United States Patent [19]

Frankel et al.

[11] **3,752,090**

[45] **Aug. 14, 1973**

[54] **DRY SANITARY TOILET**

[75] Inventors: **Donald P. Frankel**, Lake Geneva; **Charles K. Peterson**, Fontana, both of Wis.

[73] Assignee: **La Mere Industries, Inc.**, Walworth, Wis.

[22] Filed: **Jan. 20, 1971**

[21] Appl. No.: **108,050**

[52] **U.S. Cl.** ..... **110/9 R**, 4/8, 4/131, 431/79

[51] **Int. Cl.** **A47k 11/02**

[58] **Field of Search** ..... 110/9 R, 9 E; 4/131, 4/8; 431/79

[56] **References Cited**

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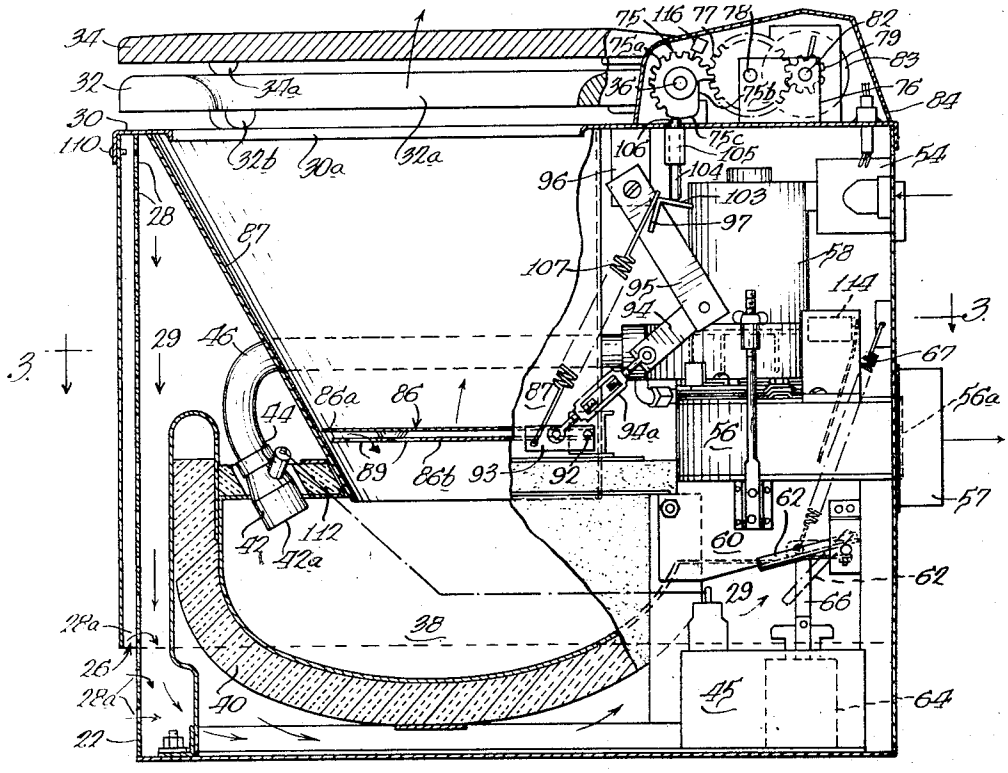
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Primary Examiner—Kenneth W. Sprague
Attorney—Hofgren, Wegner, Allen, Stellman & McCord

[57] **ABSTRACT**

An incinerating waste disposal plant is provided in the form of a dry sanitary toilet with a cooling air passage or jacket between the combustion zone and the outer wall of the cabinet for cooling the device during a cooling cycle. The exhaust blower has an inlet chamber at its intake and a variable vent valve which controls draft of air through the cooling air passage. A hopper in the toilet has side walls supporting a trap door between the toilet seat and a receiving and combustion chamber and the walls are secured to and supported by a removable top deck for ready access to all operating elements within the device for repair purposes. A gas burner having a spark gap igniter is used to supply flame to the receiving and combustion chamber. The exhaust blower can be replaced or supplemented by a venturi exhaust system which is especially useful in adapting the device for use on a diesel locomotive for using the available fuel and air supplies. In one form, all electrical components except the igniter are mounted in a separate top cabinet which also provides a back rest for the seat.

51 Claims, 13 Drawing Figures



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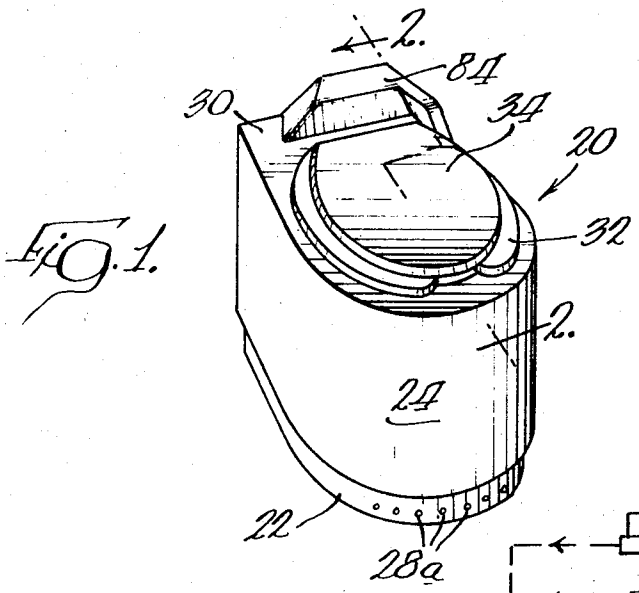


Fig. 1.

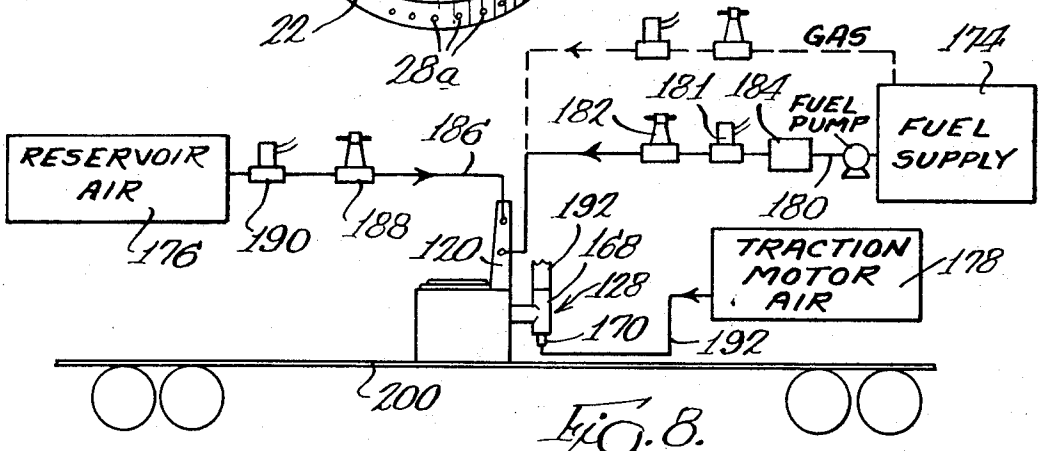


Fig. 8.

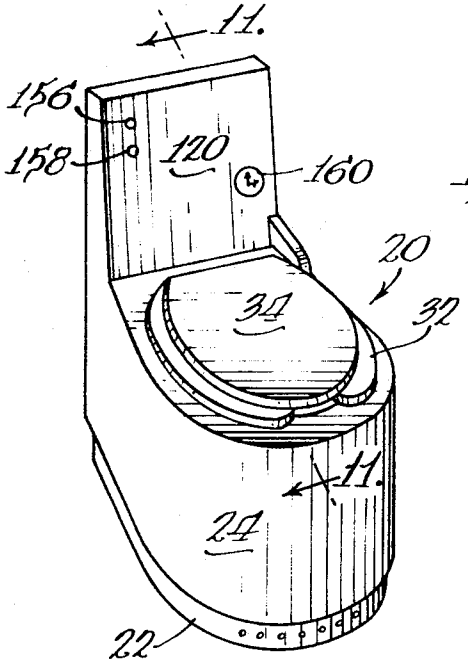


Fig. 7.

Inventors:
Donald P. Frankel
Charles K. Peterson
By Hofgren, Wegner,
Allen, Stellman & McCord
Attys

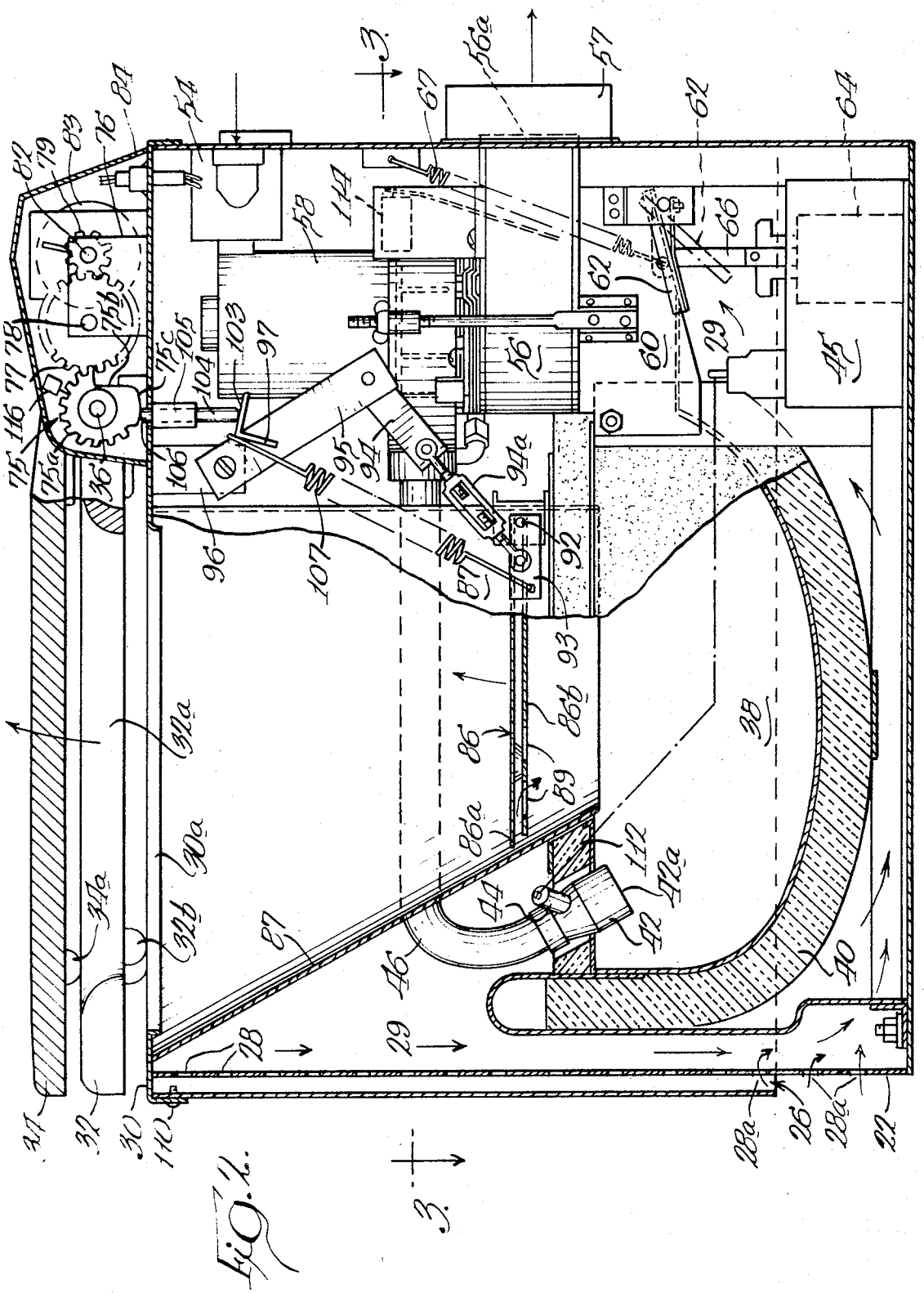


FIG. 1.

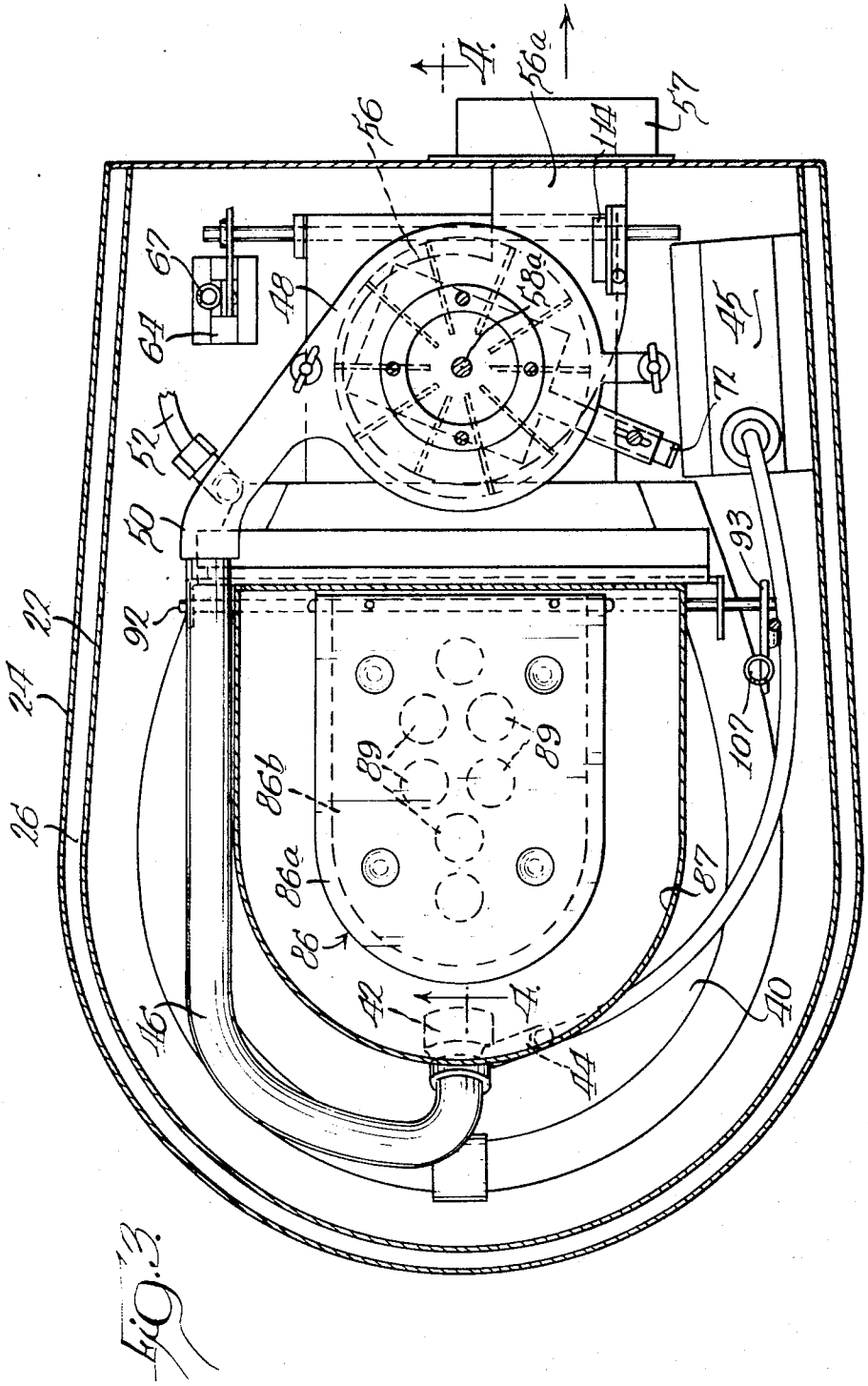

4
56a
56
57
14
67
48
58a
64
45
52
50
63
92
22
24
26
89
89
86b
86a
86
87
107
42
4
46
44
40

Fig. 3

Fig. 4.

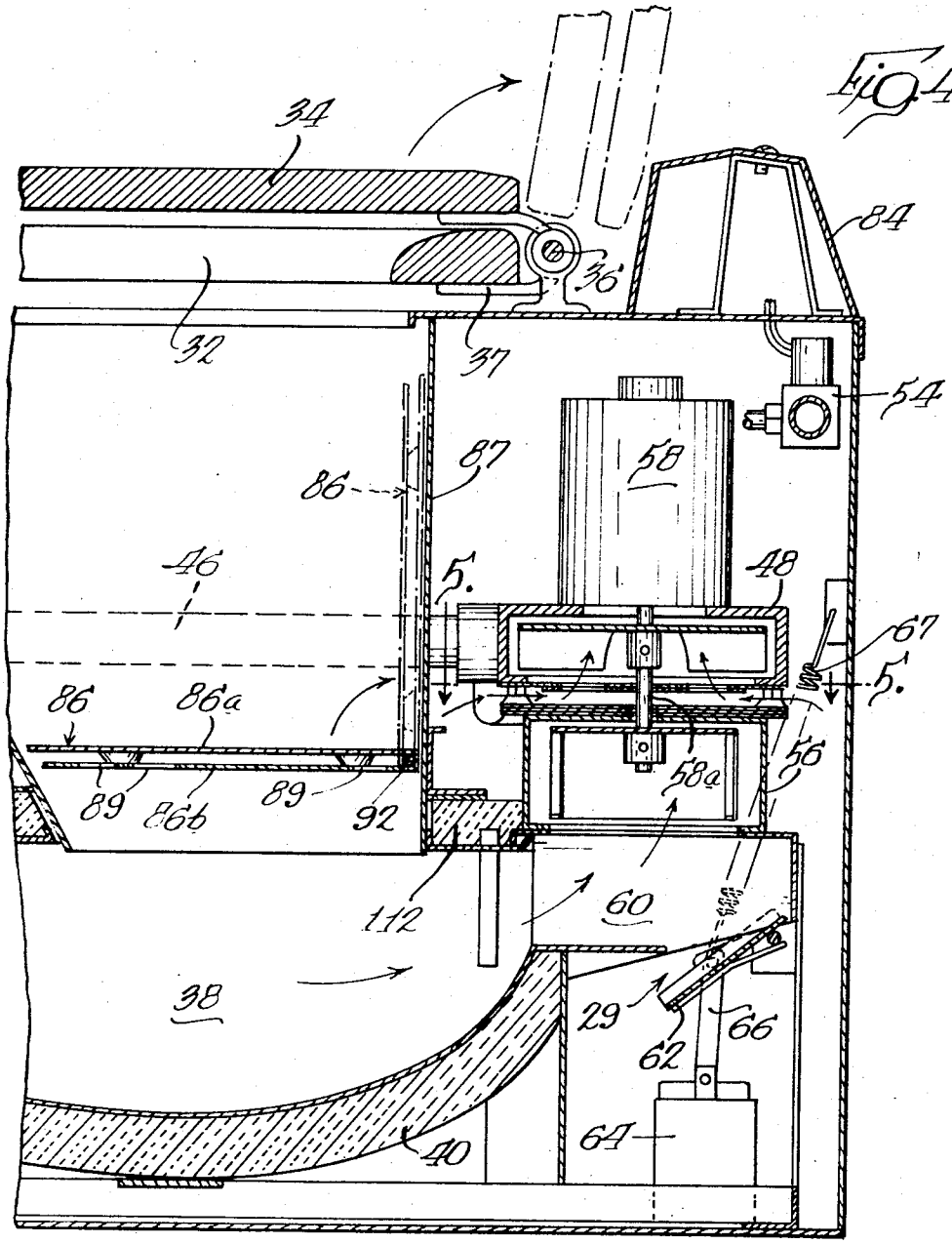

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84
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5.
48
67
86
86a
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86b
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92
58a
56
112
60
38
29
66
62
64
40

Fig. 5.

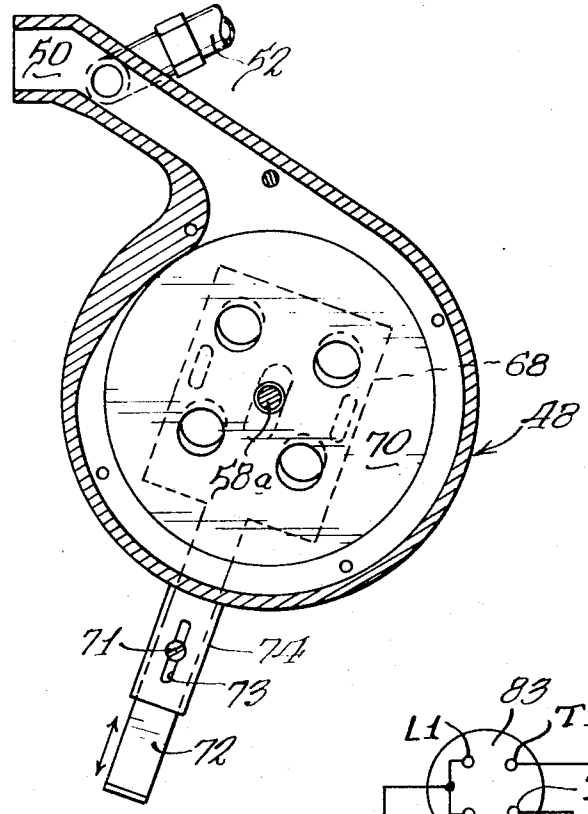

50
52
68
48
70
58a
71
74
73
72

Fig. 6.

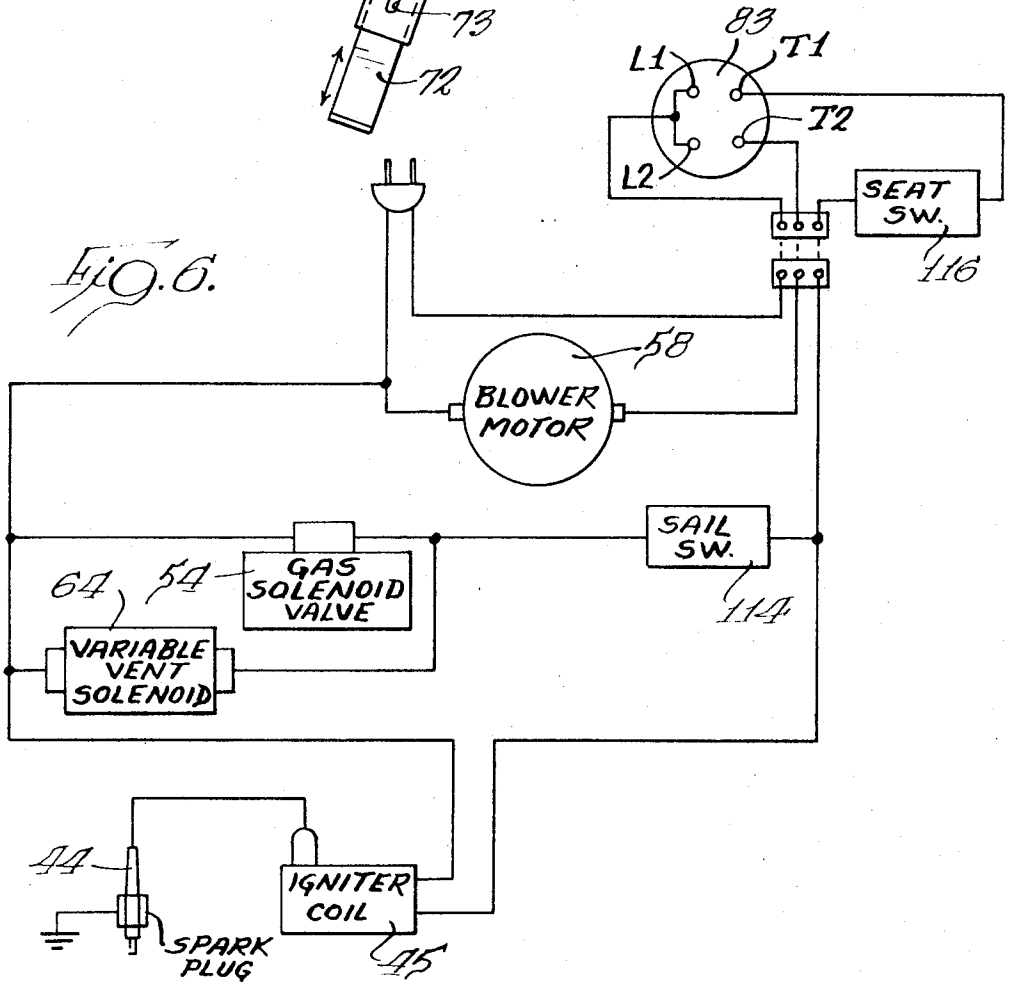

83
T1
L1
T2
L2
SEAT SW.
116
58
BLOWER MOTOR
SAIL SW.
114
64
54
GAS SOLENOID VALVE
VARIABLE VENT SOLENOID
44
IGNITER COIL
45
SPARK PLUG

Fig. 10.

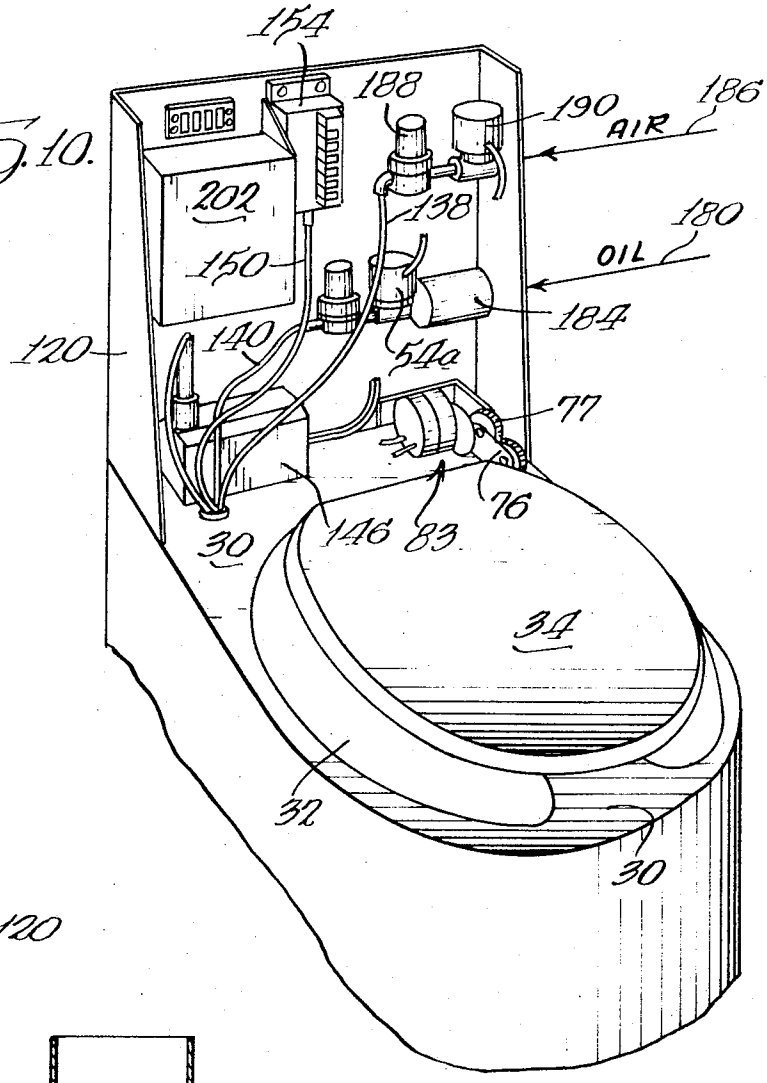


Fig. 9.

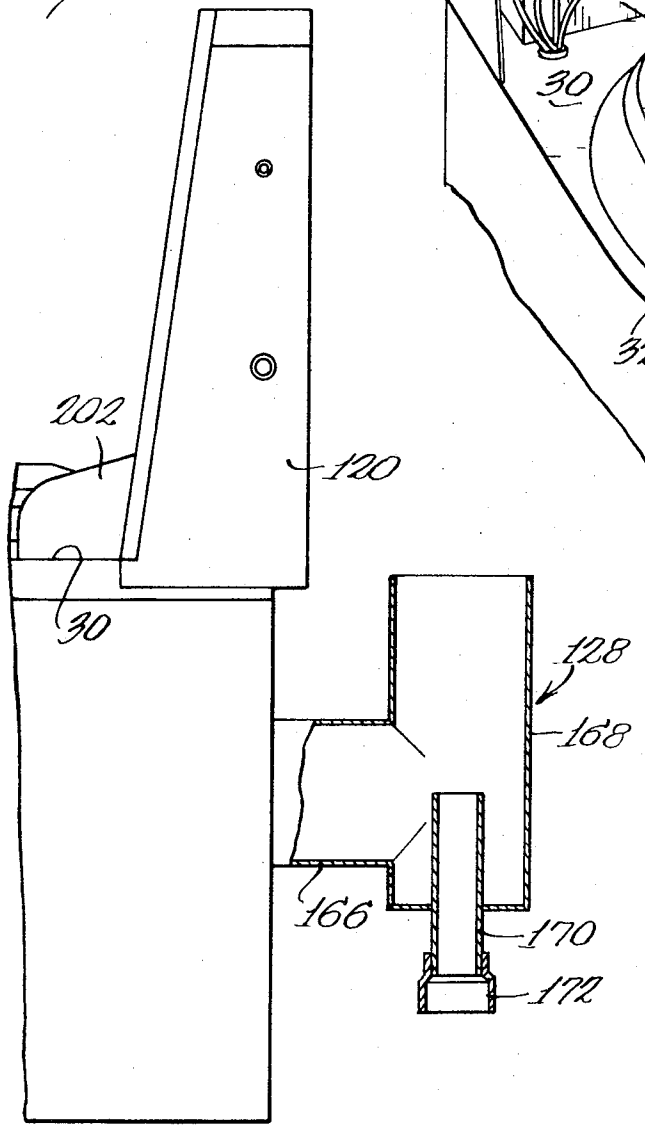
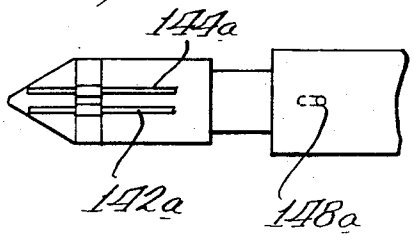


Fig. 13.



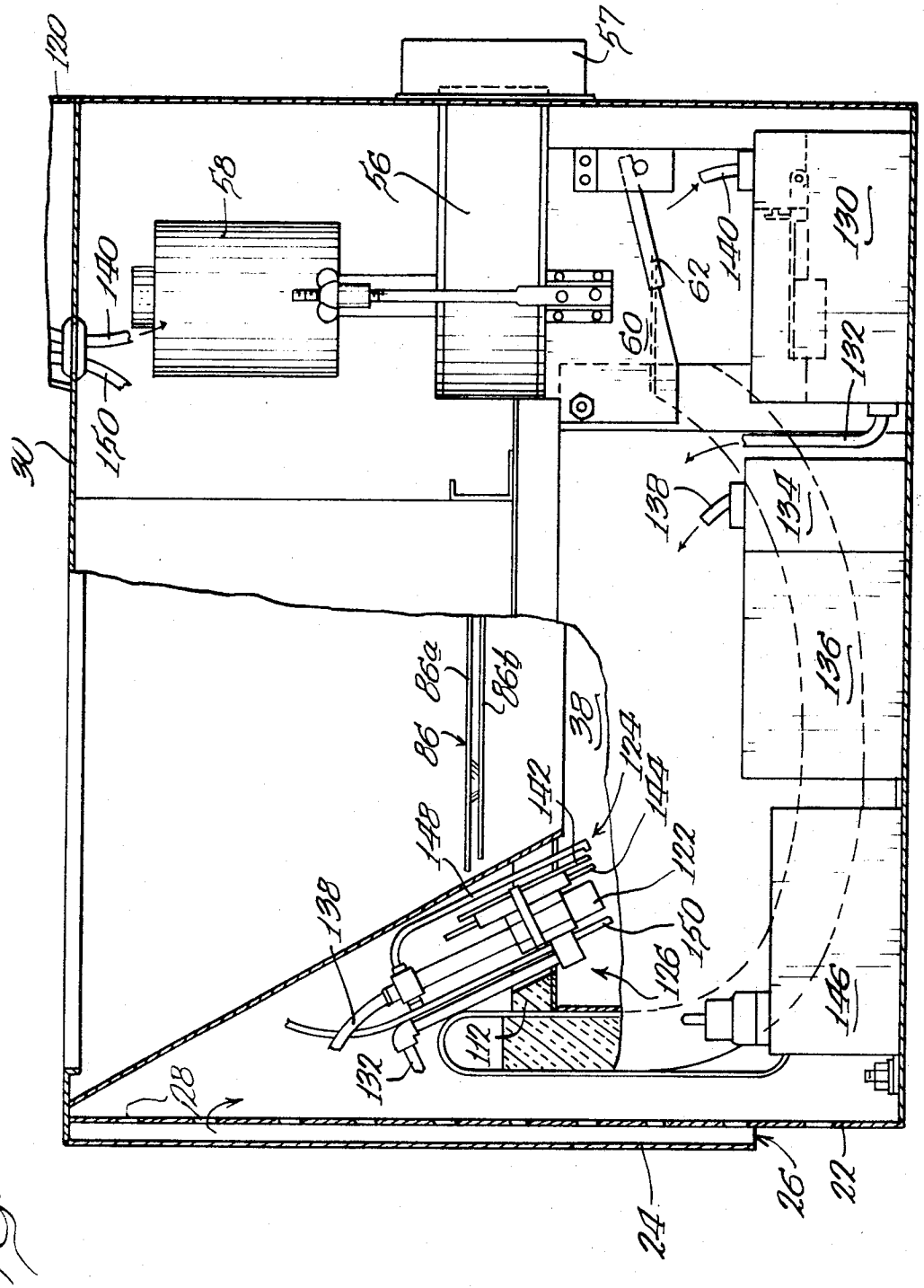
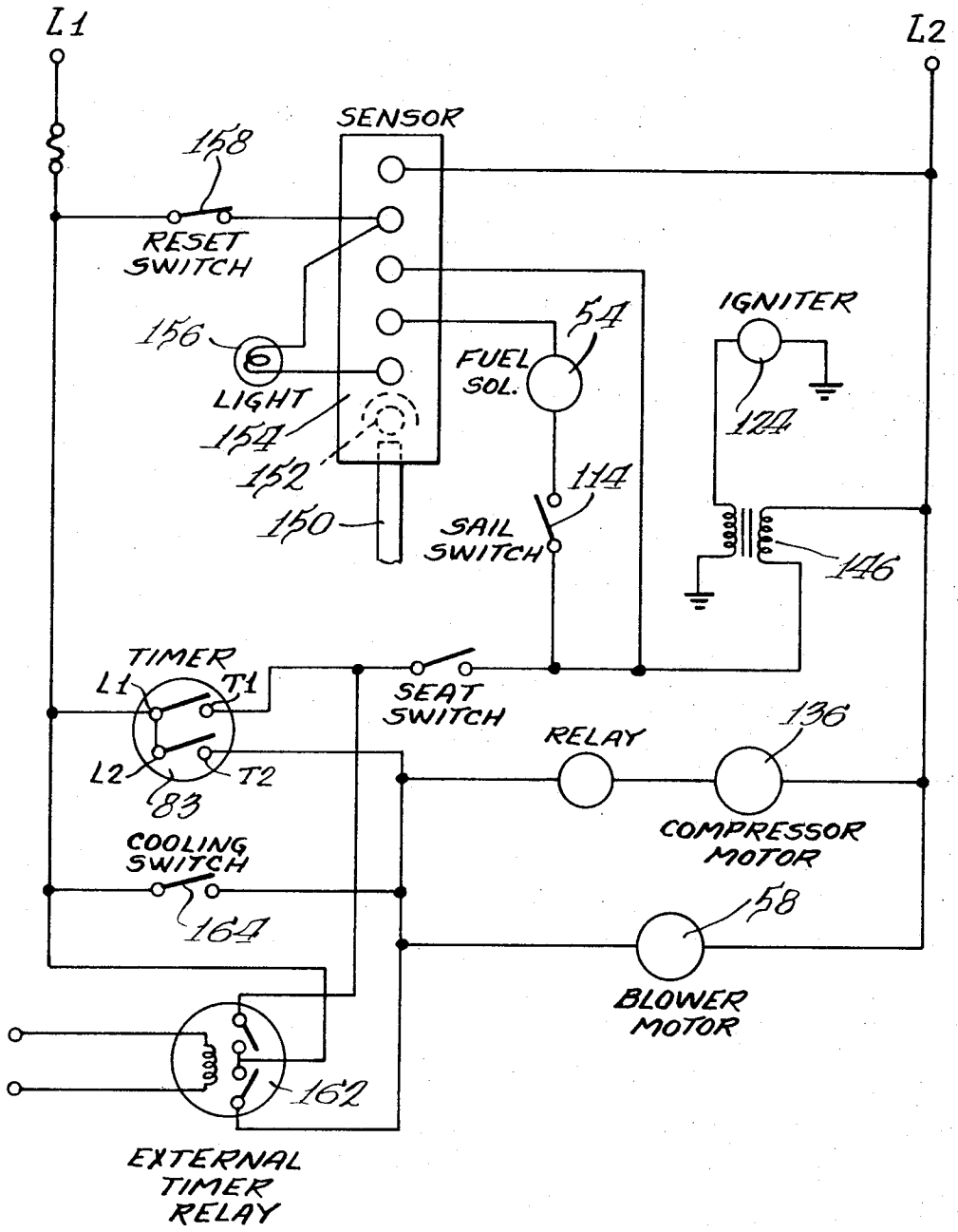

120
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58
56
140
62
130
60
132
150
30
138
134
86a
86b
86
38
136
124a
142
148
102
138
150
106
146
112
132
28
24
26
22

Fig. 11.

Fig. 12.


L1
L2
SENSOR
158
RESET SWITCH
156
LIGHT
154
152
150
54
FUEL SOL.
114
SAIL SWITCH
IGNITER
124
146
TIMER
L1
T1
L2
T2
83
SEAT SWITCH
RELAY
136
COMPRESSOR MOTOR
COOLING SWITCH
164
58
BLOWER MOTOR
162
EXTERNAL TIMER RELAY

DRY SANITARY TOILET

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to improvements in incinerating waste disposal plants and especially improvements in dry sanitary incinerating toilets. The invention also relates to incinerating toilets especially adapted for installation in the field or in moving vehicles.

2. Brief Description of the Prior Art

Incinerating toilets are becoming more and more important as pollution problems grow. For example, such toilets have found use in residences where suitable waste disposal is not available, camping areas, military camps, in installations on vehicles such as house trailers and diesel trains, cottages, boat houses and many other areas. Usually such toilets operate utilizing a burning cycle followed by a cooling cycle for cooling the combustion chamber after the waste is destroyed. It is necessary to have positive and sure ignition of the burner in order to prevent fire hazards or even explosions. Also, ignition problems can result from igniter deterioration or fouling due to direct exposure of the igniter to contamination from urine salts, splash, slosh, etc. from the raw and burning wastes in the combustion chamber.

Incinerating toilets have been provided for individual use and these, in many modern forms, include a timer for establishing a timed burning cycle, followed by a timed cooling cycle. One problem arises in use of the toilet in populated areas and by many people; the timed cycles are susceptive to overload because each time the toilet is used, the previous cycle is terminated and a new timed cycle is started. A series of consecutive uses of the device which interrupt the burning cycle before completion of waste burning can cause an undue accumulation of waste in the combustion chamber.

In use in railroad locomotives another problem arises from rough handling resulting in seat and cover breakage. Also, incinerating toilets are not normally directly adapted to use in combination with an overall locomotive system. Further, such devices often create service problems especially with respect to the electrical components because electricians dislike working within a latrine device and sometimes refuse to do so.

SUMMARY OF THE INVENTION

The present invention provides a new and useful incinerating waste disposal plant in the form of a dry sanitary toilet. One improvement of the present invention is a new exhaust system of simplified design utilizing an inlet chamber at the inlet of the exhaust blower with a variable vent valve to control the source of air or combustion gases to the inlet chamber and the amount of flow through the combustion chamber. A negative pressure is maintained in the combustion chamber to eliminate emission of odors. Another feature provided by the present invention is an improved burner fuel-air supply and ignition control system for a gas burner which uses a common fuel and air supply line but eliminates flash-back in the burner fuel supply system. As another feature the present invention provides an incinerating toilet having a removable top deck to which many of the internal parts of the device are secured so that such parts can all be removed as a unit by removal of the top deck for more ready access to other elements within the toilet.

As still another feature, an oil burner can be used and is provided with a flame detector in the form of a light sensitive system which positively and immediately reacts to cut off fuel if the flame goes out. In one preferred form of the device, a separate cabinet is provided for almost all of the electrical components for ease in servicing, with the exception of the igniter which is within the combustion chamber but, preferably, spaced away from the burner flame and is provided with an air stream delivery system for delivering a spark from the igniter spark gap via the air stream to the burner spray cone for ignition of the burner.

In locomotive use, the device can receive fuel from the locomotive diesel engine fuel supply and combustion air from the locomotive air brake reservoir. A venturi type exhaust system can be used for exhausting the combustion chamber, actuated by cooling air from the traction motor cooling system. Electric power can be derived from the locomotive electric system via an inverter.

While illustrative embodiments of the invention are shown in the drawings and will be described in detail herein, the invention is susceptible of embodiment in many different forms and it should be understood that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiments illustrated.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of one form of the incinerating toilet of this invention;

FIG. 2 is an enlarged section along line 2—2 of FIG. 1;

FIG. 3 is a section, also enlarged as in FIG. 2, along line 3—3 of FIG. 2;

FIG. 4 is a partial section through the device along line 4—4 of FIG. 3;

FIG. 5 is a further enlarged section through a pressurizer in the device taken along line 5—5 of FIG. 4;

FIG. 6 is a wiring diagram for the toilet of FIGS. 1–5;

FIG. 7 is a perspective view of another form of the incinerating toilet of this invention;

FIG. 8 is a diagrammatic showing of a wheeled vehicle, usually a diesel locomotive, with the toilet of FIG. 7 installed thereon;

FIG. 9 is an enlarged fragmentary partial side plan view of the toilet of FIGS. 7 and 8 showing details of a venturi vent system;

FIG. 10 is an enlarged fragmentary perspective view of the toilet of FIG. 7 showing mounting of electrical components;

FIG. 11 is an enlarged partial section along line 11—11 of FIG. 7;

FIG. 12 is a wiring diagram useful with one form of the device of FIG. 7; and

FIG. 13 illustrates an alternative burner ignition system similar to one illustrated in FIG. 11.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

To a large extent the present invention provides improvements and modifications in an incinerating toilet such as that shown in Frankel et al. U.S. Pat. No. 3,338,191 and, as background material and so far as description of the structure and operation of an incinerating toilet is concerned, U.S. Pat. No. 3,338,191 is

hereby incorporated herein by reference. Additionally, the preferred devices of this invention also include a timer for establishing a timed burning cycle and a timed cooling cycle and actuating linkages for the timer system similar to that described in Frankel et al. U.S. Pat. No. 3,304,559, which patent is also incorporated herein by reference for a more detailed description of the timer and timer linkages. Modifications of the systems are these patents will be described herein where appropriate.

Referring first to FIGS. 1–3, 7 and 11, the incinerating toilet includes a tear drop shaped cabinet 20 with a housing 22 and an outer side wall skirt 24 secured by suitable spacer members to the housing 22 to define an air space 26 between housing 22 and skirt 24. Air can enter air space 26 at the bottom of skirt 24 and ports 28 (FIGS. 2 and 11) are provided around the upper portion and the lower front portion of housing 22 for entry of air into air space 29 within housing 22 from space 26. Ports 28*a* (FIGS. 1 and 2) are also provided for more direct entry of air into the lower portion of space 29. Skirt 24, being shorter than housing 22, also provides a foot well at the front and sides of the device. The double wall structure of housing 22 and skirt 24 adds strength to the unit.

Housing 22 also includes a removable top deck 30 having a central waste receiving opening 30*a* with a seat such as split seat 32, with seat opening 32*a* generally registering with the opening 30*a*. A cover 34 is secured to a hinge rod 36 (FIGS. 2 and 4) for pivotal movement with rod 36 between a down or closed position and an up or open position. Spacers 34*a* are provided on the bottom surface of cover 34 for spacing cover 34 from seat 32 when cover 34 is in its closed position. Seat 32 is secured to brackets 37 which pivot on hinge rod 36 for raising and lowering seat 32. Seat 32 also has spacers 32*b* for spacing it from top wall 30 when in down position.

Mounted in the bottom of cabinet 20 is a large and deep combustion pot (FIGS. 2, 4 and 11) defining the receiving and combustion chamber 38. The receiving and combustion chamber 38 is insulated on its outer surface by layers of high temperature (up to 2,000°F or higher) insulation indicated collectively at 40. In the device of FIGS. 1–6, a gas burner 42 (FIG. 2) is mounted at an elevated position at about the lip of the receiving and combustion chamber 38 and trained downward at an angle to the side wall of the receiving and combustion chamber, generally toward the center of the combustion chamber for directing a flame into the combustion chamber. An upstream igniter is provided for burner 42 in the form of spark plug 44 which is mounted in a position spaced upstream from the flame supporting outlet or holding port 42*a* of burner 42 so that the igniter 44 is removed from and protected from contamination with urine salts, splash, slosh, etc., from the raw and burning wastes. An ignition coil 45 services spark plug 44.

A mixture of air and fuel, in this case gas, is supplied by a supply conduit or tube 46 to burner 42 from pressurizer 48 (FIGS. 2 through 5) mounted in the rear of the cabinet 20. Pressurizer 48 has an outlet mixing chamber 50 (FIGS. 3 and 5) into which a gas line 52 introduces gas fuel. A gas line solenoid valve 54, of the "on-off" type, is provided for controlling flow of gas through line 52 and into chamber 50, thereby controlling flow of gas to the burner outlet 42*a* for supporting a flame at 42*a*. Valve 54 is opened during the burning cycle and closed during the cooling cycle although pressurizer 48 functions during both cycles so that combustion air is supplied during the burning cycle and cooling air is supplied to the combustion chamber from nozzle 42 during the cooling cycle.

In the exhaust system for exhausting air and combustion gases from the receiving and combustion chamber 38 of the device of FIGS. 1–6, there is provided a blower 56 having an outlet at 56*a* attached to and in communication with suitable vent duct work at 57. A motor 58 is provided for driving both pressurizer 48 and blower 56 on a common shaft 58*a*. A housing defining an inlet chamber 60 is mounted below blower 56 at the blower intake and the housing is equipped with a hinged variable vent valve 62 for regulating the flow of air into the inlet chamber 60 from air space 29 which surrounds the combustion chamber 38 and the sides of the hopper. The variable vent valve 62 is moved to open position (shown in phantom in FIG. 2) by a solenoid 64 through suitable linkage 66 and is returned to closed position (shown in full lines in FIG. 2) by return spring 67 when solenoid 64 is deenergized.

The pressurizer 48 is mounted between the exhaust blower 56 and motor 58 to form a heat barrier between the motor 58 and the hot exhaust gases being exhausted by fan 56. Further, the air intake for pressurizer 48 is at the bottom wall adjacent the top wall of fan 56 so that air entering pressurizer 48 tends to become slightly preheated by heat exchange with the blower to increase burning efficiency.

During the cooling cycle, the plate or hinged vent valve 62 remains in closed position under tension of spring 67. Exhaust blower 56 draws cooling air supplied by the pressurizer 48 through conduit 46 and from burner outlet 42*a*, and air from various leaks in the device, i.e., as permitted by the trap door construction (described below) in the hopper, from around the burner mounting and around vent valve 62, into chamber 60 for exhausting at exhaust outlet 56*a*. During the burning cycle the vent valve 62 is moved to open position so that much more air is drawn from space 26 (FIG. 2) through ports 28, thence through space 29 and into inlet chamber 60 for exhausting, at the same time decreasing the flow of air through the combustion chamber. Ports 28*a* permit greater air flow through the portion of space 29 immediately surrounding the receiving and combustion chamber 36. The air flowing through space 29, which space surrounds the exterior of the insulated combustion chamber and the walls of the hopper, produces a cooling effect on the exterior of the insulated combustion chamber and hopper during the burning cycle. The open vent valve 62 also results in reduction of air flow through the combustion chamber by decreasing the draft on the combustion chamber by blower 56 and the reduced air flow through combustion chamber 38 results in a higher combustion chamber burning temperature. The flow through the combustion chamber 38 during the burning cycle can be restricted to as little as 2 to 15 percent of the total flow through combustion chamber during the cooling cycle.

The operation of the above described equipment is apparent. During the burning cycle the gas line solenoid valve 54 is maintained in an open position so that a mixture of combustion air and gas is delivered by pressurizer 48 to the burner 42. The igniter 44 ignites the mixture to create a flame at flame holding port 42*a*.

Blower 56 is also driven by the motor 58 and vent valve 62 is moved to open position by the solenoid 64. At the end of the burning cycle, solenoid 64 is de-energized and spring 67 closes variable vent valve 62. The gas line solenoid valve 54 also closes so that cooling air flows from nozzle 42 through the receiving and combustion chamber and other sources to cool the combustion chamber.

On initial installation of the device, the fuel-air mixture provided by the pressurizer 48 can be adjusted in accordance with the altitude and other climatic conditions at the site of installation. Accordingly, a ported adjustable valve is provided at the air intake for pressurizer 48 in the form of a ported plate 68 which is slidably mounted over a ported intake plate 70 of pressurizer 48. Plate 68 is adjusted with its ports overlapping the ports of the plate 70 until the proper mixture of air and fuel is provided as can be detected by the condition of the flame or the products of combustion. Plate 68 is then secured in position by screw 71 threaded into an arm 72 of plate 68 and riding in slot 73 in a lateral extension 74 of intake plate 70. Should change of conditions or removal of the device to a new locale necessitate adjustment of the air fuel mixture, plate 68 can be loosened and readjusted.

In both embodiments (FIGS. 1 and 7), cover 34 for the seat 32 is secured to the shaft 36 as described above. Shaft 36 is rotatably mounted through suitable mounting brackets secured to and upstanding from the top wall 30. Cover 34 and shaft 36 are pivotally movable between a position with cover 34 closing inlet 32*a* as shown in full lines in FIG. 4 and a position slightly overcenter of 90° clockwise to the position shown in the phantom in FIG. 4 with inlet 32*a* uncovered. A gear and cam sector 75 (FIG. 2) is mounted on shaft 36 for rotation therewith. Sector 75 includes a gear portion 75*a*, a cam low 75*b* and a cam high 75*c*. A channel bracket 76 (FIG. 10) is provided secured to and upstanding from casing wall 30. An idler gear 77 is meshed with the gear portion 75*a* of sector 75 is mounted on shaft 78 (FIG. 2) which is rotatably mounted through bracket 76. Gear 77 is also in mesh with a timer gear 79 on timer shaft 82 of timer 83, also rotatably supported by a bracket 76. Timer gear 79 is linked to shaft 82 through a lost motion linkage permitting gear 79 to rotate shaft 82 clockwise approximately 180° and to return 180° without rotating shaft 82 counterclockwise. Such a linkage is more particularly described in Frankel et al. U.S. Pat. No. 3,304,559. The gear train and timer are hidden by a suitable aesthetic enclosure as at 84 (FIG. 1).

As cover 34 is moved to its open position, sector 75 is rotated approximately 90° clockwise as viewed in FIGS. 2 and 4 and because the gear train from sector 75 through gear 77 to gear 79 provides a 2:1 ratio, gear 79 is rotated approximately 180° clockwise, carrying shaft 82 therewith. Sector 75 also operates a seat switch 116, opening the switch each time cover 34 is opened and reclosing switch 116 each time cover 34 is closed. Although the timer may be capable of timing a greater interval than that desired, the lost motion link and gear train will be adjusted to a given amount of rotation to shaft 82 corresponding to the desired time interval. When cover 34 is again moved to its closed position, the gears reverse their rotation but shaft 82 remains in its clockwise rotated position because of the lost motion linkage. The rotation of timer shaft 82 clockwise 180° winds the timer 83 but timer 83 is held by the gear 79 so that as long as cover 34 remains in raised position the timing action of timer 83 is blocked. Upon lowering of the seat 34, shaft 82 is freed to unwind through the lost motion linkage, thereby releasing the timer 83 to permit timing of a cycle.

Timer 83 is of the type described in the above identified U.S. Pat. No. 3,304,559 and provides a first timed burning cycle, e.g., for 10 minutes or longer, followed by a timed cooling cycle, e.g., for about 6 minutes. Where longer or shorter cycles are desired, the timer can be adjusted or can be replaced by a timer giving the appropriate burning and cooling cycles.

A trap door 86 (FIGS. 2, 4 and 11) is hingedly mounted to a back wall of receptacle 87 which is in turn secured together with the outer walls of receptacle 87 to the bottom of removable top wall 30. The trap door 86 is a heat shield composed of a pair of opposing spaced plates 86*a* and 86*b* having depressions in plates 86*a* welded to plates 86*b* to define an air space therebetween. The edges of the trap door conform to the shape of the hopper 87 and fit close to the hopper side walls when the trap door 86 is in closed position to generally block radiant heat from combustion chamber 38. Ports 89 are provided in lower plate 86*b* so that air drawn downward around the edge of plate 86*a* is drawn through the airspace between the plates 86*a* and 86*b*, through ports 89 and thence through the combustion chamber. The flow of air between the plates provides a double wall or cooling jacket effect to decrease rising or radiant heat while permitting flow of air into the combustion chamber. The flow of air also eliminates rising smoke or odors. Flow of air or gases through the unit is always in one direction toward the exhaust outlet whether by convection or under forced draft.

In the hinge mounting of trap door 86, trap door 86 is secured to a shaft 92 for pivotal movement therewith. Shaft 92 (FIGS. 2 and 3) is journalled through opposing side walls of the receptacle 87 and includes an end impaling and secured to a crank 93. Crank 93 thereby pivots with shaft 92 and trap door 86. A link 94, provided with link adjustment in the form of a turnbuckle 94*a*, is pivotally secured at one end to an arm of crank 93 and at the other end to an arm 95. Arm 95 is pivotally connected to a mounting bracket 96 secured to top deck 30. A lever 97 is also pivotally mounted at one end on a bracket secured to the top deck 30 and engages arm 95. Guide members or brackets are provided to retain the lever 97 in proper position.

At the other end of lever 97 a follower plate 103 is provided on the top of the lever 97. A plunger 104 engages the plate 103 and extends through a sleeve 105 secured at its upper end to top deck 30. Plunger 104 is vertically axially slidable in sleeve 105. The upper end of plunger 104 is provided with a dome-shaped follower surface 106 disposed for engagement with low 75*b* and high 75*c* of sector 75. A spring means in the form of a tension spring 107 is provided between crank 93 and arm 95 for normally biasing the trap door 86 to open position.

It will be apparent that in operation the above described linkages cause trap door 86 to be opened each time the cover 34 is opened and to be closed each time the cover 34 is closed. For details of such operation in a similar system see the above mentioned Frankel U.S. Pat. No. 3,338,191.

Returning now to the removable top deck or panel **30** in the unit shown in FIG. **1**, the deck is removably fastened to the remainder of the cabinet **20** by fastening means **110** (FIG. **2**) in the form of a machine screw and/or pin. The walls of hopper **87** are bolted at their upper ends to the bottom of top deck **30.** The trap door and actuating linkages therefor are mounted on the walls of hopper **87** and to top deck **30** so that when top deck **30** is removed from the remainder of the housing **22,** the hopper trap door and trap door actuating system are removed therewith giving complete and open access to the turner, receiving and combustion chamber, pressurizer, blower and motor, and exhaust inlet chamber system for ease in servicing. With the top deck **30** replaced in position, the walls of hopper **87** fit against or closely with the top insulation **112** of the receiving and combustion chamber within the device to minimize or prevent flow of air from air space **29** into the combustion chamber **38.**

A normally open sail switch **114** (See FIGS. **2** and **6**) can be provided for assuring the fuel supply is cut off should there be a loss of exhaust air supply due to exhaust blower failure or flue blockage, e.g., as may be caused by bird or mice nests in the flue. Sail switch **114** is mounted in the exhaust air stream of blower **56** and is closed by air delivered by the blower. Sail switch **114** remains closed as long as blower **56** is still running. Should the flow of air stop for some reason, the sail switch **114** opens to de-energize and close the solenoid fuel valve **58** and stop flow of fuel to the burner. This eliminates the possibility of objectionable or dangerous backup of combustion gases in the combustion chamber or puddling of fuel oil in the device. Because fuel will not flow until the sail switch is actuated by flow of air from the exhaust blower, flow of fuel is delayed or blocked at the beginning of each burn cycle until proper exhaust draft is present before the burner is ignited.

In operation of the device of FIGS. **1** through **6,** cover **34** is opened in order to use the device opening seat switch **116.** This winds timer **83** and energizes blower motor **58** but timer **83** is retained against timing operation until seat **34** is again closed. Timer **83** is a double pole single throw timer having two timed cycles (T–**1** and T–**2**) with one cycle extended 6 minutes beyond the other. The exhaust blower and open variable vent assure maximum air flow through the device during use. The burning cycle (T–**1**) circuitry is not energized because of the open switch **116.** Blocking the wound timer against operation is accomplished by gear **79** as described above until the cover **34** is reclosed. When cover **34** is reclosed the seat switch **116** is also closed to energize the burning cycle circuitry and timer **83** begins timing the cycles, a 10 minute burn cycle, followed by a 6 minute continuation of operation of blower motor **58** to provide the cooling cycle. The burning cycle is sufficient to raise the combustion chamber to 1,500°F. for at least about one-half second for purposes of destroying all odors.

The burning cycle commences when the burning circuitry is energized by closing seat switch **116.** Assuming the presence of flow of air from the exhaust blower, sail switch **114** will be closed so that the variable vent solenoid **64** and gas solenoid valve **54** will be actuated to open variable vent valve **62.** At the same time the igniter coil **45** is also energized so that spark plug **44** provides ignition sparks within burner **42** adjacent the outlet before the air-gas mixture reaches the burner outlet. The exhaust blower draws vapors and odors from the combustion chamber during a short purge cycle until an equitable air-gas mixture reaches the igniter. As the air-gas mixture is forced through conduit **46** by pressurizer **48** and encounters the spark plug **44** it becomes ignited. The pressurizer **48** produces sufficient velocity to push the ignited flame from spark plug **44** outwardly to the flame holding port **42***a* of burner **42,** preventing any flash-back through the fuel and air mixture within conduit **46.** Thus, the velocity of the fuel-air mixture is greater than the flame or flash-back velocity and the flame or back-flash velocity is determined by the fuel and air ratio in the mixture in that a stoichiometric mixture provides the fastest flame velocity while leaner or richer mixtures provide slower velocity. Accordingly, some adjustment of the fuel-air mixture can be made, should it ever be necessary, to control against flash-back, although in the preferred device a high enough velocity of fuel-air mixture is provided to prevent flash-back regardless of the condition of the fuel-air mixture.

Sail switch **114** also assists in preventing explosive hazards by assuring a proper amount of air and fuel:air ratio in the combustion chamber to keep the ratio always lower than the lowest explosion limit in the chamber. If the first surge of air from the burner nozzle is at a low velocity, the sail switch blocks the admission or injection of fuel into the air so the explosion level is never reached. This delay in feeding fuel by the sail switch also gives the exhaust blower **56** enough time to purge tube **46** of residual gases.

Burner **42** will continue to burn throughout the burning cycle, as controlled by timer **83,** unless seat cover **34** is reopened thereby opening seat switch **116** or unless sail switch **114** opens due to an absence of draft from blower **56** or blocked chimney or flue. At the end of the burning cycle time **83** de-energizes gas solenoid valve **54** and igniter **45** and also de-energizes variable vent solenoid **64** to close valve **62.** Blower motor **58** continues to run forcing air by pressurizer **48** through conduit **46** and from nozzle end **42** and drawing air from the receiving and combustion chamber **38** by blower **56.** Air is also drawn by blower **56** in through the spaces between the seat and cover and seat and top wall and through the trap door and combustion chamber to exhaust. At the end of the cooling cycle blower motor **58** is turned off by timer **83.** The negative pressure in the combustion chamber during both burning and cooling cycles retains all odors and gases within the device for venting them.

Turning now more particularly to the incinerating toilet shown in FIGS. **7** through **12,** the device is in many ways similar to the device in FIGS. **1** through **6** and where similar or same elements are shown they are similarly numbered. The device of FIGS. **7** through **12** differs from that of FIGS. **1** through **6** in that it is adapted especially for use in mobile installations such as diesel locomotives or the like, although it can be used in nonmobile installations such as cottages and other residences, parks, camps, etc. More specifically, the changes involve the use of a separate top rear electrical component cabinet **120,** the optional use of either the gas burner or an as pirating oil burner **122** with an improved igniter **124** and a flame sensor system **126,** the use of a venturi exhaust system **128** in lieu of or to supplement the exhaust blower **56,** and the combination with the unit of sources of fuel and air supply avail-

able on a railroad diesel engine (FIG. 8). Also, in the unit of FIG. 7 the top wall 30 is not fastened to the cabinet side walls but is held in place by the back cabinet 120.

In the unit of FIGS. 7 through 12, all electrical components with the exception of the burner igniter, and the exhaust blower 56 if used, are contained within the top rear cabinet 120 which has a front face sloped to properly receive seat 34 when seat 34 is moved to open position. This front rest panel of cabinet 120 prevents the cover 34 from being bent back and fulcrumed and broken over other portions of the device such as the timer and gear housing or enclosure 84 of the device shown in FIG. 1. There has been a problem with seat covers being torn off through rough handling by railroad employees and the use of the front rest panel or cabinet 120 overcomes this problem. In one form of the device which is particularly designed for use in diesel locomotives, the exhaust blower 56 can be eliminated and an induction vent system vents the device during its use so that the only electrical component within the lower casing or housing 22 is the burner igniter.

Turning now to FIG. 11, oil burner 122 is mounted facing downwardly into combustion pot 38 in a manner similar to the gas burner 42 in the device of FIGS. 1 through 6. The oil burner illustated is a Gulf-type aspirator burner (See Biber et al., U.S. Pat. No. 3,119,604) having the normal float chamber 130 with about a three inch negative pressure lift front float chamber 130 to the burner 122. Oil is supplied to burner 122 from float chamber 130 through an oil line 132 which includes and is controlled by the fuel solenoid valve 54A (FIG. 10). Valve 54A differs from valve 54 in that it is an oil-flow control valve rather than a gas shut-off valve. A compressor 134, driven by a motor 136, can be used to supply air to burner 122 via air line 138, if another suitable air supply is unavailable. The oil is aspirated by the air in the burner and upon ignition the burner supports a flame as its lower end. Oil from a suitable source of supply is delivered to the float chamber 130 via an oil inlet line 140.

Alternatively a gas burner can be used, supplied with propane or like fuel from a tank or cylinder, e.g., aboard a locomotive.

The oil burner igniter system 124 illustrated in FIG. 11 includes a pair of closely spaced electrodes 142 and 144 supplied with a high voltage from an igniter coil 146 so that a spark is created between the electrodes spaced laterally from the outlet of burner 122. A bleeder tube 148 branches from an air chamber in burner 122 so that a small amount of the air supplied by line 132 bleeds out of the air chamber through tube 148 and is directed at the outlet of tube 148 across the spark gap and toward the burner outlet. Alternatively, as shown in the burner of FIG. 13, an orifice or port 148 is machined or cast into the wall of the burner air chamber at a 45° angle to the axis of the burner to direct a stream of air through electrodes 142*a* and 144*a* and into the flame cone area at the burner flame holding port. In either event, as the air passes through the spark gap it is apparently ionized by the spark and the ionized air carries or blows the ignition spark into the cone of combustible spray ensuing from the end of burner 122. The spark thereby ignites the burner and after ignition the bleeder tube 148 or orifice 148*a* continues to supply a small amount of combustion air directly to the flame, in addition to the combustion air used to atomize the fuel within burner 122.

The flame sensor system 126 is provided for shutting off flow of fuel to the burner responsive to a "no ignition" or "no flame" condition at the burner nozzle. Such a condition can exist from ignition failure or from the flame being extinguished as through failure of fuel supply. The system relies on light detection rather than heat detection so that it shuts off the fuel after a 20 second lag when the flame goes out and does not have to wait to detect a cooling effect in the combustion chamber. The device as shown in FIG. 12 is a Rhomega Systems, Inc. (Baltimore) Flame Sensor, Part No. 4827. Accordingly, a fiber optics cord 150 of flexible fiber optics material has one end secured to the burner and directed toward the combustion chamber and extends at its other end into a sensor housing 154 in cabinet 120 for delivering the light of the flame to a photo cell 152 within housing 154. So long as the flame is present at the burner, the light conducted through the cord 150 keeps the photo cell 152 energized, which in turn keeps the circuit to fuel solenoid 58 closed, maintaining the fuel valve in open position for continued flow of oil to the burner. When the flame is extinguished, the light delivered to photo cell 152 ceases and photocell 152 breaks the circuit to the fuel line solenoid 54 after the 20 second lag, closing the solenoid valve and cutting off further flow of fuel to the burner. The 20 second lag is provided so that a momentary loss of flame will not close the system down. If the flame reignites within the 20 seconds, the burning cycle continues. Thus, any time the flame within combustion chamber 38 becomes extinguished for at least 20 seconds, the flow of fuel to the burner is quickly cut off by the flame sensor system 126. This prevents puddling of fuel.

Responsive to a no flame condition, the photo cell 152 can also turn on a warning lamp 156 mounted on the face of cabinet 120. A reset switch 158 (see especially FIG. 12) can be provided for overriding the photo cell 152 so that the device can be reactivated after inspection. The reset switch 158 momentarily breaks the circuit to the photo cell 152 so that the photo cell 152 resets. By way of explanation, the Flame Sensor includes a gate switch (not shown) with the photo cell 152. A no flame condition results in D. C. voltage buildup (about 20 seconds) before the gate opens to open the circuit to solenoid 54. This gives the 20 second lag mentioned above. Should stray light enter the optical cord 150 or photo cell 152, sail switch 114 will prevent the solenoid fuel valve 54 from being reopened by the photo cell 152 unless the exhaust blower is exhausting air from the unit at a proper rate, in which case any fuel fumes would also be vented eliminating any danger of explosion. The light 156 is merely to indicate the open or closed position of the sensor circuit at a given time.

If the incinerating toilet is to be used in public areas where overload conditions are to be expected, it is advantageous to provide an externally timed override system for increasing the timed burning cycle. For example, should the burning cycle be interrupted too often during repeated consecutive use of the device, the cycle may not be long enough to cause complete destruction of the waste in the combustion chamber. For this purpose, an external timer 160 can be provided, e.g., mounted on the front panel of cabinet 120 (FIG. 7). Timer 160 controls a timer relay 162 (FIG. 12) to

override the timer **83** and provide a preselected or preset burn cycle. After the burn cycle, the exhaust blower **58** will continue to operate and provide an untimed cooling cycle until a heat-sensitive cooling switch **164**, mounted in the exhaust system open responsive to a decrease in temperature to a "cool" level, e.g. 160°F. The timed burn cycle of timer **160** can be a prolonged burn cycle three or four times that of timer **83**. Timer **160** can also conveniently be used to burn at night a large amount of waste accumulated during daytime use of the device.

The heat-sensitive cooling switch **164** is a bimetallic switch mounted in the exhaust portion of the device, e.g., in or against the outside of the housing of the blower **56**. Switch **164** is normally open but closes at temperatures of 160°F. or above. Therefore, as seen in the wiring diagram of FIG. **12**, if the exhaust system has not been cooled to below 160°F. by the end of a timed cooling cycle, switch **164** will be in a closed position and will keep compressor motor **136** and blower motor **58** operating until a temperaure below 160°F. is reached, thereby assuring additional cooling power when and if needed to cool the combustion chamber to an acceptably low level.

Although the device as illustrated in FIG. **11** includes an exhaust blower **56**, the one form of the device for railroad use omits the blower **56** and relies entirely on a venturi system for venting the combustion chamber **38**. Such a venturi system is shown in FIG. **9** in the form of an induction Tee which includes a connector duct **166** for connecting the device to the exhaust outlet **57** and an induction flue duct **168** for connection to a suitable venting stack or flue. The induction Tee is driven by a source of pressure air supplied by an air supply tube **170** which extends approximately to the center of the juncture of connector duct **166** and induction flue duct **168**. A connector **172** is provided at the upper end of tube **170** for connecting tube **170** to a suitable high volume source of air so that air can be delivered upward through tube **170** to create a venturi effect for drawing combustion gases from outlet **57** and through the connector duct **166**. The combustion gases are vented upward by the induction flue duct **168** to the exterior. Downward or side venting can also be used. The venturi venting effect can be used either in addition to or in the absence of the blower fan **56**. At least a smaller exhaust blower fan than normally required can be used with a venturi supplement.

FIG. **8** ciagramatically illustrates the use of a device such as that shown in FIG. **9** on a diesel locomotive, caboose or elsewhere on a diesel train. Referring to FIG. **8**, a wheeled carriage such as a diesel locomotive is represented generally by the reference numeral **200**. The diesel locomotive **200** is equipped with a conventional diesel fuel tank **174**, an air brake reservoir **176** and one or more traction motor blowers providing a source of air at low pressure and at high volume as represented by "traction motor air" box **178**. A fuel line **180** extends from the oil reservoir **174** to oil line **140** and includes an oil cut-off solenoid valve **181** and a pressure reducing valve **182** for reducing pressure of oil or gas supplied from tank **174**, in this case diesel fuel. The fuel in a diesel fuel tank is boosted to 30 to 35 psig pressure before injection into the engine so a pressure reducing valve **182** is used to reduce the pressure to a much lower level, e.g., about 8 psig or less, for delivery to the float valve chamber **130** and subsequent delivery to the burner **122**. A filter **184** is also provided in the fuel line **180**.

Compressor **134** and motor **136** are eliminated from this embodiment and in lieu thereof an air line **186** extends from the air brake reservoir **176** through a pressure reducing valve **188** and an on-off control solenoid **190** and connects to air line **138** to supply combustion air to burner **122**. The pressure reduction valve **188** reduces the pressure of air from the air brake reservoir from its normal pressure of about 140 psig to a much lower pressure, e.g., about 4 psig, for use by the burner **122**.

Traction motor cooling blowers are used in a locomotive to blow air over and cool the traction motors. A small portion of this high volume low pressure air represented at **178** is delivered through a duct as shown at **192** which is connected at connector **172** for directing the air upwardly through tube **170** to drive the induction Tee or venturi system for exhausting the dry sanitary toilet. The outlet of flue duct **178** is vented by suitable duct work **192** to the exterior through the roof (or floor, depending on venting arrangement) of the locomotive. Because the sources of fuel combustion air and venturi actuating or exhausting air are readily available on the locomotive, the dry sanitary toilet unit provides for very convenient installation in minimal overall space. Further, the device does not depend on actual motion of the locomotive for operation.

In order to adapt the electrical system of the device to the 74 volt DC generating system of a diesel locomotive, a 60 cycle AC, 115 volt, 60 herz solid state inverter **202** (FIG. **10**) is provided.

The unit described with reference to FIG. **8**, i.e., that specifically adapted for locomotive installations, includes the rear top cabinet **120** and the arrangement in cabinet **120** can best be seen with reference to FIG. **10**. In the device the igniter coil **146**, the flame sensor housing **154** and the fuel solenoid **54**, are mounted to the upper cabinet **110**. Additionally, the air control solenoid **190** and the pressure regulators **182** and **188** are installed in cabinet **120**. Since the device does not include the motors **136** and **58**, the only electrical element within the lower housing is the igniter system **124**, although in one satisfactory form the solenoid **64** which operates the variable vent valve **62** is retained in the lower cabinet. The device can be conveniently serviced by an electrician simply by moving the front panel of cabinet **120** for access to the electrical components. As best seen in FIG. **9**, the front panel of cabinet **120** also includes a shield portion **202** for covering the timer and timer drive linkages for improved appearance and to keep out foreign matter.

The overall operation of the device shown in FIGS. **7** through **12** is much the same as the deivce of FIGS. **1** through **6**. However, here the flow of air through **192** to the venturi is continuous for continuous venting of gases and fumes. Solenoid valves **54**, **190** and **64** are all open during the burning cycle and solenoid **54** is closed during the cooling cycle.

In using the incinerating toilets of the present invention, it has been found that a single device can readily accommodate the requirements of a crew of 12 men each working day with an average of five uses per man per day. The sterilizing flame destroys all bacteria and virtually eliminates any pollution problems. The device does not involve any water consumption or use of chemicals and does not produce raw sewage or cause

any problems with regard to flushing and emptying, handling or pumping or the pollution dangers of operating a water toilet for as many as 60 times a day. The device is easily servicable and inexpensive to operate, costing only pennies a day for fuel. It can be installed in towers, shops, worksheds or any other place where conventional recirculating, holding, septic or sewage systems are too costly, impractical or impossible to use. Further, it finds use in climates where water toilets will freeze. More specifically, the device can be installed in vacation homes, traveling construction office trailers, industrial buildings, tug boats, house boats, warehouses, farms, mines, garages, marinas, fuel pumping and communicating relay stations, highway rest and toll stations and any other place where convenience and economy are desired.

In the form of the device especially adapted for use by the railway industry, the device can be installed in cabooses, bunk or business cars and it can be installed as easily as a household dryer or an oil fired space heater. A gas or fuel oil line, electrical connection and a flue are all that are required.

We claim:

1. An incinerating waste disposal device comprising a receptacle, a combustion chamber in the form of a bowl for receiving waste from the receptacle, an opening above the receptacle, a cover over said opening, a burner having a nozzle mounted in said combustion chamber for directing flame at the bottom of said bowl, said nozzle having a flame holding outlet, a conduit connected to the burner, means for supplying mixed air and combustible fuel through the conduit to the burner and from the nozzle thereof and means in the burner upstream from the flame holding outlet for igniting the mixture of air and fuel, said supplying means including means driving the air and gas mixture through the burner at a rate sufficient to move flame from the igniter means to the flame holding outlet and sufficient to support the flame without backflash through the burner and conduit means.

2. The device of claim 1 including a cabinet for containing said combustion chamber, said cabinet including an inner side wall having air intake port means adjacent the top thereof and at the lower front portion and an outer wall spaced from said inner wall and surrounding said inner wall defining a skirt therearound stopping short of the bottom of the inner wall and spaced therefrom to define a bottom air intake for admitting air for delivery through said top and bottom air intake means.

3. The device of claim 1 wherein said supplying means comprises a pressurizing blower for delivering the mixture of air and fuel through said conduit and burner.

4. The device of claim 1 wherein said combustion chamber comprises a generally hemispherical bowl at the bottom of said receptacle having a bottom waste receiving surface and said burner is mounted to deliver a flame generally against said waste receiving surface.

5. The device of claim 1 wherein said combustion chamber comprises a bowl at the bottom of said receptacle for receiving waste from said opening and including means mounting the burner at the top of the bowl and at an angle directing flame at the central portion of the bowl bottom, said burner nozzle being sufficiently above the bowl bottom to prevent fouling of the burner by waste material within the bowl.

6. The device of claim 1 including a hinge mounting said cover at the opening for opening and closing said cover, timer means mounted adjacent said hinge, valve means for controlling delivery of fuel by the supplying means to the burner, a gear linkage for setting said timer responsive to movement of the cover, and switch means actuated by said gear linkage for closing said valve means to stop delivery of fuel to the burner with the cover moved to open position.

7. The device of claim 1 including a cabinet for containing the receptacle and combustion chamber including a removable top cabinet deck, means mounting walls of the receptacle from the top cabinet deck, trap door means mounted in the receptacle adjacent the bottom of the receptacle walls for opening and closing the bottom of the receptacle and linkage means supported from said receptacle and top cabinet deck and accessible at the top cabinet deck for opening and closing said trap door.

8. The device of claim 1 wherein said supplying means comprises a pressurizing blower having an air intake for receiving air for delivery through the conduit and means for regulating the size of the air intake and, therefore, the amount of air delivered through said conduit in mixture with the fuel.

9. An incinerating waste disposal device comprising a receptacle having a top cover, a combustion chamber below said receptacle for receiving waste from said receptacle, an outlet for directing combustion gases from said combustion chamber, exhaust means for delivering combustion gases through the outlet, an outlet chamber at the intake for the exhaust means a source of cool air adjacent said outlet chamber, and an operable valve means for opening said chamber to said source of air.

10. The device of claim 9 including timer means for establishing a burning cycle, means for igniting the burner responsive to establishment of the burning cycle by the timer means and means for moving said operable valve means for decreasing the draft of air through the combustion chamber during the burning cycle.

11. The device of claim 9 wherein said valve means comprises a valve plate and hinge means permitting movement of the valve plate between open and restricting positions.

12. An incinerating waste disposal device comprising a receptacle having a top cover, a combustion chamber below said receptacle for receiving waste from said receptacle, an outlet for directing combustion gases from said combustion chamber, exhaust means for delivering combustion gases through the outlet, an outlet chamber at the intake for the exhaust means including an operable valve means on the outlet chamber inlet, a cooling jacket around the exterior of the device for cooling air and an outlet from said jacket adjacent the exhaust blower and wherein said valve means is mounted for movement between a position opening the jacket outlet for flow therefrom into the outlet chamber and a position closing the jacket outlet whereby substantially all air is drawn through the combustion chamber into the outlet chamber.

13. The device of claim 12 including solenoid means for moving said valve means between opening and closing positions.

14. The device of claim 12 including control means for establishing a burning cycle and a cooling cycle and means for moving said valve means to opening position responsive to the burning cycle and to closing position responsive to the cooling cycle.

15. An incinerating waste disposal system comprising a cabinet, and a combustion chamber including heating or burning means mounted in said cabinet, said cabinet including side wall, a top wall removably mounted on said side walls, an opening in said top wall, movable cover means for said opening, skirt means secured to and depending from said top wall and surrounding said opening to form side walls of a waste receptacle within said cabinet, a trap door secured to the skirt means adjacent the bottom of the receptacle for movement between a closed position in which the trap door defines the receptacle bottom for blocking passage of gases upward from said combustion chamber and an open position in which the receptacle bottom is open for delivery of waste through said opening and receptacle and into said combustion chamber and means mounted on said top wall and skirt means for movement of said trap door responsive to movement of said cover means, whereby removal of the top wall removes the receptacle and trap door and exposes the combustion chamber for servicing purposes.

16. The device of claim 15 wherein said trap door securing means is hinge means along the back wall of said receptacle.

17. An incinerating waste disposal system comprising a receptacle having a combustion chamber at the lower portion thereof for receiving waste, a burner for burning waste in the combustion chamber, light sensing means for detecting a flame at said burner, a liquid fuel supply, conduit means for delivering fuel from the supply to the burner, valve means for turning off delivery of fuel to the burner, and means responsive to the detection of a no-flame condition by said light sensing means for actuating the valve means to turn off thereby preventing puddling of liquid fuel in the combustion chamber.

18. An incinerating waste disposal system for locomotive use on a wheeled carriage, comprising, mounted on said carriage, a housing containing a waste receptacle, a burner for burning received waste, a motor system for driving said carriage, a pressurized fuel system for supplying fuel to said motor system and said burner, venturi exhaust means for exhausting said combustion chamber, means for generating forced air for cooling said motor system, means for directing a portion of said forced air through said venturi exhaust system for exhausting vapors and gases from said combustion chamber, conduit means for delivering fuel from said fuel supply to said burner and including pressure reducing valve means, a supply of compressed air, and conduit means for supplying air from said compressed air supply to said burner as combustion air.

19. The device of claim 18 including a pressure actuated brake system on said carriage for slowing or stopping said carriage actuated by the supply of compressed air, and said conduit means includes reducer valve means for reducing the pressure of the air supplied as combustion air.

20. The incinerating device of claim 19 wherein said fuel supply is at a pressure of 30 to 35 psig and the reducer valve in the fuel supply line is for reducing the pressure of fuel at the burner to about 8 psig or less, said compressed air supply is at a pressure of about 140 psig and the reducer valve in the combustion air supply line is for reducing the pressure to about 4 psig.

21. An incinerating waste disposal system comprising a receptacle having a combustion chamber for receiving waste and a burner for burning waste in the combustion chamber, means for delivering fuel to the burner, means for delivering combustion air to the burner, by-pass means on said combustion air delivering means for delivering a separate stream of air toward the flame supporting portion of the burner from a position spaced therefrom and spark gap igniter means spaced between the by-pass means and the burner frame position for providing an ignition spark for the burner whereby air through by-pass below the ignition spark from said igniter means for igniting the burner.

22. The device of claim 21 including timer means for establishing a timed burning cycle followed by a timed cooling cycle in which the burner is supplied with fuel during the burning cycle and fuel flow is stopped during the cooling cycle and including electric control means maintaining the igniter actuated continuously during the burning cycle so that opening of the fuel valve during the burning cycle results in delivery of fuel to the burner and ignition of the burner at the flame position and the by-pass means delivers additional combustion air to the burner upon ignition of the burner.

23. An incinerating waste disposal unit comprising a combustion chamber, a burner for burning waste in the combustion chamber, valve means for controlling the flow of fuel to said burner, an igniter for said burner and time delay control means responsive on actuation of said igniter to turn off said valve means upon lapse of a predetermined time delay period after actuation of the igniter.

24. An incinerating waste disposal unit comprising a waste receptacle having a combustion chamber, a burner for burning waste in combustion chamber and having a flame-supporting outlet, means for delivering fuel and air to the flame-supporting burner outlet, spark igniter means mounted near the burner outlet and means for blowing ignition sparks from the igniter to the burner outlet.

25. An incinerating waste disposal unit comprising a waste receptacle having a combustion chamber, a burner for burning waste in the combustion chamber, means for mixing fuel and air for delivery to the burner, an air inlet for said mixing means, an exhaust blower for exhausting hot combustion gases from the combustion chamber mounted in heat exchange proximity to the air inlet for prewarming air entering the mixing means, and a motor for driving both the exhaust blower and mixing means by a common shaft with the mixing means mounted between the blower and motor to act as a heat barrier to protect the motor from heat in the blower.

26. An incinerating waste disposal system comprising a receiving and combustion chamber in which waste material is received and burned, a housing containing said chamber and having an opening for delivering waste to said chamber, a trap door in said housing between said opening and chamber, a burner in said chamber, means establishing a burning cycle for burning waste and a cooling cycle for cooling said chamber, air inlet means adjacent said burner means responsive to said cycle establishing means for igniting the burner during the burning cycle and extinguishing said burner during the cooling cycle and means including means for drawing air through said chamber for cooling the chamber for establishing a negative pressure in the combustion and receiving chamber during both burning and cooling cycles.

27. An incinerating waste disposal system comprising a receiving and combustion chamber in which waste is received and burned, a cooling jacket around said combustion chamber for cooling the combustion chamber, air inlet means for entry of cooling air into said combustion chamber, a burner in said combustion chamber for burning waste, means for igniting said burner and means for regulating the rate of air flow through said cooling jacket to a high flow rate while said burner is ignited and a low flow rate while said burner is extinguished.

28. The incinerating and waste disposal system of claim 27 wherein said regulating means decreases the air flow through said combustion chamber during the burning cycle and increases the air flow through said combustion chamber during the cooling cycle.

29. The incinerating and waste disposal system of claim 28 wherein said regulating means is a diverter valve for diverting draft of air between the cooling jacket and the combustion chamber.

30. In an incinerating waste disposal system including a burner, means for cooling the combustion chamber and means for establishing a predetermined timed burning cycle for burning waste followed by a predetermined timed cooling cycle for cooling the combustion chamber, the improvement which comprises manually operable timer and control means for overriding said cycle establishing means and establishing a longer predetermined timed burning cycle, followed by an untimed cooling cycle, and temperature responsive means for terminating said untimed cooling cycle upon cooling of the combustion chamber to a preselected temperature.

31. In an incinerating waste disposal unit having a combustion chamber, a burner in the combustion chamber, a burner igniter, means controlling the burner and igniter for intermittent burner operation, and a conduit for supplying a mixture of fuel and air to the burner each time the burner is to be ignited, the improvement which comprises means for evacuating any residual fuel and air from said conduit from a prior burning operation prior to delivery of a fuel-air mixture through the conduit for igniting the burner.

32. The incinerating waste disposal system of claim 31 wherein said evacuating means includes air draft means and including means for blocking delivery of fuel into said conduit until the air flowing through the conduit reaches sufficient velocity for a fuel-air mixture to support a flame at the burner outlet in the absence of backflash within said conduit.

33. The incinerating waste disposal system of claim 31 including operable valve means for restricting, flow from the outlet of the combustion chamber during operation of the burner.

34. An incinerating waste disposal system comprising a housing having a top opening and a receiving and combustion chamber for receiving and burning waste disposal below said opening, and a trap door mounted in said housing between said opening and chamber for movement between an open position permitting direct delivery of waste from the opening to the chamber and a generally horizontal closed position shielding said opening from heat from said chamber, said trap door comprising two heat resistant plate members, means securing said plate members in facing spaced relation defining an air cooling jacket therebetween and port means through one of said plate members for drawing air between the plate members and into the combustion chamber with said trap door in closed position.

35. The incinerating waste disposal system of claim 34 wherein said port means is in the bottom one of said plate members with said trap door in closed position.

36. The incinerating waste disposal system of claim 35 including walls defining a passageway from said opening to said chamber and wherein said trap door in closed position extends into close proximity with said walls so that air drawn through the air jacket from said port enters the air jacket between the top plate and the passageway walls providing a double wall cooling effect blocking heat radiation from the combustion chamber to opening while permitting air flow from the opening to the chamber.

37. An incinerating waste disposal device comprising a combustion chamber for receiving waste to be burned, an outlet for directing combustion gases from said combustion chamber, means for delivering combustion gases through the outlet, a cooling jacket around the exterior of said combustion chamber, inlet means from the exterior of the device for cooling air and an outlet from said jacket adjacent the outlet and valve means mounted adjacent the outlet for movement between a position opening the jacket outlet for flow therefrom into the combustion chamber outlet and a position closing the jacket whereby substantially all air is drawn through the combustion chamber into the combustion chamber outlet.

38. An incinerating waste disposal system comprising a receptacle having a combustion chamber at the lower portion thereof for receiving waste, a burner for burning waste in the combustion chamber, light sensing means for detecting a flame at said burner, conduit means for delivering fuel to the burner, valve means for turning off delivery of fuel to the burner, means responsive to the detection of a no-flame condition by said light sensing means for actuating the valve means to turn off, igniter means for igniting the burner and operating continuously while fuel is being supplied to the burner and time delay control means responsive on actuation of the igniter to block response of the light sensing means to a no-flame condition for a predetermined time delay period after actuation of the igniter to give the igniter time to receive and ignite a combustible fluid.

39. The device of claim 38 wherein said light sensing means comprises a photocell mounted at a position remote from said burner and fiber optics cord means extending from said burner from said photocell for delivering light from the burner to the photocell.

40. An incinerating waste disposal system comprising a receptacle having a combustion chamber at the lower portion thereof for receiving waste, a burner for burning waste in the combustion chamber, light sensing means for detecting a flame at said burner, conduit means for delivering fuel to the burner, valve means for turning off delivery of fuel to the burner, means responsive to the detection of a no-flame condition by said light sensing means for actuating the valve means to turn off, igniter means for the burner, means for operating the igniter continuously while fuel is being supplied to the burner, said responsive means deactuating the igniter responsive to a no-flame condition, and delay means for delaying the response of the responsive means for a short period of time.

41. An incinerating waste disposal system comprising a first cabinet having a seat on the top thereof and a top waste receiving port through the seat and containing a combustion chamber for receiving waste from said port, a burner in said combustion chamber, cover means for opening and closing said port, and hinge means mounting said cover means adjacent the rear of the seat for swinging upward and backward to open the port, a second cabinet mounted on top of said first cabinet behind the seat and cover and having a front for receiving the cover in open position, light detector means in said second cabinet and means for delivering light of a flame at said burner to said detector means.

42. An incinerating waste disposal system comprising a combustion chamber for receiving waste, a burner in said combustion chamber, cover means for opening and closing said port, conduit means for delivering fuel to the burner, light sensing means for sensing a flame at the burner, valve means for turning off delivery of fuel to the burner, and means responsive to the detection of a no-flame condition by said light sensing means for turning off the valve means.

43. An incinerating waste disposal unit comprising a waste receptacle having a combustion chamber, a burner for burning waste in the combustion chamber, means for mixing fuel and air for delivery to the burner, an exhaust blower for exhausting hot combustion gases from the combustion chamber and a motor for driving both the exhaust blower and mixing means by a common shaft, said mixing means mounted between the blower and motor to act as a heat barrier to protect the motor from heat in the blower.

44. In an incinerating waste disposal system including a burner, means for cooling the combustion chamber and means for establishing a predetermined timed burning cycle for burning waste followed by a predetermined timed cooling cycle for cooling the combustion chamber, the improvement which comprises manually operable timer and control means for overriding said cycle establishing means and establishing a longer predetermined timed burning cycle, followed by a cooling cycle.

45. An incinerating waste disposal device comprising a housing containing a waste receptacle, a burner for burning received waste, a pressurized fuel system for supplying fuel to said burner, venturi exhaust means for exhausting said combustion chamber, means for generating forced air, means for directing a portion of said forced air through said venturi exhaust system for exhausting vapors and gases from said combustion chamber, conduit means for delivering fuel from said fuel supply to said burner and including pressure reducing valve means, a supply of compressed air, and conduit means for supplying air from said compressed air supply to said burner as combustion air.

46. The device of claim 45 wherein said conduit means includes reducer valve means for reducing the pressure of the air supplied as combustion air.

47. The incinerating device of claim 46 wherein said fuel supply is at a pressure of 30 to 35 psig and the reducer valve in the fuel supply line is for reducing the pressure of fuel at the burner to about 8 psig or less, said compressed air supply is at a pressure of about 140 psig and the reducer valve in the combustion air supply line is reducing the pressure to about 4 psig.

48. An incinerating waste disposal device, comprising a housing, a combustion chamber in the housing for receiving and burning waste, a burner having a nozzle for directing a flame into the combustion chamber, inlet means to said combustion chamber, for the passage therethrough of air from the exterior of said housing for burning purposes, outlet means from said combustion chamber for the passage therethrough of air and products of combustion for exhaust purposes, and passage means about the exterior of said combustion chamber and in communication with said outlet means for directing the air about the combustion chamber for cooling purposes and to exhaust the aire from said housing.

49. The device of claim 48 wherein said passage means substantially surrounds the sides and bottom of said combustion chamber.

50. An incinerating waste disposal system comprising a receptacle having a combustion chamber at the lower portion thereof for receiving waste, a burner for burning waste in the combustion chamber, light sensing means for detecting a flame at said burner, a fuel supply, means for delivering fuel from the supply to the burner, and means responsive to the detection of a no-flame condition by said light sensing means for turning off delivery of fuel to the burner.

51. An incinerating disposal device comprising a lower cabinet, a combustion chamber mounted in said lower cabinet for receiving waste, a burner for burning waste in the combustion chamber and an igniter for igniting the burner, a hinged cover at the top of said lower cabinet, a back support cabinet supported on and upstanding from the rear portion of said lower cabinet behind said cover, a photocell mounted in said upper cabinet and fiber optics cord means extending from said burner to said photocell for delivering light from the burner in the lower cabinet to the photocell in the upper cabinet.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,752,090 **Dated** August 14, 1973

Inventor(s) Donald P. Frankel and Charles K. Peterson

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 9, delete "are" and insert --of--.

Column 6, line 16, delete "outer" and insert --other--.

Column 9, line 16, delete "or" and insert --on--.

Claim 7, line 11, delete "from" and insert --to the bottom of--.

Claim 9, line 31, insert comma after "means".

Claim 12, lines 51 & 52, "including an operable valve means on the outlet chamber inlet" should be deleted.

Claim 15, line 4, delete "wall" first occurrence and insert --walls--.

Claim 15, line 18, delete "movement of" and insert --moving--.

Claim 21, line 10, delete "below" and insert --blows--.

Claim 26, line 60, insert comma after "burner".

Claim 30, line 27, after "timer" insert --means--.

Claim 31, line 41, delete "and air".

Claim 34, line 59, delete "disposal".

Claim 37, line 24, after "the" insert --combustion chamber--.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,752,090 **Dated** August 14, 1973

Inventor(s) Donald P. Frankel and Charles K. Peterson

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Claim 42, line 15, after "waste" insert --through a port--.

Claim 42, line 22, delete "turning off" and insert --closing--.

Claim 43, line 30, after "means" second occurrence, insert --being--.

Claim 48, line 18, delete the comma after "chamber".

Claim 48, line 20, after "for" insert --supporting-- and delete "purposes".

Claim 48, line 26, delete "aire" and insert --air--.

Signed and sealed this 23rd day of July 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,752,090 Dated August 14, 1973

Inventor(s) Donald P. Frankel & Charles K. Peterson

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 14, line 55, delete "wherein said" and "is".

Signed and sealed this 24th day of September 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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