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(54) **ARRANGEMENT AND METHOD IN BOILER USING FLUIDIZED-BED TECHNOLOGY**

ANORDNUNG UND VERFAHREN FÜR WIRBELSCHICHTKESSEL

DISPOSITIF ET PROCÉDÉ POUR CHAUDIÈRE À LIT FLUIDISÉ

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Description

Background

[0001] The invention relates to an arrangement comprising a boiler using fluidized-bed technology.

[0002] The invention further relates to a method for a boiler using fluidized-bed technology.

[0003] In boilers using fluidized-bed technology, such as bubbling fluidized bed boilers (BFB), the temperature of the bed is adjusted to a required level by grate dimensioning, primary air volume and circulation gas. When using certain fuels, such as dry agro fuels, the volume of circulation gas may become very large, because the temperature of the fluidized bed typically needs to be kept at 600 to 750°C to prevent sintering.

[0004] The problem is that a large circulation gas volume decreases efficiency and increases the size of the convection part of the boiler and the internal consumption. Further, even though sintering is prevented in the fluidized bed, there is often also the problem of extensive fouling of the walls of the furnace by ash compounds melting in low temperature. Large ash layers may then fall into the fluidized bed and cause disruptions in the process, especially in the floating of the bed, in the removal of bottom ash and in emissions. The result is that the proportion of the agro fuels, for instance, need to be limited in the fuel and the degree of use of the plant may be poor. Document "Ein neues Wirbelschicht-Verbrennungs- verfahren zur thermischen ververtung von Abfallstoffen" by Steinruck P, in Chemie Ingenieur Technik, Wiley Vhc. Verlag, Weinheim; DE, vol. 61, no. 11, 1 Nov. 1989 (1989-11-01), pgs. 889-891, WP000133546, ISSN: 0009-286X, DOI: 10.1.1002/CITE.330611109 discloses an arrangement in a boiler using fluidized-bed technology. The disclosed boiler comprises two zones in its furnace and a partition wall therebetween.

Brief description

[0005] The arrangement and method of the invention are characterised by what is disclosed in the characterising parts of the independent claims. Other embodiments of the invention are characterised by what is disclosed in the other claims.

[0006] Inventive embodiments are also disclosed in the specification and drawings of this application.

[0007] The idea of the invention is that the boiler is divided by a partition wall and roof structure into two sections or spaces, in the first of which fuel is gasified and in the second of which the fuel is burned.

[0008] The advantage is that it is possible to use, even without limitations, fuels, the ash of which melts in low temperatures. Another advantage may be the flexibility of the boiler in relation to the fuels that can be burned in it. Yet another advantage may be a better efficiency and reduced internal consumption due to the fact, among other things, that less high-pressure air is required to maintain a smaller fluidized bed and that less sand mass is required, which means that the bed weighs less and the structure of the boiler can be correspondingly lightened.

[0009] The idea of an embodiment is that the arrangement comprises at least two first spaces that are arranged on different sides of a second space of a furnace. The advantage is that the arrangement can be efficiently applied to large-scale boilers.

[0010] The idea of an embodiment is that it comprises nozzles arranged at the bottom or in the bottom part of the second space of the furnace for feeding bottom air. The advantage is that any fuel that ends up at the bottom of the second space can be burned.

[0011] The idea of an embodiment is that the partition wall and/or roof structure is at least partly made of a membrane wall connected to the water/vapour circulation of the boiler. The advantage is that the recovery of thermal energy can be improved and the thermal expansions of the partition wall and/or roof structure can be controlled.

[0012] The idea of an embodiment is that the partition wall comprises a bend that increases the rigidity of the partition wall.

[0013] The idea of an embodiment is that the partition wall extends to a distance from the roof structure, whereby the gap between them forms a flow path. The advantage is that a flow path is achieved that has a low flow resistance.

[0014] The idea of an embodiment is that the partition wall and/or roof structure is at least partly made of a membrane wall connected to the water/vapour circulation of the boiler and that the membrane walls are connected to each other through a lattice pipe system, and the gaps in the lattice pipe system form the flow path. The advantage is that the recovery of thermal energy is boosted and a partition wall - roof structure having good strength is formed.

[0015] The idea of an embodiment is that the roof structure comprises a bottom surface that is arranged to ascend to the end of the roof structure, and a top surface that is arranged to descend to the end of the roof structure.

[0016] The advantage is that the bottom surface guides gases toward the second space and the top surface guides the residue falling from the walls of the second space to the bottom of the second space.

Brief description of the drawings

[0017] Some embodiments of the invention are explained in more detail in the accompanying drawings, in which

Figure 1 is a schematic sectional side view of an arrangement of the invention,

Figure 2 is a schematic view of an embodiment of a detail of the arrangement according to the invention in cross-section,

Figure 3a is a schematic sectional side view of a

second arrangement of the invention,

Figure 3b is a schematic view of the cross-section of the detail of the arrangement shown in Figure 3a, and

Figure 4 is a schematic sectional side view of a third arrangement of the invention.

[0018] For the sake of clarity, the figures show some embodiments of the invention in a simplified manner. In the figures, like reference numerals identify like elements.

Detailed description

[0019] Figure 1 is a schematic sectional side view of an arrangement and method of the invention.

[0020] In this embodiment, the boiler 10 is a bubbling fluidized bed boiler (BFB). The boiler 10 may be supported from below and/or the top.

[0021] A BFB boiler, like other boiler types based on fluidization, is especially well suited for burning so-called poor-grade fuels, such as wet biomasses, sludges, recycled fuels, and waste coals; naturally other fuels can also be used. According to an idea, the boiler is used in burning so-called agro fuels. An agro fuel refers to straw, straw pellets, palm oil waste or any other waste produced in agricultural production, for example. Agro fuels typically originate from fast-growing plants and, thus, contain lots of alkalis, chlorine and phosphor.

[0022] The boiler 10 comprises a furnace that is divided into two spaces: a first space 1 and a second space 2. The boiler also has, among other things, a flue gas channel and channels for feeding combustion air, fuel, reagents and other additives possibly needed in burning into the furnace 2. Thermal energy generated in the thermal process taking place in the boiler 10 can be recovered by means of walls formed of water pipes and other heat delivery surfaces. However, it should be noted that the figures do not show all details of the boiler 10 to simplify the presentation.

[0023] The path of the gas is shown by arrows G.

[0024] The first space 1 of the furnace comprises means known per se for forming 21 a fluidized bed, and from the second space 2, they are missing.

[0025] Fuel F is fed to the first space of the furnace with appropriate means that comprise, among other things, one or more feed channels 4. The feed channel 4 is preferably directed to the middle of the bottom 15 of the first space, whereby the entire surface area of the bottom 15 is utilized as well as possible.

[0026] The boiler 10 may be a front wall-fed furnace as shown in Figure 1 or a side wall-fed furnace.

[0027] The boiler 10 comprises nozzles 22 for feeding primary air and/or circulation gas into the first space 1 of the furnace. According to an idea, only an amount of air required for the fluidization and the gasification of the fuel is fed into the first space 1. The amount of necessary circulation gas is also rather small due to the small surface area of the grate in the first space. If necessary, the temperature of the first space 1 is adjusted with circulation gas in such a manner that it is below the sintering temperature, that is, typically below 750°C. Circulation gas comprises flue gases generated during the process in the boiler 10. According to an idea, a sub-stoichiometric state prevails in the first space 1 and its air coefficient may be 0.2 to 0.5, for instance, depending on the used fuel.

[0028] A partition wall 3 and roof structure 5 are arranged between the first space 1 and the second space 2. The partition wall 3 is at least mainly vertical, whereas the roof structure 5 arranged above the first space 1 forms a horizontally extending obstacle or space divider between the first space 1 and part of the second space 2 above it.

[0029] The partition wall 3 extends to a distance from the roof structure 5, whereby the gap between them forms a flow path 18. Gases rising from the fluidized bed can flow through the flow path 18 from the first part 1 to the second part 2 as shown by arrow G.

[0030] The partition wall 3 may have additional functional features, for instance in the partition wall shown in Figure 1, there is a bend 17 that increases the rigidity of the wall 3. The location, direction, shape, depth, and number of the bend may differ from the example shown in the figure.

[0031] According to an idea, the partition wall 3 is bent at its top toward the first part 1. It is then possible to use a shorter roof structure 5, which in turn increases the effective volume of the boiler.

[0032] The partition wall 3 may also naturally be straight without any specific functional shapes.

[0033] According to an idea, the height of the partition wall 3 is selected to only just prevent the fuel from flying over to the second space 2. In an embodiment, the height of the partition wall is approximately 5 m, when the height of the boiler is approximately 20 m. The wall surfaces of the first space 1 and thus also the partition wall 3 may comprise brickwork that extends to a height of 2.5 m, for instance.

[0034] According to another idea, the wall 3 is at least partly formed of a membrane wall 16 connected to the water/vapour circulation of the boiler 10. An example of the structure of the membrane wall is shown in Figure 2.

[0035] The roof structure 5 can also be at least partly formed of the membrane wall 16 connected to the water/vapour circulation of the boiler 10.

[0036] The wall 3 and roof structure 5 that comprise a membrane wall 16 provide the advantage that they boost the recovery of thermal energy in the boiler 10.

[0037] The partition wall 3 and/or roof structure 5 can naturally be implemented using different solutions, such as a plate structure or a combination of a plate structure and brickwork.

[0038] The roof structure 5 is preferably shaped to improve the natural flow of the gases G. Thus, the bottom surface 6 of the roof structure may be arranged to ascend

toward the end 20 of the roof structure and, on the other hand, the top surface 7 of the roof structure may be arranged to descend toward the end 20 of the roof structure.

[0039] According to an idea, the roof structure 5 covers the first space 1 of the furnace entirely; most preferably the roof structure 5 extends to some extent past the partition wall 3. When it is dimensioned in this way, the roof structure 5 prevents the fall of detaching ash layers and other layers into the fluidized bed from the top part of the furnace in the second space 2. According to an idea, the roof structure extends approximately 0.5 m or more past the partition wall 3.

[0040] The layers may detach by themselves or be detached by sweepers 11, such as hydraulic guns, vapour sweepers, and audio sweepers.

[0041] Designing the top surface 7 of the roof structure to slant downward toward the end 20 guides the detached layers to the bottom of the second space 2.

[0042] The roof structure 5 also prevents thermal radiation from the top part of the second space 2 to the fluidized bed, thanks to which the temperature of the fluidized bed or first space 1 is easier to keep sufficiently low. Further, the roof structure 5 may cause turbulence in the flow of the gas G, which boosts the mixing of the fuel and air and, therefore, burning.

[0043] The second space 2 of the furnace is the combustion section, into which the remaining combustion air is fed to burn the fuel. Air nozzles 9 for feeding secondary, tertiary and possible other higher airs are arranged in the second space 2; the second space may also have nozzles for feeding circulation gas, among other things. In the second space 2, the temperature may rise substantially higher than in the first space 1, to 1100° to 1400°, for instance. The air coefficient of the top part of the second space 2 may be over one, and the fuel is burned out there.

[0044] It should be noted that the fuel gasifies and may also partly burn already in the first space 1.

[0045] The walls of the second space 2 may scorify and/or foul due to melted ash. However, this does not cause problems, because the walls can be cleaned with above-mentioned sweepers 11.

[0046] The second space 2 may have a nose 8 guiding the flow of the flue gases.

[0047] A slag and ash removal system 12 to remove the fallen matter from the boiler 10 has been arranged at the bottom of the second space 2. The slag and ash removal system 12 may also be extended to the first part 1, as shown in Figure 1. According to another idea, the first space 1 has its own bottom ash removal system.

[0048] In addition, bottom air-feeding nozzles 24 can be arranged in the second space 2, at its bottom 23 or in its bottom part. With the bottom air fed through them, it is possible to burn any fuel particles that may fly there from the first space 1.

[0049] Flue gases are led from the second space 2 of the furnace away from the furnace to a so-called empty pass and on to thermal surfaces. The second space 2 of the furnace may have thermal surfaces, but this is not necessary.

[0050] **Figure** 2 is a schematic cross-sectional view of an embodiment of the partition wall and/or roof structure of the arrangement according to the invention.

[0051] As already stated earlier, the partition wall 3 and roof structure 5 may be at least partly formed of a membrane wall 16 connected to the water/vapour circulation of the boiler 10.

[0052] The membrane wall 16 typically comprises cooling pipes 13 arranged side by side and in the same direction and fastened to each other by fins 14. This type of gas-tight structure is known from furnace walls. The membrane wall 16 may be made by welding, for example. The structure of the membrane wall 16 can naturally also be made in some other way, for instance by directly joining adjacent cooling pipes 13 or by doing the opposite, that is, by increasing the width of the fin 14 in view of the embodiment shown in Figure 2.

[0053] Figure 3 is a schematic sectional side view of another arrangement and method of the invention, and Figure 3b is a schematic view of the cross-section of a detail of the arrangement.

[0054] In this arrangement, the partition wall 3 extends to the roof structure 5. Gas G flows from the first part 1 to the second part 2 through one or more openings 19 arranged in the partition wall 3. In other words, the flow path 18 is formed of one or more openings 19.

[0055] The openings 19 are formed of the cooling pipes 13 of the membrane wall 16, from the gaps of which the fins 14 are left out along a suitable length and which are grouped in a lattice form. The membrane walls of the partition wall 3 and roof structure 5 are then connected to each other. Figure 3b shows a possible lattice 25. The lattice 25 can naturally be of some other kind, as long as the cooling pipes 13 are arranged loosely so that the gases G can flow through them via the openings 19.

[0056] The cooling pipes 13 of the lattice 25 can be connected to the cooling pipes 13 of the partition wall 3 and/or roof structure 5 through collector chambers 26. By means of the collector chambers 26, the lattice 25 may be formed of cooling pipes 13, the diameter of which differs from that of the cooling pipes 13 of the membrane wall 16. In addition, the number of cooling pipes 13 forming the lattice 25 may differ from the number of cooling pipes 13 of the membrane wall 16 connected to the collector chambers 26.

[0057] In the solution shown in Figure 3a, the lattice 25 is directed obliquely downward by dimensioning the partition wall 3 and roof structure 5. The roof structure 5 forms a lid over the lattice 25 to prevent matter detached from the second space 2 from falling into the first space 1. A bend 17 toward the first space 1 in the wall below the lattice 25 stiffens the structure, increases the effective volume of the second space 2 and guides the matter detached from the second space 2 to the bottom 23 of the second space. The direction of the bend 17 is selected to be the most advantageous for the entity.

[0058] Figure 4 is a schematic sectional side view of a third arrangement and method of the invention.

[0059] The arrangement may comprise at least two first spaces 1 that are arranged on different sides of the second space 2 of the furnace. In the solution of Figure 4, there are two first spaces 1. The features of both first spaces 1 may be as already described above: both may have a fuel feed channel 4 connected to them, for example. This type of solution is especially advantageous for use in large boilers 10. The shapes and structure of the partition wall 3 and roof structure 5 may also be implemented in some other manner, for instance as in Figure 3a.

[0060] In some cases, features disclosed in this application may be used as such, regardless of other features. On the other hand, when necessary, features disclosed in this application may be combined in order to provide different combinations.

[0061] In summary, it can be noted that the arrangement of the invention is as defined in claim 1.

[0062] Further, it can be noted that the method of the invention is as defined in claim 16.

[0063] The drawings and the related description are only intended to illustrate the idea of the invention. It is apparent to a person skilled in the art that the invention is not restricted to the embodiments described above, in which the invention is described by means of some examples, but many modifications and different embodiments of the invention are possible within the scope of the inventive idea defined in the following claims.

Reference markings

[0064]

1	First space of furnace
2	Second space of furnace
3	Partition wall
4	Feed channel
5	Roof structure
6	Bottom surface
7	Top surface
8	Nose
9	Air nozzle
10	Boiler
11	Sweeper
12	Slag and ash removal system
13	Cooling pipe
14	Fin
15	Bottom of first space
16	Membrane wall
17	Bend of wall
18	Flow path
19	Opening
20	End of roof structure
21	Means for forming fluidized bed
22	Nozzles for primary air and/or circulation gas
23	Bottom of second space
24	Nozzles feeding bottom air
25	Lattice
26	Collector chamber
F	Fuel
G	Gas

Claims

1. An arrangement comprising a boiler using fluidized-bed technology, comprising
a first space (1) of a furnace that comprises means for forming a fluidized bed (21),
a second space of the furnace that does not have means for forming a fluidized bed,
means for feeding fuel into the furnace,
a partition wall (3) that is at least mainly vertical and arranged between said spaces (1, 2) of the furnace to separate them from each other, the arrangement further comprising
a roof structure (5) arranged above the first space of the furnace to separate the first space (1) of the furnace from parts of the second space (2) of the furnace above it,
the first space (1) of the furnace being connected to the second space (2) of the furnace through a flow path (18), the flow path (18) being arranged on the side of the first space (1) of the furnace to lead gases (G) rising from the fluidized bed to the second space (2) of the furnace, **characterised in that**
fuel is arranged to be fed by a fuel feed channel (4) connected to the first space (1) of the furnace.

2. An arrangement as claimed in claim 1, **characterised in that** the means for feeding fuel comprise a feed channel (4) that opens into the first space (1) of the furnace and are directed to the centre of the bottom (15) of the first space (1).

3. An arrangement as claimed in claim 1 or 2, **characterised in that** it comprises nozzles for feeding primary air and/or circulation gas into the first space (1) of the furnace.

4. An arrangement as claimed in any one of the preceding claims, **characterised in that** it comprises at least two first spaces (1) arranged on different sides of the second space (2) of the furnace.

5. An arrangement as claimed in any one of the preceding claims, **characterised in that** it comprises nozzles for feeding secondary and possible higher airs and/or circulation gas into the second space (2) of the furnace.

6. An arrangement as claimed in any one of the preceding claims, **characterised in that** it comprises

nozzles arranged at the bottom or in the bottom part of the second space (2) of the furnace for feeding bottom air.

7. An arrangement as claimed in any one of the preceding claims, **characterised in that** the partition wall (3) is at least partly formed of a membrane wall (16) connected to the water/vapour circulation of the boiler (10).

8. An arrangement as claimed in any one of the preceding claims, **characterised in that** the partition wall (3) comprises a bend (17) that increases the rigidity of the wall (3).

9. An arrangement as claimed in any one of the preceding claims, **characterised in that** the partition wall (3) extends to a distance from the roof structure (5), whereby the gap between them forms the flow path (18).

10. An arrangement as claimed in any one of claims 1 to 8, **characterised in that** the partition wall (3) extends to the roof structure (5), and that the flow path (18) is formed by one or more gaps (19) in the partition wall (3).

11. An arrangement as claimed in any one of the preceding claims, **characterised in that** the roof structure (5) covers the first space (1) of the furnace entirely.

12. An arrangement as claimed in any one of the preceding claims, **characterised in that** the roof structure (5) is at least partly formed of the membrane wall (16) connected to the water/vapour circulation of the boiler (10).

13. An arrangement as claimed in claim 12, **characterised in that** the partition wall (3) is at least partly formed of the membrane wall (16) connected to the water/vapour circulation of the boiler (10), that the membrane wall (16) of the roof structure (5) is connected to the membrane wall (16) of the partition wall (3) through a lattice (25), and that gaps between cooling pipes (13) of the lattice (25) form the flow path (18).

14. An arrangement as claimed in any one of the preceding claims, **characterised in that** the roof structure (5) comprises a bottom surface (6) that is arranged to ascend to the end (20) of the roof structure, and a top surface (7) that is arranged to descend to the end (20) of the roof structure.

15. An arrangement as claimed in any one of the preceding claims, **characterised in that** the boiler (10) is a bubbling fluidized-bed boiler (BFB).

16. A method for a boiler using fluidized-bed technology, including:

feeding fuel directly into a first space (1) of a furnace that comprises means (21) for forming a fluidized bed,
allowing gases rising from the fluidized bed move to a second space (2) of a furnace past a partition wall (3) and under a roof structure (5) arranged above the first space (1) of the furnace, the partition wall (3) being at least mainly vertical and arranged between said spaces (1, 2) of the furnace to separate them from each other, and the roof structure (5) being arranged to separate the first space (1) of the furnace from parts of the second space (2) of the furnace above it and not forming a fluidized bed in the second space (2) of the furnace.

17. A method as claimed in claim 16, **characterised in that** only an amount of air required for the fluidization and the gasification of the fuel is fed into the first space (1) of the furnace.

18. A method as claimed in claim 16, **characterised in that** fuel that comprises agro fuel is fed into the first space (1).

Patentansprüche

1. Anlage mit einem Kessel, die Wirbelschichttechnologie verwendet, aufweisend:

einem ersten Raum (1) eines Ofens, der eine Einrichtung zum Erzeugen einer Wirbelschicht (21) umfasst,
einem zweiten Raum des Ofens, der keine Einrichtung zum Erzeugen einer Wirbelschicht hat,
Einrichtungen zum Zuführen von Brennstoff in den Ofen,
einer Trennwand (3), die mindestens hauptsächlich vertikal und zwischen den Räumen (1, 2) des Ofens angeordnet ist, um sie voneinander zu trennen, wobei die Anlage ferner aufweist:

eine Dachstruktur (5), die über dem ersten Raum des Ofens angeordnet ist, um den ersten Raum (1) des Ofens von Teilen des zweiten Raums (2) des Ofens über ihm zu trennen,
wobei der erste Raum (1) des Ofens mit dem zweiten Raum (2) des Ofens durch einen Strömungspfad (18) verbunden ist, wobei der Strömungspfad (18) auf der Seite des ersten Raums (1) des Ofens angeordnet ist, um Gase (G), die von der Wirbelschicht aufsteigen, zu dem zweiten Raum

(2) des Ofens zu leiten, **dadurch gekennzeichnet, dass**
ein Brennstoff eingerichtet ist, durch einen Brennstoffzuführkanal (4) zuführbar zu sein, der mit dem ersten Raum (1) des Ofens verbunden ist.

2. Anlage nach Anspruch 1, **dadurch gekennzeichnet, dass** die Einrichtungen zum Zuführen von Brennstoff einen Zuführkanal (4) aufweisen, der zu dem ersten Raum (1) des Ofens hin offen ist, und zu der Mitte des Bodens (15) des ersten Raums (1) hin gerichtet sind.

3. Anlage nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** sie Düsen zum Zuführen von Primärluft und/oder Umlaufgas zu dem ersten Raum (1) des Ofens aufweist.

4. Anlage nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** sie mindestens zwei erste Räume (1) aufweist, die auf verschiedenen Seiten des zweiten Raums (2) des Ofens angeordnet sind.

5. Anlage nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** sie Düsen zum Zuführen von Sekundär- und möglicher höhergradiger Luft und/oder Umlaufgas zu dem zweiten Raum (2) des Ofens aufweist.

6. Anlage nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** sie Düsen aufweist, die an dem Boden oder in dem Bodenabschnitt des zweiten Raums (2) des Ofens zum Zuführen von Bodenluft angeordnet sind.

7. Anlage nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Trennwand (3) mindestens teilweise aus einer Membranwand (16) ausgebildet ist, die mit dem Wasser-/Dampfumlauf des Kessels (10) verbunden ist.

8. Anlage nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Trennwand (3) eine Krümmung (17) aufweist, die die Steifigkeit der Wand (3) erhöht.

9. Anlage nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** sich die Trennwand (3) zu einem Abstand von der Dachstruktur (5) erstreckt, wodurch der Spalt zwischen ihnen den Strömungspfad (18) ausbildet.

10. Anlage nach einem der Ansprüche 1 bis 8, **dadurch gekennzeichnet, dass** sich die Trennwand (3) zu der Dachstruktur (5) erstreckt, und dass der Strömungspfad (18) durch einen oder mehr Spalte (19) in der Trennwand (3) ausgebildet ist.

11. Anlage nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Dachstruktur (5) den ersten Raum (1) des Ofens ganz abdeckt.

12. Anlage nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Dachstruktur (5) mindestens teilweise aus der Membranwand (16) ausgebildet ist, die mit dem Wasser-/Dampfumlauf des Kessels (10) verbunden ist.

13. Anlage nach Anspruch 12, **dadurch gekennzeichnet, dass** die Trennwand (3) mindestens teilweise aus der Membranwand (16) ausgebildet ist, die mit dem Wasser-/Dampfumlauf des Kessels (10) verbunden ist, dass die Membranwand (16) der Dachstruktur (5) mit der Membranwand (16) der Trennwand (3) durch ein Gitter (25) verbunden ist, und dass Spalte zwischen Kühlrohren (13) des Gitters (25) den Strömungspfad (18) ausbilden.

14. Anlage nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Dachstruktur (5) eine Bodenfläche (6), die eingerichtet ist, zu dem Ende (20) der Dachstruktur aufzusteigen, und eine obere Fläche (7) aufweist, die eingerichtet ist, zu dem Ende (20) der Dachstruktur abzusteigen.

15. Anlage nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** der Kessel (10) ein blasenbildender Wirbelschichtkessel (BFB) ist.

16. Verfahren für einen Kessel, der Wirbelschichttechnologie verwendet, umfassend:

Zuführen eines Brennstoffs unmittelbar in einen ersten Raum (1) eines Ofens, der eine Einrichtung (21) zum Erzeugen einer Wirbelschicht umfasst,
Ermöglichen, dass sich Gase, die von der Wirbelschicht aufsteigen, zu einem zweiten Raum (2) des Ofens hinter einer Trennwand (3) und unter einer Dachstruktur (5) bewegen, die über dem ersten Raum (1) des Ofens angeordnet ist, wobei die Trennwand (3) mindestens hauptsächlich vertikal und zwischen den Räumen (1, 2) des Ofens angeordnet ist, um sie voneinander zu trennen, und wobei die Dachstruktur (5) eingerichtet ist, den ersten Raum (1) des Ofens von Teilen des zweiten Raums (2) des Ofens über ihr zu trennen und
Nicht-Erzeugen einer Wirbelschicht in dem zweiten Raum (2) des Ofens.

17. Verfahren nach Anspruch 16, **dadurch gekennzeichnet, dass** lediglich eine für das Wirbelschichtverfahren und die Vergasung des Brennstoffs benö-

tigten Luftmenge zu dem ersten Raum (1) des Ofens zugeführt wird.

18. Verfahren nach Anspruch 16, **dadurch gekennzeichnet, dass** ein Brennstoff, der Agrobrennstoff umfasst, zu dem ersten Raum (1) zugeführt wird.

Revendications

1. Agencement comprenant une chaudière utilisant la technologie à lit fluidisé, comprenant :

un premier espace (1) d'un four qui comprend des moyens destinés à former un lit fluidisé (21),
un second espace du four qui ne comporte pas de moyens destinés à former un lit fluidisé,
des moyens destinés à alimenter le four en combustible,
une cloison (3) qui est au moins principalement verticale et agencée entre lesdits espaces (1, 2) du four pour les séparer l'un de l'autre, l'agencement comprenant en outre
une structure de toit (5) agencée au-dessus du premier espace du four pour séparer le premier espace (1) du four des parties du second espace (2) du four au-dessus de celui-ci,
le premier espace (1) du four étant raccordé au second espace (2) du four à travers une veine d'écoulement (18), la veine d'écoulement (18) étant agencée sur le côté du premier espace (1) du four pour conduire des gaz (G) s'élevant du lit fluidisé vers le second espace (2) du four, **caractérisé en ce que**
du combustible est prévu pour être alimenté par un canal d'alimentation en combustible (4) raccordé au premier espace (1) du four.

2. Agencement selon la revendication 1, **caractérisé en ce que** les moyens d'alimentation en combustible comprennent un canal d'alimentation (4) qui débouche dans le premier espace (1) du four et sont dirigés vers le centre du fond (15) du premier espace (1).

3. Agencement selon la revendication 1 ou 2, **caractérisé en ce qu'**il comprend des buses pour alimenter le premier espace (1) du four en air primaire et/ou en gaz de circulation.

4. Agencement selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend au moins deux premiers espaces (1) agencés sur des côtés différents du second espace (2) du four.

5. Agencement selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend des buses pour alimenter le second espace (2) du four en air secondaire et éventuellement supérieur et/ou en gaz de circulation.

6. Agencement selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend des buses agencées au fond ou dans la partie de fond du second espace (2) du four pour alimenter de l'air de fond.

7. Agencement selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la cloison (3) est au moins en partie formée d'une paroi à membrane (16) raccordée à la circulation d'eau/de vapeur de la chaudière (10).

8. Agencement selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la cloison (3) comprend un coude (17) qui augmente la rigidité de la paroi (3).

9. Agencement selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la cloison (3) s'étend à une distance de la structure de toit (5), l'écart entre elles formant la veine d'écoulement (18).

10. Agencement selon l'une quelconque des revendications 1 à 8, **caractérisé en ce que** la cloison (3) s'étend vers la structure de toit (5), et **en ce que** la veine d'écoulement (18) est formée par un ou plusieurs écarts (19) dans la cloison (3).

11. Agencement selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la structure de toit (5) couvre entièrement le premier espace (1) du four.

12. Agencement selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la structure de toit (5) est au moins en partie formée de la paroi à membrane (16) raccordée à la circulation d'eau/de vapeur de la chaudière (10).

13. Agencement selon la revendication 12, **caractérisé en ce que** la cloison (3) est au moins en partie formée de la paroi à membrane (16) raccordée à la circulation d'eau/de vapeur de la chaudière (10), **en ce que** la paroi à membrane (16) de la structure de toit (5) est raccordée à la paroi à membrane (16) de la cloison (3) par l'intermédiaire d'un treillis (25), et **en ce que** des écarts entre des tuyaux de refroidissement (13) du treillis (25) forment la veine d'écoulement (18).

14. Agencement selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la structure de toit (5) comprend une surface de dessous (6) qui est agencée pour monter vers l'extrémité (20) de la structure de toit, et une surface de dessus (7)

qui est agencée pour descendre vers l'extrémité (20) de la structure de toit.

15. Agencement selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la chaudière (10) est une chaudière à lit fluidisé bouillonnant (CLFB).

16. Procédé pour une chaudière utilisant une technologie à lit fluidisé, comprenant les étapes suivantes :

alimenter directement un premier espace (1) d'un four en combustible qui comprend des moyens (21) destinés à former un lit fluidisé,
laisser des gaz s'élevant du lit fluidisé se déplacer vers un second espace (2) d'un four au-delà d'une cloison (3) et sous une structure de toit (5) agencée au-dessus du premier espace (1) du four, la cloison (3) étant au moins principalement verticale et agencée entre lesdits espaces (1, 2) du four pour les séparer l'un de l'autre, et la structure de toit (5) étant agencée pour séparer le premier espace (1) du four de parties du second espace (2) du four au-dessus de celui-ci et
ne pas former un lit fluidisé dans le second espace (2) du four.

17. Procédé selon la revendication 16, **caractérisé en ce que** seule une quantité d'air requise pour la fluidification et la gazéification du combustible alimente le premier espace (1) du four.

18. Procédé selon la revendication 16, **caractérisé en ce que** du combustible qui comprend un agro-combustible alimente le premier espace (1).

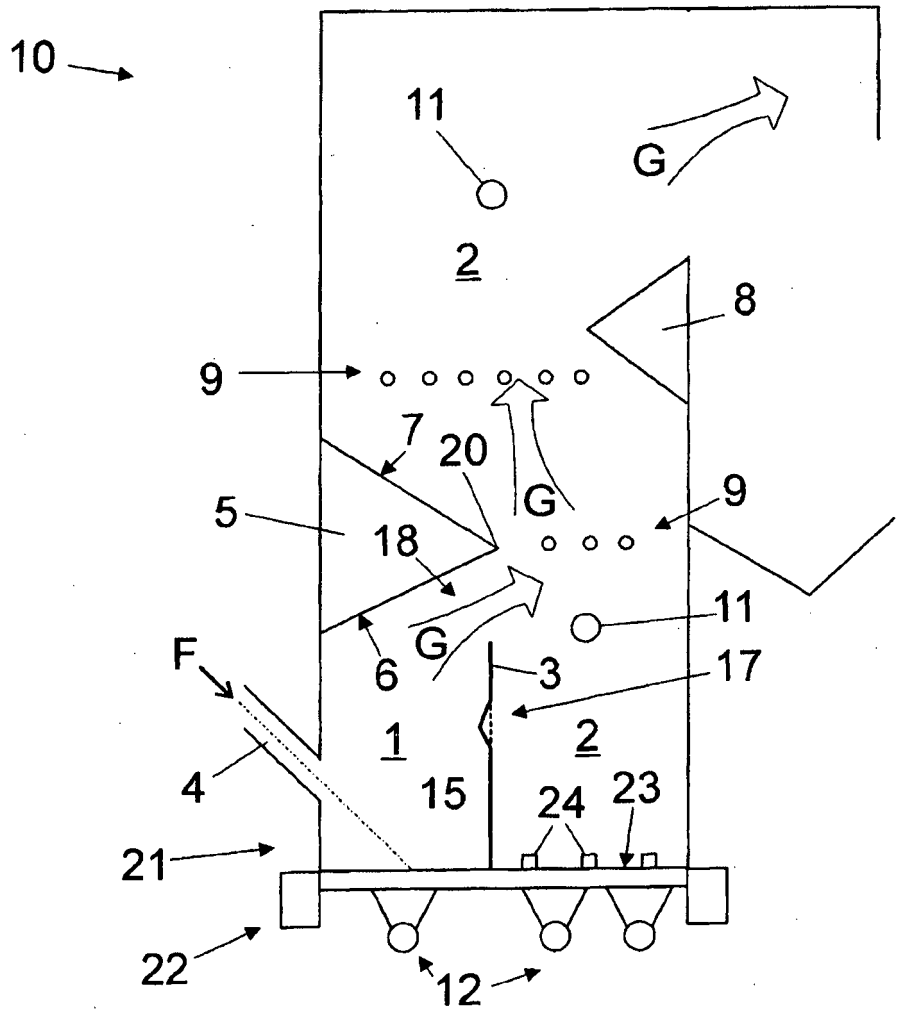

Fig. 1

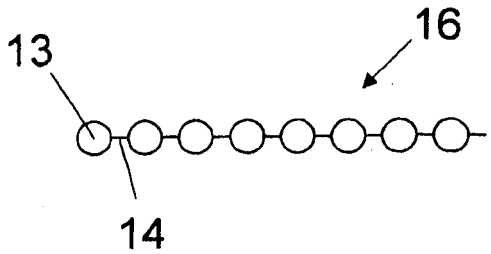

Fig. 2

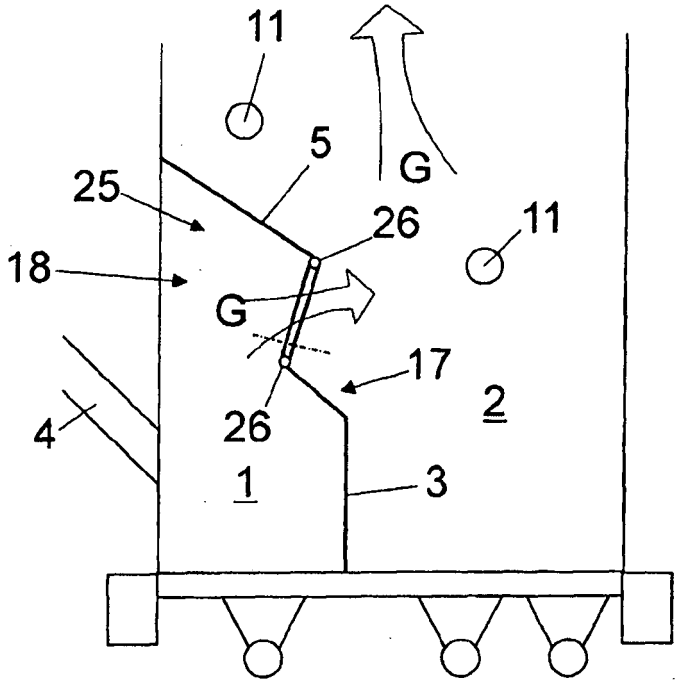

Fig. 3a

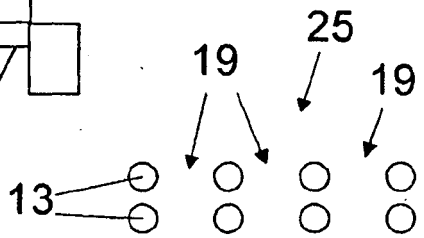

Fig. 3b

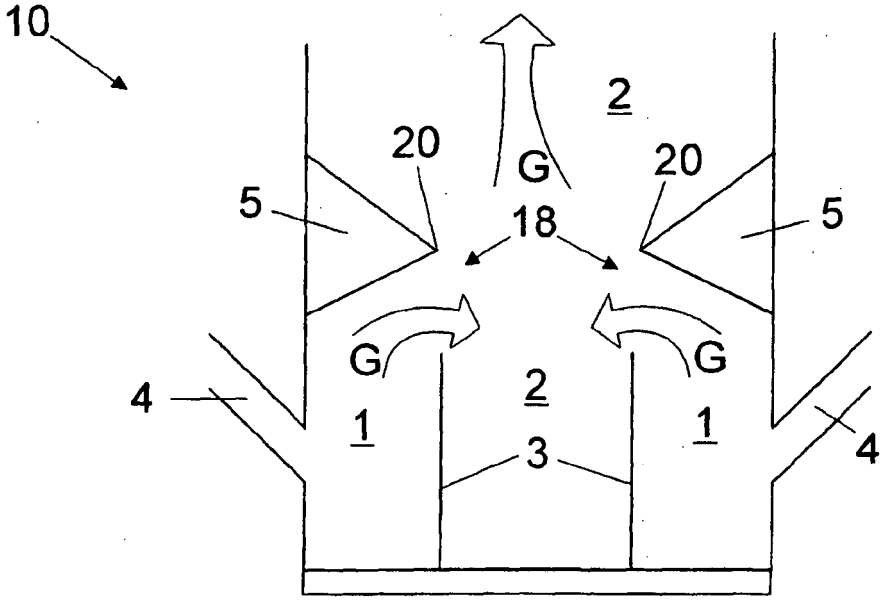

Fig. 4

REFERENCES CITED IN THE DESCRIPTION

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Non-patent literature cited in the description

- Ein neues Wirbelschicht-Verbrennungs- verfahren zur thermischen ververtung von Abfallstoffen. **STEINRUCK P.** Chemie Ingenieur Technik. Wiley, 01 November 1989, vol. 61, 889-891 **[0004]**