



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 002 995 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
24.05.2000 Bulletin 2000/21

(51) Int. Cl.⁷: **F23G 5/16**, F23J 3/04

(21) Application number: **99116686.9**

(22) Date of filing: **26.08.1999**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **10.11.1998 JP 31910898**

(71) Applicant:
**Innovative Environmental Technology Co., Ltd.
Fukuoka-shi, Fukuoka (JP)**

(72) Inventors:
• **Muta, Masao**
9-13-6, Tenjin 5-chome, Chuo-Ku, Fukuoka (JP)
• **Shibata, Makoto**
9-13-6, Tenjin 5-chome, Chuo-Ku, Fukuoka (JP)
• **Takeda, Masuo**
9-13-6, Tenjin 5-chome, Chuo-Ku, Fukuoka (JP)

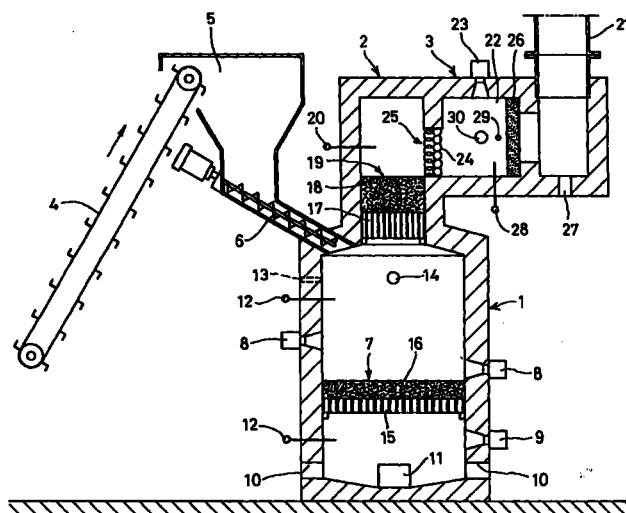
(74) Representative:
Schieschke, Klaus, Dipl.-Ing.
Patentanwälte
Eder & Schieschke,
Elisabethstrasse 34/II
80796 München (DE)

(54) **Waste incinerator and secondary combustion device**

(57) A secondary combustion device (3) that prevents the production of dioxins during cooling, and an incinerator that produces no dioxins. A secondary burner (23) is mounted in a secondary combustion chamber (22) provided in a duct (2). A plate-shaped sintered alumina filter (26) is provided at the outlet of the secondary combustion chamber. The alumina filter (26) catches flying ashes contained in waste gas and burn

them with secondary combustion heat to considerably reduce the amount of flying ashes in exhaust gas and oxidize copper chloride, iron chloride and carbon present in flying ashes, thereby preventing the flying ashes from acting as a catalyst for converting dioxin precursors into full-fledged dioxins and preventing the production of dioxins during cooling of exhaust gas.

FIG. 1



EP 1 002 995 A2

Description

BACKGROUND OF THE INVENTION

[0001] This invention relates to a waste incinerator and its secondary combustion device.

[0002] Into wastes incinerators, besides paper and woodchips, difficult-to-burn materials such as kitchen refuse are dumped. Exhaust gas and ashes discharged from incinerators thus contain large amounts of unburned materials. Such unburned materials typically contain dioxins, one of the most dangerous poisons on earth, thus causing serious environmental pollution problems.

[0003] Some of the dioxins contained in such unburned materials are produced when wastes burn at a low temperature in an incinerator, and other convert during cooling from dioxin precursors contained in the exhaust gas. It is known, that such dioxin precursors have a similar molecular structure as dioxins and convert to dioxins during cooling at temperatures of about 300°C in the presence of such catalysts as copper chloride, iron chloride and carbon in flying ashes.

[0004] An object of this invention is to provide a secondary combustion device that prevents the production of dioxins during cooling, and an incinerator that discharges no dioxins.

SUMMARY OF THE INVENTION

[0005] According to this invention, there is provided a secondary combustion device comprising a secondary combustion chamber into which combustion gas is to be introduced, a secondary burner provided in the secondary combustion chamber, a porous filter of sintered alumina provided at an outlet of the secondary combustion chamber, and a means for creating a negative pressure in the back side of the porous filter.

[0006] As the material for the porous filter, sintered alumina is used because it has an excellent heat resistance and chemical resistance and it will not react chemically with any components in flying ashes even at high temperatures or will not deteriorate.

[0007] Other features and objects of the present invention will become apparent from the following description made with reference to the accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Fig. 1 is a vertical sectional view of an incinerator embodying the present invention;

Fig. 2 is an enlarged sectional view of the hearth of the same; and

Fig. 3 is an enlarged sectional view of the secondary combustion device of the same.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0009] An embodiment of this invention is now described with reference to Figs. 1 through 3. The incinerator of the embodiment comprises a combustion chamber 1 in which wastes are burned, a duct 2 connected to the smoke discharge port at the top of the chamber 1, a secondary combustion device 3 in the duct. Wastes are put into a hopper 5 by a bucket conveyor 4 and then fed into the combustion chamber 1 by a screw conveyor 6.

[0010] In the combustion chamber 1, burners 8 are provided right over a hearth 7. A preheating burner 9, an air passage 10 and an ash removal port 11 are provided below the hearth 7. The combustion chamber 1 is also provided with a temperature sensor 12, chamber pressure measuring port 13 and an inspection window 14.

[0011] The hearth 7, shown enlarged in Fig. 2, has a double-wall structure comprising a stainless steel honeycomb member 15 and an upper layer 16 of tangled stainless steel whiskers. The honeycomb lower member 15 and the upper whisker layer 16 are red-heated by combustion heat and air supplied into the chamber 1 from under the hearth 7. The hearth also serves to let the wastes on the hearth, which decrease in volume by burning, gradually fall therethrough, thus promoting combustion of unburned wastes and considerably reducing the amount of ashes. The whiskers forming the upper layer 16 may be chips produced during machine cutting.

[0012] At the entrance of the duct 2, a filter 19 is provided, which, like the hearth 7, has a double-wall structure comprising a lower stainless steel honeycomb member 17 and an upper layer of tangled stainless steel whiskers 18. The filter 19 is red-heated by combustion heat and promotes combustion of unburned components in the gas. A temperature sensor 20 is provided in the duct 2. The outlet of the duct 2 is connected to a cooling device (not shown) by a duct 21.

[0013] The secondary combustion device 3, shown enlarged in Fig. 3, comprises a secondary burner 23 mounted in a secondary combustion chamber 22, a three-dimensionally reticulated kanthal filter 25 provided at the inlet of the secondary combustion chamber 22 and formed by arranging helical coils 24 of kanthal wire perpendicular to each other, and a plate-shaped filter 26 of sintered alumina provided at the outlet of the chamber 22. A vacuum pump (not shown) is connected to an air suction port 27 formed in the back of the alumina filter 26. Like the combustion chamber 1, the secondary combustion chamber 22 is provided with a temperature sensor 28, a chamber pressure measuring hole 29 and an inspection window 30.

[0014] The kanthal filter 25 is red-heated by secondary combustion heat and serves to stabilize the secondary combustion temperature and keep it high. It may be provided in the combustion chamber 1 and the duct

2 close to the combustion chamber.

[0015] The alumina filter 26 has fine pores in the order of micron and serves to catch flying ashes contained in the exhaust gas to burn them with secondary combustion heat, thereby considerably reducing the amount of flying ashes and oxidizing copper chloride, iron chloride, carbon, etc. present in the flying ashes. The vacuum pump and the air suction port 27 serve to keep air-permeable the fine pores of the alumina filter 26.

[0016] In the embodiment, a single-tier hearth is used. But instead, a plurality of hearths may be provided in vertical tiers. In the embodiment, the filters in the hearth and at the entrance of the duct have a double-wall structure comprising a stainless steel honeycomb member and a layer of tangled stainless steel whiskers. But instead, they may be meshed, porous or fibrous (longer than whiskers) members made of a heat-resistant metal other than stainless steel or a ceramic material. Of course, such members may be used in combination. In a multi-tier hearth arrangement, each hearth may be formed from a different material from other hearths.

[0017] Instead of helical coils, the kanthal filter provided in the secondary combustion chamber may be formed of a flat meshed plate, a metallic wire woven in a three-dimensional lattice pattern, or a corrugated, three-dimensionally woven metallic wire or a combination thereof. This filter may be made from platinum wire or any other metallic wire high in heat resistance and resistance to high-temperature oxidation instead of kanthal wire.

[0018] According to this invention, by the provision of the secondary burner provided in the secondary combustion chamber and the sintered alumina filters with fine pores at the outlet of the secondary combustion chamber, the filter can catch flying ashes contained in exhaust gas to burn them with secondary combustion heat, thereby considerably reducing the amount of flying ashes in exhaust gas, and oxidizing copper chloride, iron chloride and carbon present in the flying ashes. This prevents the flying ashes from acting as a catalyst for converting dioxin precursors into full-fledged dioxins, thereby preventing the production of dioxins during cooling. The filter of woven metallic wire provided near the secondary burner is red-heated by secondary heat, so that the secondary combustion temperature is stably kept high.

[0019] For the incinerator at the invention, the hearth of the combustion chamber, which is formed of a heat-resistant metal or a ceramic member having a large surface area with meshed or honeycomb gaps, red-heats and let the wastes thereon, which decrease in volume by burning, fall gradually through its gaps, thus promoting combustion of any unburned components. The amount of ashes thus considerably decreases.

Claims

1. A secondary combustion device comprising a secondary combustion chamber into which combustion gas is to be introduced, a secondary burner provided in said secondary combustion chamber, a porous filter of sintered alumina provided at an outlet of said secondary combustion chamber, and a means for creating a negative pressure in the back side of said porous filter.
2. The secondary combustion device as claimed in claim 1 further comprising a filter provided upstream of said porous filter and close to said secondary burner and formed of a metallic wire having heat resistance and resistance to high-temperature oxidation in meshed or a three-dimensionally meshed form, or a combination thereof.
3. An incinerator comprising a combustion chamber having a hearth and an exhaust port, a duct connected to said exhaust port, and the secondary combustion device as claimed in claim 1 or 2 provided in said duct.
4. The incinerator as claimed in claim 3 wherein said hearth is formed of heat-resistant metal or ceramics in the form of meshed, honeycomb, fibrous, whiskery or porous members, or a combination thereof.
5. The incinerator as claimed in claim 3 or 4 further comprising a filter provided at said exhaust port and formed of heat-resistant metal or ceramics in the form of meshed, honeycomb, fibrous, whiskery or porous members, or a combination thereof.
6. The incinerator as claimed in claim 3, 4 or 5 further comprising a filter provided in said combustion chamber near its top or in said duct near said combustion chamber and formed of a metallic wire having heat resistance and resistance to high-temperature oxidation in meshed or a three-dimensionally meshed form, or a combination thereof.

FIG. 1

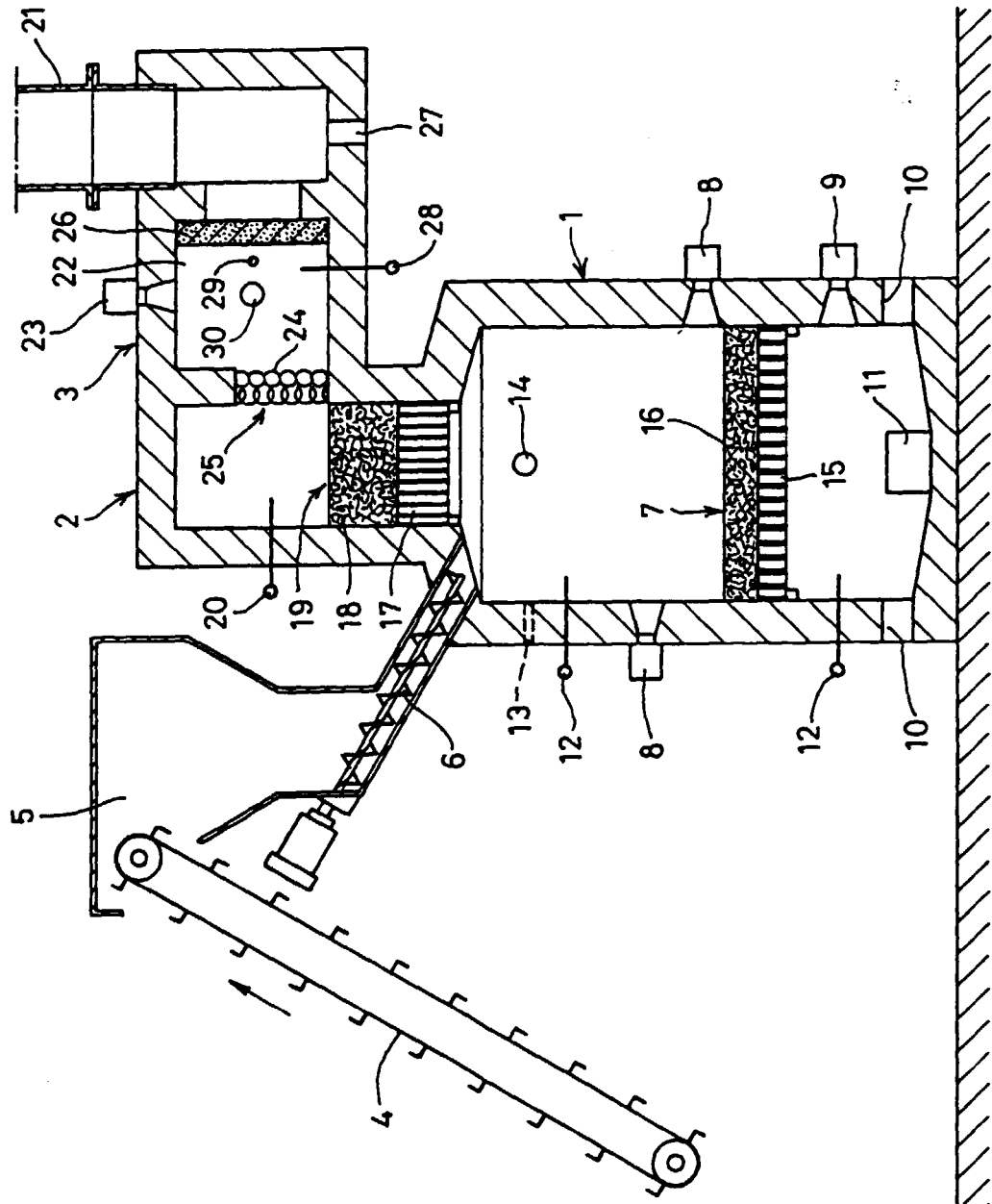


FIG. 2

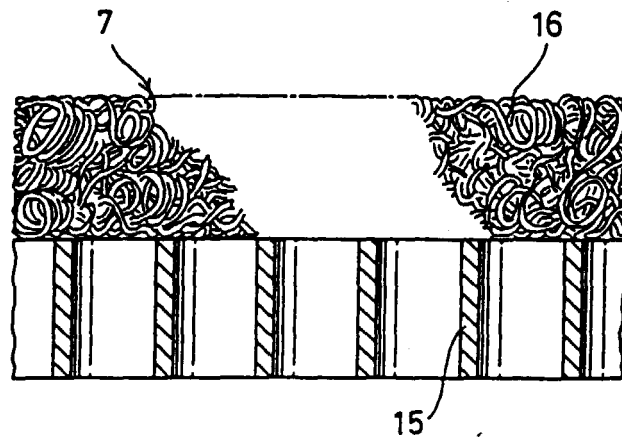


FIG. 3

