

- [54] **METHOD AND APPARATUS FOR
CHEMICAL WASTE DISPOSAL**
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[22] Filed: **Aug. 23, 1972**
[21] Appl. No.: **283,085**

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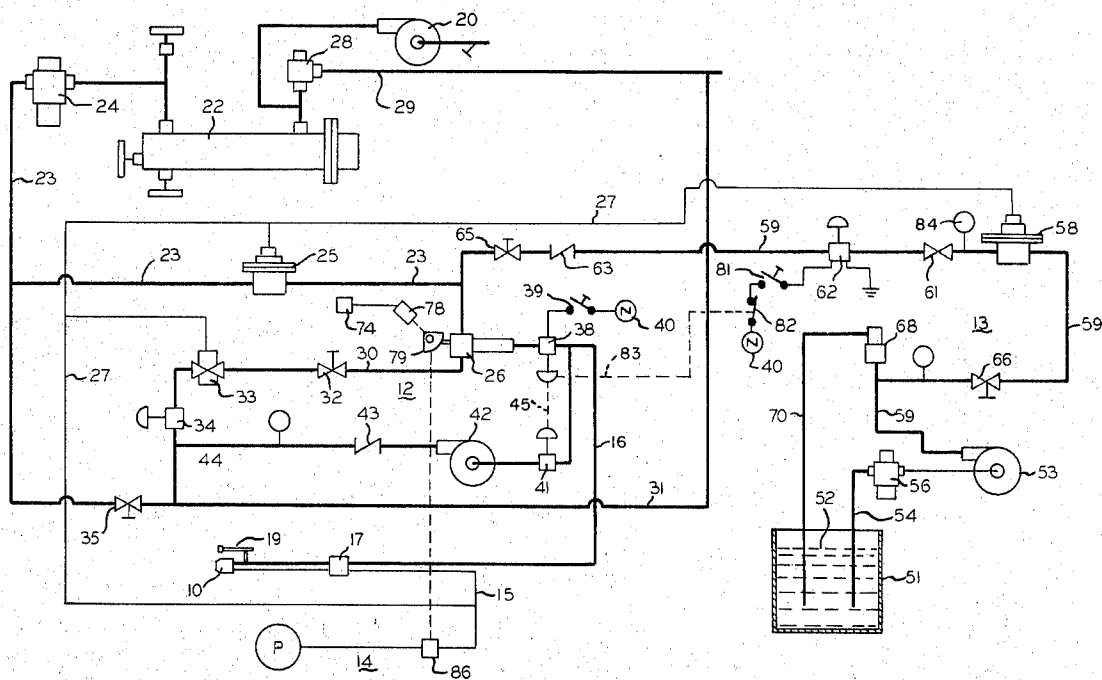
- [52] U.S. Cl. **431/12, 431/62, 431/90**
[51] Int. Cl. **F23n 1/02**
[58] Field of Search 137/114, 637.1, 6, 90;
431/2, 90, 12, 62, 63; 236/15 E; 110/75

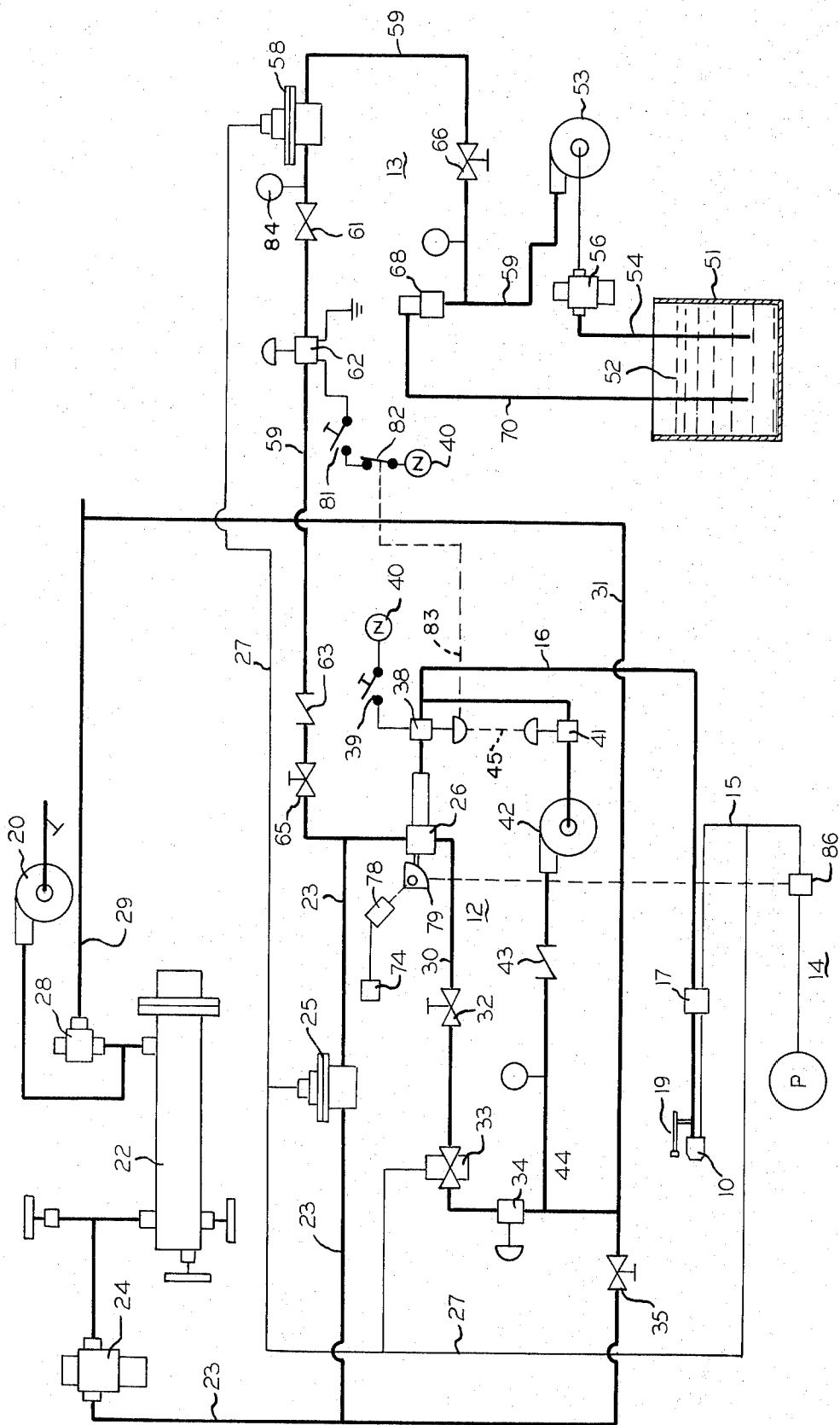
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[57] **ABSTRACT**

A method and apparatus for disposing of flammable fluids by burning and including means for selectively injecting the fluids into the primary fuel supply of burner means at a controlled rate of injection.

10 Claims, 1 Drawing Figure





METHOD AND APPARATUS FOR CHEMICAL WASTE DISPOSAL

BACKGROUND OF THE INVENTION

This invention relates to the disposal of flammable fluids and more particularly to the disposal of fluid chemical wastes by incineration.

Many industrial processes result in the production of flammable waste fluids which are unsuitable for further use. For example, some processes may use organic solvents such as benzene, alcohol, methanol, toluene and the like which become contaminated by their particular solute. The disposal of waste chemicals has become a serious problem since ecological concerns militates against dumping. While certain waste chemical products may be stored for possible reprocessing, this requires expensive storage facilities and handling equipment. In the case of many chemical wastes, reprocessing may be impossible or economically impractical. While destruction by burning may be preferred in many instances, special handling and facilities may be necessary to avoid uncontrolled burning or explosion.

SUMMARY OF THE INVENTION

It is a general object of the invention to provide a method and apparatus for economically disposing of flammable fluids.

A further object of the present invention is to provide a method and apparatus for disposing of flammable fluids by burning which is safe and also extracts useful heat.

Another object of the invention is to provide a method and apparatus for disposing of flammable fluids which may be adapted to the primary fuel delivery means of a burner apparatus.

How the foregoing and other more specific objects are achieved will appear from time to time throughout the course of the description of a preferred embodiment of the invention which will be set forth hereinafter.

In general, the invention comprises a method and apparatus for disposing of flammable fluids by controllably mixing them with the primary fuel supply to a burner, and including means for selectively directing the waste material at controlled rates to the primary fuel supply of the burner.

DESCRIPTION OF THE DRAWING

The single FIGURE of the drawing schematically illustrates a fluid disposal system according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The apparatus according to the preferred embodiment of the invention is schematically illustrated in the drawing to include a burner 10, a primary fuel delivery system 12 and a waste fluid delivery system 13. The burner 10 may be of any conventional type, such as that used in boilers, furnaces, incinerators or heating systems.

The burner 10 may be supplied with combustion air under pressure from an air delivery system 14 and through an air supply line 15. The air supply line 15 and a fuel supply line 16 are coupled to a manifold 17 which mixes the air and fuel and directs the mixture to

a burner 10. Burner combustion may be initiated in any suitable manner such as by a pilot assembly 19. Those skilled in the art will appreciate that the primary fuel delivery system 12 may be of any conventional type and may be constructed and arranged to provide burner 10 with any suitable fuel such as oil. The schematically illustrated system may include, for example, a fuel pump 20 for delivering oil from a storage tank (not shown) to an oil heater 22. A conduit 23 couples the exit end of the heater 22 through an oil strainer 24, a pressure regulator 25, and a metering valve 26 for regulating the rate of fuel delivery to burner 10. Pressure regulator 25 may be of any well known type which is operative to regulate the pressure, and hence the flow rate in accordance with the pressure in an air loading line 27.

If the pump 20 is sized such that its output exceeds the quantity of fuel that can be accepted by fuel system 12 and burner 10, a pressure valve 28 and a fuel return conduit 29 may be provided in a shunting relation relative to the fuel delivery system 12. In order to permit the circulation of heated fuel during times when the burner 10 is off so that said fuel will not become too viscous, a bypass conduit 30 containing an orifice gate valve 32, a back pressure valve 33 and normally open solenoid valve 34 may be coupled between the metering valve 26 and a second bypass conduit 31. In this manner, the rate of fuel flow through conduit 30 can be regulated in accordance with fuel pressure so that the fuel flow rate through conduit 23 may remain substantially constant during periods of minimum operation of burner 10 or when the latter is off. If the burner is not to be operated for extended periods, a valve 35 in second bypass conduit 31 may be opened thereby bypassing the metering valve 26 and burner 10. The metering valve 26 is coupled to the burner 10 by conduit 16 which includes a selectively operable solenoid valve 38 which may be energized by closing a manual switch 39 to couple solenoid valve 38 to a source of electrical energy 40. For a more complete description of the fuel system just described, reference is made to U.S. Pat. No. 2,896,699 issued July 28, 1959 and assigned to the assignee of the present invention.

The waste fluid delivery system 13 includes a reservoir 51 for containing the flammable waste liquid 52 and a waste fluid delivery pump 53. The inlet of pump 53 is coupled to reservoir 51 by a pipe 54 which may include a strainer 56. The outlet of pump 53 is coupled to fuel delivery pipe 23 through pressure regulator 58 by fluid delivery pipe 59. Interposed in pipe 59 are orifice 61, solenoid valve 62 and check valve 63. Hand valves 65 and 66 may be disposed adjacent the opposite ends of pipe 59.

Initially, it can be presumed that the fuel delivery system 12 is operating in a normal fashion to deliver the quantity of fuel required by burner 10. A servo motor 78 coupled to a control circuit 74 is effective to position a cam 79 which controls the quantity of fuel being delivered to burner 10 through metering valve 26. Control circuit 74 provides signals to servo motor 78 in accordance with burner demands so that metering valve 26 is adjusted to regulate the volume flow to nozzle 10 as described in the aforementioned U.S. Pat. No. 2,896,699.

The air loading line 27 is connected from the air system 14 to the pressure regulator 25 of the primary fuel delivery system 12 and to the pressure regulator 58 of

the waste fluid delivery system 13. As a result, the pressure in both delivery systems can be coordinated to insure that the waste fluid will enter the primary fuel system at the desired rate.

In operation of the oil system, oil is normally provided from the oil pump 20 through the oil heater 22, strainer 24, the oil regulator 25 and the metering valve 26. If the oil supply solenoid 38 is open, oil flows through line 36 to nozzle 10 where the oil is atomized due to air from the source 14. The atomized fuel is subsequently burned in a combustion chamber (not shown). When solenoid valve 38 is closed to disconnect the nozzle 10 from the fuel oil supply, the nozzle may be purged by purge pump 42 and solenoid 41 which may be interlocked with valve 38 as symbolized by dash line 45 for being simultaneously energized when valve 38 closes. Air from air supply line 15 exerts a pressure on the oil in nozzle 10 and reverses the flow of oil in line 16. The purge pump 42 acts to overcome resistance in purge line 44 and bypass conduit 31.

Prior to initiation of the delivery of waste fluid from system 13, hand valves 65 and 66 are closed and solenoid valve 62 is de-energized. Valve 62 is actuated by closing switch 81 to couple valve 62 to source 40 through contacts 82 interlocked with valve 38 as indicated at 83 so that contacts 82 are closed when main fuel system solenoid valve 38 is open. Accordingly solenoid valve 62 can operate only when solenoid valve 38 is energized to close contacts 82 whereby waste fluid can be delivered to the primary fuel system 12 only when solenoid 38 is energized and fuel is being provided to burner 10. Assuming that the primary fuel system is operating to deliver fuel to nozzle 10, pump 53 is initially energized to establish pressure in pipe 59 on the upstream side of valve 66 and to set pressure relief valve 68. Hand valve 66 is then opened whereby pressure is established in pipe 59 upstream of valve 65, as sensed in any suitable manner, such as by pressure gage 84. In the latter event, valve 65 may then be opened to couple the waste fluid system to the primary fuel system 12. In this manner, the secondary fluid enters the line 23 and metering valve 26 where the solvent mixes with the primary fuel and is subsequently burned after passing through the nozzle 10. The flow of solvent is controlled by pressure regulator 58 and orifice 61. When solvent enters the metering valve, the flow of oil decreases in proportion to the amount of secondary liquid flowing into the primary system 12. Thus the total flow of primary fuel and waste liquid stays relatively constant. The interlocking of valves 38 and 62 also prevents the secondary fluid from entering the fuel tank (not shown) because valve 62 will close to terminate the flow of fluid 52 when valve 38 closes to cut off the flow of primary fuel. The purging of nozzle 10 and line 27 occurs however any time the burner 10 is shut down regardless of whether or not secondary fluid is being mixed with fuel.

As described above, servo motor 78 is operative to position cam 79 such that metering valve 26 is adjusted to regulate the primary fuel in accordance with the demands of burner 10. Cam 79 is also coupled to a pressure regulator 86 in air loading line 27 which is also connected to pressure regulators 25 and 58 through air loading line 27. As cam 79 increases the flow rate of fuel supplied to nozzle 10 it simultaneously increases the pressure in air loading line 27 whereby, the pressure regulator 58 is correspondingly actuated so that an

increased quantity of secondary fluid will also be provided to the nozzle 10. Conversely, when the fuel demand in nozzle 10 decreases, cam 79 will act upon regulator 86 to decrease the air pressure in line 27 to thereby decrease the quantity of fuel and secondary fluid being provided to nozzle 10. It will also be appreciated that as the pressure in air loading line 27 is varied, there is a corresponding variation in the flow rate in air supply line 15.

It can thus be seen that the secondary fluid delivery system 13 provides an automatic means for delivering waste fluid to the oil delivery system 12 and for regulating the flow thereof in relation to primary fuel flow rates. Further, the secondary fluid delivery system 13 can deliver fuel only when primary fuel is flowing to nozzle 10.

While only a single embodiment of the invention has been illustrated and described, it is not intended to be limited thereby but only by the scope of the appended claims.

I claim:

1. A fuel burning apparatus including a burner, a primary fuel delivery system coupled to said burner and adapted to be connected to a source of primary fuel for delivery of primary fuel to said burner, a secondary fuel delivery system coupled to said primary fuel delivery system and adapted to be coupled to a source of secondary fuel for delivering secondary fuel to said primary fuel delivery system,

- first selectively operable coupling means connected in said primary fuel delivery system and having an open state for permitting the flow of primary fuel and a closed state for preventing the same,
- second selectively operable coupling means coupled in said secondary fuel delivery system having an open state for permitting the flow of secondary fuel and a closed state for preventing the same,
- third means operatively associated with said first and second selectively operable means for preventing said second selectively operable means from being placed in its open state when said first selectively operable means is in its closed state.

2. The apparatus set forth in claim 1 including first flow regulating means in said primary fuel delivery system for regulating the flow rate of said primary fuel and second flow regulating means in said secondary fuel delivery system for regulating the flow rate of said secondary fuel, and fourth means operatively associated with said first and second flow regulating means for coordinating the flow rates of said primary and secondary fuel.

3. The apparatus set forth in claim 2 and including fifth means coupled to said fourth means and responsive to fuel demands for actuating said fourth means thereby to coordinate the flow rates of said primary and secondary fuels in accordance with said burner demands.

4. The apparatus set forth in claim 3 wherein said first and second flow regulating means include pressure responsive means, an air system for supplying combustion air to said burner, said air system also being coupled to the pressure responsive means of said first and second flow regulating means and to said fourth means, said fourth means being operative to regulate the pressure of said air system in accordance with burner conditions, changes in the pressure of said air system acting

on said pressure responsive means being effective to modify the flow rate of said primary and secondary fuels.

5. The apparatus set forth in claim 4 wherein said secondary fuel delivery system includes pump means having an inlet coupled to receive secondary fuel and an outlet for delivering secondary fuel, pressure relief valve means coupled between the outlet of said pump and a return secondary fuel path, and first and second selectively operable valve means in said secondary fuel delivery system, said first selectively operative valve means being disposed adjacent the outlet of said pump, said second selectively operative valve means being disposed adjacent the connection between said primary and secondary fuel systems.

6. Fuel burning apparatus comprising a burner, a primary fuel delivery system coupled to said burner and adapted to be connected to a source of primary fuel for delivering primary fuel to said burner,

a secondary fuel delivery system coupled to said primary fuel delivery system and adapted to be coupled to a source of secondary fuel for delivering secondary fuel to said primary system,

first flow regulating means in said primary fuel delivery system for regulating the flow rate of said primary fuel,

second flow regulating means coupled in said secondary fuel delivery system for regulating the flow rate of said second fuel,

third means coupled to said first and second flow regulating means for simultaneously increasing or decreasing the flow rates of said primary and secondary fuels in accordance with burner fuel demands whereby the relative proportions of said primary and secondary fuels remains substantially constant as total fuel flow varies with variations in burner fuel demands.

7. The apparatus set forth in claim 6 and including fourth means coupled to said third means and responsive to burner fuel demands for actuating said third means to simultaneously adjust the flow rates of said primary and secondary fuels in accordance with said burner fuel demands whereby the flow rates of both said primary and secondary fuels will both be increased or decreased in relation to burner fuel demands increase or decrease.

8. The apparatus set forth in claim 7 wherein said first and second flow regulating means include pressure responsive means, an air system for supplying combustion air to said burner, said air system also being coupled to the pressure responsive means of said first and second flow regulating means and to said fourth means, said fourth means being operative to regulate the pressure of said air system in accordance with burner conditions, changes in the pressure of said air system acting on said pressure responsive means being effective to modify the flow rate of said primary and secondary fuels.

9. The apparatus set forth in claim 8 whereby said secondary fuel system includes pump means having an inlet coupled to receive secondary fuel and an outlet for delivering secondary fuel, pressure relief valve means coupled between the outlet of said pump and a return secondary fuel path, and first and second selectively operable valve means in said secondary system, said first selectively operative valve means being disposed adjacent the outlet of said pump, said second selectively operative valve means being disposed adjacent the connection between said primary and secondary fuel systems.

10. A method of incinerating waste fluid comprising the steps of:

providing a primary fuel to a combustion device for burning the same,

regulating the flow rate of said primary fuel to said burner,

injecting the waste fluid to be incinerated into the stream of primary fuel,

regulating the flow rate of said waste fluid,

reducing the quantity of primary fuel provided to said burner in accordance with the quantity of waste fluid being injected into said fuel stream, mixing said primary fuel and waste fluid,

providing said mixture to said burner,

determining fuel requirements of said burner and proportionately adjusting the flow rates of both said primary fuel and waste fluid in accordance with increases or decreases in burner fuel requirements whereby the proportions of said primary and secondary fuels remain substantially constant as total fuel requirements vary.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,826,604 Dated July 30, 1974

Inventor(s) Roy M. Rulseh

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

Claim 9, column 6, line 13, cancel "whereby" and substitute
---wherein---.

Signed and sealed this 7th day of January 1975.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents