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(54) **METHOD AND DEVICE FOR READJUSTING THE HEAT TRANSFER SURFACE OF A FLUIDIZED BED**

VERFAHREN UND VORRICHTUNG ZUM ÄNDERN DER WÄRMEÜBERTRAGUNGSFLÄCHE EINES WIRBELBETTES

PROCEDE ET DISPOSITIF DE REAJUSTEMENT DE LA SURFACE DE TRANSFERT THERMIQUE D'UN LIT FLUIDISE

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- **PATENT ABSTRACTS OF JAPAN, Vol. 7, No. 291, M-265; & JP,A,58 164 914 (KAWASAKI JUKOGYO KK), 29 Sept 1983**

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Description

TECHNICAL FIELD

[0001] A PFBC power plant (Pressurized Fluidized Bed Combustion) is provided with a steam turbine for utilizing steam energy generated in a tube system immersed into a fluidized bed. A gas turbine is employed at the same time for utilizing the energy contents in flue gases formed during combustion in the bed. The invention relates to the problem of dimensioning the heat-transferring tube area of the tube system.

BACKGROUND ART

[0002] During combustion of particulate fuel, usually coal, in a pressurized fluidized bed of a PFBC power plant, the bed is supplied with combustion air in the form of compressed air from the pressure vessel which surrounds a bed vessel, wherein the fluidized bed is stored, via fluidization nozzles below the bed. The combustion gases which are formed during the combustion process are passed through a freeboard above the bed surface, whereupon they are cleaned and passed to a gas turbine. The combustion gases drive the gas turbine, which in turn drive a generator as well as a compressor which provides the pressure vessel with compressed air.

[0003] For cooling the bed to a temperature of the order of magnitude of 850°C, a steam generator in the form of a tube bundle, which constitutes a component in a steam system, is placed in the bed. In the tube bundle steam is generated, energy thus being obtained from the bed via the steam turbines to which the steam is led in the steam system. At full load, the entire tube bundle is situated within the bed. The cooling capacity of the tube bundle must be dimensioned to the power output from the bed to be able to maintain the correct bed temperature. At full load output from the plant, it is desired that both the steam turbine and the gas turbine are supplied with nominal power values for the respective turbine type, dimensioned for the plant. On the other hand, it is a difficult technical problem to dimension the steam turbine to the exactly nominally correct power value when designing a PFBC plant, that is, the design of the steam turbine. The dimensioning of the steam turbine is dependent on the fuel fineness, the moisture content of the fuel, the type of fuel, etc., whereby the dimensioning of the steam turbine entails an adaptation to each individual plant taking into consideration, inter alia, the properties of the fuel. A fundamental and difficult question to answer is how large a heat-transfer area is required in the tube bundle to achieve a certain desired steam production. At full load, the heat transfer to the tube bundle shall be designed such that the calculated desired nominal temperature of the combustion gases, which are to drive the gas turbine, at full bed height at the same time provides a nominal steam production in the tube bundle such that a 100 per cent power output from the gas turbine is obtained while at the same time a 100 per cent power output is obtained at the steam turbine.

[0004] The heat absorption in the bed is performed by the generation of steam in the steam generator shaped as a tube bundle. The steam production is controlled by the relationship

$$Q = k * A * \Delta T$$

where

- Q is the transferred quantity of heat
- ΔT is the locally driving temperature difference
- A is the installed area of the steam generator
- k is the heat-transfer coefficient

[0005] For the steam cycle in a PFBC power plant, the temperature difference cannot be freely influenced. The reason for this resides in factors associated with combustion engineering and especially environmental factors.

[0006] A constitutes the installed area of the steam generator in the PFBC plant and cannot be influenced without interfering in the plant.

[0007] The third parameter k can be influenced to a certain extent. However, it must be pointed out that the parameter k or that part of the parameter k which is related to the external heat-transfer coefficient is - from the engineering point of view - a difficult parameter to calculate with satisfactory accuracy and thus to take into account when dimensioning the steam generator. This means that when designing the steam generator for a PFBC plant, a certain inaccuracy in the area dimensioning must be accepted. In addition, the dimensioning of the steam generator requires that variation in the steam production due to, for example, the quality of the fuel is taken into consideration.

[0008] Another problem which should be observed is the uncertainty which arises because of the properties of the bed, over which technicians have moderate control. This includes, for example, variation of particle fineness or particle properties when the quality or composition of the fuel fluctuates, or when changing to firing of a somewhat different type of coal than what was originally intended when firing, for example, particulate coal, all of these examples resulting in a changed k-value with an ensuing incorrectly dimensioned heat transfer.

[0009] When adjusting a correct heat-transfer area in a fluidized bed, it has previously been necessary to increase or reduce the already-installed tube area, when it is found afterwards that the tube area is inaccurately dimensioned. This is costly.

[0010] Another way of solving the problem with dimensioning of the tube area of the tube system is disclosed in SE 91018820. According to this publication, the heat-transfer area of the steam generator is designed somewhat oversized in the bed of a PFBC power plant. In this way, a surplus of steam is generated in the steam system of the power plant. The surplus steam is discharged from the steam system downstream of the bed and is supplied to a preheater in the form of a heat exchanger, which the combustion air flows through upstream of the bed, a higher temperature thus being imparted to the combustion air included, which results in the power output from the gas turbine increasing. In this connection, an incorrectly dimensioned tube system may be corrected by transferring a variable quantity of energy to a gas system in which the gas turbine is included. A disadvantage of such a solution is that it entails installation of additional components and associated control equipment and thus makes the plant more complicated.

[0011] US-A-3 542 523 describes a fluidized bed combustion system comprising a number of peripheral pockets each having its own heat exchanger and air supply. The air supply can be individually activated or deactivated to control the cooling capacity.

SUMMARY OF THE INVENTION

[0012] The present invention is defined in claims 1,4,9 and 10. The heat-transfer area of the steam generator is designed somewhat oversized in the bed in a PFBC power plant. By then creating one or more non-fluidized zones in the bed during operation, the active heat-transfer tube area may be adjusted. A certain part of the tube area is rendered passive as regards heat transfer.

[0013] Defluidization is achieved in a very simple manner by shutting off the fluidizing air to the bed below a vertical channel where a defluidized zone is to be created. A barrier in the form of a shelf or a stop plate is installed near the lowermost level of the tube bundle, thus preventing fluidizing air from reaching the bed above the barrier. This results in the creation of an almost vertically standing defluidized zone above the barrier. The cross-section area of the zone in the horizontal direction is determined by the horizontal area of the barrier.

[0014] In the non-fluidized zones, no significant combustion takes place, since no, or a very limited, particle movement occurs. No, or very little, power is thus absorbed by tubes disposed in these non-fluidized zones. Tube surfaces which, by the actions described according to the invention, end up in non-fluidized zones will thereby not be heat-transfer areas. By creating non-fluidized zones with an adapted area, the too large heat-transfer area of the tube system may be compensated for by means of non-fluidized zones in the bed.

[0015] Most appropriately, these defluidized zones are created nearest the walls of the combustor by shutting off the fluidizing air as mentioned above and installing stop plates at the boiler walls in the vicinity of the lower level of a tube bundle.

[0016] Some of the advantages of readjusting the heat-transfer area of the tube system according to the invention are the following:

- the non-fluidized zones are achieved in a very simple manner, as already mentioned, for example by installing stop plates according to the embodiments,
- the extent of the defluidization and the reduction of the heat-transfer area, dependent thereon, of the tube system can be easily changed, and
- the actions described can be realized at low costs.

[0017] An additional advantage of the invention is that the risks of erosion on tube surfaces and boiler walls are reduced. Experience has shown a tendency to erosion in vertical channels in a fluidized wall, where no obstacles to a bed material flow in the vertical direction occur, as is the case precisely at a gap between tubes in a tube bundle and an adjacent boiler wall. The upwardly-rising flows of fluidizing gas and the flows of bed material may in these gaps reach high velocities, which results in a higher erosion effect on the wall and tube material close to the path of the flow. By placing the defluidized barriers according to the invention, for example in the form of stop plates, at the boiler walls near the lower level of the tube system, the occurrence of erosion-promoting gaps is prevented between tubes and boiler wall.

[0018] Still another advantage of the method according to the invention can be understood when considering the construction of the walls in the room which surrounds the bed. These walls consist of tube panels, which at the same time constitute a part of the walls of the combustor. These tube panels are traversed by water, included in the steam system of the plant. The water is usually heated in an economizer and is thereafter preheated further in the tube panels around the bed before the water is supplied to a steam generator in the bed. From the point of view of manufacturing, it is an advantage to be able to heat the water in the economizer to a high degree. If the heating is driven too far in the economizer, on the other hand, a risk of boiling of the water in the panel walls of the combustor arises. To overcome this problem, it has previously been necessary to insulate the walls of the bed in the combustor, for example by means of ceramics, to prevent too much heat from being transferred from the bed to the water in the tube panels around the bed. With the method according to the invention, an insulating layer is achieved by means of the non-fluidized zones along the walls of the bed, which layer provides the same effect as the above-mentioned installed extra ceramic insulation on the insides of the bed walls. If desired, this extra insulation may be excluded.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] Figure 1 schematically illustrates a view of a pressurized fluidized bed where the positions of the defluidizing devices according to the invention are shown.
[0020] Figure 2 shows the same view as Figure 1 with regions where non-fluidized zones are created between the tube bundle and the boiler wall by means of devices according to the invention marked as regions in the figure with heavier shading.
[0021] Figure 3 schematically shows a view of a pressurized fluidized bed where the positions of the defluidizing devices according to the invention are shown in a bed where two tube bundles create an intermediate gap and where a non-fluidized zone is created between two tube bundles by means of devices according to the invention, the non-fluidized region being marked in the figure as a region with heavier shading in the gap created between the tube bundles.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0022] A number of embodiments of the invention will be described with reference to the accompanying drawings.
[0023] In an overall figure (Figure 1), the central units of a PFBC power plant are represented, wherein a combustor 1 is housed in a pressure vessel 2. Air from a compressor (not shown) is supplied to the pressure vessel 2 via the air inlet 3 for pressurization of the pressure vessel 2 and hence also the combustor 1. The compressed air 4 is supplied to the combustor 1 via fluidization nozzles 5 at the bottom of the combustor for fluidization of a bed 6 accommodated in the combustor. The bed consists of bed material and of particulate fuel which is burnt in the fluidizing air 4 supplied to the bed 6. Combustion gases from the bed 6 pass through a freeboard above the surface of the bed and are forwarded via the outlet 8 for cleaning in dust separators, whereafter the combustion gases are expanded in a gas turbine (not shown), where the energy contents in the gases are transformed into useful energy.
[0024] In the fluidized bed 6, a tube bundle 10, which is completely immersed into the bed at full-load operation, is also shown. Water is supplied to the tube bundle 10 at 11 for cooling the bed 10 and further for generating steam in the tubes in the tube bundle. The steam is forwarded at 12 to a steam turbine (not shown) in a steam cycle in the plant.
[0025] According to the invention, the heat-transfer area of the tubes in the tube bundle 10 is made somewhat larger than what is justified to achieve a cooling of the bed which is sufficient to maintain the bed at an optimum working temperature.
[0026] According to the invention, the heat-transfer area of the tubes of the tube bundle 10 can then be reduced by installing a barrier or shield in the form of - in the simplest case - a shelf 15 near the lowermost level 14 of the tube bundle. The shelf is suitably located horizontally or almost horizontally and is connected to the boiler wall 16, that is, in this case to the wall of the combustor 1 and will thus block the inlet for a flow of fluidized bed material to a gap 17 shown between the tube bundle 10 and the boiler wall 16. As illustrated in Figure 2, an almost vertical channel 18 of non-fluidized bed material thus arises along the boiler wall 16. In this channel 18 no significant combustion takes place, since no transfer of fuel to the non-fluidized region takes place, which means that the tube surfaces which are situated within the vertical non-fluidized channel 18 will not function as heat-transfer areas to any significant extent. In this way, a reduction of an actively heat-transferring area in the tube bundle is achieved. The reduction of this heat-transfer area of the tube bundle 10 may then be chosen by means of adaptation of the area of the shelf 15 which shields off the region above the shelf from access to fluidizing air and thus creates a non-fluidized channel 18 of the desired magnitude.
[0027] To improve the function of the shielding by means of the shelf 15, the supply of fluidizing air 4 to fluidization nozzles 19, located below the shelf 15, is shut off.
[0028] In the simplest case, the shelf 15 consists of a plate which is attached to the boiler wall 16, for example by welding thereto. Other materials and other forms than a plate shelf plane may, of course, be used. For reasons of flow characteristics, other geometries of the barrier may be desirable. For example, shapes with triangular cross sections may be preferable.
[0029] In those cases where more than one tube bundle 10 occurs in a combustor 1, it may be justified to create defluidized zones in a similar manner as above in vertical gaps which occur between the various tube bundles. In this case, a shelf 15 is installed in a corresponding manner below the gap which occurs between two tube bundles. This leads to the creation of a non-fluidized zone 18 in the gap between the adjacent tube bundles.
[0030] In another, alternative embodiment of a defluidizing member 15, instead of a shelf 15 there may be arranged a low, preferably vertical, fixedly mounted partition which is applied near the lowermost tubes of the tube system (10), between the gap 17 and the tube system 10, while at the same time fluidizing air is not supplied below the gap 17 in the bed. Through this arrangement, non-fluidized ash and bed material will accumulate in a pocket between the partition and the boiler wall 16, whereby the accumulated material will serve as a defluidizing shelf similar to the shelf 15 described above.

Claims

1. A method for adjusting the heat-transferring tube area in an oversized tube system (10) immersed into

a fluidizing bed (6) in a power plant which comprises a combustor (1) with a fluidized bed (6) enclosed therein, wherein a fuel is burnt, where the bed is fluidized by means of air (4) which is supplied to the bottom of the bed via nozzles (5) and where the bed is cooled by means of a coolant which traverses the tube system (10), **characterized** in that the heat-transfer area of the tube system (10) is reduced to an optimum level by arranging, at the lowermost level of the tube system (10), fixedly mounted barrier members (15) which constantly prevent fluidization of the bed (6) in non-fluidized, essentially vertical channels (18) downstream of the barrier member (15), whereby the tube surfaces which are located within the non-fluidized channel (18) are not supplied with any heat and are thus made passive from the point of view of heat transfer.

2. A method according to claim 1, **characterized** in that the barrier members (15) are in the form of shelves or plates, wherein the cross-section area of the vertical non-fluidized channels (18), and hence the reduction of the heat-transfer area of the tube system, are determined by the area of the fluidization-preventing barrier members (15).

3. A method according to claim 2, **characterized** in that fluidizing air to the bed (6) is shut off at fluidization nozzles (19) located upstream of the fluidization-preventing barrier members (15).

4. A fluidized bed combustor (1) comprising means for adjusting the heat-transferring tube area in an oversized tube system (10) immersed into a fluidizing bed (6), wherein a fuel is burnt, enclosed in said combustor (1), wherein the bed is fluidized by means of air (4) which is supplied to the bottom at the bed via nozzles (5) and where the bed is cooled by means of a coolant which traverses the tube system (10), **characterized** in that said means for adjusting the heat-transferring tube area comprises barrier members (15) fixedly mounted at the lowermost level of the tube system (10), said barrier members constantly preventing fluidization of the bed (6) in non-fluidized, essentially vertical channels (18) downstream of the barrier member (15), whereby the tube surfaces which are located within the non-fluidized channel (18) are not supplied with any heat and are then made passive from the point of view of heat transfer, such that the heat-transfer area of the tube system (10) is reduced to an optimum level by means of said barrier members (15).

5. A fluidized bed combustor (1) according to claim 4, **characterized** in that the fluidization-preventing barrier member (15) consists of a shield or shelf which is applied essentially horizontally at the lowermost level of the tube system (10).

6. A fluidized bed combustor (1) according to claim 5, **characterized** in that the barrier member (15) is applied against the boiler wall (16) and hence creates a non-fluidized channel (18) in a gap (17) exhibited between the tube system (10) and the boiler wall (16).

7. A fluidized bed combustor (1) according to claim 5, **characterized** in that the barrier member (15) is applied essentially horizontally at the lowermost level of the tube system (10) at the gap which occurs between two tube bundles in the tube system (10) and hence creates a non-fluidized channel (18) in said gap.

8. A fluidized bed combustor (1) according to any of the claims 4-7, **characterized** in that the fluidization-preventing barrier member (15) consists of a plate.

9. A method for adjusting the heat-transferring tube area in an oversized tube system (10) immersed into a fluidizing bed (6) in a power plant which comprises a combustor (1) with a fluidized bed (6) enclosed therein, wherein a fuel is burnt, where the bed is fluidized by means of air (4) which is supplied to the bottom of the bed via nozzles (5) and where the bed is cooled by means of a coolant which traverses the tube system (10), **characterized** in that the heat-transfer area of the tube system (10) is reduced to an optimum level by arranging, at the lowermost level of the tube system (10), a fixedly mounted essentially vertically arranged partition, and by blocking the supply of air in the area between the partition and a wall (16) of the combustor (1), such that fluidization of the bed (6) is constantly prevented in non-fluidized, essentially vertical channels (18) downstream of said area between the partition and the wall, whereby the tube surfaces which are located within the non-fluidized channel (18) are not supplied with any heat and are thus made passive from the point of view of heat transfer.

10. A fluidized bed combustor (1) comprising means for adjusting the heat-transferring tube area in an oversized system (10) immersed into a fluidizing bed (6), wherein a fuel is burnt, enclosed in said combustor (1), wherein the bed is fluidized by means of air (4) which is supplied to the bottom at the bed via nozzles (5) and where the bed is cooled by means of a coolant which traverses the tube system (10), **characterized** in that said means for adjusting the heat-transferring tube area comprises an essentially vertically arranged partition, fixedly mounted at the lowermost level of the tube system (10), wherein the air supply is arranged such that the supply of air is blocked in the area between the partition and a wall (16) of the combustor (1), such that fluidization of the bed (6) is constantly prevented in non-fluidized, essentially vertical channels (18) downstream of the area between the partition and the wall (16), whereby the tube surfaces which are located within the non-fluidized channel (18) are not supplied with any heat and are then made passive from the point of view of heat transfer, such that the heat-transfer area of the tube system (10) is reduced to an optimum level.

Patentansprüche

1. Regulierverfahren für einen Wärmeübertragungsrohrbereich in einem übergroßen in einem in einer Wirbelschicht niedergesenkten Rohrsystem eines Kraftwerkes, das einen Brenner (1) mit einer darin angeordneten Wirbelschicht (6) enthält, in der ein Brennstoff verbrannt wird, wobei die Schicht mit Hilfe von Luft (4) verwirbelt wird, die der Schicht am Boden der Schicht über Düsen (5) zugeleitet wird, und die Schicht mit Hilfe eines das Rohrsystem durchströmenden Kühlmittels gekühlt wird, **dadurch gekennzeichnet**, daß der Wärmeübertragungsbereich des Rohrsystemes (10) auf eine optimale Größe verkleinert wird, indem im untersten Bereich des Rohrsystemes (10) fest montierte Sperrteile (15) angeordnet werden, die ständig verhindern, dal3 die Schicht (6) in nichtdurchwirbelten, im wesentlichen lotrechten Kanälen (18) stromabwärts der Sperrteile (15) durchwirbelt wird, wodurch die innerhalb der nichtdurchwirbelten Kanäle (18) liegenden Rohroberflächen nicht mit Wärme beaufschlagt werden und daher in Bezug auf die Wärmeübertragung passiv verbleiben.

2. Verfahren gemäß Patentanspruch 1, **dadurch gekennzeichnet**, daß die Sperrteile (15) die Gestalt von Regalen oder Platten haben, wobei der Querschnitt der lotrechten, nichtdurchwirbelten Kanäle (18) und somit die Verringerung des Wärmeübertragungs - bereiches des Rohrsystemes von der Fläche der die Durchwirbelung verhindernden Sperrteile (15) bestimmt werden.

3. Verfahren gemäß Patentanspruch 1, **dadurch gekennzeichnet**, daß die Wirbelluft zur Schicht (6) an stromaufwärts der die Durchwirbelung verhindernden Sperrteile (15) liegenden Wirbeldüsen (19)gesperrt wird.

4. Wirbelschichtbrenner (1) mit einem Teil, der den Wärmeübertragungsrohrbereich eines übergroßen in einem in einer Wirbelschicht (6) niedergesenktes Rohrsystemes (10) reguliert, in der ein in diesem Brenner (1) vorliegender Brennstoff verbrannt wird, wobei die Schicht mit Hilfe von Luft (4) verwirbelt wird, die der Schicht am Boden der Schicht über Düsen (5) zugeleitet wird und die Schicht mit Hilfe eines das Rohrsystem durchströmenden Kühlmittels gekühlt wird, **dadurch gekennzeichnet**, daß dieser Regulierteil für den Wärmeührtragungsrohrbereich im untersten Bereich des Rohrsystemes (10) fest montierte Sperrteile (15) umfaßt, die ständig verhindern, daß die Schicht (6) in nichtdurchwirbelten, im wesentlichen lotrechten Kanälen (18) stromabwärts des Sperrteiles (15) durchwirbelt wird, wodurch die innerhalb der nichtdurchwirbelten Kanäle (18) liegenden Rohroberflächen nicht mit Wärme beaufschlagt werden und daher im Hinblick auf die Wärmeübertragung passiv verbleiben, wodurch der Wärmeübertragungsbereich des Rohrsystemes (10) auf eine optimale Größe mit Hilfe dieser Sperrteile (15) verkleinert wird.

5. Wirbelschichtbrenner (1) gemäß Patentanspruch 4, **dadurch gekennzeichnet**, daß der die Durchwirbelung verhindernden Sperrteil (15) aus einem Wehr oder Regal besteht, das im wesentlichen horizontal im untersten Bereich des Rohrsystemes (10) angeordnet ist.

6. Wirbelschichtbrenner (1) gemäß Patentanspruch 5, **dadurch gekennzeichnet**, daß der Sperrteil (15) gegen die Kesselwand (16) gelehnt wird und dadurch einen nichtdurchwirbelten Kanal (18) in einem zwischen dem Rohrsystem und der Kesselwand (16) liegenden Spalt (17) bildet.

7. Wirbelschiehtbrenner (1) gemäß Patentanspruch 5, **dadurch gekennzeichnet**, daß der Sperrteil (15) im wesentlichen horizontal im untersten Bereich des Rohrsystemes (10) an dem Spalt, der zwischen zwei Rohrbündeln des Rohrsystemes (10) entsteht angeordnet wird und dadurch einen nichtdurchwirbelten Kanal (18) in diesem Spalt bildet.

8. Wirbelschichtbrenner (1) gemäß irgendeinem der Patentansprüche 4 bis 7, **dadurch gekennzeichnet**, daß der die Durchwirbelung verhindernden Sperrteil (15) aus einer Platte besteht.

9. Regulierverfahren für einen Wärmeühertragungsrohrbereich in einem übergroßen in einem in einer Wirhelschicht niedergesenkten Rohrsystem eines Kraftwerkes, das einen Brenner (1) mit einer darin angeordneten Wirbelschicht (6) enthält, in der ein Brennstoff verbrannt wird, wobei die Schicht mit Hilfe von Luft (4) verwirbelt wird, die der Schicht am Boden der Schicht über Düsen (5) zugeleitet wird und die Schicht mit Hilfe eines das Rohrsystem (10) durchströmenden Kühlmittels gekühlt wird, **dadurch gekennzeichnet**, daß der Wärmeübertragungsbereich des Rohrsystemes (10) auf eine optimale Größe verkleinert wird, indem im untersten Bereich des Rohrsystemes (10) eine fest montierte

Trennwand angeordnet wird, und indem die Luftzufuhr zum Bereich zwischen der Trennwnd und einer Wand (16) des Brenners (1) gesperrt wird, sodaß die Durchwirbelung des Bettes (6) ständig in nichtdurchwirbelten, im wesentlichen lotrechten Kanälen (18) stromabwärts dieses Bereiches zwischen der Trennwand und der Wand verhindert wird, wodurch die innerhalb der nichtdurchwirbelten Kanäle (18) liegenden Rohroberflächen nicht mit Wärme beaufschlagt werden und daher im Hinblick auf die Wärmeübertragung passiv verbleiben.

10. Wirbelschichtbrenner (1) mit einem Teil, der den Wärmeübertragungsrohrbereich eines übergroßen in einem in einer Wirbelschicht (6) niedergesenktes Rohrsystemes (10) reguliert, in der ein in diesem Brenner vorliegender Brennstoff verbrannt wird, wobei die Schicht mit Hilfe von Luft (4) verwirbelt wird, die der Schicht am Boden der Schicht über Düsen (5) zugeleitet wird und die Schicht mit Hilfe eines das Rohrsystem (10) durchströmenden Kühlmittels gekühlt wird, **dadurch gekennzeichnet,** daß dieses Regulierteil für den Wärmeübertragungsrohrbereich eine im wesentlichen lotrechte, im untersten Bereich des Rohrsystemes (10) fest montierte Trennwand umfaßt, wobei die Luftzufuhr so angeordnet ist, daß die Luftzufuhr im Bereich zwischen der Trennwand und der Wand (16) des Brenners (1) gesperrt wird, sodaß die Durchwirbelung des Bettes (6) ständig in nichtdurchwirbelten, im wesentlichen lotrechten Kanälen (18) stromabwärts dieses Bereiches zwischen der Trennwand und der Wand verhindert wird, wodurch die innerhalb der nichtdurchwirbelten Kanäle (18) liegenden Rohroberflächen nicht mit Wärme beaufschlagt werden und daher im Hinblick auf die Wärmeübertragung passiv verbleiben, sodaß der Wärmeübertragungsbereich des Rohrsystemes (10) auf eine optimale Größe verkleinert wird.

Revendications

1. Procédé pour ajuster l'aire de section transversale d'un tube de transfert thermique dans un système (10) de tube surdimensionné immergé dans un lit (6) fluidisé dans une centrale électrique qui comporte une chambre (1) de combustion ayant enfermée en son sein un lit (6) fluidisé, dans lequel un combustible est brûlé, le lit étant fluidisé au moyen d'air (4) qui est fourni au fond du lit par des buses (5) et le lit étant refroidi au moyen d'un agent de refroidissement qui traverse le système (10) de tube, **caractérisé en ce que** l'aire de section transversale de transfert thermique du système (10) de tube est réduite à un niveau optimum en agençant, au niveau le plus inférieur du système (10) de tube, des éléments (15) formant barrières montés de manière fixe qui empêchent de manière constante la fluidisation du lit (6) dans des canaux (18) sensiblement verticaux non fluidisés en aval de l'élément (15) formant barrière, grâce à quoi les surfaces de tube qui se trouvent à l'intérieur du canal (18) non fluidisé ne reçoivent pas du tout de chaleur et sont ainsi rendues passives du point de vue du transfert thermique.

2. Procédé suivant la revendication 1, **caractérisé en ce que** les éléments (15) formant barrières sont sous la forme de plaques ou plateaux dans lequel l'aire de section transversale des canaux (18), verticaux non fluidisés et, par conséquent, la réduction de l'aire de section transversale de transfert thermique du système de tube, sont déterminées par l'aire de section transversale des éléments (15) formant barrières empêchant la fluidisation.

3. Procédé suivant la revendication 2, **caractérisé en ce que** l'alimentation en air de fluidisation vers le lit (6) est fermée au niveau de buses (19) de fluidisation qui se trouvent en amont des éléments (15) formant barrières empêchant la fluidisation.

4. Chambre (1) de combustion à lit fluidisé comportant des moyens destinés à ajuster l'aire de section transversale du tube de transfert thermique dans un système (10) de tube surdimensionné immergé dans un lit (6) fluidisé, dans lequel un carburant est brûlé, enfermé dans la chambre (1) de combustion, dans laquelle le lit est fluidisé au moyen d'air (4) qui est fourni au fond du lit par l'intermédiaire de buses (5) et où le lit est refroidi au moyen d'un agent de refroidissement qui traverse le système (10) de tube, **caractérisée en ce que** les moyens destinés à ajuster l'aire de section transversale du tube de transfert thermique comportent des éléments (15) formant barrières montés de manière fixe au niveau le plus inférieur du système de tube (10), les éléments formant barrières empêchant de manière constante la fluidisation du lit (6) dans des canaux (18) sensiblement verticaux non fluidisés en aval de l'élément (15) formant barrière, grâce à quoi les surfaces de tube qui se trouvent à l'intérieur du canal (18) non fluidisé ne reçoivent aucune chaleur et sont ainsi rendues passives du point de vue du transfert thermique, de sorte que l'aire de section transversale de transfert thermique du système (10) de tube est réduite à un niveau optimum au moyen d'éléments (15) formant barrières.

5. Chambre (1) de combustion à lit fluidisé suivant la revendication 4, **caractérisée en ce que** l'élément (15) formant barrière empêchant la fluidisation est constitué d'un plateau ou d'un écran qui est appliqué sensiblement horizontalement au niveau le plus inférieur du système (10) de tube.

6. Chambre (1) de combustion à lit fluidisé suivant la revendication 5, **caractérisée en ce que** l'élément (15) formant barrière est appliqué contre la paroi (16) de chaudière et, par conséquent, créé un canal (18) non fluidisé dans un interstice (17) présent entre le système (10) de tube et la paroi (16) de chaudière.

7. Chambre (1) de combustion à lit fluidisé suivant la revendication 5, **caractérisée en ce que** l'élément (15) formant barrière est appliqué sensiblement horizontalement au niveau le plus inférieur du système (10) de tube à l'interstice qui apparaît entre deux faisceaux de tubes dans le système (10) de tube et créé, par conséquent, un canal (18) non fluidisé dans ledit interstice.

8. Chambre (1) de combustion à lit fluidisé suivant l'une quelconque des revendications 4 à 7, **caractérisée en ce que** l'élément (15) formant barrière empêchant la fluidisation est constitué d'une plaque.

9. Procédé pour ajuster l'aire de section transversale d'un tube de transfert thermique dans un système (10) de tube surdimensionné immergé dans un lit (6) fluidisé dans une centrale électrique qui comporte une chambre (1) de combustion ayant enfermée en son sein un lit (6) fluidisé, dans lequel un combustible est brûlé, où le lit est fluidisé au moyen d'air (4) qui est fourni au fond du lit par l'intermédiaire de buses (5) et où le lit est refroidi au moyen d'un agent de refroidissement qui traverse le système (10) de tube, **caractérisé en ce que** l'aire de section transversale de transfert thermique du système (10) de tube est réduite à un niveau optimum en agençant, au niveau le plus inférieur du système (10) de tube, une cloison agencée sensiblement verticalement et montée de manière fixe, et en bloquant l'alimentation en air dans l'aire de section transversale entre la cloison et une paroi (16) de la chambre (1) de combustion, de sorte que la fluidisation du lit (6) est empêchée de manière constante dans des canaux (18) sensiblement verticaux non fluidisés en aval de l'aire de section transversale entre la cloison et la paroi, grâce à quoi les surfaces de tube qui se trouvent à l'intérieur du canal (18) non fluidisé ne reçoivent aucune chaleur et sont ainsi rendues passives du point de vue du transfert thermique.

10. Chambre (1) de combustion à lit fluidisé comportant des moyens destinés à ajuster l'aire de section transversale de tube de transfert thermique dans un système (10) surdimensionné immergé dans un lit (6) fluidisé, dans lequel un combustible est brûlé, enfermé dans la chambre (1) de combustion, dans lequel le lit est fluidisé au moyen d'air (4) qui est fourni au fond du lit par des buses (5) et où le lit est refroidi au moyen d'un agent de refroidissement qui traverse le système (10) de tube, **caractérisée en ce que** lesdits moyens destinés à ajuster l'aire de section transversale de tube de transfert thermique comporte une cloison agencée sensiblement verticalement, montée de manière fixe au niveau le plus inférieur du système (10) de tube, dans lequel l'alimentation en air est agencée de sorte que l'alimentation en air est bloquée dans l'aire de section transversale entre la cloison et une paroi (16) de la chambre (1) de combustion, de sorte que la fluidisation du lit (6) est empêchée de manière constante dans des canaux (18) non fluidisés sensiblement verticaux en aval de l'aire de section transversale entre la cloison et la paroi (16), grâce à quoi les surfaces de tube qui se trouvent à l'intérieur du canal (18) non fluidisé ne reçoivent aucune chaleur et sont ainsi rendues passives du point de vue du transfert thermique, de sorte que l'aire de section transversale de transfert thermique du système (10) de tube est réduite à un niveau optimum.

Fig 1

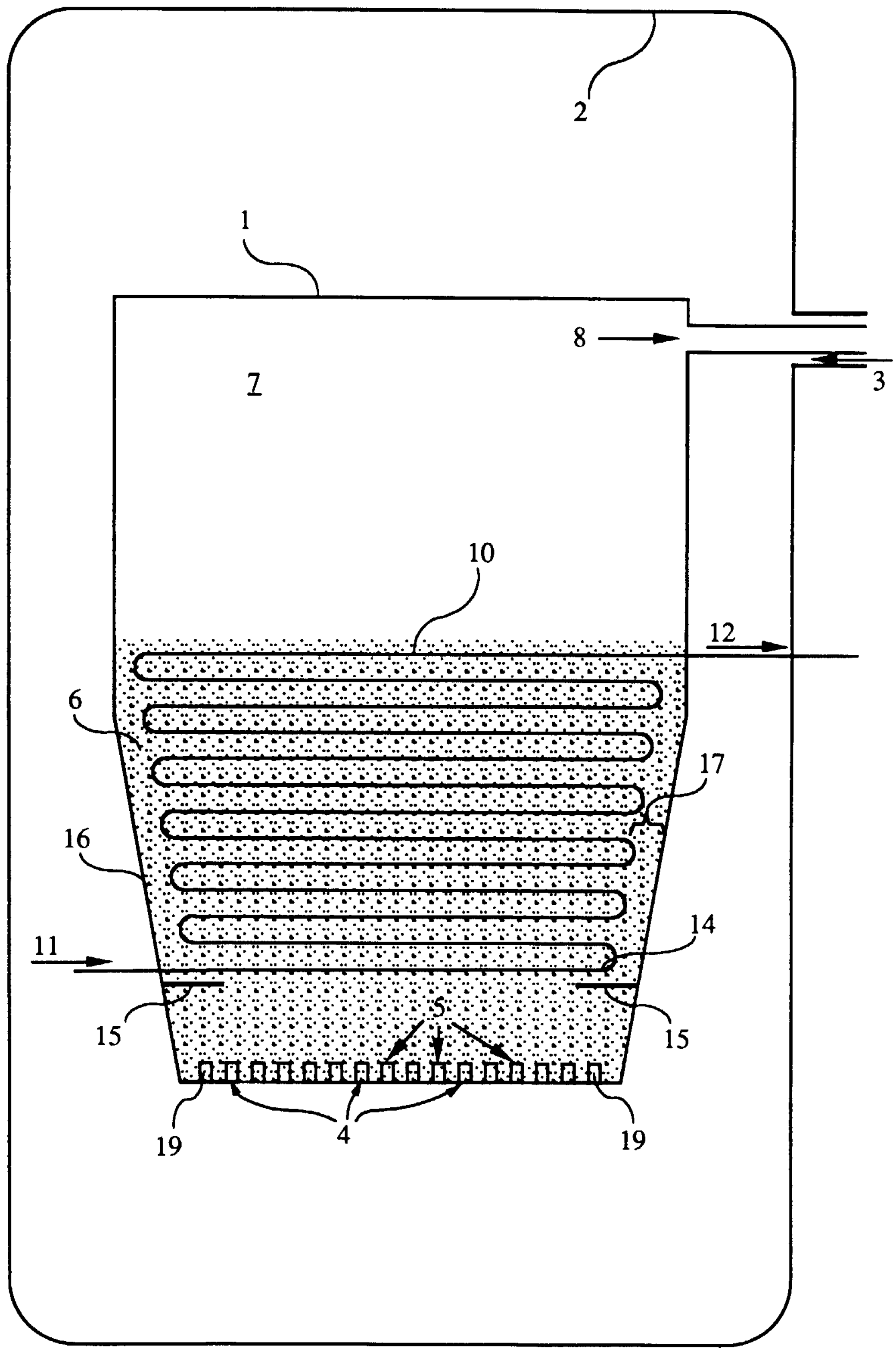

Fig 2

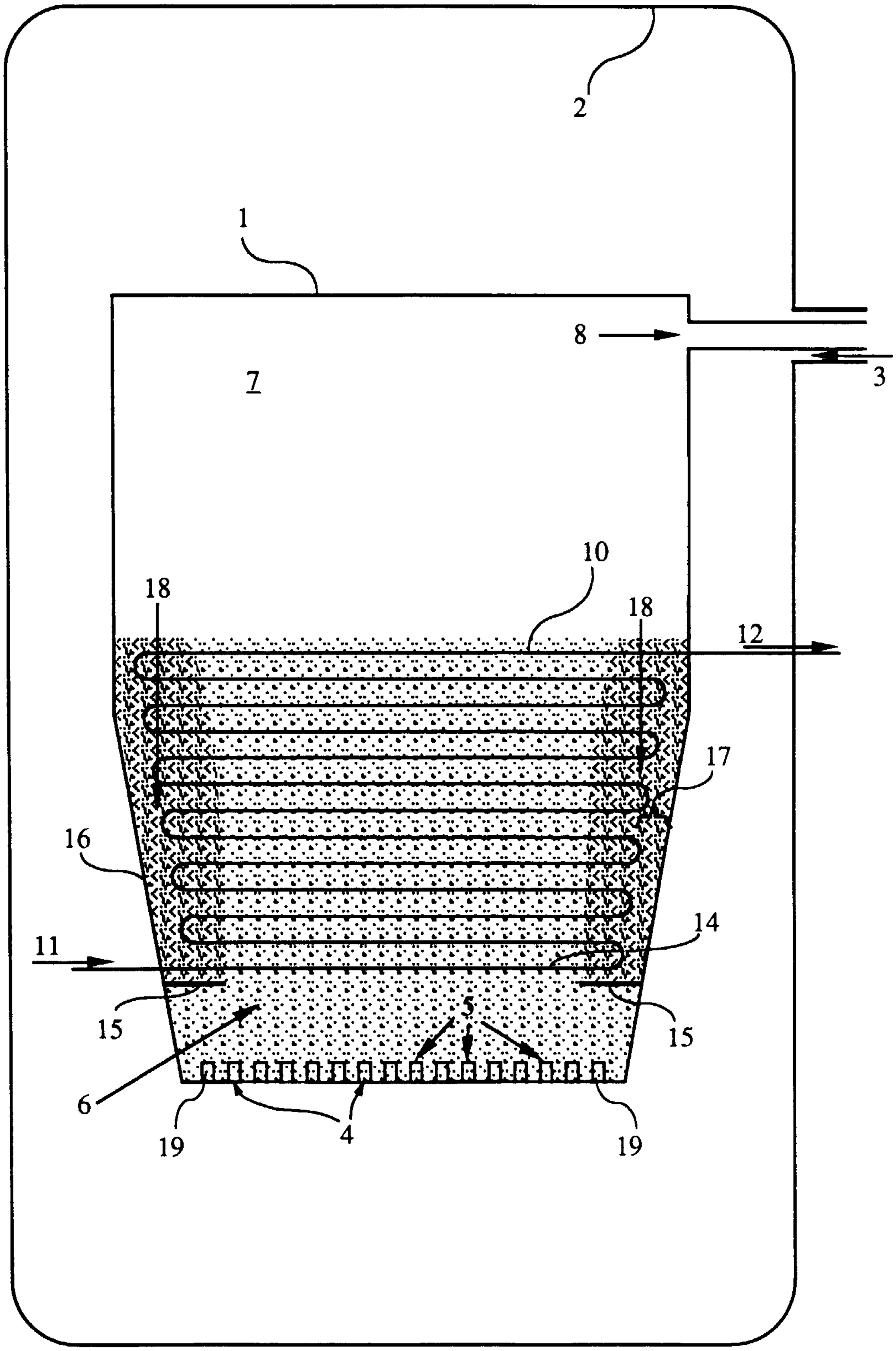

Fig 3