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(54) Stepped grate beam for a combustion grate

(57) In a stepped grate beam (1) for a combustion grate for an incineration or combustion plant, said plant comprising one or more grate sections having a plurality of grate beams (1) extending obliquely downwards in the direction of movement of the fuel on top of the grate, the grate beams (1) have a grate top (2) stepped downwardly in said direction and are placed with lateral surfaces (3) closely adjacent to each other across the width of the combustion grate. Mutually adjacent grate beams (1) are relatively reciprocable in the longitudinal direction and the grate beams (1) are adapted for the passage therethrough of a heat transmission medium: The confinement (4) of the heat transmission medium is provided by one or more in U-form bent plate elements (5), the sides of which are cut in steps corresponding to the stepped grate top (2) and welded to the underside of the grate top (2). In this way the number of individual components to be welded together to produce the stepped grate beam (1) is substantially reduced.

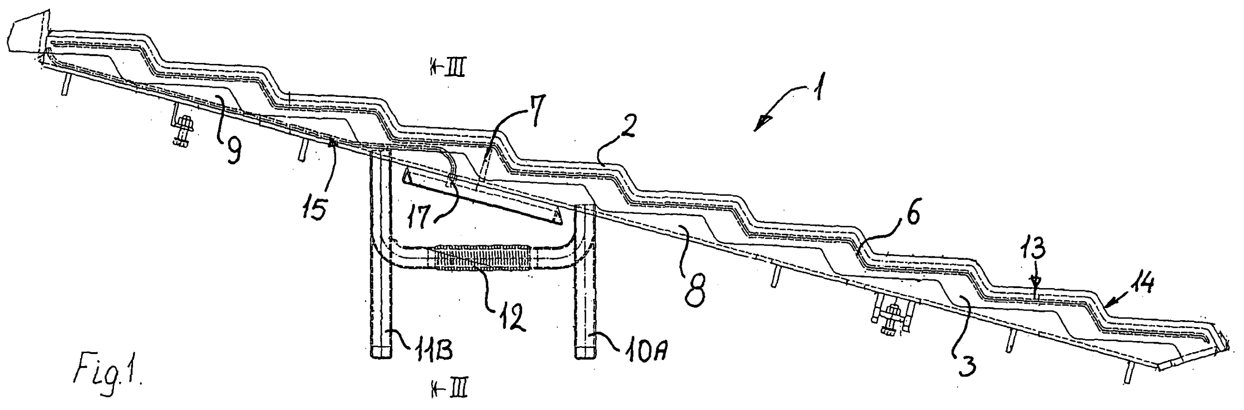

Fig.1.

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Description

TECHNICAL FIELD

[0001] The present invention relates to a stepped grate beam of the kind set forth in the introductory part of claim 1.

BACKGROUND ART

[0002] In stepped grate beams for a combustion grate of this kind it is known to have the grate beam adapted for the passage theretrough of a heat transmission medium in order to balance temperature differences along the length of the beam, thereby minimizing the difference in width between its two ends caused by such temperature differences. A stepped grate beam of this kind is e.g. known from WO 96/23174, in which the bottom of the ducts for the heat transmission medium is stepped corresponding to the stepped grate top, in order to provide a mainly constant cross section of the ducts and thus a constant flow of the heat transmission medium in the ducts. The provision of the ducts with this configuration implies the assembly of a relatively large number of individual parts by welding, resulting in a relatively complex and time-consuming production process.

DISCLOSURE OF THE INVENTION

[0003] Based on this prior art it is the object of the present invention to provide a stepped grate beam of the kind referred to above, with which it is possible to reduce the number of individual components to be welded together during production, and this object is achieved with a stepped grate of said kind, which according to the present invention also comprises the features set forth in the characterising clause of claim 1. With this arrangement only two major components are used for providing the stepped grate top and the confinement for the heat transmission medium.

[0004] It is another object of the present invention to maintain a circulation of heat transmission medium through a mainly constant cross section immediately below the grate top and this object is achieved with a stepped grate of said kind, which according to the present invention also comprises the features set forth in the characterising clause of claim 2. With this arrangement the flow of the heat transmission medium immediately below the grate top is maintained at a constant level along the stepped grate beam by having a mainly constant cross section for this flow.

[0005] Further advantageous features, the effects of which will be evident from the detailed portion of the present description, are set forth in the subordinate claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] In the following detailed portion of the present description the invention will be explained in more detail with reference to the drawings, in which

Fig. 1 shows a stepped grate for a combustion grate in accordance with the present invention seen from the side and in cross section,

Fig. 2 shows the stepped grate of Fig. 1 seen from above, and

Fig. 3 shows the stepped grate of Fig. 1 in a cross section along the lines III-III in Fig. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0007] The stepped grate beam 1, shown in Figs. 1-3 comprises a grate top 2 formed of two separate stepped grate top plates 2A and 2B mutually connected by welding 14 in the mainly vertically extending parts thereof. Between the two grate top plates 2A and 2B slots 13 provide primary air openings for admitting primary air from a primary air chamber positioned underneath the stepped grate beam 1.

[0008] A confinement 4 for heat transmission medium is provided in the form of U-formed plate elements 5A and 5B, the sides of which are cut in steps corresponding to the stepped grate tops 2A and 2B and welded to the underside of the grate top plates 2A and 2B, respectively, leaving a space between the two U-formed plate elements 5A and 5B, providing access for primary air to the primary air openings 13. A first dividing plate 6, formed in steps corresponding to the steps of the grate top plate 2 is positioned inside the confinement 4 in order to provide a mainly constant cross section for the flow of heat transmission medium immediately below the grate top 2. At a suitable position between the two ends of the stepped grate beam 1 a second dividing plate 7 is positioned underneath the first dividing plate 6 in order to divide the confinement for heat transmission medium underneath the first dividing plate 6 into an inlet chamber 8 and outlet chamber 9. The inlet chamber 8 is provided with an inlet connection 10 and the outlet chamber 9 is provided with an outlet connection 11 for supplying and draining of heat transmission medium to and from the confinement 4. As shown in Fig. 3, the two separate confinements 4A and 4B for heat transmission medium are connected in series by mutually connecting the outlet connection 11 from the confinement 4A to the inlet connection 10 of the confinement 4B. Naturally, other ways of connecting the inlet connections and the outlet connections 10 and 11, respectively can be used and the several stepped grate beams 1 positioned across a stepped grate can be connected in parallel and in series in any convenient way.

[0009] The series connection 12 is provided by means of a flexible tube in order to allow a certain expansion or subtraction due to temperature variations.

[0010] The stepped grate beam 1 shown in Fig. 1 is intended to be used for circulation of water or other liquid heat transmission medium and in order to remove possible air inside the confinement 4 during filling of the confinements with water or similar liquid heat transmission medium, an air escape system 15 in the form of a tube 16 extending inside the confinement 4 from the upper part thereof to a suitable position underneath the stepped grate beam 1 is provided. The outlet 17 from the tube 16 is provided with a valve to be opened to release air from the air escape system 15.

[0011] Referring to Fig. 2, it can be seen that the lateral surfaces of the stepped grate beam 1 are provided with wear plates 3, which, when the stepped grate beam 1 is positioned in a stepped grate, are positioned to be in slideable abutment against corresponding wear plates on neighbouring stepped grate beams 1.

[0012] An incineration or combustion plant comprising stepped grate beams 1 as described above, will normally comprise a number of grate sections, each having a plurality of grate beams extending obliquely downwards in the direction of movement of the fuel on top of the grate. Each of said grate sections may comprise stepped grate beams 1 in accordance with the present invention and the purpose of having a heat transmission medium circulating through said stepped grate beams 1 is primarily to equalize the temperature over the individual stepped grate beams 1 and secondarily to equalize the temperature over a grate section comprising such stepped grate beams 1. A further purpose of the circulation of heat transmission medium could be to either heat up or cool down the fuel on top of said stepped grate beam 1, in order to control the combustion of the fuel on the stepped grate section. Thus, in the infeed section, in which the fuel material is heated up and possibly dried, it may be advantageous to circulate hot heat transmission medium in the stepped grate beams 1, whereas in succeeding grate sections, in which the fuel is combusted, it may be advantageous to circulate heat transmission medium at a lower temperature. In this connection it may be advantageous to have the confinement for the heat transmission medium constructed to sustain relatively high pressures, so that water may be circulated at a temperature above 100° Celsius without boiling due to the fact that the pressure inside the confinement 4 is kept sufficiently high to prevent boiling of the water. Furthermore, it may be advantageous in certain circumstances to circulate other types of heat transmission medium in the stepped grate beams 1, such heat transmission mediums including different gases, such as atmospheric air, different types of heat transmission oils, water vapour, etc.

[0013] In the drawings the stepped grate beam 1 is shown to comprise two grate beam modules, each consisting of a stepped grate top 2A, 2B, two confinements for heat transmission medium 4A, 4B, etc. As shown in the drawings, the two grate beam modules A and B are provided in two different widths, and with these two widths three different widths of the resulting stepped grate beam 1 can be provided by combining two modules A, two modules A and B and two modules B and B, respectively. In a preferred embodiment the module width A and B are chosen to be approximately 170 mm and 130 mm, resulting in possible stepped grate beam widths of 260 mm, 300 mm and 340 mm, respectively. With this choice of module widths a grate section width can be constructed within 40 mm by suitably choosing stepped grate beams 1 among the above combinations as long as more than three stepped grate beams 1 are provided side by side in said grate section. Normally, the stepped grate beams positioned side by side are alternately stationary and movable in order to move the fuel on top of the grate forward inside the combustion chamber, i.e. downwards along the stepped grate.

[0014] Above the invention has been described in connection with a specific embodiment thereof, as indicated in the drawings, however many modifications may be envisaged by a man skilled in the art without departing from the following claims.

Claims

1. Stepped grate beam (1) for a combustion grate for an incineration or combustion plant, said plant comprising one or more grate sections having a plurality of grate beams (1) extending obliquely downwards in the direction of movement of the fuel on top of the grate, said grate beams (1) having a grate top (2) stepped downwardly in said direction and being placed with lateral surfaces (3) closely adjacent to each other across the width of the combustion grate, mutually adjacent grate beams (1) being relatively reciprocable in the longitudinal direction, said grate beam (1) being adapted for the passage therethrough of a heat transmission medium, **characterised in that** the confinement (4) of the heat transmission medium is provided by one or more in U-form bent plate elements (5), the sides of which are cut in steps corresponding to the stepped grate top (2) and welded to the underside of the grate top (2).

2. Stepped grate beam (1) in accordance with claim 1, **characterised by** further comprising a first dividing plate (6) inside each heat transmission medium confinement (4), said first dividing plate (6) being formed with steps corresponding to the grate top (2) and positioned at a constant distance from the said grate top (2) to provide a mainly constant cross section for the flow of heat transmission medium immediately below said grate top (2).

3. Stepped grate beam (1) in accordance with claim 2, **characterised by** further comprising a second di-

viding plate (7) dividing the volume below the first dividing plate (6) inside the confinement (4) into an inlet chamber (8) and an outlet chamber (9), said inlet and outlet chambers (8,9) being provided with inlet and outlet connections (10,11) positioned close to and on opposite sides of said second dividing plate (7), for supplying and draining of heat transmission medium to and from said confinement (4).

4. Stepped grate beam (1) in accordance with any of the preceding claims, **cha r- acterised** by each grate beam (1) comprising two confinements (4A, 4B) being connected in series (12) for the flow of the heat transmission medium through said confinements (4A, 4B).

5. Stepped grate beam (1) in accordance with claim 4, **characterised by** each grate beam (1) comprising primary air openings (13) in the form of series of longitudinally extending slots (13) positioned between the confinements (4A, 4B) and thus communicating with a primary air space below the grate (1) and positioned centrally in the grate top (2A, 2B).

6. Stepped grate beam (1) in accordance with claim 5, **characterised by** the slots (13) being provided in the mainly horizontally extending parts of the grate top (2A, 2B), preferably over the whole length of the horizontally extending parts thereof.

7. Stepped grate beam (1) in accordance with any of the preceding claims, **characterised by** each grate beam (1) being provided from two grate beam modules, each of said modules comprising a grate top (2A, 2B) and a confinement (4A, 4B) and being positioned relative to one another to provide the primary air opening (13) in the form of slots (13), and the mainly vertical parts of the stepped grate tops (2A, 2B) being mutually connected by welding in order to secure that the primary air slots (13) open only in the mainly horizontal surfaces of the grate tops (2A, 2B).

8. Stepped grate beam (1) in accordance with claim 7, **characterised by** the grate beam modules being provided in two widths A and B, and three different widths of grate beams (1) being provided by the combinations A+A; A+B and B+B, respectively.

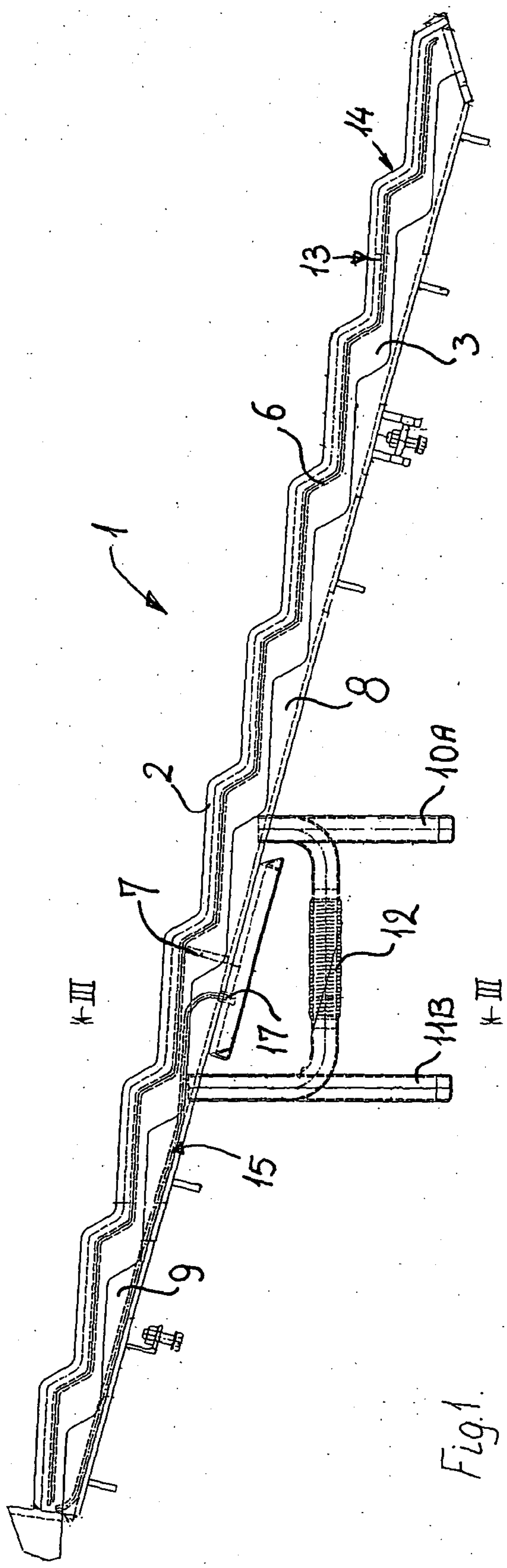
1
2
3
6
7
8
9
10A
11B
12
13
14
15
17
III
III

Fig.1.

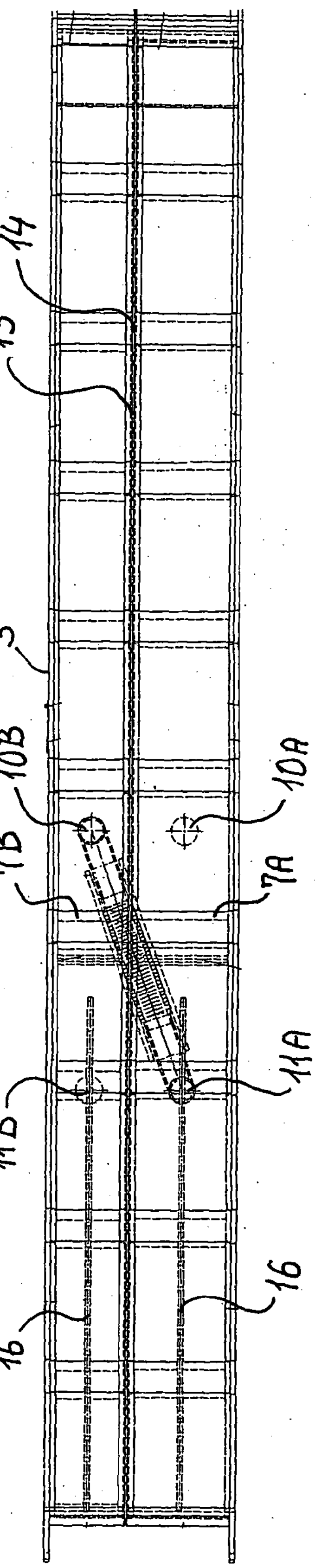
3
7A
7B
10A
10B
11A
11B
13
14
16
16

Fig.2.

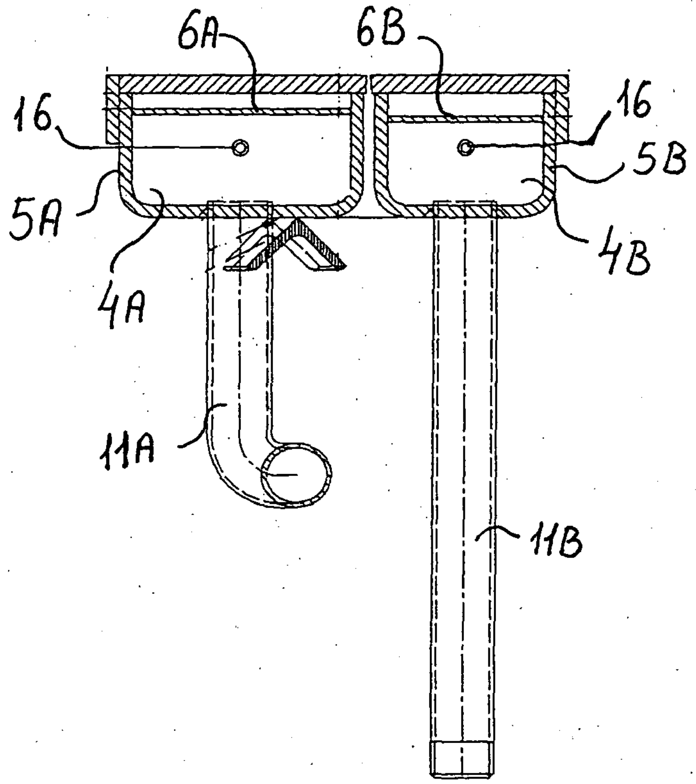

Fig.3.

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EUROPEAN SEARCH REPORT

Application Number
EP 07 01 7632

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	21 January 2008	Mougey, Maurice

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CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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Application Number
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