United States Patent

Sheffield

[15] **3,688,709**

[45] **Sept. 5, 1972**

[54] HOLLOW GRATE INCINERATOR

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[73] Assignee: **Anti-Pollution Incinerators,** Cambridge, Mass.

[22] Filed: **Nov. 3, 1970**

[21] Appl. No.: **86,414**

[52] **U.S. Cl.** .....**110/8 R,** 110/18 R

[51] **Int. Cl.**.....**F23g 5/00**

[58] **Field of Search**.....110/7, 8, 18, 179

[56] **References Cited**

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[57] **ABSTRACT**

A furnace structure incorporating a hollow grate wherein incoming combustion air is circulated around the combustion chamber and through the hollow grate.

9 Claims, 6 Drawing Figures

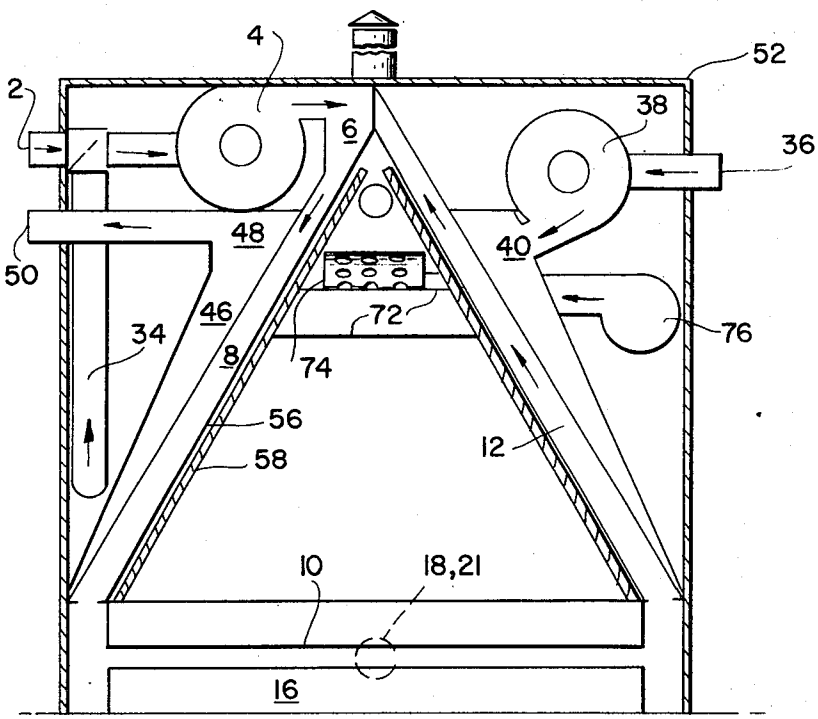


FIG. 2

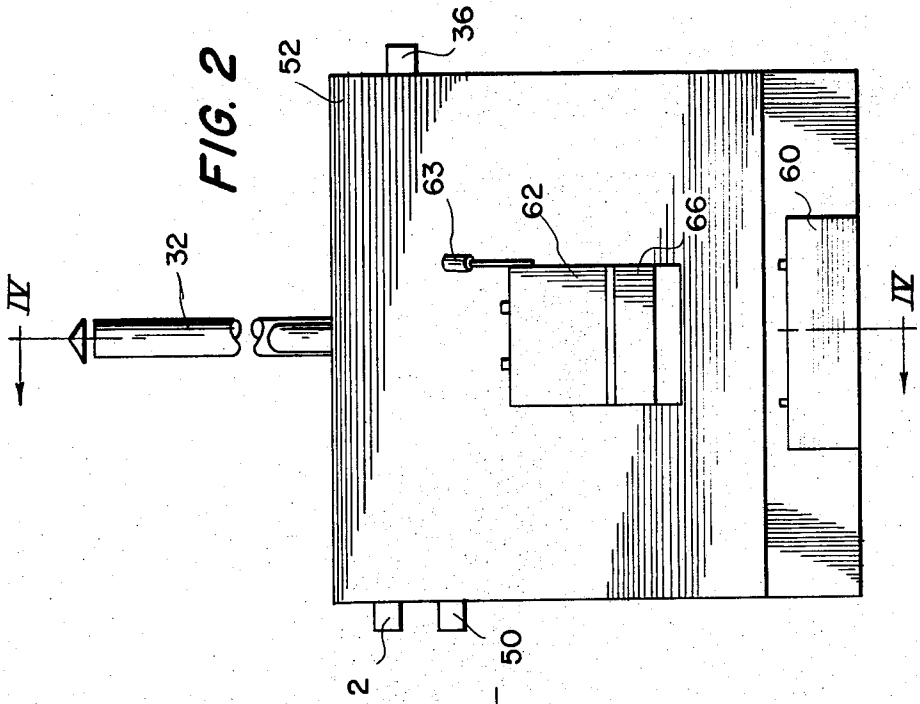
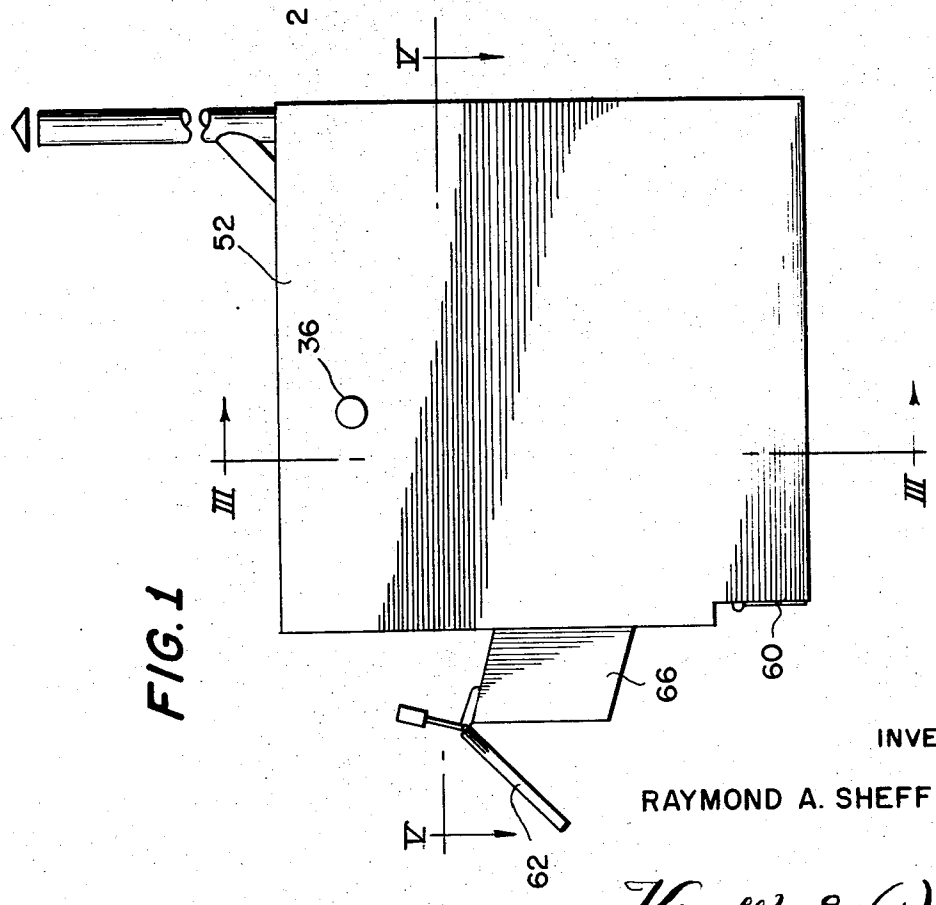


FIG. 1



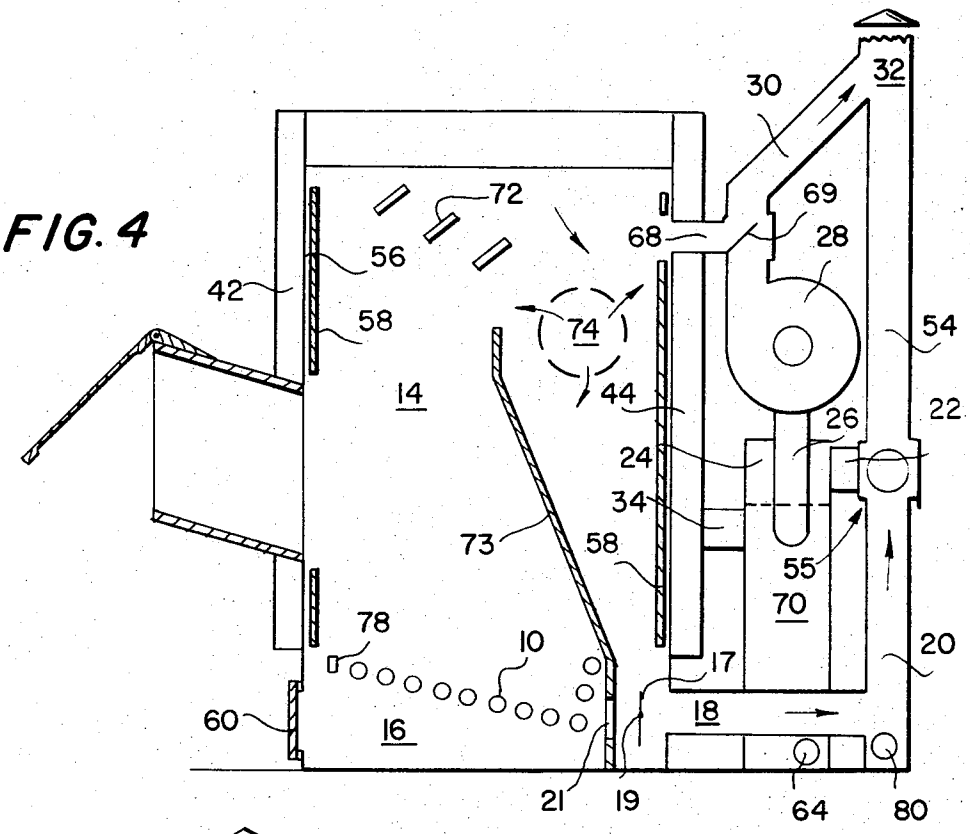
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FIG. 4



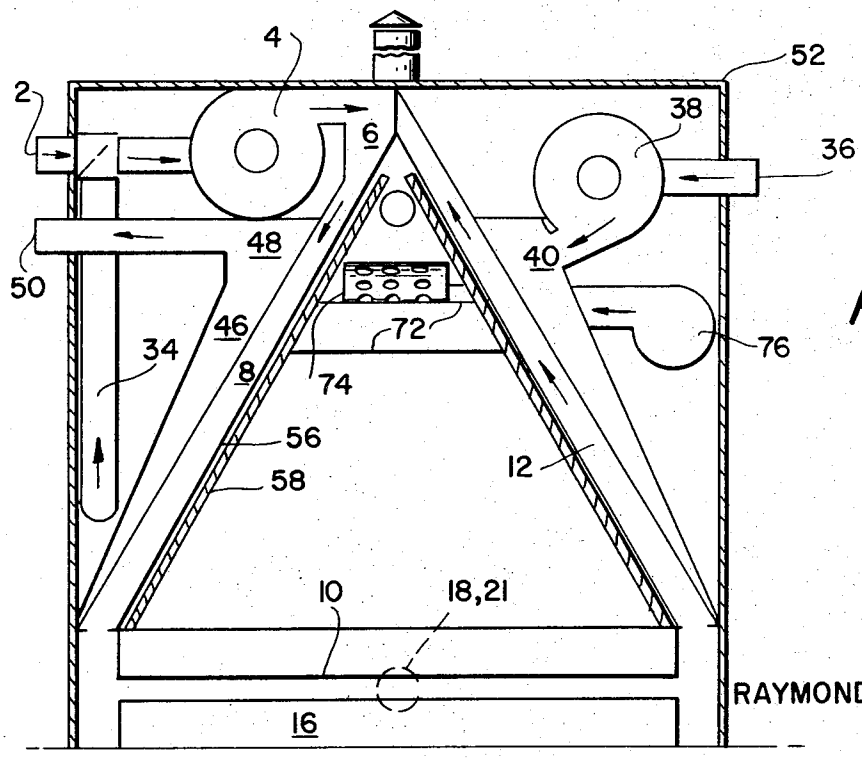


FIG. 3

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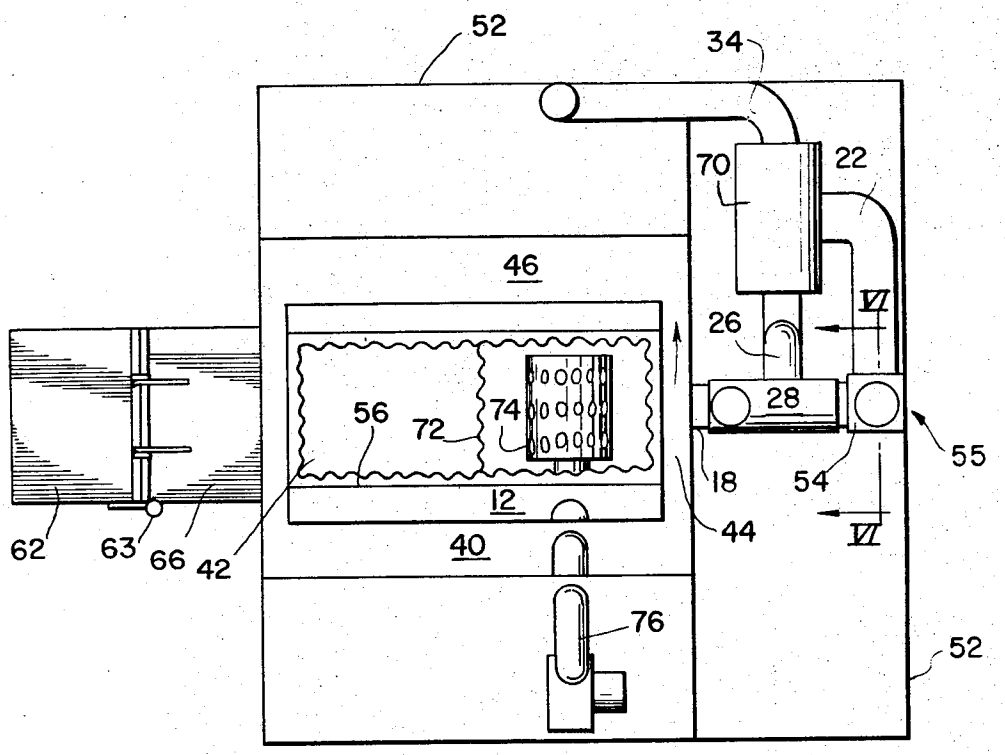


FIG. 5

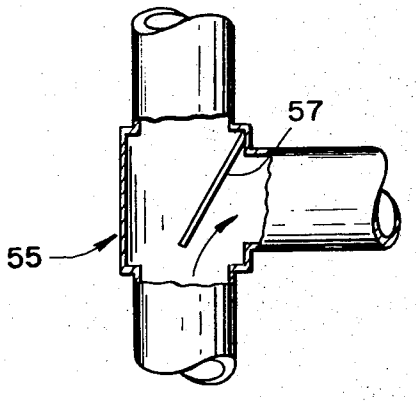


FIG. 6

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HOLLOW GRATE INCINERATOR

BACKGROUND OF THE INVENTION

The field of the invention is furnace structures having a hollow grate feeding air. In the present invention air is circulated not only through the hollow grate but around the combustion chamber.

The state of the prior art may be ascertained by reference to U.S. Pat. Nos. 992,004 of Kreutzer et al. and 2,469,639 of Franklin which issued May 9, 1911 and May 10, 1949, respectively. Kreutzer et al. disclose a fireplace grating having hollow tubes therein. Franklin discloses a furnace construction which incorporates hollow grating bars. In the furnace of Franklin, outside air is passed through the grating bars in order to cool them and then the preheated air flows upwardly and discharges from a flue into the top of the combustion chamber.

None of the prior art devices have recognized the need for cooling the combustion chamber and preventing air pollution by circulating air around the combustion chamber in a plurality of layers.

SUMMARY OF THE INVENTION

Having in mind the limitation of the prior art, it is an object of the present invention to prevent air pollution while achieving complete combustion in an incinerator.

Another object of the present invention is to provide an incinerator made from light metal which has extended life.

Still another object of the present invention is to provide a high capacity incinerator.

The objects of the present invention are achieved by a furnace structure having a hollow grate and a plurality of air passages around the combustion chamber through which combustion air is circulated, preheated and used in the combustion of material to be incinerated.

BRIEF DESCRIPTION OF THE DRAWINGS

The spirit of the invention can best be understood by reference to the drawings, wherein:

FIG. 1 is a side elevational view of the outside of the furnace;

FIG. 2 in a front elevational view of the outside of the furnace;

FIG. 3 is a sectional view along the lines III—III of FIG. 1;

FIG. 4 is a sectional view along the lines IV—IV of FIG. 2;

FIG. 5 is a sectional view along the lines V—V of FIG. 1; and

FIG. 6 is a sectional view of a detail of FIG. 5 along the lines VI—VI.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With particular reference to FIG. 1, a furnace 1 is shown having an outer shell 52 of light metal such as sheet metal, with a feed chute 66, a feed chute door 62 and a counterbalance 63. Clean air enters an insulation chamber in the furnace by inlet 36 while ashes are removed through ash clean-out door 60, and combustion gases as removed through emission stack 32.

FIG. 2, in addition to FIG. 1, shows inlet 2 for providing outside air for combustion to a blower and clean insulation air outlet 50.

FIG. 3 shows a front cross section of the triangular combustion chamber with the cooling means incorporated therein. Outside air enters through inlet 2 and is compressed in combustion air blower 4 for delivery to plenum chamber 6. Cold air passes from plenum chamber 6 through cold side duct 8 and passes through hollow tube grating 10. Air heated in the tubes 10 is passed through hot side duct 12 to the top of the combustion chamber.

Additional cooling insulation air enters clean air inlet 36 and is compressed in cold air supply blower 38 for delivery to chamber 40. The cold air in chamber 40 passes counter-current to the air in chamber 12 and circulates through duct 46 to heat incoming air in cold side duct 8. The clean insulation air from hot air distribution plenum 48 is exhausted through clean air outlet 50.

Combustion air from heated air supply 12 is diverted by baffles 72 to be mixed with oil from burner 76 and perforated drum 74. Combustion takes place in combustion chamber 14 and fumes are removed through collar 18 while burning gases are admitted through inlet 21. Ashes are removed from ash pit chamber 16.

A by-pass outlet or observation port is designated as 68. The inside skin of the combustion chamber 56 is constructed of mild steel. The combustion chamber has a stainless steel lining 58 for protecting the mild steel from oxidation and corrosion resulting from the heat of combustion.

An alternative combustion air supply from a gas washer is provided in conduit 34 for entrance into conduit 2.

A side view of the furnace is shown in cross-section in FIG. 4. The hollow grating tubes 10 are shown as positioned transversely in the furnace and aligned in a slanting row from the front of the furnace to the rear thereof. At the rear of the furnace some of the tubes are slanted upwards to form the back of the grate. A removable grate bar 78 is positioned in alignment with the front of the tubular grate. In addition to baffles 72 at the top of the combustion chamber, a baffle 73 is at the rear of the tubular grating.

Clean insulation air duct 42 is shown at the front of the furnace while clean insulation air duct 44 is in the rear. Burning oil from perforated drum 74 is circulated down behind baffle 73 and its further circulation is controlled by damper 17 having a pivot 19. Any portion of the burning gas may be circulated through inlet 21 while another portion is circulated through collar 18.

The products of combustion entering collar 18 are conducted to combustion furnace outlet duct 20. In duct 20 there is a clean-out port 80. From conduit 20 the gases enter inlet 22 leading to plenum chamber 24 of gas washer 70. Gas washer 70 has a sludge clean-out port 64. Clean emission gas passes through air duct 26 to blower 28. Blower 28 expels clean gas through duct 30 to emission stack 32. Bypass 68 is controlled by damper 69. There is an alternate combustion air supply 34 from gas washer 70. Duct 54 is an alternative bypass to emission stack 32 from duct 20.

FIG. 5 is a cross-section in plan view of the furnace. In addition to the elements shown in FIGS. 3 and 4, the

circulation path from cold air supply **40** through clean air ducts **42** and **44** to duct **46** is shown.

In FIG. **6** the three-way conduit **55** of FIG. **5** is shown having damper **57**.

I claim:

1. A furnace structure comprising:

a. a combustion chamber having a plurality of outer walls, a hollow grate, a base with said hollow grate therein, side walls extending inwardly from said base at an acute angle defining a triangular chamber with an air inlet at the top thereof and said hollow grate comprising a plurality of metal tubes;

b. means for circulating air around said outer walls and through said hollow grate; and

c. means for sustaining combustion in said combustion chamber.

2. The furnace of claim **1**, wherein said means for circulating air includes an air passage around said combustion chamber defined by an outer wall and said hollow grate, and an inlet and an outlet in said outer wall.

3. The furnace of claim **1**, wherein said means for circulating air includes a first air passage around said combustion chamber defined by a first outer wall and said hollow grate, a first inlet and a first outlet in said first outer wall, and a second air passage around said first air passage defined by a second outer wall, and a second inlet and a second outlet in said second outer wall.

4. The furnace of claim **3**, further comprising blowers in said first and second inlets.

5. The furnace of claim **3**, further comprising overhead baffles at the top of said combustion chamber and a vertical baffle at the rear of said combustion chamber.

6. The furnace of claim **5**, further comprising combustion inlet means through the bottom of said vertical baffle and combustion outlet means behind said vertical baffle.

7. The furnace of claim **6**, further comprising flow control means for proportioning the flow of combustion gases through said combustion inlet means and said combustion outlet means.

8. The furnace of claim **7**, further comprising a gas washer connected to said combustion outlet means.

9. The furnace of claim **8**, further comprising means for connecting said gas washer and said first inlet.

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