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(54) **BOILER WATER CYCLE OF A FLUIDIZED BED REACTOR AND A FLUIDIZED BED REACTOR
WITH SUCH BOILER WATER CYCLE**

KESSELWASSERKREISLAUF FÜR EINEN WIRBELBETTREAKTOR UND WIRBELBETTREAKTOR
MIT SOLCH EINEM KESSELWASSERKREISLAUF

CIRCUIT D'EAU DANS UN RÉACTEUR À LIT FLUIDISÉ ET RÉACTEUR À LIT FLUIDISÉ MUNI D'UN
TEL CIRCUIT D'EAU

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US-A- 3 863 606 US-A- 4 183 330**

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Description

[0001] The present invention relates to a boiler water cycle of a fluidized bed boiler (FB boiler) and to a fluidized bed boiler having such a boiler water cycle in accordance with the introductory part of claim 1. The invention especially relates to a boiler water cycle of a 400 MW_e supercritical circulating fluidized bed boiler (CFB) operating on a once-through principle.

[0002] In FB boilers, as in any other thermal power boilers, evaporation, i.e. boiling, of the preheated inlet water takes place mainly by means of water tube panels in the outer walls of a boiler furnace. The water to be evaporated is mostly led either from the steam drum of a drum boiler or from the preheating surfaces for water in a once-through utility boiler to the lower part of the boiler by one or more drop legs. The drop leg is usually connected to a number of inlet ducts, by means of which water is introduced to inlet headers arranged below the furnace, which inlet headers have a length corresponding to the width of the furnace walls. Water tubes in the water tube panels of the outer walls of the furnace in turn are connected to the inlet headers to heat up and evaporate water in the water tubes. The water tubes of the outer walls are connected from the upper end to outlet headers and pipings, by means of which steam is led further to water separation and super heating.

[0003] In order to be able to guarantee uniform distribution of water in the water tubes of the water tube panel, the drop leg is usually connected to a large number of inlet ducts, which are connected from one end approximately at equal intervals to the whole length of the inlet headers. Once-through utility boilers, which have such a large number of inlet ducts, are disclosed, for example, in patent specifications US 4,290,389, US 3,399,656 and US 3,369,526. US 4,183,330 discloses an example of an FB boiler, having a number of inlet lines connecting drop legs of a steam drum to an annular inlet header introducing water to the wall tubes of the furnace.

[0004] Publication EP 0 064 092 A1 discloses a fluidized bed boiler with a boiler water cycle having inlet headers below the front wall, rear wall and centre part of the furnace. US patent No. 4,449,482 discloses a fluidized bed boiler with a boiler water cycle having two inlet headers below the centre part of the furnace.

[0005] The drop leg may be substantially vertical, whereby it generally ends to the outside of the bottom level of the boiler or the lower part thereof may be turned to horizontal, being then able to extend as such below one of the boiler walls. In the latter case, the inlet ducts of the inlet header being connected to the wall, may be relatively short. Especially, when there are two drop legs, they may preferably extend below the longer sidewalls, in other words the front wall and the rear wall, or alternatively below the shorter sidewalls thereof.

[0006] The boiler water cycles described above are working solutions as such, but in large boilers they may become rather complicated. The boiler water cycle be-

comes especially complicated when the bottom grid of the furnace is also cooled by evaporation tubes and due to the large size of the grid, it is advantageous, and in drum boilers even necessary, to locate one or more inlet headers to run in the longitudinal direction below the centre part of the grid. Especially with fluidized bed boilers, the arrangement of inlet ducts of a so called grid chamber is problematic, because also an inlet chamber for fluidizing air, a so called wind box must be arranged in the fluidized bed boiler below the grid. If the wind box is desired to be arranged as one large, undivided construction, which is advantageous in view of homogeneous air distribution, the grid chamber should generally be located inside the wind box. Thereby, the numerous inlet ducts must be led through the wind box.

[0007] An object of the present invention is to provide a boiler water cycle of a fluidized bed boiler, which diminishes problems related to boiler water cycles of a fluidized bed boiler in accordance with the prior art.

[0008] Especially, an object of the invention is to provide a simple and reliable boiler water cycle of a supercritical circulating fluidized bed boiler operating on a once-through principle.

[0009] A further object of the invention is to provide a fluidized bed boiler having such a boiler water cycle.

[0010] In order to solve the above-mentioned prior art problems, a boiler water cycle of a fluidized bed boiler and a fluidized bed boiler having such a boiler water cycle are provided, the characteristic features of which are introduced in the characterizing part of the independent apparatus claims.

[0011] Thus, a boiler water cycle of a fluidized bed boiler in accordance with the present invention comprises a drop leg and a number of horizontal inlet headers, substantially of the length of a front wall of the boiler furnace, arranged below the furnace of the fluidized bed boiler, panels of water tubes of the front wall and of a rear wall, the extensions of the water tubes being directly connected to the inlet headers and each inlet header being in flow communication with the drop leg merely by means of an inlet duct connected to the end of the inlet header.

[0012] The furnace of the fluidized bed boiler is usually of the horizontal cross-section rectangular and the front wall and the rear wall of the furnace usually refer to longer walls of the furnace. The shorter side walls of the furnace may preferably also be cooled in accordance with the present invention, but it is possible that the feed of water to the shorter walls of the furnace is carried out in a conventional way by utilizing a number of inlet ducts. A third alternative that comes into question especially when the lengths of the longer or shorter walls of the furnace are relatively close to each other, is that the shorter walls of the furnace are cooled in accordance with the invention and the longer walls in a conventional manner.

[0013] When each inlet header is in flow communication with the drop leg according to the present invention, preferably only with one drop leg, merely by means of an inlet duct connected to the end of the inlet header, the

complexity caused by numerous inlet ducts is avoided. Connecting to the end of the inlet header refers in this connection either to an inlet duct being connected parallel to the inlet header right to the end thereof or the inlet duct being connected to the side wall of the inlet header, but substantially to the first end thereof. The arrangement in accordance with the invention is especially advantageous in large circulating fluidized bed boilers, in which it is desired to form an undivided wind box enabling a homogenous flow of fluidizing gas. The manufacture of such is severely hampered by numerous inlet lines of the prior art.

[0014] Naturally, a disadvantage of the arrangement in accordance with the present invention is that the inner diameters of the inlet headers must be large enough to be able to ensure sufficient boiler water flow also to the far end of the inlet header. The required size of the inlet headers depends thus on the amount of water to be fed, but according to a preferred embodiment, the inner diameter of the inlet headers is at least 200mm, most preferably at least 300 mm. Large inlet headers as such increase costs, but the inventor of the present invention has surprisingly noticed that with large FB boilers, especially with supercritical once-through CFB boilers, the power output of which is at least 400 MW_e, it is advantageous to use the above described, very simple arrangement for inlet headers for boiler water.

[0015] Especially when the boiler water cycle in accordance with the invention is a supercritical once-through cycle, an especially simple and advantageous arrangement is provided, when there is only one drop leg, whereby each of the inlet headers is in flow communication with one common drop leg.

[0016] According to a preferred embodiment of the present invention, the inlet headers comprise a front wall chamber arranged below the front wall of the furnace, a rear wall chamber arranged below the rear wall of the furnace and at least one, so called grid chamber below the centre part of the furnace grid. In this preferred embodiment, generally a first portion of the extensions of the water tubes in the front wall of the furnace is connected directly to the front wall chamber and, correspondingly, a first portion of the extensions of the water tubes in the rear wall of the furnace is connected directly to the rear wall chamber. According to the arrangement, not all of the water tubes of the water tube panel of the front wall and the rear wall are connected to the above mentioned front wall chamber and the rear wall chamber, but a second portion of the water tubes of the front wall and of the rear wall extend as grid tubes parallel to the furnace grid to the grid chamber. By utilizing this arrangement, it is possible to provide a uniform distribution of boiler water to all grid tubes, too. The grid chambers are preferably arranged below the furnace grid, inside the wind box.

[0017] Since the strength requirements of the grid tubes are higher than the requirements of the water tubes of the front walls and the rear walls, and since enough space must remain between the grid tubes for the nozzles

for fluidizing air, the grid tubes are usually of larger diameter than the water tubes of the walls. Therefore, each grid tube is preferably connected by means of a special fitting member to a water tube of the above-mentioned second portion of the water tubes in the front wall or the rear wall.

[0018] It is advantageous in large boilers to have two grid chambers, whereby the second portion of the extensions of the water tubes in the front wall are preferably connected to the first grid chamber and the second portion of the extensions of the water tubes in the rear wall are connected to the second grid chamber. The water tubes of the first and second portion preferably alternate in the front wall and the rear wall, whereby, for example, every second water tube of the front wall is in connection with the front wall chamber and the rest of them are in connection with the first grid chamber.

[0019] A significant additional advantage of the large inlet headers is that they can be arranged as support structures of the lower part of the furnace, whereby they decrease the number of other supporting structures. Especially in large FB boilers, it is possible to simplify the support of the centre part of the grid, when a large grid chamber in accordance with a preferred embodiment of the present invention forms a part thereof.

[0020] The invention is discussed more in detail with reference to the accompanying drawings, in which

Fig. 1 schematically illustrates a side view of a circulating fluidized bed boiler, comprising a boiler water cycle in accordance with a preferred embodiment of the present invention;

Fig. 2 schematically illustrates a vertical sectional view of a lower part of a circulating fluidized bed boiler, comprising a boiler water cycle in accordance with a preferred embodiment of the present invention;

Fig. 3 schematically illustrates a detail of a lower part of boiler water tubes of a circulating fluidized bed boiler in accordance with a preferred embodiment of the present invention.

[0021] Fig. 1 illustrates a CFB boiler 10 in accordance with a preferred embodiment of the present invention, comprising a furnace 12. The boiler in accordance with the invention may be a natural circulation boiler, in other words, a drum boiler, but it is most preferably a supercritical once-through utility boiler, which is illustrated, for example, in Fig. 1. The horizontal cross-section of the furnace is usually rectangular, and it is limited by a bottom, a ceiling and sidewalls, of which one long sidewall, a so-called front wall 14, is shown in the Figure. The walls limiting the furnace are conventionally manufactured as a water tube wall construction, in other words from water tubes 16 and fins connected gas tight therebetween. The water tubes and fins form water tube panels 18, which

are used for boiling water, i.e., for converting preheated feed water to steam.

[0022] A so-called wind box 20 is arranged below the furnace for supplying primary gas, generally air, required for the combustion of fuel and for the fluidization of the fluidized bed, to the furnace. Other conventional parts of the CFB boiler, such as fuel inlet means, discharge channels for flue gases and bottom ash as well as particle separators and return ducts related thereto are also connected to the furnace. For simplicity, these details, which are irrelevant to the present invention, are not disclosed in Fig. 1.

[0023] The preheated feed water 22 led from the water preheating surfaces, so called economizers, and the possible liquid returned from the steam separator 24 are led by means of a drop leg 26 to the level of the furnace bottom, from where it is distributed by means of inlet ducts 28 to the inlet headers 30 of the evaporator tubes in the sidewalls of the boiler. According to the conventional technique, multiple inlet ducts are connected, approximately equally spaced throughout the whole length of the inlet headers. It is, however, characteristic of the present invention that each inlet header 30 is in flow connection with a drop leg 26 merely by means of an inlet duct 28 connected to the end of the inlet header. To enable this, the diameter of the inlet headers 30 must naturally be sufficient, substantially greater than that in the prior art arrangement. The inner diameter of the inlet headers in accordance with the invention is preferably at least 200 mm, most preferably at least 300 mm. The structure of the inlet pipings in accordance with the invention is very simple, and it does not disturb the location of the apparatuses connected to the lower part of the furnace nor, for example, the formation of an extensive, undivided wind box 20.

[0024] The water from inlet headers 30 is led to the water tube panels 18 to evaporate and further as steam to the outlet headers 32. If the boiler is a so-called drum boiler, the force driving water and steam upwards in the panels is the weight of the liquid column in the drop leg of the drum. If in turn the boiler is a so-called forced circulation boiler, especially a so-called supercritical once-through boiler, the driving force is the pressure generated by the pump of the water cycle (not shown in Fig. 1). The steam from the outlet headers 32, possibly still containing some liquid water, is led to the water and steam separating apparatus 24 by means of collector tubes 34. The steam continues further in the steam pipings 36 to the superheaters arranged, for example, in the flue gas channel.

[0025] Fig. 2 schematically illustrates a simplified vertical cross-section of a lower part of the furnace 12 of a fluidized bed boiler having a water cycle in accordance with a preferred embodiment of the present invention. Fig. 2 shows a front wall 14 and a rear wall 38, which are formed of water tube panels of the furnace 12, as well as a wind box 20. Fig. 2 also schematically illustrates the wind box 20 with fluidizing gas nozzles 40 which are ar-

ranged between the grid tubes 42.

[0026] Extensions 44, 46 of the first portion of the water tubes in the front wall 14 and the rear wall 38 are connected directly to a front wall chamber 48 and a rear wall chamber 50, respectively. The front wall chamber 48 and the rear wall chamber 50 are both connected in a manner shown in Fig. 1 to a drop leg merely by means of an inlet duct connected to the end of the chamber. Since thereby there are no other inlet ducts connected to the inlet headers, in accordance with the present invention, each cross-section of the furnace 12 is simple in that there are no inlet ducts of the inlet headers hampering the connection of other apparatuses to the lower part of the furnace 12.

[0027] In the embodiment of Fig. 2, there are two other inlet headers arranged in the wind box 20, a so called first and second grid chamber 52, 54. Grid tubes 42 are connected to the grid chambers, each of which is preferably connected to a water tube of the front wall 14 or the rear wall 38 in a manner disclosed below. Since the grid chambers 52, 54, too, are connected in a manner illustrated in Fig. 1 to the drop leg merely by means of an inlet duct connected to the end of the chamber, there are no inlet ducts connected to the centre part of the grid chambers 52, 54 which would hamper the formation of an undivided wind box. The grid chambers 52, 54 extending throughout the length of the boiler walls also significantly reinforce the grid structure and thus diminish the need for other supporting structures.

[0028] Fig. 3 schematically illustrates a detail of a lower part of the boiler water tubes in a circulating fluidized bed boiler in accordance with a preferred embodiment of the present invention. This drawing shows a front wall chamber 48, a first grid chamber 52 and the water tubes connected thereto. Naturally, the drawing could also illustrate correspondingly water tubes connected to a rear wall chamber and a second grid chamber. As it was shown earlier in connection with Fig. 2, the grid tubes are preferably arranged longitudinally at the centre part of the grid cross-section, and the length of the substantially horizontal portion of the grid tubes 42 parallel to the grid is thus approximately half of the whole width of the grid.

[0029] The grid tubes 42 connected to the first grid chamber 52 run from the grid chamber first to a certain extent upwards and then turn parallel to the grid towards the front wall 14, where they again turn upwards. Since the diameter of the grid tubes is preferably greater than the diameter of the water tubes 54, 54' of the furnace wall, the grid tubes are preferably connected by fitting members 56 to the water tubes 54' of the furnace wall. Advantageously, every second of the tubes of the furnace wall belongs to the so called first portion 54 of the water tubes, the extensions 44 thereof being connected directly to the front wall chamber 48 and the rest of the tubes belong to a so called second portion 54', which is connected by means of fitting members 56 to the grid tubes 42 and therethrough to the first grid chamber 52.

[0030] The present invention has been described with reference to some exemplary arrangements. These ar-

rangements have not been given to limit the scope of invention, but the invention is solely limited by the patent claims and the definitions given therein.

Claims

1. Boiler water cycle of a fluidized bed boiler (10), comprising a drop leg (26) and a number of horizontal inlet headers (30, 48, 50, 52, 54) arranged below the furnace of the fluidized bed boiler, wherein the inlet headers comprise a front wall chamber (48) arranged below a front wall (14) of the furnace and a rear wall chamber (50) arranged below a rear wall (38) of the furnace and at least one grid chamber (52, 54) arranged below the centre part of a furnace grid in a wind box (20) of the fluidized bed boiler, and panels (18) of water tubes (16) of the front wall (14) and the rear wall (38), extensions (44, 46) of the water tubes being directly connected to the inlet headers, **characterized in that** the horizontal inlet headers (30, 48, 50, 52, 54) are substantially of the length of the front wall (14) of the boiler furnace (12) and each of the inlet headers is in flow communication with a drop leg (26) merely by means of an inlet duct (28) connected to the end of the inlet header.
2. Boiler water cycle according to claim 1, **characterized in that** the boiler water cycle is a supercritical once-through cycle.
3. Boiler water cycle according to claim 1 or 2, **characterized in that** each inlet header is in flow communication to only one drop leg (26).
4. Boiler water cycle according to claim 3, **characterized in that** each inlet header is in flow communication with a common drop leg (26).
5. Boiler water cycle according to claim 1, **characterized in that** a portion of the extensions (44) of water tubes in the front wall (14) are connected directly to the front wall chamber (48), a portion of the extensions (46) of water tubes in the rear wall (38) are connected directly to the rear wall chamber (50) and another portion (54') of the water tubes in the front wall and another portion of the water tubes in the rear wall extend parallel to the furnace grid as grid tubes (42) connected to the grid chamber (52, 54).
6. Boiler water cycle according to claim 1, **characterized in that** the diameter of the water tubes (54) in the front wall (14) and rear wall (38) is smaller than the diameter of the grid tubes (42) and each water tube of said another portion of the water tubes of the front wall and rear wall is connected to the grid tube by means of a fitting member (56).

7. Boiler water cycle according to claim 5, **characterized in that** the inlet headers comprise two grid chambers (52, 54) and said another portion of the extensions of the water tubes in the front wall (14) is connected to the first grid chamber (52) and said another portion of the extensions of the water tubes in the rear wall (38) is connected to the second grid chamber (54).
8. Boiler water cycle according to claim 1, **characterized in that** the inner diameter of the inlet headers is at least 200 mm.
9. Boiler water cycle according to claim 8, **characterized in that** the inner diameter of the inlet headers is at least 300 mm.
10. Boiler water cycle according to claim 1, **characterized in that** the grid chamber (52) is arranged to act as supporting element of the grid.
11. A fluidized bed boiler (10), **characterized in that** the boiler comprises a boiler water cycle in accordance with one of claims 1-10.

Patentansprüche

1. Kesselwasserkreislauf eines Wirbelschichtkessels (10), bestehend aus einem Fallrohr (26) und einer Anzahl horizontaler Eintrittssammler (30, 48, 50, 52, 54), die unterhalb der Feuerung des Wirbelschichtkessels angeordnet sind, wobei die Eintrittssammler eine Vorderwandkammer (48), die unterhalb einer Vorderwand (14) der Feuerung angeordnet ist, und eine Rückwandkammer (50), die unterhalb einer Rückwand (38) der Feuerung angeordnet ist, und zumindest eine Rostkammer (52, 54) umfasst, die unterhalb des mittleren Teils eines Feuerungsrosts in einem Windkasten (20) des Wirbelschichtkessels angeordnet ist, und Paneelen (18) von Wasserrohren (16) der Vorderwand (14) und der Rückwand (38), wobei Verlängerungen (44, 46) der Wasserrohre direkt mit den Eintrittssammlern verbunden sind, **dadurch gekennzeichnet, dass** die horizontalen Eintrittssammler (30, 48, 50, 52, 54) im Wesentlichen der Länge der Vorderwand (14) der Kesselfeuerung (12) sind und jeder der Eintrittssammler in Strömungsverbindung mit einem Fallrohr (26) lediglich mittels eines Eintrittskanals (28) steht, der mit dem Ende des Eintrittssammlers verbunden ist.
2. Kesselwasserkreislauf nach Patentanspruch 1, **dadurch gekennzeichnet, dass** der Kesselwasserkreislauf ein überkritischer offener Kreislauf ist.
3. Kesselwasserkreislauf nach Patentanspruch 1 oder 2, **dadurch gekennzeichnet, dass** jeder Eintritts-

sammler in Strömungsverbindung lediglich mit einem Fallrohr (26) steht.

4. Kesselwasserkreislauf nach Patentanspruch 3, **dadurch gekennzeichnet, dass** jeder Eintrittssammler in Strömungsverbindung mit einem gemeinsamen Fallrohr (26) steht. 5
5. Kesselwasserkreislauf nach Patentanspruch 1, **dadurch gekennzeichnet, dass** ein Abschnitt der Verlängerungen (44) der Wasserrohre in der Vorderwand (14) direkt mit der Vorderwandkammer (48) verbunden ist, ein Abschnitt der Verlängerungen (46) der Wasserrohre in der Rückwand (38) direkt mit der Rückwandkammer (50) verbunden ist, und ein anderer Abschnitt (54') der Wasserrohre in der Vorderwand und ein anderer Abschnitt der Wasserrohre in der Rückwand sich parallel zum Feuerungsrost als Rostrohre (42) erstrecken, die mit der Rostkammer (52, 54) verbunden sind. 10 15 20 25
6. Kesselwasserkreislauf nach Patentanspruch 1, **dadurch gekennzeichnet, dass** der Durchmesser der Wasserrohre (54) in der Vorderwand (14) und Rückwand (38) kleiner ist als der Durchmesser der Rostrohre (42) und jedes Wasserrohr des anderen Abschnitts von Wasserrohren der Vorderwand und Rückwand mittels eines Passteils (56) mit dem Rostrohr verbunden ist. 25 30
7. Kesselwasserkreislauf nach Patentanspruch 5, **dadurch gekennzeichnet, dass** die Eintrittssammler zwei Rostkammern (52, 54) umfassen und besagter zweiter Abschnitt der Verlängerungen der Wasserrohre in der Vorderwand (14) mit der ersten Rostkammer (52) und besagter zweiter Teil der Verlängerungen der Wasserrohre in der Rückwand (38) mit der zweiten Rostkammer (54) verbunden ist. 35 40
8. Kesselwasserkreislauf nach Patentanspruch 1, **dadurch gekennzeichnet, dass** der lichte Durchmesser der Eintrittssammler zumindest 200 mm ist. 40
9. Kesselwasserkreislauf nach Patentanspruch 8, **dadurch gekennzeichnet, dass** der lichte Durchmesser der Eintrittssammler zumindest 300 mm ist. 45
10. Kesselwasserkreislauf nach Patentanspruch 1, **dadurch gekennzeichnet, dass** die Rostkammer (52) derart angeordnet ist, dass sie als Stützelement des Rosts dient. 50
11. Wirbelschichtkessel (10), **dadurch gekennzeichnet, dass** der Kessel einen Kesselwasserkreislauf nach einem der Patentansprüche 1 bis 10 umfasst. 55

Revendications

1. Circuit d'eau de réacteur dans un réacteur à lit fluidisé (10), comportant un tube de chute (26) et un certain nombre de tuyaux collecteurs horizontaux d'admission (30, 48, 50, 52, 54) agencés au-dessous du foyer du réacteur à lit fluidisé, dans lequel les tuyaux collecteurs comprennent une chambre de paroi avant (48) disposée au-dessous d'une paroi avant (14) du foyer et une chambre de paroi arrière (50) agencée au-dessous d'une paroi arrière (38) du foyer et au moins une chambre de grille (52, 54) agencée au-dessous de la partie centrale d'une grille de foyer dans une boîte à vent (20) du réacteur à lit fluidisé, et des panneaux (18) de tubes à eau (16) de la paroi avant (14) et de la paroi arrière (38), des prolongements (44, 46) des tubes à eau étant directement raccordés aux tuyaux collecteurs d'admission, **caractérisé en ce que** les tuyaux collecteurs horizontaux d'admission (30, 48, 50, 52, 54) sont essentiellement de la longueur de la paroi avant (14) du foyer du réacteur (12) et chacun des éléments collecteurs d'admission se trouve être en communication d'écoulement avec un tube de chute (26) simplement au moyen d'une conduite d'entrée (28) raccordée à l'extrémité du tuyau collecteur d'admission. 5 10 15 20 25 30
2. Circuit d'eau de réacteur selon la revendication 1, **caractérisé en ce que** le circuit d'eau du réacteur est un circuit à passage unique supercritique. 30
3. Circuit d'eau de réacteur selon la revendication 1 ou 2, **caractérisé en ce que** chaque tuyau collecteur d'admission se trouve en communication d'écoulement avec seulement un tube de chute (26). 35
4. Circuit d'eau de réacteur selon la revendication 3, **caractérisé en ce que** chaque tuyau collecteur d'admission se trouve en communication d'écoulement avec un tube de chute commun (26). 40
5. Circuit d'eau de réacteur selon la revendication 1, **caractérisé en ce qu'une** partie des prolongements (44) des tubes à eau de la paroi avant (14) est raccordée directement à la chambre de paroi avant (48), une partie des prolongements (46) des tubes à eau de la paroi arrière (38) est raccordée directement à la chambre de paroi arrière (50) et **en ce qu'une** autre partie (54') des tubes à eau de la paroi avant et une autre partie des tubes à eau de la paroi arrière s'étendent parallèlement à la grille de foyer en tant que tubes de grille (42) raccordés à la chambre de grille (52, 54). 45 50
6. Circuit d'eau de réacteur selon la revendication 1, **caractérisé en ce que** le diamètre des tubes à eau (54) de la paroi avant (14) et de la paroi arrière (38) est plus petit que le diamètre des tubes de grille (42) 55

et **en ce que** chaque tube à eau de ladite autre partie des tubes à eau de la paroi avant et de la paroi arrière est raccordée au tube de grille au moyen d'un élément d'ajustement (56).

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7. Circuit d'eau de réacteur selon la revendication 5, **caractérisé en ce que** les tuyaux collecteurs d'admission comprennent deux chambres de grille (52, 54) et **en ce que** ladite autre partie des prolongements des tubes à eau de la paroi avant (14) est raccordée à la première chambre de grille (52) et ladite autre partie des prolongements des tubes à eau de la paroi arrière (38) est raccordée à la seconde chambre de grille (54).
8. Circuit d'eau de réacteur selon la revendication 1, **caractérisé en ce que** le diamètre intérieur des tuyaux collecteurs d'admission est au moins de 200 mm.
9. Circuit d'eau de réacteur selon la revendication 8, **caractérisé en ce que** le diamètre intérieur des tuyaux collecteurs d'admission est au moins de 300 mm.
10. Circuit d'eau de réacteur selon la revendication 1, **caractérisé en ce que** la chambre de grille (52) est agencée en vue d'agir comme élément de support de la grille.
11. Réacteur à lit fluidisé (10), **caractérisé en ce que** le réacteur comporte un circuit d'eau de réacteur selon l'une des revendications 1 à 10.

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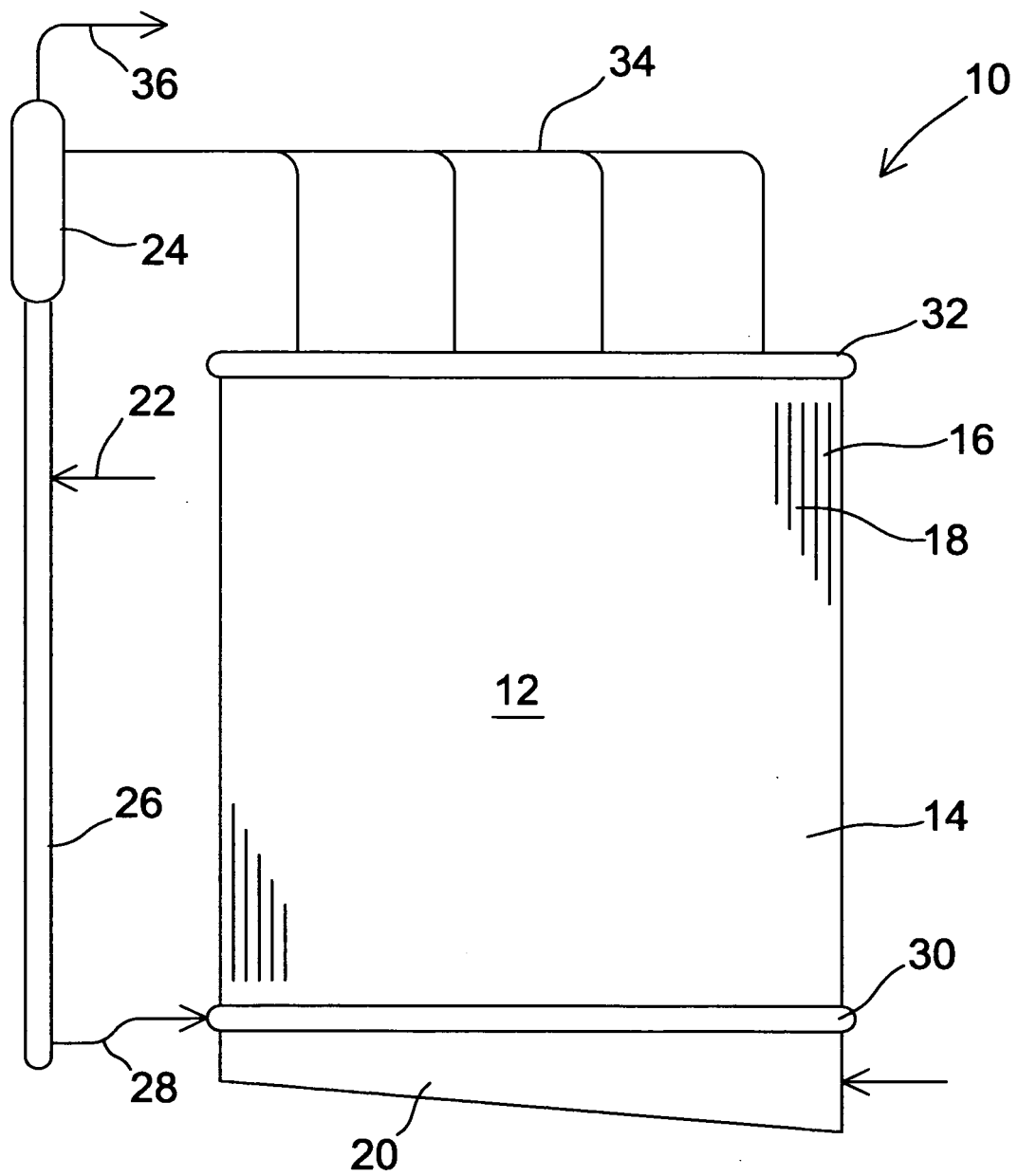


Fig. 1

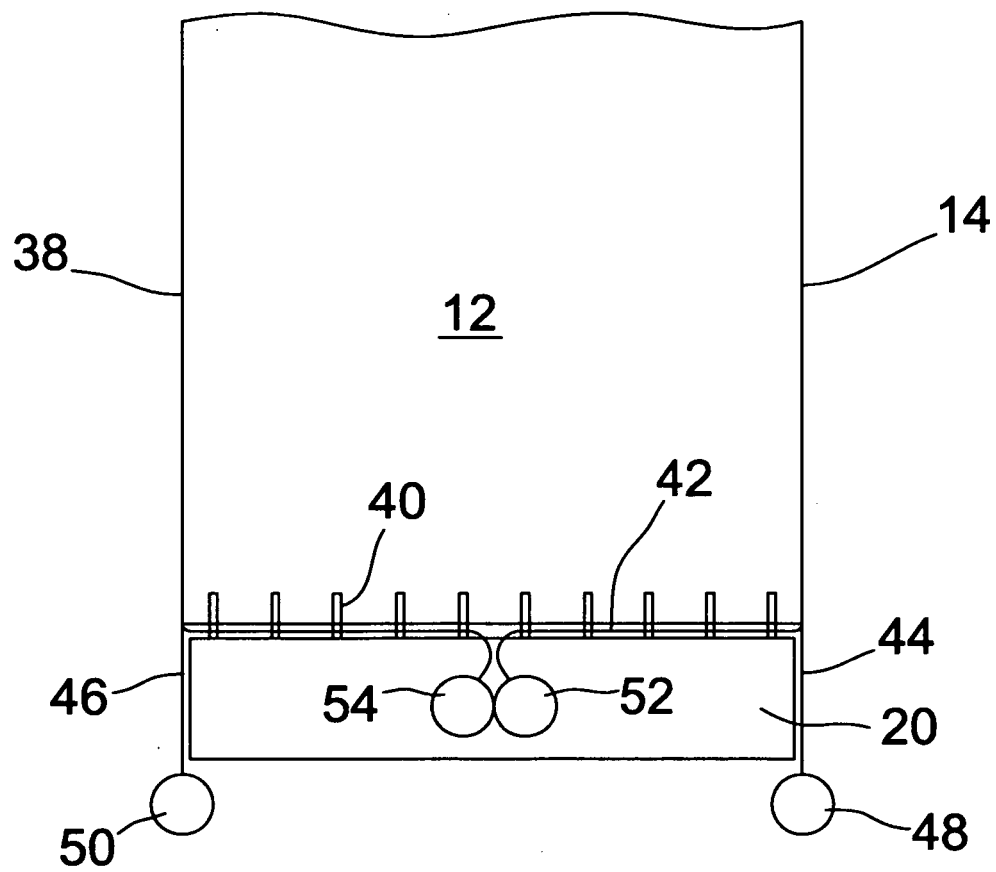


Fig. 2

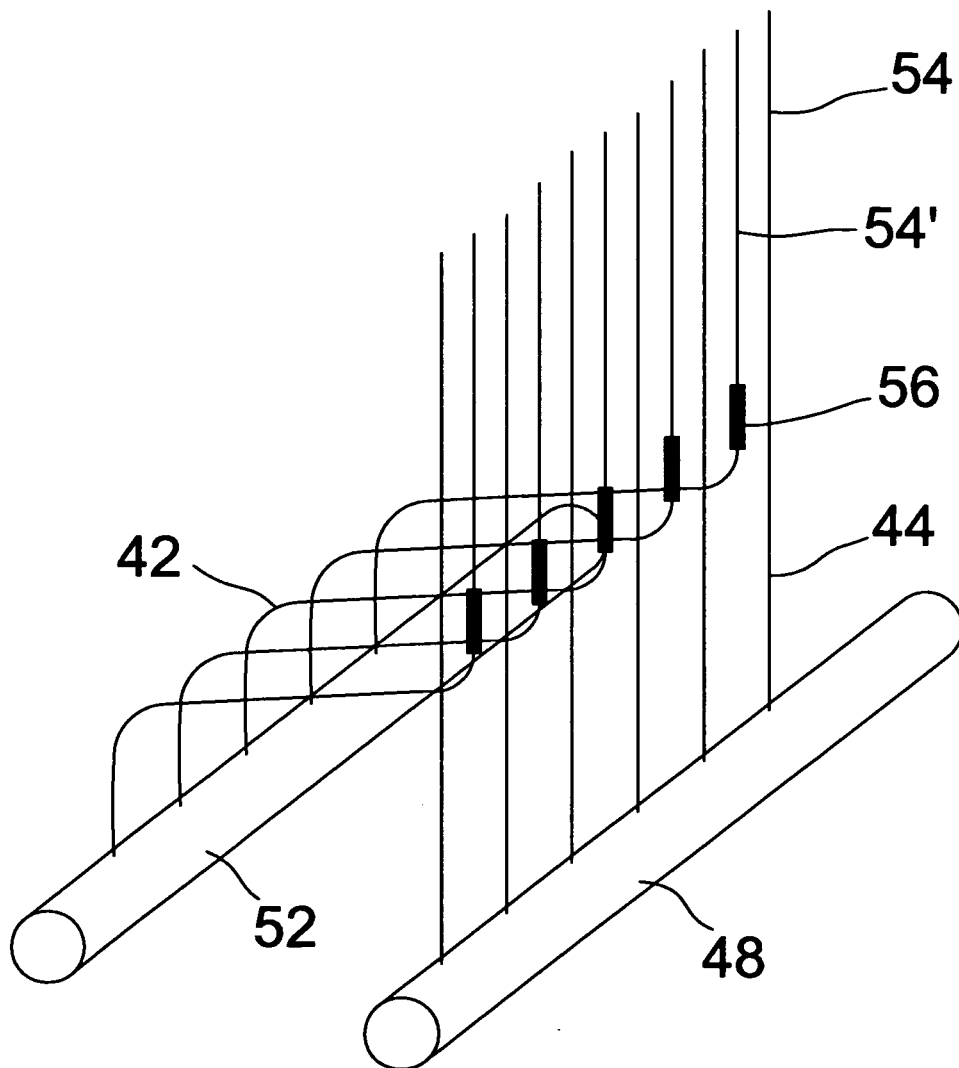


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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