(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 389 286 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
10.10.2007 Bulletin 2007/41

(21) Application number: **02764106.7**

(22) Date of filing: **12.04.2002**

(51) Int Cl.:
F23L 1/00 *(2006.01)* ***F23L 9/02*** *(2006.01)*

(86) International application number:
PCT/LT2002/000003

(87) International publication number:
WO 2002/086390 (31.10.2002 Gazette 2002/44)

(54) **SOLID FUEL BURNING METHOD AND HEATING BOILER**

FESTBRENNSTOFFVERBRENNUNGSVERFAHREN UND HEIZKESSEL

PROCEDE DE BRULAGE DE COMBUSTIBLE SOLIDE ET CHAUDIERE DE CHAUFFAGE

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR

(30) Priority: **19.04.2001 LT 2001044**

(43) Date of publication of application:
18.02.2004 Bulletin 2004/08

(73) Proprietor: **Strupaitis, Edmundas**
Vilnius 4002 (LT)

(72) Inventor: **Strupaitis, Edmundas**
Vilnius 4002 (LT)

(74) Representative: **Jeck, Anton**
Patentanwalt,
Klingengasse 2
71665 Vaihingen/Enz (DE)

(56) References cited:
EP-A- 0 636 840
EP-A- 1 070 918
CH-A- 182 328
CH-A- 222 759
DE-A- 10 021 434
US-A- 4 782 765
US-A- 4 823 710

EP 1 389 286 B1

Printed by Jouve, 75001 PARIS (FR)

Description

FIELD OF THE INVENTION

[0001] The present invention is of the field of heating techniques and relates to a method of the air feed and distribution in combustion chamber and boiler for central heating. The boiler also supplies hot water for domestic purpose.

[0002] There is known an incinerator of sectional structure which has an airpipe for sending combustion air into a furnace. The airpipe is a straight pipe tapered off at end portion and closed by a plug. The airpipe is also inserted into a furnace through a hole opened on an upper furnace wall. The air is fed into an airpipe by a fan. Combustion air spouts through the airpipe holes and burns fuel, in this case refuse (see patent EP 0636840A1).

This air feed and distribution in combustion chamber method and combustion device are suitable for safe and intensive refuse firing but it is not effective for long - duration economic fuel burning.

[0003] There is known a burner for burning, granular, pellet or similarly sized solid heating fuel includes a retort in which solid fuel is ignited and burned. A peripheral electrical igniter is included within the retort for initiating self-sustaining combustion of the solid fuel at its uppermost surface. Combustion air is supplied centrally within the retort and is emitted radially outward for burning solid fuel evenly across its uppermost surface.

The construction of such a burner is complex and it is unfit for burning a fire-wood.

SUMMARY OF THE INVENTION

[0004] The object of the present invention is to propose a method of air feed and distribution in a combustion chamber, which will allow simplifying construction of heating boiler.

The said purpose is achieved when the heating boiler comprises a combustion chamber, which a double wall has a reservoir filled with water to be heated, a smoke outlet opening, a fuel charging means, ash removal openings with door, a water inlet and a water outlet, wherein the combustion chamber is installed vertically and is of the shape of a rounded or polygon cylinder, on the top of which there is a hole, with an air feeding tube able to slide freely up and down with an air distributor at the end of said tube resting on the fuel surface in the combustion chamber, wherein the air distributor is hollow and is of disc shape, on the upper zone of which there is a tip for its connection to the air feeding tube, and on the lower zone of which there is a cone head; On the peripheral zone of the air distributor, on the tip, at the narrow end of the cone head and at its sides there are holes, communicating with the internal cavity of the air distributor.

It is another object of the invention to propose an air distribution method.

The said purpose is achieved by feeding air into the combustion chamber by a tube from above, the tube has an air distributor at the end, which rests on the fuel, moves down when fuel volume in the combustion chamber decreases and the air is distributed as following: 40 - 60 % is supplied into the combustion zone, 10 - 30 % - onto the edges of the combustion zone, 20 - 40 % - above the combustion zone.

[0005] To achieve the goal described above easier some of essential characters of the heating boilers are specified as the following:

- the disc area of the air distributor constitutes 0,3 - 0,5 of cross-sectional area of the combustion chamber.
- the air feeding tube has a telescopic construction striving to decrease its length (a tube of a less diameter is put into another tube and is able to slide freely inside this tube).

BRIEF DESCRIPTION OF THE DRAWING

[0006] The essence of the invention may be better understood from the following detailed description which refers to the drawing where a longitudinal section of the heating boiler is shown.

[0007] The heating boiler comprises of the main parts as the following: combustion chamber 1, air feeding tube 2, air distributor 3, cover 4 and air transmission cylinder 5 connected to it, protective housing 6 and heat insulating wrap 7.

The combustion chamber 1 is of the shape of a vertical cylinder and has double wall, i.e. internal 8 and external 9. The reservoir in the wall is filled with water 10. In the upper part of the combustion chamber 1 there is an opening of smoke outlet 11 and a fuel charge opening 12. At the bottom part of the combustion chamber 1 there is an ash removal opening 13. Fuel charge and ash removal openings 12 and 13 have doors respectively to 14 and 15. The top of the combustion chamber 1 is covered with a cover 4 and a transmission cylinder 5 is inside upper part of the combustion chamber 1. Between the transmission cylinder 5 and the internal wall 8 of the combustion chamber 1 there is a gap 16 thus smoke is directed along the wall 8. The bottom of the transmission cylinder 5 has a partition prolonging the path of smoke up to the outlet opening 11. In the cover 4 there is an air inlet opening 17.

The air feeding tube 2 is of telescopic construction striving to decrease its length (a tube of a less diameter is put into another tube of a larger diameter and is able to slide freely inside this tube). The air feeding tube 2 shown in the drawing consists of three tubes of different diameters. The air feeding tube 2 is put into the inside of the combustion chamber 1 via the hole in the bottom of the transmission cylinder 5.

The air distributor 3 is hollow and of disc shape. On its upper zone there is a tip 18, and on the lower zone - a cone head 19. On the peripheral zone of the air distributor

3, on the tip 18 and at the narrow end and sides of the cone head 19 there are holes respectively to 3a, 18a, 19a and 19b, communicating with the internal cavity of the air distributor.

The air distributor 3 is connected to the internal air feeding tube 2a via the tip 18. To the internal air feeding tube 2a there is a thin rope 20 attached which is led out into the exterior of the heating boiler through the cover 4 and over pulleys 21 and 22.

There is a valve 23 installed at the opening of air inlet 17. The heating boiler is mounted on the foundation 24 produced of bricks or fireproofing concrete.

The drawing does not show any water inlet and water outlet.

FUNCTIONAL DESCRIPTION

[0008] The preparation of the heating boiler for combustion is as the following. When the rope 20 is pulled, the air distributor 3 with the air feeding tube 2 is drawn (lifted) to the bottom of the transmission cylinder 5. The door 14 is opened, and through the fuel charge opening 12 fuel is charged into the combustion chamber 1 up to its top; on the top there is kindling put; when the rope 20 is released the air distributor 3 rests on the kindling and the top part of fuel.

The heating boiler functions as the following.

When the door 14 and valve 23 are opened, the kindling is fired through the fuel charge opening 12 and the door 14 is closed. During the burning of fuel its volume in the combustion chamber 1 is decreasing and the combustion zone is getting (sliding) down. Because the air distributor 3 is resting on the burning fuel, it is also moving down up to the bottom of the combustion chamber 1 until fuel burns away completely. During the burning of the fuel, the heat released is transferred to the water 10 through the wall 8. Combustion is occured as the following.

Air gets into the combustion chamber 1 through the air feeding opening 17, the transmission cylinder 5, the air feeding tube 2 and the air distributor 3. The air with the help of the air distribution 3 is distributed so that one part of air is directly supplied into the combustion zone through the holes 19a and 19b, the second part is supplied onto the edges of the combustion zone through the hole 3a, and the third air part is supplied above the air distributor 3 through the hole 18a. The air supplied into the combustion zone through the cone head 19 (holes 19a and 19b) is used in CO generation, the air supplied through the hole 3a, is partly used for CO generation and partly for CO combustion, and the air supplied in through the hole 18a is used for CO combustion.

Air fed to the combustion chamber is distributed as the following: 40-60% is supplied into the combustion zone, 10-30% is supplied onto the edges of the combustion zone, 20-40% above the combustion zone.

The advantages of the air feed and distribution method described above is that during the basic time of combustion the heating boiler operates under optimal conditions, i.e. only the upper part of fuel burns intensively, combustible gas released does not cool down, does not heat the total fuel in the combustion chamber and burns effectively.

The heating boiler described above burns fire - wood and other wooden craps, e.g. sawdust.

The power of the heating boiler depends on the area of the combustion chamber cross - section, time of combustion - on the height of combustion chamber. Intensity of fuel combustion may be defined manually or by automatic monitoring of the draught gauge by opening or closing the valve 23.

The method for feeding and distributing air in a combustion chamber as proposedabove may be applied to heating equipment with various powers.

Claims

1. A heating boiler comprising a combustion chamber (1), comprising a double wall (8) (9) which forms a reservoir filled with water to be heated, a smoke outlet opening (11); a fuel charging means (12) ash removal openings (13) with doors, a water inlet and a water outlet, wherein the said combustion chamber is installed vertically and is of the shape of a rounded or polygon cylinder, on the top of which there is a hole with an air feeding tube (2), **characterised in that** the air feeding tube is able to slide freely up and down with an air distributor (3) at the end of said tube resting on the fuel surface in the combustion chamber; the air distributor is hollow and is of disc shape, on the upper zone of which there is a tip (18) for connection to the air feeding tube, and on the lower zone of which there is a cone head (19) on the peripheral zone of the distributor, on the tip, at the narrow end of the cone head and at its sides there are holes (3a) (18a) (19a) (19b) communicating with the internal cavity of the air distributor.

2. The boiler according to claim 1 **characterised in that** the disc area of the air distributor constitutes 0,3 - 0,5 of cross sectional area of the combustion chamber.

3. A boiler according to claim 1 **characterised in that** the air feeding tube has a telescopic construction.

4. Method for feeding and distributing air in the combustion chamber of a heating boiler according to any one of claims 1 to 3 where the air is fed into the combustion chamber by a tube from above **characterized in that** the tube has an a air distributor at the end which rests on The fuel surface, moves down when the fuel volume in the combustion chamber decreases and the air is distributed as following: 40-60 % is supplied into combustion zone, 10-30 % onto the edges of the combustion zone. 20-40 %

above the combustion zone.

Patentansprüche

1. Heizkessel mit einer Verbrennungskammer (1), die eine Doppelwand (8, 9) aufweist, die einen mit zu erhitzendem Wasser gefüllten Behälter bildet, und ferner eine Rauchausgangsöffnung (11), eine Brennstoffladevorrichtung (12), Ascheentfernungsöffnungen (13) mit Türen, einen Wassereingang und einen Wasserausgang aufweist, wobei diese Verbrennungskammer vertikal eingebaut ist und die Form eines runden oder vieleckigen Zylinders aufweist, an dessen oberen Ende ein Loch (17) mit einem Luftzufuhrrohr (16) vorgesehen ist,
dadurch gekennzeichnet,
dass das Luftzufuhrrohr (16) derart ausgebildet ist, dass es mit einem Luftverteiler (3) am Ende des genannten Rohrs (16), das auf einer Brennstoffoberfläche in der Verbrennungskammer ruht, frei auf- und niedergleitet, dass der Luftverteiler (3) hohl ausgebildet ist und die Form einer Scheibe aufweist, auf deren oberer Zone ein Oberteil (18) zur Verbindung mit dem Luftzufuhrrohr (16) und auf deren unterer Zone ein konischer Kopf (19) am Verteilerumfang vorgesehen ist, während am oberen Ende, am engen Ende des konischen Kopfs und an den Seiten der Scheibe Löcher (3a, 18a, 19a, 19b) vorhanden sind, die mit dem Innenraum des Luftverteilers (16) in Verbindung stehen.

2. Kessel nach Anspruch 1,
dadurch gekennzeichnet,
dass die Scheibenfläche des Luftverteilers 0,3-0,5 der Querschnittsfläche der Verbrennungskammer aufweist.

3. Kessel nach Anspruch 1,
dadurch gekennzeichnet,
dass das Luftzufuhrrohr (16) einen Teleskopaufbau aufweist.

4. Verfahren zur Zuführung und Verteilung von Luft in der Verbrennungskammer eines Heizkessels gemäß einem der Ansprüche 1 bis 3, wobei die Luft mittels eines Luftzufuhrrohrs von oben in die Verbrennungskammer zugeführt wird,
dadurch gekennzeichnet,
dass das Luftzufuhrrohr am Ende einen Luftverteiler aufweist, der auf der Brennstoffoberfläche ruht, der sich ferner nach unten bewegt, wenn das Brennstoffvolumen in der Verbrennungskammer abnimmt, wobei die Luft folgendermaßen verteilt wird: 40-60% werden der Verbrennungszone, 10-30% werden den Rändern der Verbrennungszone und 20-40% werden dem Raum über der Verbrennungszone zugeführt.

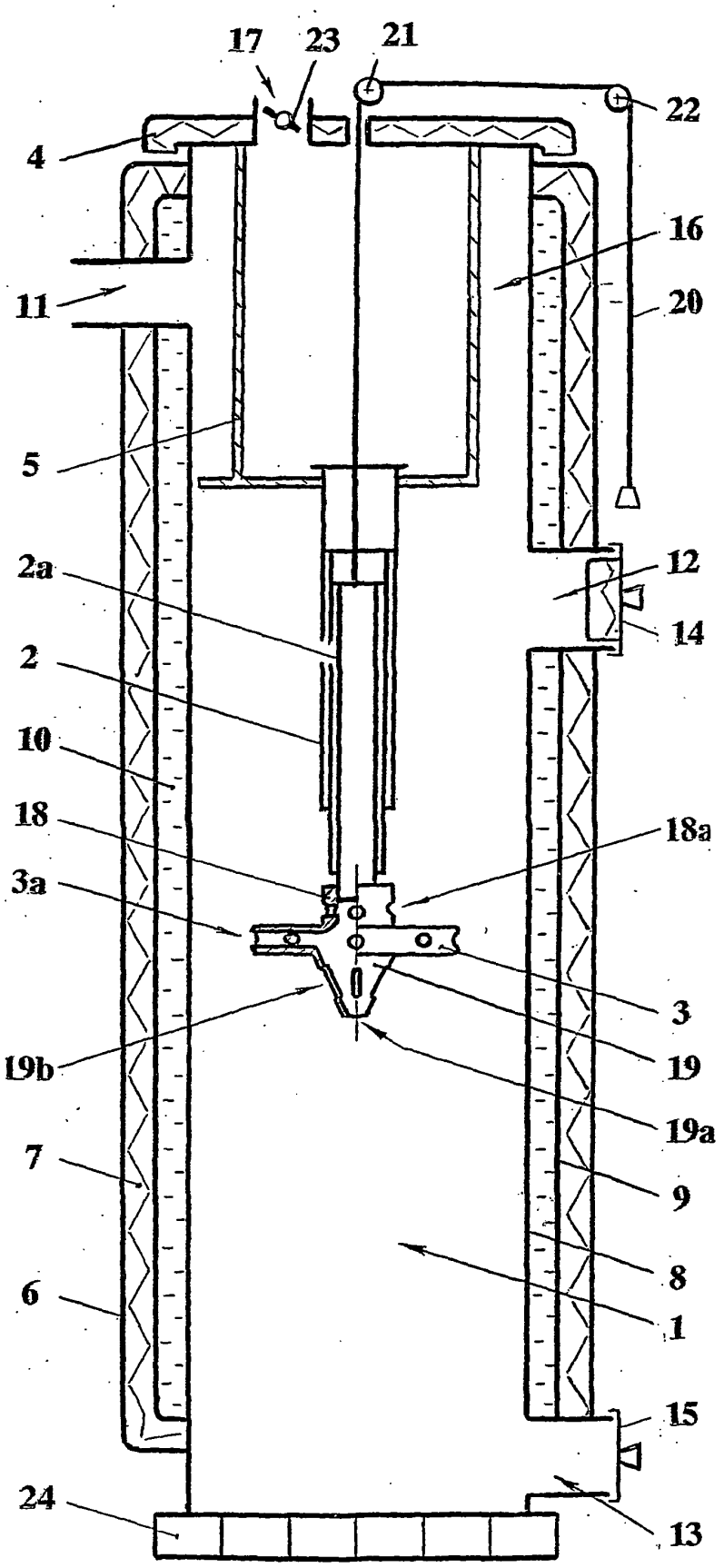
Revendications

1. Chaudière de chauffage comprenant une chambre de combustion (1) comprenant une paroi (8, 9) double? qui forme un réservoir empli d'eau à chauffer, une ouverture (11) de sortie de fumée, des moyens (12) de chargement de combustible, des ouvertures (13) d'enlèvement de la cendre ayant des portes, une entrée d'eau et une sortie d'eau, dans laquelle la chambre de combustion est installée verticalement et a la forme d'un cylindre de section transversale circulaire ou polygonale au sommet duquel il y a un trou ayant un tube (2) d'alimentation en air, **caractérisé en ce que** le tube d'alimentation en air peut coulisser librement vers le haut et vers le bas, alors qu'un distributeur (3) d'air à l'extrémité de ce tube repose sur la surface du combustible dans la chambre de combustion ; le distributeur d'air est creux et a la forme d'un disque sur la zone supérieure duquel il y a une pointe (18) de connexion au tube d'alimentation en air et sur la zone inférieure duquel il y a un sommet (19) de cône sur la zone périphérique du distributeur, sur la pointe, à l'extrémité étroite du sommet du cône et sur ses côtés il y a des trous (3, 18a, 19a, 19b) communiquant avec la cavité intérieure du distributeur d'air.

2. Chaudière suivant la revendication 1, **caractérisée en ce que** la zone en forme de disque du distributeur d'air représente de 0, 3 à 0,5 fois la surface de la section transversale de la chambre de combustion.

3. Chaudière suivant la revendication 1, **caractérisée en ce que** le tube d'alimentation en air est télescopique.

4. Procédé pour alimenter et distribuer de l'air dans la chambre de combustion d'une chaudière de chauffage suivant l'une quelconque des revendications 1 à 3, dans lequel on envoie l'air dans la chambre de combustion par un tube par le haut, **caractérisé en ce que** le tube a un distributeur d'air à l'extrémité qui repose sur la surface du combustible, se déplace vers le bas lorsque le volume du combustible dans la chambre de combustion diminue et l'air est distribué de la manière suivante : de 40 à 60 % est envoyé dans une zone de combustion, de 10 à 30 % est envoyé sur les bords de la zone de combustion, de 20 à 40 % est envoyé au-dessus de la zone de combustion.


17
23
21
22
4
16
11
20
5
12
2a
14
2
10
18
18a
3a
3
19b
19
19a
7
9
8
6
1
15
24
13

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 0636840 A1 **[0002]**