



(12) **EUROPEAN PATENT APPLICATION**

(21) Application number : **93830015.9**

(51) Int. Cl.⁵ : **F23G 7/06**

(22) Date of filing : **21.01.93**

(30) Priority : **30.01.92 IT MI920175**

(43) Date of publication of application :
01.09.93 Bulletin 93/35

(84) Designated Contracting States :
AT BE DE ES FR GB PT SE

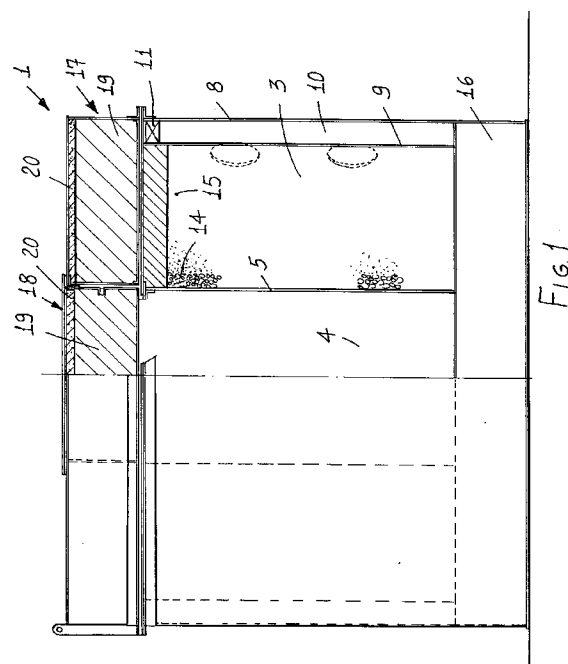
(71) Applicant : **GEICO S.p.A.**
Via Cornaggia, 58
I-20092 Cinisello Balsamo, Milano (IT)

(72) Inventor : **Isola, Antonio**
GEICO S.p.A., Via Cornaggia, 58
I-20092 Cinisello Balsamo, Milano (IT)
Inventor : **Neri, Sergio**
GEICO S.p.A., Via Cornaggia, 58
I-20092 Cinisello Balsamo, Milano (IT)

(74) Representative : **Cicogna, Franco**
Ufficio Internazionale Brevetti Dott.Prof.
Franco Cicogna Via Visconti di Modrone, 14/A
I-20122 Milano (IT)

(54) **Regenerative incinerator for damping polluting emissions, in particular for processing paint residue containing emissions.**

(57) The present invention relates to a regenerative incinerator for damping polluting emissions, in particular for processing paint residue containing emissions. The incinerator comprises an incinerator body in which there is defined a processing cavity, which is divided into at least two chambers containing a filtering material. Between these two chambers there is formed a space, which is separated from the two chambers by means of a perforated wall and which comprises heating means for holding the space at a high temperature. The two chambers respectively communicate with an inlet duct for the fluid to be processed and a further duct for the processed fluid, the processed fluid passing successively through one of the filtering material holding chambers, the high temperature space and through the other filtering material holding chamber.



BACKGROUND OF THE INVENTION

The present invention relates to a regenerative incinerator for damping or reducing polluting emissions, in particular for processing paint residue containing emissions.

As is known, the reduction of polluting substances present in industrial emissions is a very important problem.

This problem is particularly serious with respect to the industrial system emissions containing toxic or noxious substances, such as, for example, the air discharged from painting rooms, which air contains vapours and suspended particles of very toxic materials.

The air purification systems which are at present used in this field have high assembling and maintenance costs, and they do not always provide a satisfactory reduction of the toxic and noxious substances entrained by this air.

SUMMARY OF THE INVENTION

The aim of the present invention is to overcome the above mentioned problems, by providing a regenerative incinerator for damping or reducing polluting emissions, which is adapted to efficiently purify the air being processed.

Within the scope of the above aim, a main object of the present invention is to provide a regenerative incinerator which is specifically designed for processing air containing volatile and inflammable substances.

Another object of the present invention is to provide such a regenerative incinerator which can be easily constructed and has a very reduced maintenance cost.

According to one aspect of the present invention, the above mentioned aim and objects, as well as yet other objects, which will become more apparent hereinafter, are achieved by a regenerative incinerator for damping polluting emissions, characterized in that said regenerative incinerator comprises an incinerator body in which is defined a processing cavity divided into at least two filtering material containing chambers.

Between the above mentioned chambers there is defined a space separated from said two chambers by means of a perforated wall, in said space being provided heating means for holding in said space a high temperature.

The above mentioned chambers communicate, respectively, with an inlet duct for a fluid to be processed and an outlet duct for the outlet of the processed fluid, said fluid being caused to pass, successively, through one of the filtering material containing chambers, through the high temperature space and through the other filtering material containing cham-

ber.

This cycle is reversed, with a timing of about two minutes, in order to hold a constant and homogeneous thermal gradient in the sand.

BRIEF DESCRIPTION OF THE DRAWINGS

Further characteristics and advantages of the invention will become more apparent hereinafter from the following disclosure of a preferred, though not exclusive, embodiment of a regenerative incinerator according to the invention, which is illustrated, by way of an indicative but not limitative example, in the figures of the accompanying drawings, where:

Figure 1 is a partially cross-sectioned view, in elevation, showing the regenerative incinerator according to the present invention;

Figure 2 is a schematic cross-sectional view of Figure 1, taken substantially along the section line II-II of Figure 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the number references of the above mentioned figures, the regenerative incinerator according to the present invention comprises an incinerator body 1, in which there is defined a processing cavity, which is divided into at least two chambers, respectively indicated at 2 and 3, in which a filtering material is located.

Between the chambers 2 and 3 there is provided a space 4, which is separated from the two chambers 2 and 3 by means of a perforated wall 5, and in which there are arranged heating means, for example electrical resistances of any known types and which have not been specifically shown for simplicity, so as to hold the space 4 at a high temperature, preferably from 700°C and 900°C.

The two chambers 2 and 3, as shown, communicate, respectively, with an inlet duct 6 for the inlet of the fluid to be processed, generally consisting of air polluted by toxic or noxious substances, and with an outlet duct 7 for discharging the processed fluid.

The fluid to be processed is introduced in. to the regenerative incinerator by means of a pumping or sucking or drawing operation, so as to cause said fluid to successively pass through the chamber 2, the high temperature space 4 and the other chamber 3, as it will become more apparent hereinafter.

This operating cycle, as stated, will be advantageously automatically reversed preferably with a timing of about 2 minutes.

More specifically, the incinerator body 1 comprises a cylinder, in which there is coaxially formed the mentioned space 4, also of cylindric shape, and being delimited by the perforated sheet metal wall 5.

Facing the outer wall 8 there is coaxially ar-

ranged a holding net 9 for holding a filtering material located in the chambers 2 and 3 and, between the net 9 and outer wall 8 there is defined a gap 10.

The net 9 is laterally supported by suitable spacer means 11, arranged between the net 9 and outer wall 8.

The net 9 is supported by a perforated sheet metal element.

The inside of the incinerator body 1 is divided into two substantially like portions by means of a pair of radially extending walls, respectively indicated at 12 and 13, which are arranged at a diametrical plane and tightly separating the chamber 2 from the chamber 3, as well as the respective portions of the gap 10.

The inlet duct 6 is connected to a hole, formed through the outer wall 8, at the chamber 2 region, whereas the outlet duct 7 is connected to a hole formed through the outer wall 8 at the chamber 3.

The filtering material contained in said chambers 2 and 3 comprises sand or siliceous gravel.

Preferably, a layer 14 of siliceous gravel, of small particle size, is provided in abutment against the perforated wall 5, whereas the remaining portion of the chambers 2 and 3 is also filled by siliceous gravel 15 of finer particle size.

Inside the incinerator body 1, moreover, is provided a base layer 16, of a thermally insulating material, such as, for example, a ceramic fibre and/or mineral wool layer, which does not affect the gap 10.

The top portion of the body 1 is covered by a cover element 17, through the central part of which, at the space 4, there is formed a hole closed by a plug element 18.

The cover or cap element 17 and plug 18 are suitably thermally insulated, preferably by means of an inner insulating layer 19, made of ceramic fibers, and by means of a mineral wool outer layer 20.

Moreover, in the chambers 2 and 3, on the top of the sand or siliceous gravel layer, there is provided a further thermally insulating layer, of the ceramic fibre type.

The above disclosed incinerator, according to the present invention, operates as follows.

The air to be processed, containing inflammable and volatile substances, is entrained, under a suitable pressure, inside the incinerator body 1 through the inlet duct 6.

The polluted air is conveyed to the space 4, passing through the sand or gravel layer arranged inside the chamber 2.

The sand will provide a thermal "flywheel" or storing means (having a high thermal capacity) which will allow a desired temperature to be easily held with a reduced power requirement by the electric resistances.

Moreover, since the high temperature present in the space 4 will heat the sand or gravel held in the chamber 3, as the polluted air is conveyed toward the

space 4, this air will be progressively heated, with a consequent pre-heating and gradual oxidation of the several components of the inflammable-volatile substances entrained thereby.

The increasing thermal gradient inside the sand containing spaces, will provide a gradual oxidation of the several components of the solvents to be processed.

Because of this, as the air containing this volatile and inflammable substances arrives at the space 4, the volatile and inflammable substances will be immediately oxidated or burnt.

The combustion residue, passing through the sand or gravel in the chamber 3, will be filtered and progressively cooled, and will release into the sand an amount of energy which will actually correspond to the energy or power amount supplied by the heating elements, apart from some losses.

The thus purified air will be discharged through the outlet duct 7.

Preferably, the advancement speed of the air through the chambers 2 and 3 will be of about 0.5 m/second.

It should be apparent that, as the cycle is reversed, the outlet duct 7 will operate as an inlet duct, and the inlet duct 6 will operate as the outlet duct.

From the above disclosure it should be apparent that the invention fully achieves the intended aim and objects.

In particular, it is to be pointed out that a regenerative incinerator has been provided which is specifically designed to provide very good results even if the air to be processed is polluted by volatile-inflammable substances very toxic or noxious.

The invention as disclosed is susceptible to several variations and modifications, all of which will come within the spirit of the inventive idea.

Moreover, all of the details can be replaced by other technically equivalent elements.

In practicing the invention, the used material, provided that they are compatible to the intended use, as well as the contingent size and shapes, can be any, according to requirements.

Claims

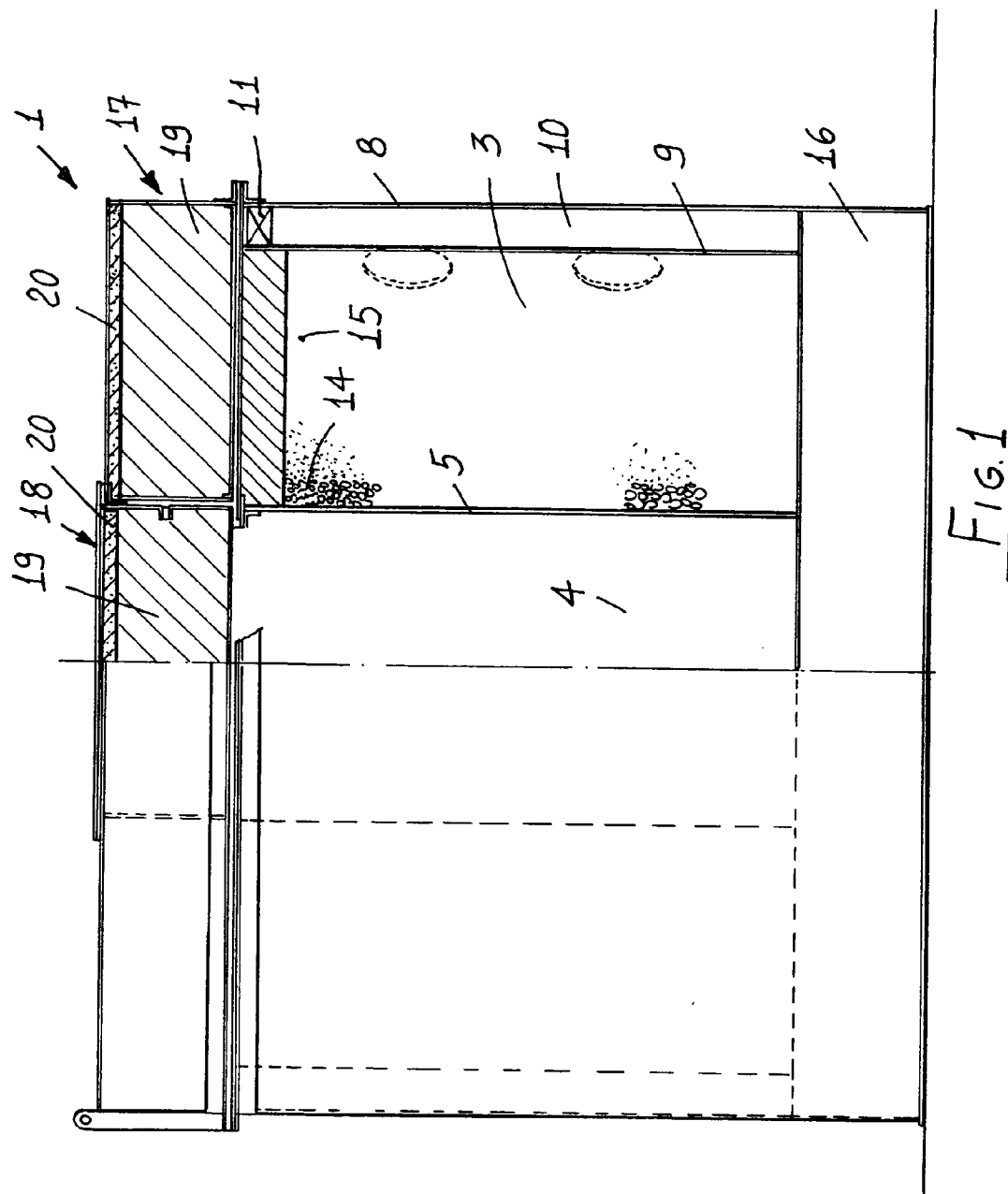
1. A regenerative incinerator for damping polluting emissions, in particular for processing emissions containing paint residues, characterized in that said incinerator comprises an incinerator body, in which there is defined a processing cavity, divided into at least two filtering material containing chambers, between said two chambers there being provided a space separated from said two chambers by means of a perforated wall and including therein heating means for holding said space at a set high temperature, said two cham-

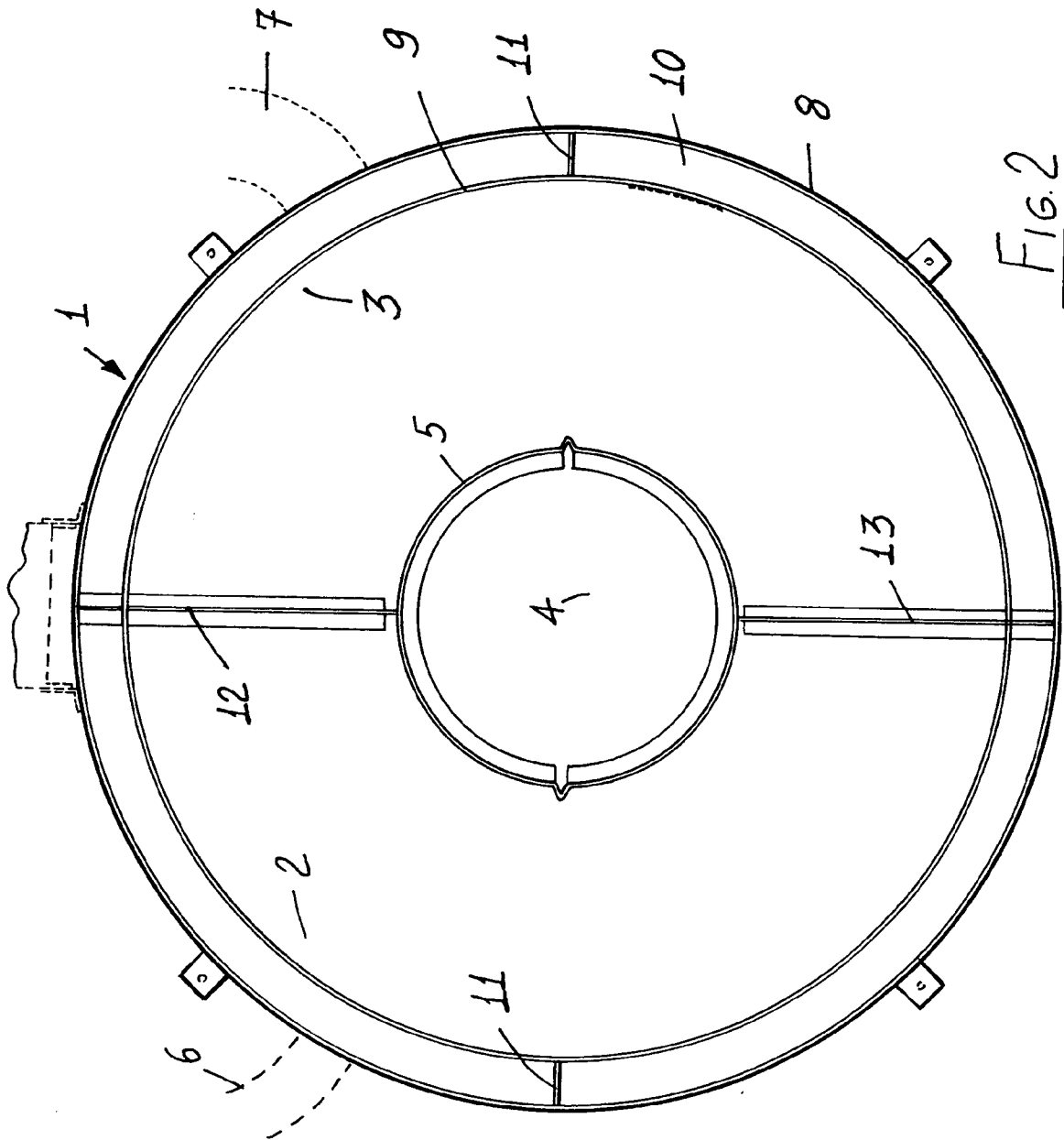
bers respectively communicating with an inlet duct for the fluid to be processed and an outlet duct for discharging processed fluid therefrom, said fluid being caused to successively pass through one of said filtering material containing chambers, through said high temperature space and through said other filtering material containing chamber, the flow of said fluid being cyclically reversed.

2. A regenerative incinerator, according to Claim 1, characterized in that said body comprises a substantially cylindric outer wall, said space being delimited by a cylindric perforated sheet metal wall coaxially arranged with respect to the outer wall, said chambers being formed between said perforated sheet metal wall and said body and being separated from one another by radially extending walls which extend between said perforated sheet metal wall and said outer wall. 10
3. A regenerative incinerator, according to the preceding claims, characterized in that there is provided a holding net, facing said outer wall, for holding the filtering material located in said chambers, between said net and outer wall there being formed a gap divided into two portions by said radially extending wall and respectively communicating with said inlet duct and said outlet duct. 15
4. A regenerative incinerator, according to one or more of the preceding claims, characterized in that said filtering material comprises gravel and/or sand. 20
5. A regenerative incinerator, according to one or more of the preceding claims, characterized in that said filtering material comprises siliceous gravel, of a small particle size, abutting against said perforated wall, and finer particle size gravel in the remotely arranged regions of said incinerator. 25
6. A regenerative incinerator, according to one or more of the preceding claims, characterized in that said body is provided, in its inside, with a thermally insulating material base layer. 30
7. A regenerative incinerator, according to one or more of the preceding claims, characterized in that said body is closed, at the top thereof, by a cover element holding at least a layer of a thermally insulating material and including a plug element closing the top portion of said space. 35
8. A regenerative incinerator, according to one or more of the preceding claims, characterized in 40

that said plug element comprises a box-like body holding therein a thermally insulating material.

9. A regenerative incinerator, according to one or more of the preceding claims, characterized in that said thermally insulating material comprises a ceramic fibre inner layer and a mineral wool outer layer. 45







European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 83 0015

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	EP-A-0 440 181 (LTG LUFTECHNISCHE GMBH) * claims; figure 1B *	1-9	F23G7/06
A	GB-A-2 044 900 (NITTETU CHEMICAL ENGINEERING LTD) * claims; figure 1 *	1-9	
A	US-A-4 802 423 (R.L. PENNINGTON) * claims; figure 1 *	1-9	
A,P	US-A-5 163 829 (H.N. WILDENBERG) * claims; figure 4 *	1-9	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			F23G B01D
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 19 MAY 1993	Examiner CORDERO ALVAREZ M.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 01.92 (P0401)