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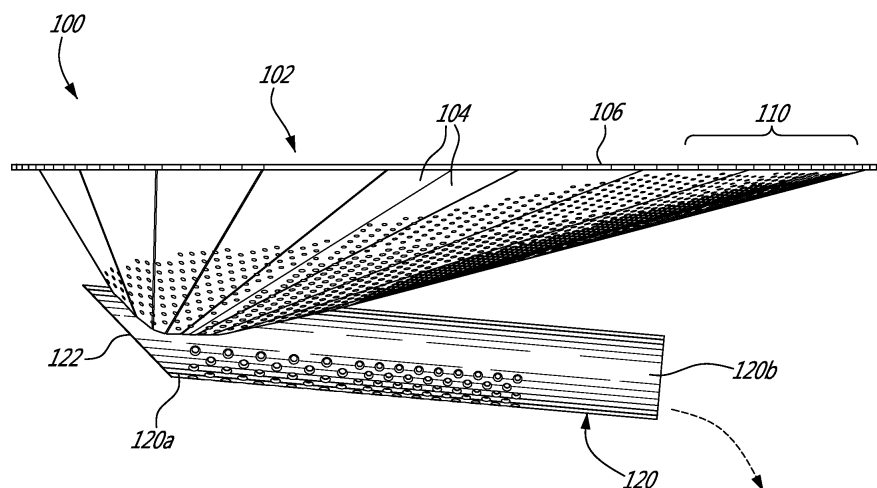
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(54) **Grate and method of burning a granular fuel material**

(57) The substantially horizontally-disposed grate is used for burning a granular fuel material, for instance a biomass material, to be fed onto a loading area of the grate while a primary air feed is coming from below the grate. The grate includes a perforated bed floor having a downwardly-sloping upper surface converging towards a discharge opening where char is concentrated as the granular fuel material is burned during operation. The grate also includes an elongated and bottom-perforated

char-receiving conduit positioned immediately under the bed floor. The char-receiving conduit has an inlet end positioned under the discharge opening, and an outlet end that is opposite the inlet end. The char-receiving conduit downwardly slopes between the inlet end and the outlet end. A method of burning a granular fuel material is also disclosed. The proposed concept can increase the overall thermal efficiency of a heat generator and reduce gas and particle emissions in the atmosphere.





EUROPEAN SEARCH REPORT

Application Number
EP 13 15 9838

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 169 655 A (MURPHY, THOMAS) 9 November 1875 (1875-11-09) * page 1, line 6 - page 2, line 19; figures 1-9 *	1	INV. F23B10/02 F23B30/02 F23B60/02 F23B90/06 F23J1/00
A	EP 1 319 152 B1 (EHGARTNER FRIEDRICH [AT]) 18 June 2003 (2003-06-18) * paragraph [0025] - paragraph [0042]; figures 1-6 *	1	
A	EP 1 559 957 A1 (THERMOROSSI SPA [IT]) 3 August 2005 (2005-08-03) * paragraph [0019] - paragraph [0025]; figures 1-8 *	1	
A	WO 2006/008762 A1 (DI CECILIA FILIPPO ANTONIO [IT]) 26 January 2006 (2006-01-26) * page 4, line 2 - page 8, line 5; figures 1-11 *	1	
A	CH 166 697 A (DANSART NICOLAS [LU]) 31 January 1934 (1934-01-31) * page 1; figure 1 *	1	TECHNICAL FIELDS SEARCHED (IPC)
A	US 4 932 336 A (SROWIG NORBERT [DE] ET AL) 12 June 1990 (1990-06-12) * column 4, line 58 - column 6, line 26; figure *	17	F23B F23J F23H F23G F24B
A	WO 03/025459 A1 (FLS MILJOE AS [DK]; JOHNSEN JOERGEN BOEGILD [DK]; IVERSEN STEEN BRUMME) 27 March 2003 (2003-03-27) * page 10, line 4 - page 19, line 18; figure *	17	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 10 May 2016	Examiner Theis, Gilbert
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			

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



LACK OF UNITY OF INVENTION
SHEET B

Application Number

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-16

A substantially horizontally-disposed grate for burning a granular fuel material to be fed onto a loading area of the grate while an air feed is coming from below the grate, the grate including : a perforated bed floor having a downwardly-sloping upper surface converging towards a discharge opening where char is concentrated as the granular fuel material is burned during operation; and an elongated and bottom-perforated char-receiving conduit positioned immediately under the bed floor, the char-receiving conduit having an inlet end positioned under the discharge opening, and an outlet end that is opposite the inlet end, the char-receiving conduit downwardly sloping between the inlet end and the outlet end.

2. claims: 17-21

A method of burning a granular fuel material, the method including the concurrent steps of : loading the granular fuel material in a loading area of a substantially horizontally-disposed bed floor; vibrating the bed floor to move the granular fuel material from the loading area towards a discharge opening located away from and vertically below the loading area; feeding primary air across the bed floor, the primary air coming from a bottom side and passing through a multitude of spaced-apart perforations made in the bed floor; drying, mostly by radiation heat, the granular fuel material immediately after the granular fuel material is loaded onto the bed floor; transforming, by pyrolysis, the dried granular fuel material into volatile compounds and char, and generating heat above the bed floor; collecting and concentrating the char passing through the discharge opening into an elongated chamber extending substantially horizontally underneath the bed floor; and generating heat by burning the char inside the chamber as the char is moved from the discharge opening towards an outlet end of the chamber by the vibrations of the bed floor.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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