

[54] **SYSTEM FOR ELIMINATING ENVIRONMENTAL POLLUTION**

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[51] Int. Cl. **B01d 47/02**

[58] Field of Search **110/8 R, 8 E, 119, 110/165 R; 55/DIG. 41, DIG. 30, 223, 228, 233, 247, 255, 256; 261/93, 94, 98, DIG. 9, 124; 210/290**

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Primary Examiner—Frank W. Lutter

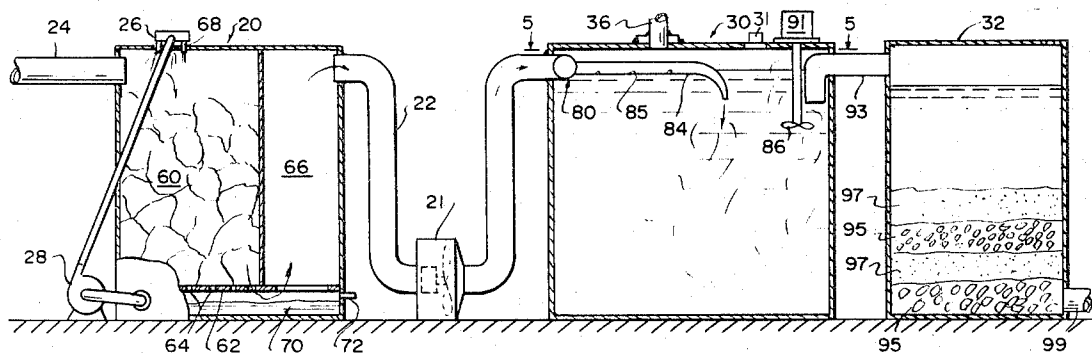
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[57] **ABSTRACT**

A system for the disposing of rubbish without polluting the environment includes an incinerator for initially burning the rubbish, which incinerator includes a water bath for catching and cooling the noncombustibles therein. A conveyer belt conveys the noncombustible material from the furnace for refining and reuse. A blower takes a suction on the smoke in the fire box of the incinerator and draws it through a compression box where it is scrubbed with water, filtered and then deposited in a final bath tank. The water in the bath tank is subsequently purified in a filter box, and is then deposited directly into the municipal drain system.

1 Claim, 6 Drawing Figures



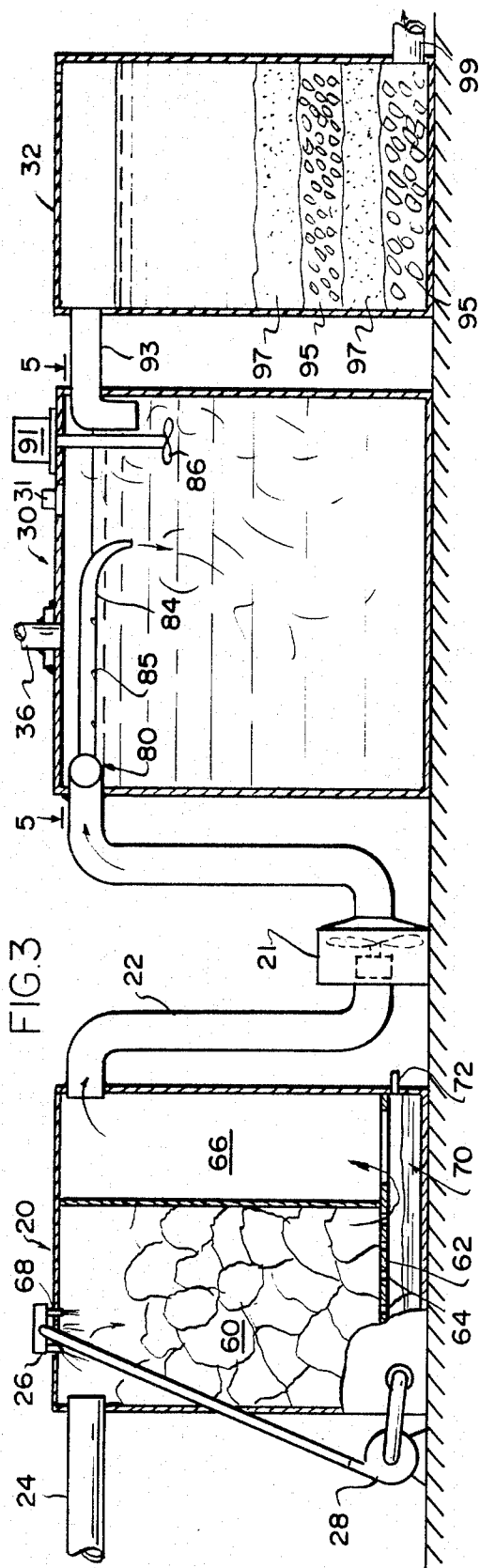


FIG. 3

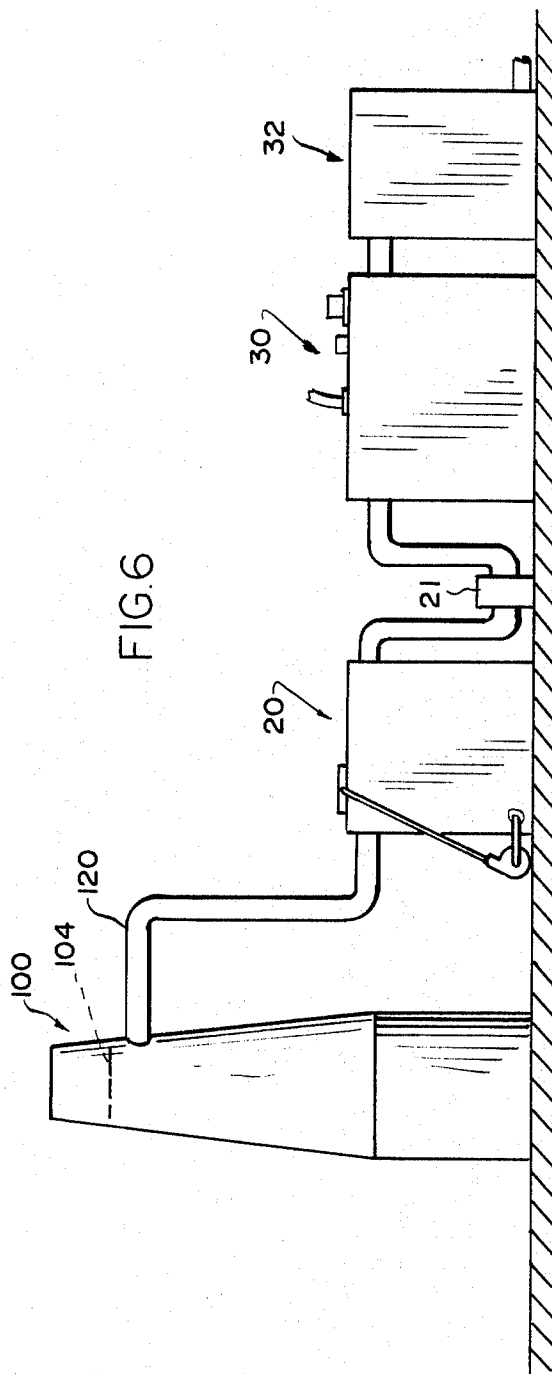


FIG. 6

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FIG. 4

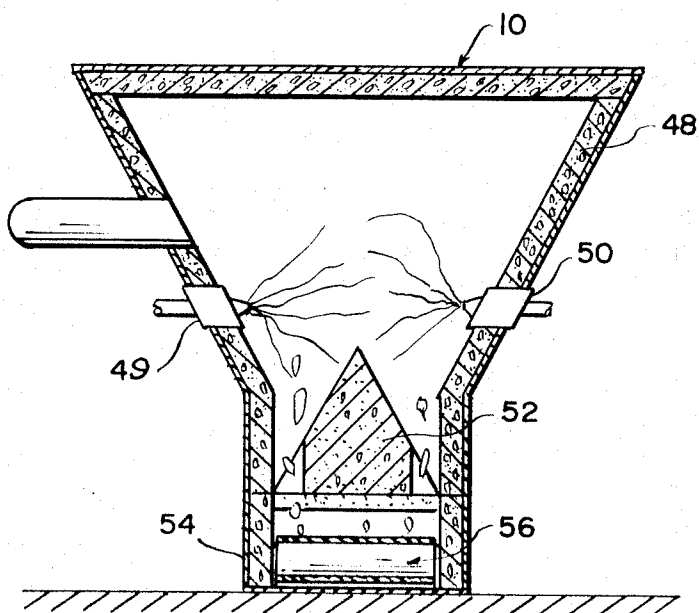
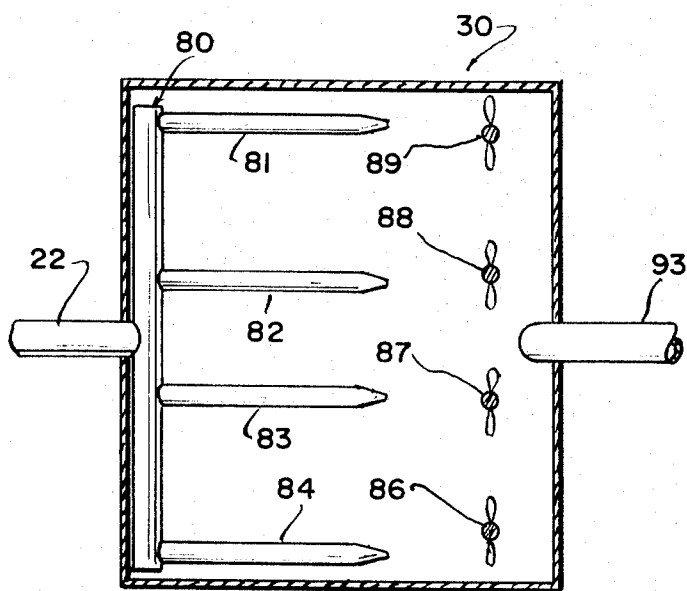


FIG. 5



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SYSTEM FOR ELIMINATING ENVIRONMENTAL POLLUTION

BACKGROUND OF THE INVENTION

Various systems have been proposed for the disposing of rubbish and/or smoke from combustion without polluting the atmosphere. Generally, where incinerators are used to burn rubbish, they have been extremely complicated and costly to manufacture. In fact the cost of such systems are so great that only the larger municipalities can afford to incinerate their rubbish.

Of course, from a purely ecological standpoint, the burning of rubbish in an incinerator is not the complete answer. Some way must be provided for preventing the smoke and gasses of combustion from polluting the atmosphere. Systems have been proposed for purifying the smoke and gasses of combustion prior to discharging them from the incinerator but once again these systems are at best complicated and costly. Furthermore, in those systems which provide for purifying the smoke there has generally been some impure byproduct which in the end is discharged into the environment.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a simple and inexpensive system for disposing of rubbish and/or smoke and gasses of combustion.

It is another object of this invention to provide a system for eliminating environmental pollution caused by the disposal of rubbish and/or smoke and gasses of combustion wherein substantially no impure byproduct is discharged into the environment to pollute the same.

In one embodiment of this invention, an incinerator is provided wherein the rubbish is shredded and gravity fed into the incinerator where it is burned. At the base of the incinerator there is provided a water bath for receiving and cooling the noncombustible materials in the rubbish. A conveyor belt within the water bath provides means for removing the cooled noncombustibles from the incinerator for refining and further use. A blower is connected by a ventilation line to the fire box and takes a suction on the smoke or gasses of combustion withdrawing them from the furnace substantially without the same escaping to the atmosphere. The smoke is then drawn into a compression box where nozzles add a fine spray of water into the smoke for washing the carbon particulates and other impurities therefrom. Within the compression box there is a filter comprising limestone rock in the form of rip rap. The smoke and water mixture is drawn through this rip rap by the blower so the carbon particulates suspended therein are deposited on the limestone rock. Subsequently, the blower discharges the washed smoke through a plurality of pipes into a final bath tank. The bath tank contains agitators positioned adjacent each of the discharge pipes which act to break the bubbles of gas as they are formed in the bath. Any impure particulates contained in the bubbles then fall to the bottom of the bath. The back pressure of the blower discharging the gas into the bath applies a pressure to the bath water in the tank and moves it through a line into a final filter box. Alternate layers of activated charcoal and sand in the box filters the water and it is subsequently discharged in a purified form into the municipal drainage system.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram of the system for eliminating environmental pollution in accordance with this invention;

FIG. 2 is a side elevation view partially cut away and partially in cross-section illustrating the incinerator used in accordance with this invention;

FIG. 3 is a side elevation view in cross-section of the filtering and purifying system in accordance with this invention;

FIG. 4 is a side elevation view in cross-section taken along the line 4—4 of FIG. 2;

FIG. 5 is a side elevation view in cross-section taken along the lines 5—5 of FIG. 3; and

FIG. 6 is a schematic diagram of a further embodiment of this invention.

DETAILED DESCRIPTION

Referring to FIG. 1, a schematic diagram is shown illustrating in simplified form one embodiment of this invention. Generally, an incinerator 10 is provided for firing the rubbish deposited therein. Adjoining the incinerator 10 is a hopper 12 wherein the rubbish is deposited, shredded and fed into the incinerator. A temperature control recorder 14 maintains a predetermined temperature within the incinerator and provides the proper air flow for sustaining combustion in the known manner. The recorder maintains the heat of combustion at approximately 2,200°F. which is generally sufficient to melt most of the metals and glass found in the rubbish.

A cooling bath 15 is positioned in the base of the incinerator below the burners. The melted noncombustibles fall into this bath and are cooled to form nuggets. A conveyer 17 conveys the cooled noncombustibles from the incinerator. These nuggets can be very useful. For instance, by using known refining techniques various metals such as aluminum and tin can be reclaimed from the nuggets for reuse.

Adjacent the incinerator 10 is a compression box 20 which contains a filter for removing the carbon particulates from the smoke or gasses of combustion. A blower 21 draws a suction, through the vent line 22, the compression box 20 and vent line 24, directly on the gasses of combustion as they are emitted from the burning process in the incinerator. These gasses are withdrawn from the incinerator substantially without any of them escaping to the atmosphere and are taken to the compression box 20 where a header 26 containing fog-type nozzles adds a fine spray of water to the smoke. This mixture of smoke and water is drawn through the filter where the carbon particulates and other impurities are deposited. A recirculating pump 28 recirculates the water back to the nozzles for efficient and continuous washing of the smoke.

After the blower 21 draws the washed smoke through the compression box 20, it deposits it under pressure in a final water bath tank 30 where the last of the impurities are removed. A vent 31 permits the purified gas to escape to the atmosphere while the bath water under pressure is then discharged into a filter box 32, which contains alternate layers of activated charcoal and sand for purifying the same. Subsequently, the purified water is discharged through pipe 34 to the municipal drain system. Makeup water is fed to the bath tank 30 through the line 36 automatically to maintain the de-

sired water level within the final bath 30. This can be done in any known manner, for instance, with the use of a float valve or the like.

Now referring to FIGS. 2-5 the operation of this particular embodiment of the invention can be studied in greater detail. Under the opening in the hopper 12 for admitting the rubbish, there is positioned a conveyer belt 38 which is driven by the electric motor 40. The rubbish is moved in a direction shown generally by the arrow 42 until the rollers 44 pick up the rubbish and deposit it on a spiked shreader 46, which is driven in the direction shown by an electric motor (not shown) to breakup or shread the rubbish so it becomes more readily combustible.

The shreader then throws the rubbish into the incinerator 10 which is enclosed on all sides by fire brick 48. The rubbish is gravity fed through two oppositely disposed banks of 18 burners each, which are shown at 49 and 50 in FIG. 4. A baffle of fire brick 52 which is substantially triangular in cross-section extends upwardly into the fire box and is used to slow the fall of the rubbish in the fire box to provide ample time for burning the same.

Located in the base 54 of the furnace beneath the baffle 52 is a cooling or collecting bath 15. It is anticipated that there will be included in the rubbish collected in a typical municipality noncombustible substances like glass, cans and other metals. By having the incinerator set at about 2,200°F. the glass and metals will be melted, and when the molten mass reaches the bath 15 it will harden into nuggets which will fall on the conveyer belt 56. The belt 56 is operated to move the solidified nuggets to a second conveyer 17 which transports the nuggets from the cooling bath outside the furnace to be deposited in trucks or other storage places. As previously stated, the nuggets can later be refined to provide reusable materials. Since the nuggets are removed by the belt which is totally submerged in the cooling bath, there is in effect no opening between the furnace and the atmosphere for the gasses of combustion to escape.

As shown in FIG. 3, the compression box 20 is connected to the interior of the furnace 10 through the ventilating line 24. The compression chamber is sealed and has a first compartment which contains a filter formed from lime rock 60 loosely stacked in the form of rip rap on the base or grate 62. Suitable openings such as at 64 are provided to permit the smoke and gasses of combustion which are drawn into the compression box by blower 21 to pass through the filter portion and into the empty chamber 66 on which the blower 21 takes its suction. The loose spacing of the rip rap or lime rock 60 slows down the flow of the gasses through the filter but still permits the continuous flow there-through. Connected to a header 26 positioned on the top of the compression box are three mist nozzles 68 which are continuously operated to mix a fine spray of water with the gasses of combustion. This fine spray mixes with the gasses and causes the carbon particulates and other impurities to precipitate out and be deposited on the lime rock as the gas is drawn through the filter. The water drains from the lime rock into a collecting pool 70 in the base of the compression box 20. A recirculating pump 28 recirculates the water from the collecting pool 70 back to the nozzles for washing the incoming gasses. Provision is provided to add makeup feed water to the base through the line 72. This

can be done automatically through the use of a float valve or the like.

The washed gasses of combustion are drawn from the empty chamber 66 by the blower 21 through ventilating line 22 and are blown under pressure into the final bath tank 30. Located in the final bath tank 30 at the end of the ventilating duct 22 is a header 80 (FIGS. 3 and 5). Extending from the header 80 are four ducts or pipes 81-84. Each one of these pipes is reduced from a 3 inch diameter to a ½ inch opening at the end. Furthermore, each end is bent in a goose-neck fashion into the bath. Along the bottom of each of the pipes are a plurality of ½ inch holes such as at 85 which are spaced approximately 6 inches apart. The outlets are located approximately 9 inches below the surface of the water in the bath tank. Positioned adjacent the end of each of the ducts 81-84 are agitating fans 86-89. Each of these are driven by suitable means such as an electric motor 91 shown driving the agitator 86.

The small holes 85 in the duct lines and the necking down of the opening in the end of each of the ducts permits the gas to escape from the ducts into the tank under relatively high pressure which causes great agitation of the water. This operation in connection with the individual agitators adjacent each of the pipes acts to break up the bubbles of gas as they are forced into the bath tank causing any carbon particulates or other impurities contained within the bubbles to settle to the bottom of the bath tank.

A pipe 93 connects the final bath tank to the filter box 32. As shown in FIG. 3, the filter box comprises from the bottom, upwardly alternating layers 95 and 97 of activated charcoal and sand. Water is moved from the bath tank under pressure of the blower 21 into the final filter box where it is discharged as pure water from the drain tile 99 into the municipal drainage system.

As can be understood from the foregoing description, this system relatively speaking is inexpensive to manufacture. The water, lime rock, activated charcoal and sand which are used to purify the gasses of combustion and the wash water itself are all easy to obtain and inexpensive. The hopper, incinerator, compression box, final bath and filter box are likewise relatively inexpensive. For instance, in none of these are there expensive grates, baffles and the like which have found their way into many of the prior art applications. In addition the system only requires one man who operates the hopper and conveyer from the incinerator. He can monitor the operation of the entire system through a single control panel located at the incinerator. Furthermore, the water which is used to cleanse the smoke and gasses of combustion is itself subsequently purified so that the only foreign substance which is taken from the system is in the form of the solidified nuggets, which later can be reclaimed through refining processes and reused. Of course, sediment eventually collects in the compression, final bath and filter tanks but suitable manholes are provided for cleaning these tanks and in some instances it is simply a matter of using a tank truck with proper suction equipment including a hose which can be inserted into the tanks for easy withdrawal of the sediment. Acid can be formed from burning rubbish, which includes garbage, which acid will attack the metal parts within the incinerator and the vent line 24. To avoid this acid one only has to place about two shovels of crushed lime rock in each ton of garbage.

The heated lime will nullify the acid formed by the burning rubbish and extend the life of the system.

Referring to FIG. 6 there is shown a further embodiment of this invention. Like numbers are used to identify similar elements in the first embodiment. In some instances it may be desirable to only eliminate the smoke and gasses of combustion without providing the rubbish disposal feature. As shown in FIG. 6, the smokestack 100 which could be located at a foundry, junkyard, power plant or other like place, has a duct 120 that takes suction on the stack at a point just below a baffle 104. The baffle 104 could be a fine mesh screen or the like such that any big particles suspended in the smoke would strike the baffle and be deflected back to the base of the stack. The suction blower 21 would draw substantially all of the smoke and other gasses of combustion from the stack 100 and deliver the same directly to the compression box 20 where the remaining steps required for purifying the smoke are the same as for the rubbish disposal system previously described. It should be apparent that by removing the need for an incinerator the cost of the system is reduced even more. Furthermore, because the water which is finally discharged to the city drain is substantially as pure as drinking water the system can be assembled in just about any plant cite.

What has been described therefore is a relatively simple and inexpensive system for eliminating environmental pollution, which can dispose of rubbish and obnoxious smoke and gasses of combustion without discharging any pollutants to the surrounding environment.

I claim:

1. A system for eliminating the discharge into the atmosphere of gasses polluted with carbon particulates including in combination, a source of the polluted gas including incinerator means for firing rubbish, said incinerator means comprising means for shreading and feeding the rubbish into the incinerator, a fire box and

a baffle of fire brick substantially triangular in cross-section which extends upwardly into said fire box to slow the fall of the rubbish in the fire box to provide ample time for burning the same, bath means for receiving and cooling the noncombustibles in the rubbish, and means for conveying the cooled noncombustibles from said incinerator means for salvage thereof substantially without the escape of the gasses of combustion from the incinerator means, a compression tank, means for taking a suction on the gas at said source and discharging substantially all of the gas into said compression tank, nozzle means for applying a fine spray of water into said compression tank in mixture with the gas, filter means in said compression tank including limestone rock in the form of rip rap, said suction means for drawing the gas comprising said mixture of fine spray and carbon particulates through said filter means to remove said carbon particulates, means for collecting the water used in said spray in said filter means and recirculating the same back through said nozzle means, a bath tank of water, a header in said bath tank, said suction means discharging the scrubbed gas into said header, a plurality of ducts positioned below the surface of the water in said bath tank and extending transverse from said header out into said tank, each duct including a plurality of spaced apart small apertures and terminating in a goose-neck portion directed into the bath water which has a diameter reduced from the diameter of said duct, a plurality of agitating fans one for each duct positioned in said bath tank adjacent each goose-neck portion, said small apertures, said goose-neck portion and said fans cooperating to cause agitation of the water to thoroughly mix the gas in said bath water, and purifying means including a filter box having alternate layers of activated charcoal and said connected to said bath tank for purifying the bath water, and means for draining the purified bath from said purifier means as clean water.

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