Compressed air will be passed only to those compactors which signal the selector 250 that they are ready for second stage compaction (step IV, FIG. 6). Then air will be supplied to the first compactor which called for compressed air to operate its second stage while the compressed air supply is withheld from the second stages of all other compactors. The compactor supplied with air will then perform at least steps IV and V of the programmed outlined in FIG. 6, but may perform all of steps IV-XIII before releasing the compressor to supply air to the second stage of another compactor. Thereafter the second stage of the next compactor which called for compressed air will be supplied, and so on until the second stages of all compactors calling for air are supplied. It will be understood that in practice no compactor operates for more than a few minutes at a time out of every hour, so that a single air compressor 202a can take care of a rather large number of compactors in any particular system.

An important feature of the present invention is the exclusion of electrical and electronic circuitry and components from the compactor units 10. The employment of pneumatic components, valves switches and the like insures greater reliability in operation than is provided by conventional electrical and electronic components. Also increased safety in operation, simplification of servicing and maintenance and reduction in installation costs are attained. Noise of operation is minimized and reduced to acceptable levels.

While a preferred embodiment of the invention has been illustrated and described in detail, it will be apparent that many variations and modifications are possible without departing from the invention.

What is claimed is:

1. An automatic refuse compaction system, comprising a duct for receiving refuse deposited therein, said duct having an open top, closed bottom and open lateral end; first compaction means movably disposed in said duct to press vertically downward on a pile of refuse at the bottom of the duct to effect a first stage of compaction; means for retracting said first compaction means laterally in the duct to clear the duct and permit passage of refuse past the first compaction means to the bottom of the duct; a compaction chamber having an end wall and opening into said lateral end of said duct for receiving refuse therefrom; second compaction means movable horizontally transversely of the duct to push refuse through said open lateral end of the duct and to compress the refuse in said compaction chamber against said end wall while said first compaction means remains stationary to hold down the refuse in the duct during movement of said second compaction means; pneumatically actuated valve means; pneumatically actuated control means pneumatically connected to said

valve means to operate the same; sensing means in said duct arranged to detect vertical passage of refuse therethrough; pneumatic switch means operatively interconnecting said sensing means and said pneumatic control means to actuate the same so that the first compaction means is operated when refuse deposited in the duct is detected by said sensing means; fluid conducting means operatively connecting said valve means in circuit with said second compaction means for operating and controlling the same cyclically; and pneumatic means operatively connecting said pneumatic control means and said first compaction means, so that the first and second compaction means operate cyclically in sequence.

2. An automatic refuse compaction system as defined in claim 1, further comprising pneumatic deodorant spray means and pneumatic insecticide discharge means disposed in said duct for deodorizing and disinfecting refuse therein, said deodorant spray means and said insecticide discharge means being connected to said pneumatic control means for actuation thereby in coordination with operation of either one of the first and second compaction means.

3. An automatic refuse compaction system as defined in claim 1, further comprising a source of fire extinguishing fluid connected to said duct; pneumatically controlled valve means connected to said source of fire extinguishing fluid for controlling discharge of said fluid into the duct; fire detection means disposed in said duct, both said fire detection means and said valve means being connected to said pneumatic control means so that said fire extinguishing fluid is discharged into the duct when a fire in the duct is detected by said fire detection means, said pneumatic control means being so arranged that both the first and second compaction means are actuated and remain stationary in actuated position when fire is detected in the duct and while said fluid is being discharged into the duct, to cut off air from the fire in the duct and to compress the burning refuse in the duct.

4. An automatic refuse compaction system as defined in claim 1, wherein said first compaction means comprises hinged, cooperating compactor plates arranged to pivot in said duct between vertical and horizontal positions, said plates clearing the duct to permit passage of refuse while the plates are in vertical position, said plates applying downward pressure on the refuse at the bottom of the duct when the compactor plates are in horizontal position.

5. An automatic refuse compaction system as defined in claim 1, further comprising pneumatic drive means connected to said first compaction means; and fluid drive means connected to said second compaction means, both drive means being operatively connected to said pneumatic control means for actuation thereby in a prescribed program of operation.

6. An automatic refuse compaction system as defined in claim 5, further comprising fluid containing tank chambers connected in a fluid circuit with said fluid drive means for passing fluid to and from said fluid drive means; said pneumatically actuated valve means being disposed in said fluid circuit for controlling passage of said fluid at predetermined pressures to and from said fluid drive means; and pressure booster means connected in said fluid circuit for increasing

11

pressure of fluid in said fluid drive means in the event that said second compaction means encounters excessive resistance while moving refuse from the duct to said compaction chamber.

7. An automatic refuse compaction system as defined in claim 6, further comprising pneumatically operated mechanical reciprocation means connected to said booster means so that the second compaction means applies pressure to resisting refuse in the duct with a reciprocative tamping action, said reciprocation means being connected to said pneumatic control means for controlled operation thereby only when the booster means is operating.

8. An automatic refuse compaction system as defined in claim 1, further comprising pneumatically operated refuse discharge means located at said compaction chamber for discharging compacted refuse therefrom, said discharge means being operatively connected to said pneumatic control means for operation thereby when said second compaction means reaches said lateral end of the duct to complete compression of the refuse in said compaction chamber.

9. An automatic refuse compaction system as defined in claim 8, wherein said second compaction means comprises a circular compactor head; and further comprising guide means at said lateral end of the duct to prevent deflection of said head when the head approaches said lateral end of the duct while compacting refuse in said compaction chamber; said compaction chamber having an open bottom, said refuse discharge means comprising a pneumatically operated door at the bottom of said compaction chamber, said door being arranged to be opened when refuse is fully compacted in said compaction chamber; a movable

12

plate at the top of said compaction chamber for pushing compacted refuse out of the compaction chamber while said door is opened, said plate being arranged to clear said compactor head of refuse while said plate pushes compacted refuse out of the compaction chamber; and pneumatic drive means operatively connected to said door and to said movable plate for operating the same, said pneumatic drive means being further connected in a pneumatic circuit with said pneumatic control means for actuation thereby when the compactor head is located at said one lateral end of the duct.

10. An automatic refuse compaction system as defined in claim 9, wherein said compactor head has a hardened curved edge; and a shearing plate having a curved serrated edge at said guide means to cooperate with the hardened edge of the compactor head in shearing off refuse entering the compaction chamber.

11. An automatic refuse compaction system, comprising a duct for receiving refuse deposited therein, said duct having an open top, closed bottom and open lateral end; a compaction chamber having an end wall and opening into said lateral end of said duct for receiving refuse therefrom; compaction means movable horizontally transversely of the duct to push refuse through said open lateral end of the duct to compress the refuse in said compaction chamber against said end wall; pneumatically actuated valve means; pneumatically actuated pneumatic control means pneumatically connected to said valve means to operate the same; and fluid conducting means connecting said valve means in circuit with said compaction means for controlling and operating the same so that the compaction means operates cyclically.

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