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(54) **Burner that uses a granular-type solid biomass fuel**

(57) Burner that uses a granular-type solid biomass fuel, comprising a combustion chamber (2) where combustion takes place, and an unburned fuel discharge device (3) for discharging the unburned fuel generated during combustion. The unburned fuel discharge device (3) forms the base of the combustion chamber (2), said unburned fuel discharge device (3) comprising at least three discharge plates (4, 5, 6, 7, 8) arranged parallel to one another, at least two of said discharge plates (4, 5, 6)

being movable and at least one of said discharge plates (7, 8) being fixed, the movable discharge plates (4, 5, 6) and the fixed discharge plates (7, 8) being arranged in an alternating manner, each of the discharge plates (4, 5, 6, 7, 8) comprising at least one hole, said holes being arranged and the movable discharge plates (4, 5, 6) being moved such that the passage of an air stream through the discharge device (3) is prevented.

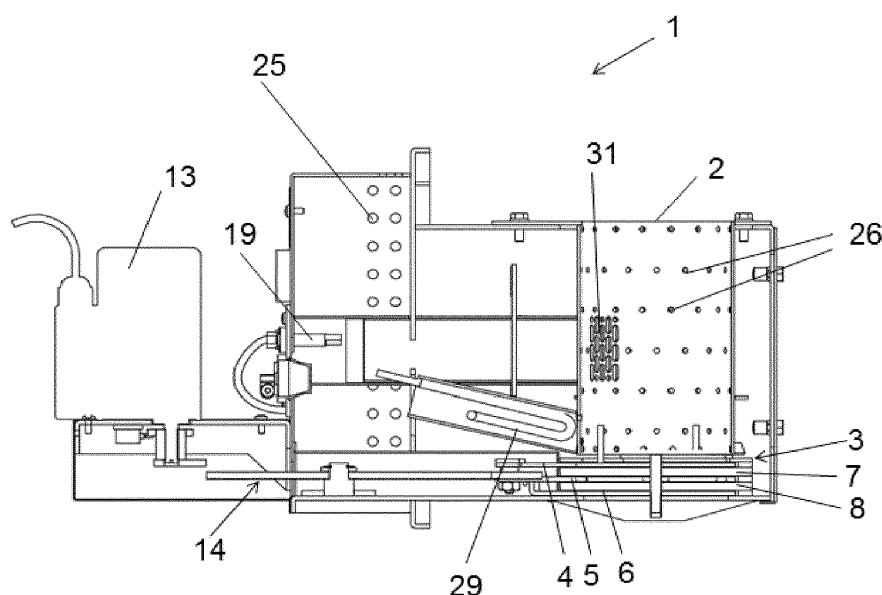


FIG. 3

Description

TECHNICAL FIELD

[0001] The present invention relates to burners that use a granular-type solid biomass fuel.

PRIOR ART

[0002] Boilers and stoves that use a granular-type solid biomass fuel are known. The burners used in such apparatus must manage the unburned fuel generated during combustion.

[0003] Document ES1092733U therefore describes an automatic burner cleaning device for boilers of this type comprising a movable part located in the lower portion of the burner. Said movable part is a plate that slides horizontally such that it acts as the bottom of the burner when closed, retaining the fuel, and leaves the base of the burner exposed in an open position, causing the unburned fuel to fall by gravity into an ash collection drawer arranged below the burner.

[0004] In addition, document ES1077147U describes a boiler comprising a burner and an unburned fuel discharge device which is arranged in the lower portion of the burner. The unburned fuel discharge device comprises a movable element that can be moved between a forward position and a backward position, being suitable for retaining the unburned fuel produced during combustion in the combustion body and also for pushing said unburned fuel. Said device comprises a guide preventing the unburned fuel from moving with the movable element as it moves backwards, said unburned fuel falling into a channel arranged in the lower portion of the burner. While the movable element moves forward, it pushes the unburned fuel through the channel until they are discharged from the burner through a gate that opens and closes.

[0005] Finally, document FR2906011A1 describes a brazier comprising a combustion chamber comprising a plurality of holes on its base for introducing air in the combustion chamber. The combustion chamber is arranged inside a second ash and combustion agent supply chamber. The combustion chamber comprises a side opening and a baffle for discharging part of the ashes generated during combustion. The brazier comprises a second device for discharging ashes that fall through the holes of the base of the combustion chamber comprising two fixed separating elements and each comprising an opening and two rotary dragging elements rotating at the same time as the base of the combustion chamber. The device enables discharging ashes without an air stream going through them.

DISCLOSURE OF THE INVENTION

[0006] The object of the invention is to provide a burner that uses a granular-type solid biomass fuel, as defined in the claims.

[0007] The burner of the invention comprises a combustion chamber where combustion takes place and an unburned fuel discharge device for discharging the unburned fuel generated during combustion. The unburned fuel discharge device forms the base of the combustion chamber.

[0008] The unburned fuel discharge device comprises at least three discharge plates arranged parallel to one another, at least two of said discharge plates being movable and at least one of said discharge plates being fixed. The movable discharge plates and fixed discharge plates are arranged in an alternating manner. Each of the discharge plates comprises at least one hole.

[0009] The holes are arranged and the movable discharge plates are moved such that the passage of an air stream through the discharge device is prevented. A burner comprising an unburned fuel discharge device assuring proper cleaning of the burner without air streams going through it is therefore provided. Preventing the passage of an air stream through the discharge device assures good combustion, since it assures that the air goes through the combustion chamber instead of being diverted through the discharge device.

[0010] These and other advantages and features of the invention will become evident in view of the drawings and the detailed description of the invention.

DESCRIPTION OF THE DRAWINGS

[0011]

Figure 1 shows a perspective view of an embodiment of a boiler comprising a first embodiment of the burner according to the invention.

Figure 2 shows a perspective view of the burner of the boiler of Figure 1.

Figure 3 shows a sectional view of the burner of the boiler of Figure 1.

Figure 4 shows an exploded view of the discharge device of the burner of the boiler of Figure 1.

Figure 5 shows a perspective view of the movable upper discharge plate of the discharge device of the burner of the boiler of Figure 1.

Figure 6 shows a perspective view of the fixed upper discharge plate of the burner of the boiler of Figure 1.

Figure 7 shows an exploded view of the discharge device of the burner according to a second embodiment of the invention.

Figure 8 shows a perspective view of the discharge device of the burner of Figure 7 in stand-by.

Figure 9 shows a perspective view of the discharge device of the burner of Figure 7 when the movable discharge plates are moved.

DETAILED DISCLOSURE OF THE INVENTION

[0012] Figure 1 shows a boiler 17 for heating preferably water that uses a granular-type solid biomass fuel. The boiler 17 comprises a burner 1 according to the invention where combustion takes place, a loading device supplying the fuel to said burner 1 and an airflow managing device. The airflow is necessary for combustion to occur or be rekindled. The boiler 17 also comprises a combustion control device comprising a flame detector 19, and a controller device 20 controlling and managing the loading device, the unburned fuel discharge device 13, the airflow managing device and the combustion control device.

[0013] The solid biomass fuel used in the embodiment of the boiler 17 comprises grains, olive pits, coal, straw, sawdust, etc.; the fuel used is preferably a wood pellet.

[0014] As shown in Figure 1, the boiler 17 comprises a tank 21 containing a fluid to be heated, preferably water. It also comprises a heat exchanger 22 preferably arranged vertically. The heat exchanger 22 is formed by a plurality of tubes through which hot gases generated in the burner 1 circulate and it is communicated with the water to be heated. In the portion through which gases circulate, the heat exchanger 22 comprises baffles slowing down the passage of fumes, thus allowing an improvement in the heat exchanger.

[0015] Figures 2 and 3 show the burner 1 of the boiler for heating water of Figure 1. The burner 1 comprises a combustion chamber 2 where combustion takes place and an unburned fuel discharge device 3 for discharging the unburned fuel generated during combustion, the unburned fuel discharge device 3 forming the base of the combustion chamber 2.

[0016] The fuel is introduced into the combustion chamber 2 through the loading device, and said fuel falls by gravity to the lower portion of the combustion chamber 2 where the unburned fuel discharge device 3 is located. After some time, the fuel that has not been consumed becomes an unburned residue, mainly in the form of ash, that must be discharged from the burner 1 to assure the correct operation of the boiler. In this embodiment, the unburned fuel discharge device 3 is an automatic device and is controlled by the controller device 20 to perform the necessary extraction movements for discharging the amount of ash considered appropriate.

[0017] In the embodiment, the heat exchanger 22 of the boiler 17 also comprises an automatic ash cleaning device 23 which also is managed by the controller device 20.

[0018] The airflow necessary for combustion is provided by the airflow managing device comprising at least one motor-fan 24 arranged in the top portion of the boiler 17 as shown in Figure 1. Said air, coming from the out-

side, is drawn by said motor-fan 24 into the boiler 17 through air inlets 25 allowing the entry of air into the burner 1. Likewise, the combustion chamber 2 comprises a plurality of perforations 26 to allow the entry of said air into the combustion chamber 2. Since the unburned fuel discharge device 3 prevents the passage of an air stream to the unburned fuel tank, the only air path passes through the combustion chamber 2.

[0019] The fuel loading device of the embodiment is an automatic device and comprises a load doser device, preferably in the form of a worm screw, depositing fuel in the combustion chamber 2. The loading device also comprises a conveyor 28, preferably a motorized screw conveyor, although a conveyor belt could also be used, transporting the fuel from an external storage silo, not shown in the drawings, to said load doser device. The fuel is therefore automatically administered and dosed into the combustion chamber 2 through the load doser device, which deposits the fuel in the combustion chamber 2 to be burned in a dosed manner depending on the desired consumption temperature. The rate of combustion is regulated through the controller device 20 which orders the motor-fan 24 to provide more or less air to the burner 1, and therefore burns at the required rate at all times. The amount of fuel to be administered is also regulated by the same controller device 20 and, in combination with the rate of combustion, it sets the power of the boiler 17 to reach the required water temperature at all times.

[0020] The unburned fuel discharge device 3 of the burner 1 of the invention comprises movable discharge plates and fixed discharge plates. For correct operation, the unburned fuel discharge device 3 comprises at least three discharge plates arranged parallel to one another, at least two of said discharge plates being movable and at least one of said discharge plates being fixed. The movable discharge plates and fixed discharge plates are arranged in an alternating manner. Furthermore, each of the discharge plates comprises at least one hole, said holes being arranged and the movable discharge plates being moved such that the passage of an air stream through the unburned fuel discharge device 3 is prevented.

[0021] Preventing the passage of an air stream through the unburned fuel discharge device 3 assures good combustion, since it assures that the air goes through the combustion chamber 2.

[0022] In this first embodiment of the burner 1, as shown in Figure 4, the unburned fuel discharge device 3 comprises five discharge plates 4, 5, 6, 7 and 8, three of said discharge plates 4, 5 and 6 being movable and two of said discharge plates 7 and 8 being fixed. As defined above, the movable discharge plates 4, 5 and 6 and fixed discharge plates 7 and 8 are arranged in an alternating manner. The movable discharge plates 4, 5 and 6 move integrally with one another.

[0023] In this embodiment, all the discharge plates 4, 5, 6, 7 and 8 comprise the same number of holes 9 and

10, specifically four holes 9 and 10 in each plate. In other possible embodiments, the discharge plates 4, 5, 6, 7 and 8 can comprise a different number of holes.

[0024] In this embodiment, the combustion chamber 2 is cylindrical and the holes 9 and 10 of the discharge plates 4, 5, 6, 7 and 8 are arranged inside a circle 2b of the unburned fuel discharge device 3 forming the base of the combustion chamber 2. The combustion chamber 2 is made from a material resistant to oxidation and high temperatures.

[0025] As seen in detail in Figures 3 and 4, the discharge plates 4, 5, 6, 7 and 8 are concentric and the circle 2b of the discharge plates 4, 5, 6, 7 and 8 is divided into circular sections having a specific angle α , 45 degrees in this embodiment, solid sections 11 and 12 and hollow sections being alternated, the holes 9 and 10 of the discharge plates 4, 5, 6, 7 and 8 being said hollow sections.

[0026] In this embodiment, the movement of the movable discharge plates 4, 5 and 6 is rotational, rotating said specific angle α in both directions. In other possible embodiments, the specific angle α can have other values, therefore if the angle is 60 degrees, each discharge plate will comprise three holes and the movable discharge plates 4, 5 and 6 would rotate 60 degrees in both directions.

[0027] In this embodiment, the movable discharge plates 4, 5 and 6 closest to one another are arranged such that their holes 9 are not superimposed, i.e., the holes 9 of the movable discharge plate 4 are not superimposed on the holes 9 of the movable discharge plate 5, whereas the holes 9 of the movable discharge plate 5 are not superimposed on the holes 9 of the movable discharge plate 6. In other words, the movable discharge plates 4, 5 and 6 closest to one another are arranged such that their holes 9 or hollow sections are shifted by the specific angle α , in this case 45 degrees. In contrast, the fixed discharge plates 7 and 8 are arranged such that their holes 10 are superimposed on one another. Furthermore, when the unburned fuel discharge device 3 is in stand-by, the holes 9 of the movable upper discharge plate 4 are not superimposed on the holes 10 of the first fixed discharge plate 7. Therefore, while the unburned fuel discharge device 3 is in stand-by, the unburned fuel produced during combustion are arranged on the solid sections 11 and 12 of the movable upper discharge plate 4 and fixed upper discharge plate 7.

[0028] Furthermore, in this embodiment the burner 1 comprises a dragging element 15 cooperating with the movable upper discharge plate 4, said dragging element 15 preferably being a fixed element. The dragging element 15 is arranged parallel to the discharge plates 4, 5, 6, 7 and 8 and comprises as many arms 15a as holes 9 in the movable upper discharge plate 4 has. When the movable discharge plates 4, 5 and 6 rotate, the arms 15a of the dragging element 15 prevent the unburned fuel arranged on the movable upper discharge plate 4 from moving at the same time as said movable upper discharge plate 4. The dragging element 15 is concentric to

the discharge plates 4, 5, 6, 7 and 8, and its arms 15a extend from the center to the perimeter of the combustion chamber 2.

[0029] The discharge plates 4, 5, 6, 7 and 8 are arranged contacting one another, so the discharge plate arranged immediately on top acts like a dragging element for the discharge layer arranged immediately below it.

[0030] The way to discharge the unburned fuel according to this first embodiment is as follows: when the unburned fuel discharge device 3 is activated, in the first 45 degree counterclockwise rotation of the movable discharge plates 4, 5 and 6, the unburned fuel on the solid sections 11 of the movable upper discharge plate 4 and the unburned fuel on the solid sections 12 of the fixed upper discharge plate 7 are arranged on the solid sections 12 of the second movable discharge plate 5 through the holes 10 of the fixed upper discharge plate 7. In the second 45 degree clockwise rotation of the movable discharge plates 4, 5 and 6, the unburned fuel on the solid sections 11 of the second movable discharge plate 5 will be deposited on the solid sections 11 of the third movable discharge plate 6 through the holes 10 of the second fixed discharge plate 8. Finally, in a third 45 degree counterclockwise rotation of the movable discharge plates 4, 5 and 6, the unburned fuel on the third movable discharge plate 6 are discharged to an unburned fuel tank 18 of the boiler and at the same time, as occurred in the first rotation, the unburned fuel on the solid sections 11 of the movable upper discharge plate 4 and the unburned fuel on the solid sections 12 of the fixed upper discharge plate 7 are arranged on the solid sections 12 of the second movable discharge plate 5 through the holes 10 of the fixed upper discharge plate 7. Therefore 3 movements of the movable discharge plates 4, 5 and 6 are necessary to discharge the unburned fuel from the combustion chamber 2 to the unburned fuel tank 18. Depending on the amount of ashes to be discharged, these movements must be repeated a greater or lesser number of times. Therefore, the unburned fuel can be discharged while the burner 1 is operating, achieving clean and efficient combustion because the combustion chamber 2 is continuously kept in an optimal state of cleanliness, thus assuring better combustion quality.

[0031] In this embodiment, the unburned fuel discharge device 3 comprises position detecting means, not shown in the drawings, for detecting the position of the movable discharge plates 4, 5 and 6. Specifically, it comprises two limit switches, each of which is arranged at one end of the rotation performed by the movable discharge plates 4, 5 and 6. Therefore, in order to prevent unburned fuel from crusting on the movable upper discharge plate 4, a small movement that is enough to inactivate the activated limit switch and return to the place of origin can be performed.

[0032] In this embodiment, the burner 1 comprises a motor 13 and a crank-connecting rod mechanism 14 connected to the motor 13 for rotating the movable discharge plates 4, 5 and 6, said movable discharge plates 4, 5 and

6 comprising a respective arm 4a, 5a and 6a that is connected to the crank-connecting rod mechanism 14.

[0033] In other possible embodiments, the plates can be rotated using another type of actuator causing the same effect, for example, a linear actuator. In other embodiments, the movable discharge plates 4, 5 and 6 could be rotated manually.

[0034] In this first embodiment, as shown in Figure 3, the burner 1 also comprises an automatic ignition device 29 comprising an automatic ignition system which is suitable for generating the flame necessary for combustion to occur.

[0035] The combustion control device is also arranged in the burner 1. Said control device comprises a flame detector 30 comprising a brightness detector controlling the brightness of the combustion flame. The combustion chamber 2 comprises a plurality of grooves 31 suitable for the brightness detector to capture the brightness of said flame. It is therefore possible to control flame intensity, and thereby enough information for the control device to regulate suitable fuel and air supply and thus prevent hazardous gases, such as CO₂, CO or NO_x, from being generated.

[0036] The operation of the boiler 17 arises from need to obtain hot water for use in heating, heating sanitary water or any other type of water to be supplied at temperature higher than room temperature. The user can program the desired temperature through the controller device 20. If the temperature is higher than the temperature of the water in the tank 21, the controller device 20 orders the loading device to introduce the required amount of fuel into the combustion chamber 2, and starts the automatic ignition device 29 if needed. The controller device 20 detects the existence of a flame and its quality through the combustion control device and from that moment on, it starts to manage the speed of the motor-fan 24 of the airflow managing device and of the motor of the loading meter 7 of the loading device until optimally burning the necessary amount of fuel, until reaching the programmed water temperature. This process is repeated indefinitely as long as there is a hot water demand. The controller device 20 of the boiler is capable of detecting the need to clean the combustion chamber 2 and the heat exchanger 22, activating the unburned fuel discharge device 3 of the combustion chamber 2 and the automatic ash cleaning device 14 of the heat exchanger 22 if needed.

[0037] The controller device 20 of the boiler 17 is a processor managing the electrical and mechanical devices of the boiler 17. Said controller device 20 is connected to different sensors for different functions necessary for the correct operation of the boiler 17, acting as a single, perfectly consolidated, assembly. The fuel supply, rate of combustion, cleaning of the heat exchanger 22, cleaning of the burner 1, in addition to all the safety systems incorporated in the boiler 17 (water temperature, primary pressure, flame arrestor, flame quality, fume temperature, etc.) are controlled from said device.

[0038] Figures 7 to 9 show a second embodiment of the unburned fuel discharge device 3 of the burner 1 according to the invention. The same reference numbers used for the first embodiment are used in these Figures 7 to 9 to identify similar elements.

[0039] This second embodiment differs from the first embodiment in the shape of the holes 9 and 10 of the discharge plates 4, 5, 6, 7 and 8 of the unburned fuel discharge device 3 and in the manner in which the movable discharge plates 4, 5 and 6 are moved.

[0040] In this second embodiment, the discharge plates 4, 5, 6, 7 and 8 comprise a groove-shaped hollow section, solid sections 11 and 12 and said hollow section being alternated with one another, the holes 9 and 10 of the discharge plates 4, 5, 6, 7 and 8 being said hollow sections. In other possible embodiments, the discharge plates 4, 5, 6, 7 and 8 can comprise a plurality of grooves.

[0041] Furthermore, the movement of the movable discharge plates 4, 5 and 6 is linear, sliding at least the width of the holes 9 and 10 such that one hole 9 of a movable plate 4, 5 and 6 is communicated with one hole of a fixed plate 7 and 8, as seen in Figure 9.

[0042] In this second embodiment, the movable upper discharge plate 4 comprises a single hole 9, so a dragging element is unnecessary since the actual walls of the combustion chamber 3 act as a dragging element. In other possible embodiments not shown in the drawings in which the upper discharge plate comprises more than one hole, the discharge device may comprise a dragging element arranged parallel to the discharge plates and may comprise as many arms as there are holes in the upper plate. Said arms of the dragging element would have substantially the same length as said holes.

[0043] Figure 8 shows the discharge device 3 in a stand-by state, whereas Figure 9 shows the discharge device 3 when the movable discharge plates 4, 5 and 6 have been moved the width of the hole 9 and 10. The operation of the unburned fuel discharge device 3 of this second embodiment is the same as that described for the first embodiment, but in this case instead of the movable discharge plates 4, 5 and 6 rotating 45 degrees, they slide the width of the hole 9 and 10, as seen in Figure 9.

[0044] Other features are similar to those of the first embodiment, so it is not considered necessary to describe them again.

[0045] The burner 1 according to the invention could also be applied in a stove. The operation of the burner 1 in an stove would be the same as in a boiler.

Claims

1. Burner that uses a granular-type solid biomass fuel, comprising a combustion chamber (2) where combustion takes place, and a unburned fuel discharge device (3) for discharging the unburned fuel generated during combustion, **characterized in that** the unburned fuel discharge device (3) forms the base

- of the combustion chamber (2), said unburned fuel discharge device (3) comprising at least three discharge plates (4, 5, 6, 7, 8) arranged parallel to one another, at least two of said discharge plates (4, 5, 6) being movable and at least one of said discharge plates (7, 8) being fixed, the movable discharge plates (4, 5, 6) and the fixed discharge plates (7, 8) being arranged in an alternating manner, each of the discharge plates (4, 5, 6, 7, 8) comprising at least one hole (9, 10), said holes (9, 10) being arranged and the movable discharge plates (4, 5, 6) being moved such that the passage of an air stream through the unburned fuel discharge device (3) is prevented.
2. Burner according to the preceding claim, wherein the movable discharge plates (4, 5, 6) move integrally with one another.
 3. Burner according to any of the preceding claims, wherein the unburned fuel discharge device (3) comprises five discharge plates (4, 5, 6, 7, 8), three of said discharge plates (4, 5, 6) being movable and two of said discharge plates (7, 8) being fixed.
 4. Burner according to any of the preceding claims, wherein all the discharge plates (4, 5, 6, 7, 8) comprise the same number of holes (9, 10).
 5. Burner according to any of the preceding claims, wherein the combustion chamber (2) is cylindrical and the holes (9, 10) of the discharge plates (4, 5, 6, 7, 8) are arranged inside a circle (2b) of the unburned fuel discharge device (3) forming the base of the combustion chamber (2).
 6. Burner according to the preceding claim, wherein the discharge plates (4, 5, 6, 7, 8) are concentric, the circle (2b) of the discharge plates is divided into circular sections having a specific angle (α), preferably 45 degrees, solid sections (11, 12) and hollow sections being alternated, the holes (9, 10) of the discharge plates (4, 5, 6, 7, 8) being said hollow sections, and the movement of the movable discharge plates (4, 5, 6) is rotational, rotating said specific angle (α) in both directions.
 7. Burner according to any of claims 1 to 5, wherein the discharge plates (4, 5, 6, 7, 8) comprise at least one groove-shaped hollow section, solid sections and at least said hollow section being alternated, the holes of the discharge plates being said hollow sections, and the movement of the discharge plates is linear, sliding at least the width of the grooves such that at least one groove of a movable plate is communicated with at least one groove of a fixed plate.
 8. Burner according to claim 6 or 7, wherein the closest movable discharge plates are arranged such that their holes (9) are not superimposed on one another.
 9. Burner according to any of claims 6 to 8, wherein the fixed discharge plates (7, 8) are arranged such that their holes (10) are superimposed on one another.
 10. Burner according to any of claims 6 to 9, wherein when the unburned fuel discharge device (3) is in stand-by, the holes (9) of the movable upper discharge plate (4) are not superimposed on the holes (10) of the first fixed discharge plate (7).
 11. Burner according to any of the preceding claims, comprising a dragging element (15) cooperating with the movable upper discharge plate (4), said dragging element (15) being preferably a fixed element.
 12. Burner according to the preceding claim, wherein the dragging element (15) is arranged parallel to the discharge plates (4, 5, 6, 7, 8) and comprises as many arms (15a) as there are holes (9) in the upper discharge plate (4).
 13. Burner according to any of the preceding claims, comprising a motor (13) and a crank-connecting rod mechanism (14) connected to the motor (13) for moving the movable discharge plates (4, 5, 6), said movable discharge plates (4, 5, 6) comprising a respective arm (4a, 5a, 6a) that is connected to the crank-connecting rod mechanism (14).
 14. Boiler **characterized in that** it comprises a burner (1) according to any of the preceding claims.
 15. Stove **characterized in that** it comprises a burner (1) according to any of claims 1 to 13.

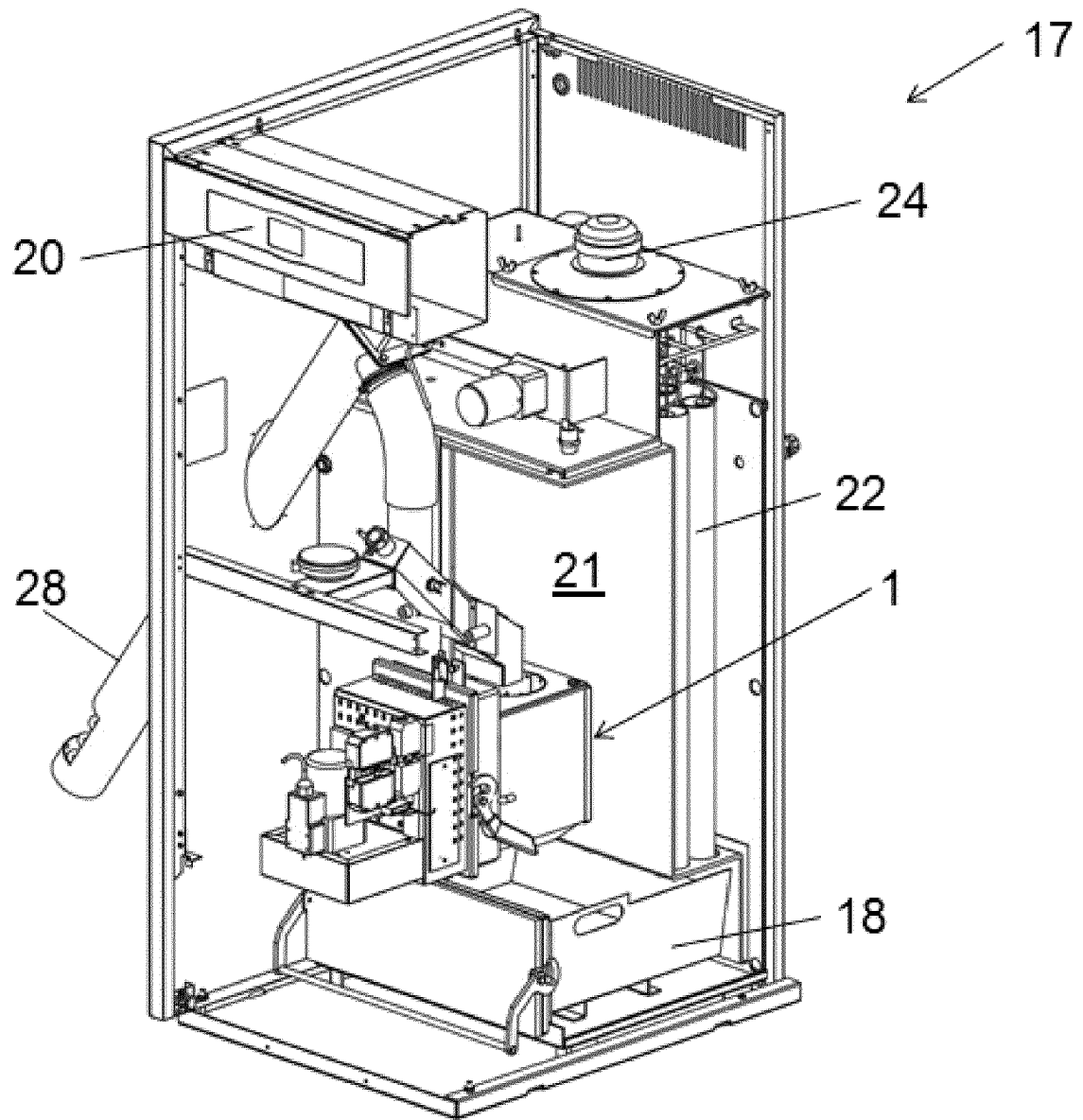


FIG. 1

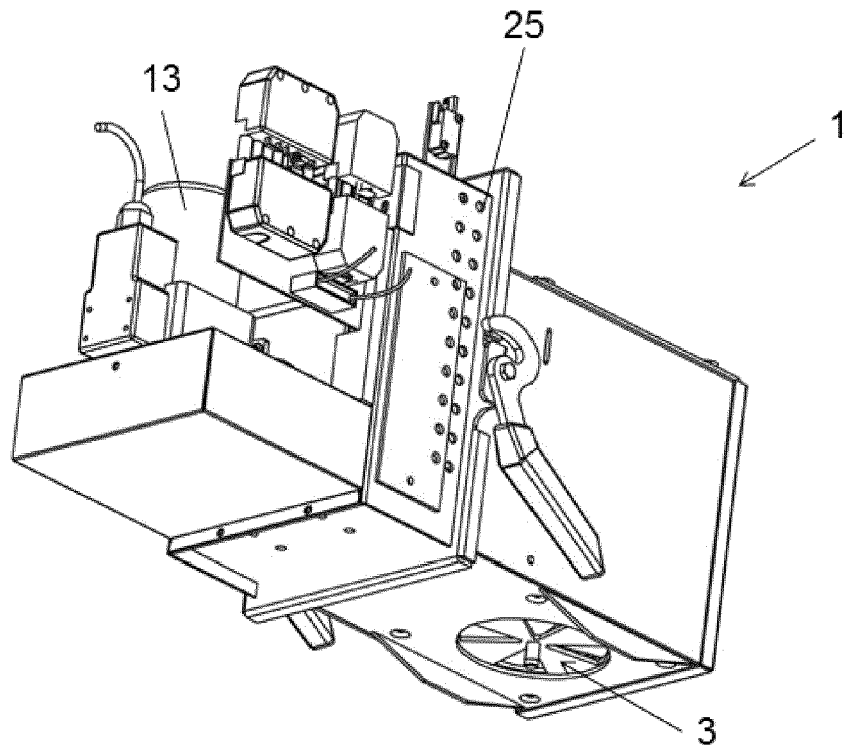


FIG. 2

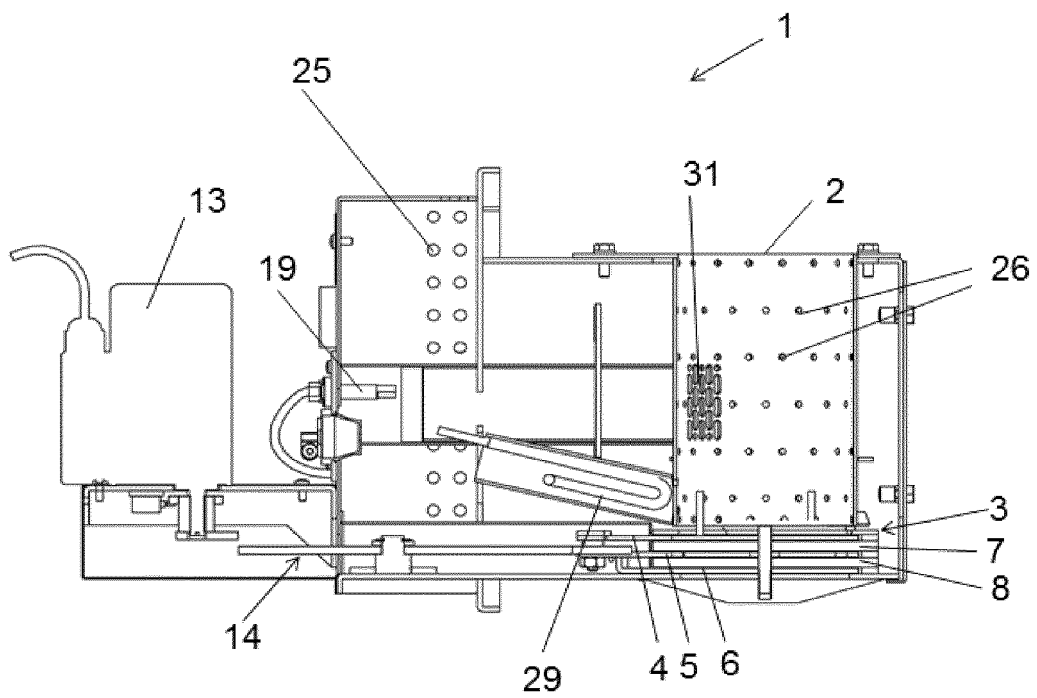


FIG. 3

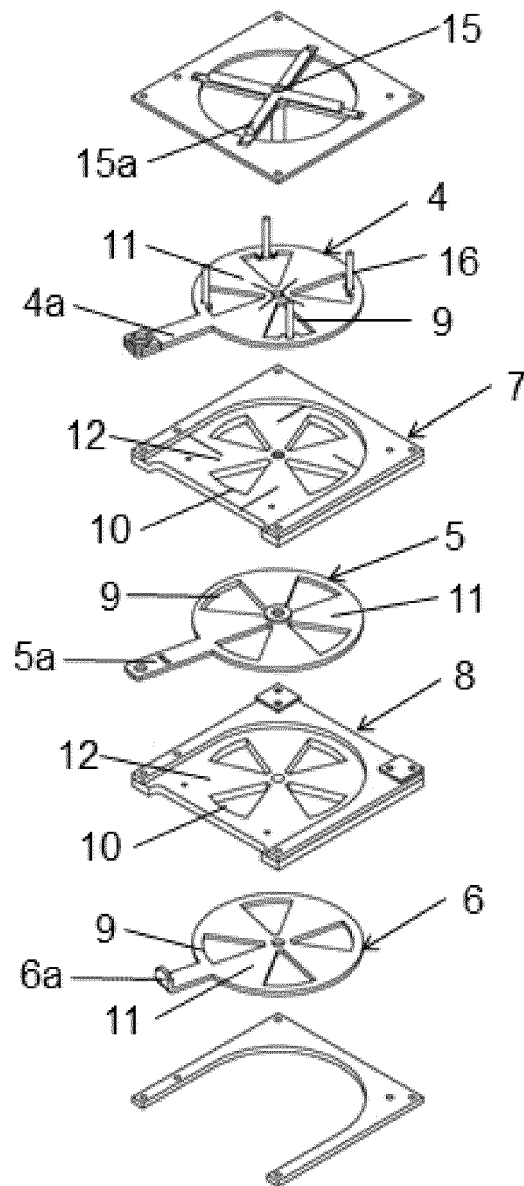


FIG. 4

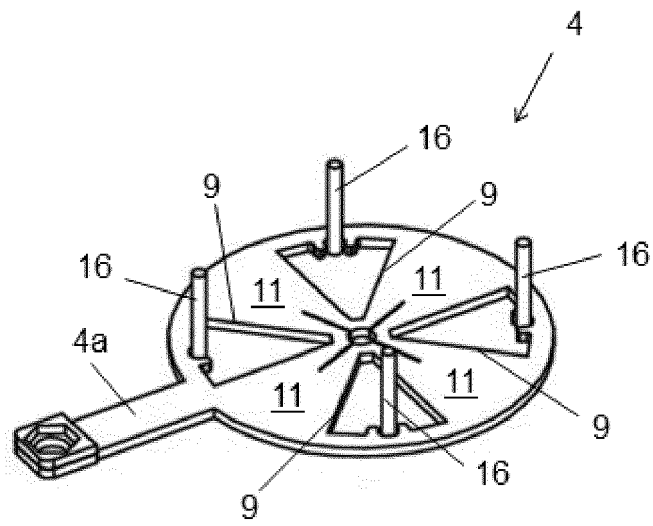


FIG. 5

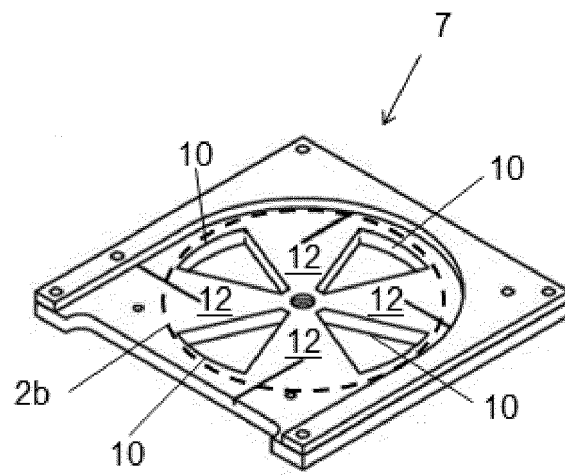


FIG. 6

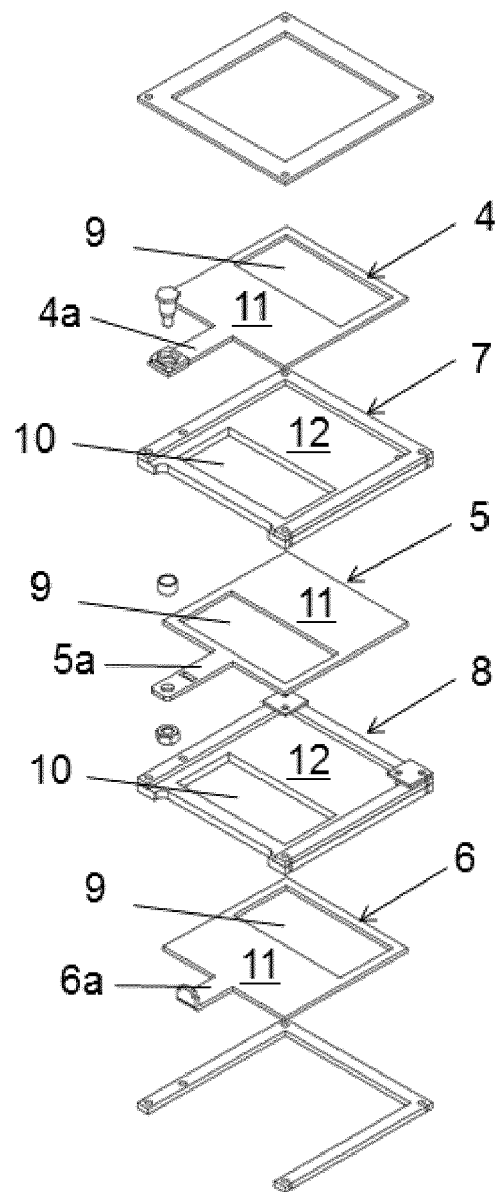


FIG. 7

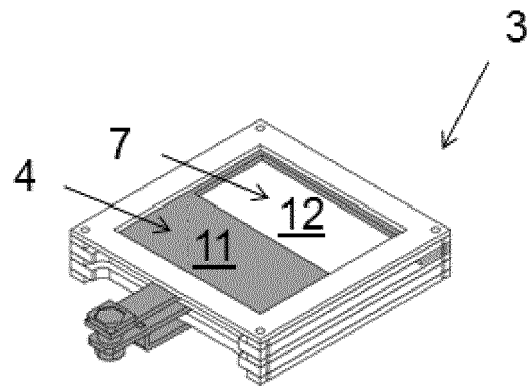


FIG. 8

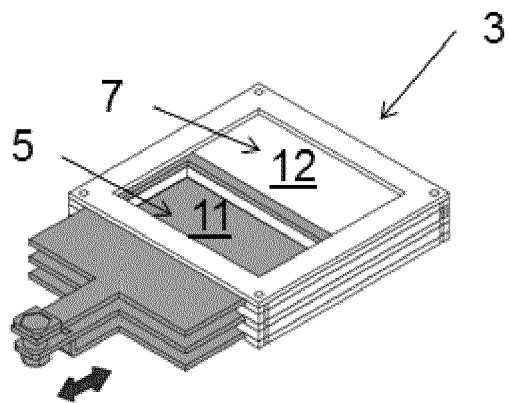


FIG. 9



EUROPEAN SEARCH REPORT

Application Number
EP 14 38 2238

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 20 2009 013250 U1 (GLOECKLER STEPHAN [DE]) 11 February 2010 (2010-02-11)	1,2,4,5, 11-15	INV. F23G7/10
Y	* the whole document *	6-10	F23B50/12 F23H13/02
Y	EP 0 304 514 A1 (VFM VERKOOP FAB METAALPROD [BE]) 1 March 1989 (1989-03-01)	6-10	
A	* column 2, line 13 - column 3, line 27; figures 1-5 *	1	
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A	KR 2013 0082312 A (KOREA ENERGY RESEARCH INST [KR]) 19 July 2013 (2013-07-19)	1	
	* paragraph [0027] - paragraph [0034] *		
	* paragraph [0046] - paragraph [0048]; figures 1-4 *		
			TECHNICAL FIELDS SEARCHED (IPC)
			F23G F23B F23J F24B F23H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 3 December 2014	Examiner Harder, Sebastian
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 38 2238

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03-12-2014

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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