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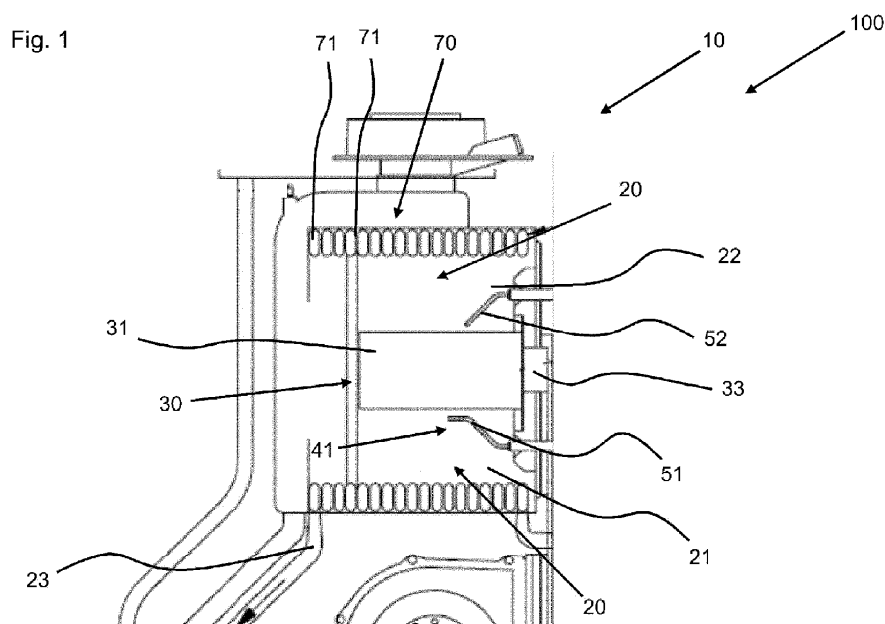
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(54) **SYSTEM AND METHOD FOR DETECTING A BACKFLOW OF A FLUID IN A COMBUSTION CHAMBER OF A BOILER**

(57) The invention relates to a system (10) for detecting a backflow of a fluid, in particular a backflow of a fluid originating from a blocked condensate trap, in a combustion chamber (20) of a boiler (100), in particular for domestic hot water generation or central heating, wherein a burner (30) for combusting fuel gas, in particular in-

cluding hydrogen, is arranged within the combustion chamber (20), characterized in that a sensor (40) for detecting fluid includes at least one probe (41) that is adapted and arranged in a lower part (21) of the combustion chamber (20) to get into physical contact with the fluid.



Description

[0001] The invention relates to a system for detecting a backflow of a fluid, in particular a backflow of a fluid originating from a blocked or clogged condensate trap, in a combustion chamber of a boiler, in particular for domestic hot water generation or central heating, wherein a burner for combusting fuel gas, in particular including hydrogen, is arranged within the combustion chamber. Additionally, the invention relates to a method for detecting the backflow of the fluid in the combustion chamber of the boiler.

[0002] Burner configured to combust a combustible mixture of gases are well established in state of the art, in particular in the field of residential or commercial hot water preparation. The combustible mixture of gases is typically supplied to a combustion chamber of the burner by means of an intake that feeds the combustible mixture of gases as premixed gases or as separate gases to the combustion chamber.

[0003] The combustion process is typically monitored to maintain regular operation and in particular to identify unsafe conditions. For example, GB 2 310 942 A describes a burner with carbon monoxide detection and an automatic deactivation system. US 2007/281257 A1 discloses a secondary safety circuit for a gas-fired device comprising a sensor and a valve that can be positioned in a pilot burner gas line. The secondary safety circuit ensures that the valve is closed when a unsafe condition is detected by the sensor. WO 2020/183289 A1 describes a temperature sensor for a gas burner comprising a thermocouple.

[0004] EP0 619 865 B1 is directed to providing a unitary combination of a thermoelectric sensing device and a flamestrip for use in fully premixed air/fuel gas burner apparatus and as another object in providing a fully premixed air/fuel gas burner apparatus incorporating a thermoelectric sensing device and a flamestrip and discloses a thermoelectric sensor assembly for use with a flamestrip in a fuel gas burner. The sensor assembly may be in the form of a probe having temperature sensors downstream of the flamestrip in and adjacent the flame region, and temperature sensors upstream of the flamestrip. A voltage output signal from the sensor assembly is used as an indication of the aeration of the flame and/or of flame establishment and/or flame failure and/or flame lightback.

[0005] EP 2 330 346 A2 is directed to providing a temperature sensor for burners having characteristics such as to allow a positioning thereof with high accuracy and to obviate deformations and degradation of the sensor or parts thereof and discloses to a temperature sensor for a burner, comprising two metal wires implementing a thermocouple, a protection sheath receiving the two metal wires, a head in metal material having a front side intended to be facing the environment, the temperature of which is intended to be measured, and a rear side opposite the front side. The two metal wires are connect-

ed in a thermal exchange relationship to said rear side of said head, in which said head comprises a front portion connectable to a burner wall of said burner so that the thermocouple is connectable to the burner by means of said metal head.

[0006] US 2005/0079459 A1 is directed to providing a more reliable way of detecting explosive flammable vapours compared to conventional solutions and describes a flammable vapor detector system comprising a thermocouple mounted in a combustion chamber of a hot water heater, combustion air intake means to supply combustion air to said combustion chamber, a gas burner in said chamber, a gas supply line secured to said gas burner, an external gas valve in said supply line, a gas valve control circuit to control the ON/OFF state of said external gas valve, said gas valve control circuit being connected to said thermocouple, said thermocouple being exposed to said combustion chamber to sense the temperature therein and being set to cause the control circuit to shut off said external gas valve when said temperature in said combustion chamber reaches a predetermined set temperature value upon burning flammable vapors as they propagate in said combustion chamber through said combustion air intake means.

[0007] US 2003/049574 A1 is directed to providing an improved solution which is particularly efficient from the point of view of safety, which is suitable for a dirty environment, which requires no modification to the basic structure of the appliances and which, as a result, can be applied not only to new appliances, but also to already existing appliances by means of a simple modification and pertains to a gas appliance, which comprises an atmosphere control pilot light and means for detecting the temperature of the flame of the said pilot light which are operationally coupled to means for cutting off the gas supply to the main burner. The gas supply to the main burner is interrupted when the temperature detection means detect cooling of the flame of the pilot light which is caused by gas enrichment of the mixture (presence of vapors in the primary air or obstruction of the air intake by a liquid phase).

[0008] Acidic water or condensate is produced in particular when a carbon-based fuel gas or hydrogen fuel gas is combusted. Typically, the acidic waste is collected in a condensate trap of the boiler and expelled via a condensate drainage or pipe. A blocked or clogged condensate trap may cause a backflow of fluid in the combustion chamber. For safety reasons and to avoid malfunctions, it is advisable to shut down or deactivate the boiler before fluid may enter the combustion chamber.

[0009] For example, GB 2 423 141 A is directed to providing guidance to a service engineer when attending a defective boiler and discloses a diagnostic system for a condensing boiler comprising an overflow electrode arranged within a condensate trap of the boiler. Diagnostic means use the output of the overflow electrode to determine whether there is an overflow in the condensate trap. The system may be utilized to monitor a condensing boiler.

er with a burner.

[0010] It is the technical object of the present invention to improve boiler safety compared to conventional solutions, in particular with respect to the detection of blocked or clogged condensate traps or pipes.

[0011] This technical object is achieved by a system for detecting a backflow of a fluid, in particular a backflow of a fluid originating from a blocked condensate trap, in a combustion chamber of a boiler, in particular for domestic hot water generation or central heating, wherein a burner for combusting fuel gas, in particular including hydrogen, is arranged within the combustion chamber, characterized in that a sensor for detecting fluid includes at least one probe that is adapted and arranged in a lower part of the combustion chamber to get into physical contact with the fluid.

[0012] This technical object is also achieved by a method for detecting a backflow of a fluid, in particular a backflow of a fluid originating from a clogged condensate pipe, in a combustion chamber of a boiler, in particular for domestic hot water generation or central heating, wherein a burner for combusting fuel gas, in particular including hydrogen, is arranged within the combustion chamber, characterized in that a probe arranged in a lower part of the combustion chamber is brought into at least partial physical contact with the fluid for detection thereof.

[0013] The invention relies on, in at least one aspect, the detection of fluid, in particular of acid waste or condensate, within the combustion chamber. Although water in the combustion chamber may potentially damage components, such as in particular the insulation panel, it was found that this risk is relatively low, in particular when a timely deactivation of the burner occurs. Detection of fluid or water within the combustion chamber may in particular utilize one or more sensors that may include at least one probe, dedicated for this purpose only. Alternatively, at least one multi-purpose sensor that might include at least one probe may be used for the detection of fluid or water within the combustion chamber. In particular, the sensors may be also be used for flame detection or flame stability during operation of the boiler.

[0014] In another aspect, the at least one probe arranged within the lower part of the combustion chamber is adapted to exhibit a defined signal response when brought in physical contact with water or fluid. A reliable signal detection is beneficial to deactivate the burner in a timely manner when fluid enters the combustion chamber.

[0015] The arrangement of the at least one probe in the lower part of the combustion chamber may in particular be understood with respect to the field of gravity, such that the at least one probe preferably gets into contact with fluid or water entering the combustion chamber before the combustion chamber gets flooded. In one aspect, the lower part of the combustion chamber may be bounded, in particular in the vertical direction, by a burner wall of the burner arranged within the combustion chamber, such that the at least one probe may be brought into

contact with fluid entering the combustion chamber and accumulating in the lower part of the combustion chamber before parts of the burner wall get into contact with the fluid.

[0016] The at least one probe may for example be configured to generate a signal indicative of fluid or water entering the combustion chamber. The at least one probe may be operatively connected to a controller, in particular micro controller, printed circuit board or the like, that is configured to control and in particular to deactivate the burner when a signal indicative of a water entry is received.

[0017] The fuel gas can be a natural gas, methane, ethylene, propane, butane, coal gas, biogas etc., mixtures of the same, and mixtures of the same additionally comprising hydrogen or hydrogen, in particular pure hydrogen. Pure hydrogen is present if the fuel gas has a at least 98 vol% of hydrogen. The method and system for detecting the backflow is also applicable to a variety of burners with different setup, layout and/or technical design, in particular to burners that are configured for premixed combustion, partially premixed combustion or non-premixed combustion. For premixed combustion, a combustible mixture of gases typically including a fuel gas and oxygen or air is provided to the burner. The combustible mixture of gases supplied to a premixed burner may in particular include hydrogen or oxyhydrogen. In some embodiments, supplying the combustible mixture of gases to the burner may include at least mixing fuel gas, in particular hydrogen, and air as a premix and supplying the premix to the burner and/or at least supplying fuel gas, in particular hydrogen, and air separately to the burner.

[0018] According to possible embodiments, the at least one probe may be a detection electrode configured to detect an ionization current for flame detection. The ionization current can be used for flame detection in particular when a carbon-based fuel gas or a mixture comprising a carbon-based fuel gas is combusted to generate heat. When the detection electrode is in contact with fluid or water, the ionization current is expected to drop abruptly and may thus provide a reliable signal indicative of water entry in the combustion chamber. Preferably, the ionization current is monitored to detect a possible water entry when a carbon-based fuel gas or a mixture of a non-carbon-based fuel gas, in particular hydrogen, and a carbon-based fuel gas at a ratio of 98%vol or less is combusted in the boiler to generate heat. Fluid entering the combustion chamber may in particular be detected by modification, in particular interruption, of the monitored ionization current. An advantage of the invention is that most current natural gas boilers comprise the detection electrode configured to detect the ionization current wherein the detection electrode will be short circuited when there is fluid or water inside the boiler. Said detection electrode can be used when the boiler is retrofitted to a hydrogen gas boiler. For hydrogen gas boilers there is no need of the detection electrode since there is no

carbon content to detect the flame. But the detection electrode can be used to detect if the combustion chamber is full of fluid or water.

[0019] Alternatively, the at least one probe is an injection electrode configured for spark injection or, respectively, to ignite the fuel gas supplied to the burner in particular in presence of a heat request. For example, the injection electrode may be adapted to inject a surface-stabilized or matrix-stabilized combustion process of pure hydrogen or a carbon-based fuel gas. Electrodes, in particular electrodes configured for flame detection or spark injection, may be configured to send a signal to a controller. In particular, the electrodes may be configured to go into short circuit when contacted by fluid or water, which may be utilized as a reliable signal indicating water entry in the combustion chamber.

[0020] Alternatively, the at least probe may be configured as an electrode (combined electrode, mono electrode) that is configured both for spark ignition and for flame detection.

[0021] The at least one probe may be embodied by a first thermocouple arranged in the geodetically lower part of the combustion chamber, wherein a second thermocouple embodies another probe that is arranged in the different, in particular a geodetically upper, part of the combustion chamber. The first and second thermocouple may include a pair of wires or conductors made from different metals for generating signals indicative of temperature differences utilizing the Seebeck effect. In particular, the signals of the first and the second thermocouple may be compared to determine temperature differences within the combustion chamber. Alternatively or additionally, the signals of the first and the second thermocouple may be compared with a predetermined nominal value, respectively. In particular a temperature difference between the signal of the first thermocouple and the nominal value and a temperature difference between the signal of the second thermocouple and the same or a different nominal value can be determined. When the lower, first thermocouple is in contact with water, the detected temperature differences are expected to be significant, which may be used as a reliable indication of water entry. Additionally, the lower, first thermocouple is in contact with water, a drop of temperature is very fast, which can also be used as a reliable indication of water entry.

[0022] The fluid may, for example, be detected by measuring a first temperature at least at the location of the probe or first thermocouple in the lower part of the combustion chamber. Preferably, a second temperature is measured at least at the location of the probe or second thermocouple in the different, in particular upper, part of the combustion chamber. Water entry in the combustion chamber may in particular be detected by evaluating the difference of the first and the second temperature and/or by evaluating the temperature drop.

[0023] Preferably, the first and the second thermocouple may be configured to measure temperatures with re-

spect to a common reference temperature. The reference temperature may in particular be provided by a surface temperature of the burner. For example, the first and the second thermocouple may be arranged on a burner wall of a surface-stabilized burner for establishing at least an approximate heat reference.

[0024] In some embodiments, the first and the second thermocouple can project from the burner wall of the burner in opposite directions to in particular generate signals indicative of heat differences between the lower and upper part of the combustion chamber.

[0025] In particular embodiments, the first and the second thermocouple may be arranged at a distance from each other on a, in particular substantially, cylindrical burner wall. The first and the second thermocouple can be arranged at an angle range between 0° to 180°, in particular 5° to 180° or 35° to 180° or 45° to 90°, relative to each other. The minimum distance between two thermocouples can be 30° to 180°, preferably 70°. If the distance between the thermocouples is high, the temperature measurement is not homogenous. On the other side, if the distance between the thermocouples is too low, it is harder to recognize when a thermocouple gets into contact with the liquid. The symmetry axis of the substantial cylindrical burner wall may in particular be oriented in horizontal direction such that the first thermocouple projects from the burner wall downwards into the lower part of the combustion chamber and the second thermocouple projects from the burner wall upwards into the upper part of the combustion chamber.

[0026] In at least one aspect, the invention relates to a boiler, in particular for domestic hot water generation or central heating, comprising the system for detecting a back flow or configured to implement the method of detecting the backflow as described herein before.

[0027] In the figures, the subject-matter of the invention is schematically shown, wherein identical or similarly acting elements are usually provided with the same reference signs.

FIG. 1 illustrates a first embodiment of a system for detecting a backflow of fluid in a combustion chamber in a schematic sectional view.

FIG. 2 shows a second embodiment of a system for detecting a backflow of fluid in a combustion chamber in another schematic sectional view.

Fig. 3 a top view on a burner arranged in the combustion chamber and two thermocouples arranged at different positions.

Fig. 4 a perspective view on a burner with two thermocouples.

[0028] Figure 1 shows a boiler 100 for domestic hot water generation that includes a gas-fueled burner 30 arranged in a central part of a combustion chamber 20.

A heat exchanger 70 is in thermal contact with the burner 30 and includes at least one duct for conducting a heat-absorbing fluid. The at least one duct winds in coils 71 around an outer periphery of the combustion chamber 20 so that the heat-absorbing fluid, in particular water, may absorb a substantial amount of heat generated in the combustion process.

[0029] The burner 30 is of the surface-stabilized type and comprises a substantially cylindrical burner wall 31 that is perforated. Fuel gas supplied to the burner 30 by means of an intake 33 may traverse the burner wall 31 via holes. An injection electrode 52 for spark injection is adapted to ignite the fuel gas traversing the burner wall 31 to establish a stabilized flame strip on the outer surface of the cylindrical burner wall 30.

[0030] The burner 100 is configured for premixed combustion. During operation, the intake 33 feeds a combustible mixture of gases comprising at least a fuel gas, in particular hydrogen, and air or oxygen to the burner.

[0031] A detection electrode 51 for flame detection is configured to detect an ionization current that is established in particular when carbon-based fuel is combusted. The injection or spark electrode 52 and the detection electrode 51 are operatively connected to a controller, in particular micro-controller or printed circuit board, for controlled operation of the boiler 100, in particular in presence of a heat request or load.

[0032] As illustrated in figures, the cylindrical burner 30 is aligned in a horizontal direction with respect to the field of gravity in the combustion chamber 20. In particular when fuel gas comprising carbon-based fuel is combusted during operation of the burner 30, acid fluid or water is generated that eventually condenses and may be released from the combustion chamber 30 via a drain 23 and be further conducted to a condensate trap of the boiler 100. Typically, the drain 23 is located within the combustion chamber 20 at a low position with respect to the field of gravity such that the combustion chamber 20 may substantially be drained from condensate that accumulates within the combustion chamber 20 when the burner 30 is operated.

[0033] In case of a blocked or condensate trap or drain 23, fluid flows back to the combustion chamber 20 which may cause malfunctions or damages to the boiler 100. Fluid entering the combustion chamber 20 via the drain 23 typically starts to flood a lower part 21 of the combustion chamber 20 before the water level eventually may reach a lower portion of the cylindrical burner wall 31. The boiler 100 comprises a system 10 configured to detect such a backflow in a timely manner. The system 10 has a sensor for detecting fluid within the combustion chamber 20 that includes or is embodied by at least one probe 41 arranged in the lower part 21 of the combustion chamber 20. The probe 41 is configured to generate a well-defined and reproducible signal response when in direct physical contact with the fluid.

[0034] In the first embodiment illustrated in Fig. 1, the probe 41 is embodied by the detection electrode 51. The

detection electrode 51 may transmit signals indicative of the ionization current to the controller, in particular in presence of a load or heat request. Water entry in the combustion chamber 20 may be detected by modified signals, in particular by an interruption of the ionization current or otherwise by a short circuit caused by fluid or water contacting the probe 41.

[0035] Alternatively, the spark or injection electrode 52 may be arranged in the lower part 21 of the combustion chamber 20 to detect the water entry. In this case the detection typically relies by determining a short circuit when the injection electrode 52 is wetted or partially submerged in fluid.

[0036] The controller shuts off and deactivates the boiler 100 in case fluid is detected by the at least one probe 41. In particular, the controller may direct the gas supply of the burner to be cut off in case of a clogged or blocked condensate trap.

[0037] Fig. 2 shows a second embodiment of the system 10 for detection of the backflow of fluid that may in particular originate from a blocked condensate trap. The sensor 40 of the second embodiment comprises two probes or thermocouples 61, 62 that are arranged on the cylindrical burner wall 31 and project therefrom in opposite radial directions. The thermocouples 61, 62 are configured to measure temperatures by utilizing the Seebeck effect. The first thermocouple 61 is arranged in the lower part 21 of the combustion chamber 20, whereas the second thermocouple 62 is arranged in the upper part 22 of the combustion chamber. With respect to the symmetry axis of the substantial cylindrical burner wall 31, the first and second thermocouple are arranged relative to each other at an angle of about 180°.

[0038] The first and the second thermocouple 61, 62 are arranged, in particular welded on the burner wall 31 to measure temperatures with respect to the surface temperature of the burner wall 31 as reference. The first thermocouple projects downwards from a lower portion of the burner surface 30 into the lower part 21 of the combustion chamber 20, whereas the second thermocouple 62 projects upwards from an upper portion of the burner surface 30 into the upper part 22 of the combustion chamber 20. The first thermocouple 61 generates signals that are proportional to the first temperature at in the lower part 21 of the combustion chamber 20. The second thermocouple 62 generates signals that are proportional to a second temperature at in the upper part 22 of the combustion chamber 20. The signals of the first and second thermocouples 61, 62 are received and evaluated by the controller of the boiler 100. Preferably, the first and second temperatures are continuously or at least frequently detected and compared with each other, in particular by means of a plausibility algorithm for determining a water entry in the combustion chamber 20. Additionally, the values detected by the thermocouples 61, 62 can be used to verify the correct operation of the boiler. Water entry in the combustion chamber 20 is detected by at least approximately determining or evaluating the difference

of the first and the second temperatures that are respectively indicative of the temperature in the lower part 21 and in the upper part 22 of the combustion chamber 20. When the probe 41 or first thermocouple 61 gets into direct contact with water, the difference between the first temperature and the second temperature rises rapidly, which is used as trigger indicating a blocked drain 23 or condensate trap. Typically, the controller immediately deactivates the boiler 100 in such an event.

[0039] Fig. 3 shows a top view on a burner 30 arranged in the combustion chamber and two thermocouples 61, 62 arranged at different positions. The first and second thermocouple 61, 62 are arranged on the burner wall 31 in distance to each other in circumference direction of the burner wall 31. In particular, the first and second thermocouple are arranged in distance to each other by 45° in circumference direction of the burner wall 31.

[0040] Fig. 4 shows a perspective view on a burner 30 with two thermocouples 61, 62. In said embodiment the thermocouples are arranged in distance form each other along an axial direction of the burner 30. In particular, in said embodiment the two thermocouples 61, 62 are not arranged in distance form each other in circumference direction of the burner 30 so that the angle between the two thermocouples is 0°.

Reference Signs

[0041]

10	system
20	combustion chamber
21	lower part
22	upper part
23	drain
30	burner
31	burner wall
33	intake
40	sensor
41	probe
51	detection electrode
52	injection electrode
61	first thermocouple
62	second thermocouple
70	heat exchanger
71	coil
100	boiler

Claims

1. A system (10) for detecting a backflow of a fluid, in particular a backflow of a fluid originating from a blocked condensate trap, in a combustion chamber (20) of a boiler (100), in particular for domestic hot water generation or central heating, wherein a burner (30) for combusting fuel gas, in particular including hydrogen, is arranged within the combustion cham-

ber (20), **characterized in that** a sensor (40) for detecting fluid includes at least one probe (41) that is adapted and arranged in a geodetically lower part (21) of the combustion chamber (20) to get into physical contact with the fluid.

2. The system (10) according to claim 1, **characterized in that** the at least one probe (41) is a detection electrode (51) configured to detect an ionization current for flame detection.

3. The system (10) according to one of the claims 1, **characterized in that** the at least one probe (41) is an injection electrode (52) configured for spark injection.

4. The system (10) according to claim 1, **characterized in that** the at least one probe (41) is a first thermocouple (61) arranged in the lower part (21) of the combustion chamber (20), wherein the sensor (40) includes a second thermocouple (62) that is arranged in a different, in particular geodetically upper, part (22) of the combustion chamber (20).

5. The system (10) according to claim 4, **characterized in that** the first and the second thermocouple (61, 62) project from a burner wall (31) of the burner (30) in opposite directions.

6. The system (10) according to claim 4 or 5, **characterized in that**

a. the first and the second thermocouple (61, 62) are arranged at a distance from each other on a, in particular substantially, cylindrical burner wall (31) and/or

b. the first and the second thermocouple (61, 62) are arranged on a, in particular substantially, cylindrical burner wall (31) at an angel range between 0° to 180°, in particular 5° to 180° or 35° to 180° or 45° to 90°, relative to each other.

7. The system (10) according to one of the previous claims 1 to 6, **characterized in that** the burner (30) is configured to combust a fuel gas, in particular a mixture of a carbon based fuel gas and hydrogen.

8. A method for detecting a backflow of a fluid, in particular a backflow of a fluid originating from a clogged condensate pipe, in a combustion chamber (20) of a boiler (100), in particular for domestic hot water generation or central heating, wherein a burner (30) for combusting fuel gas, in particular including hydrogen, is arranged within the combustion chamber (20), **characterized in that** a probe (41) arranged in a lower part (21) of the combustion chamber (20) is brought into physical contact with the fluid for detection thereof.

9. The method according to claim 8, **characterized in that** the fluid is detected by modification, in particular interruption, of an ionization current.
10. The method according to claim 9, **characterized in that** the fuel gas consists of a mixture of a carbon based fuel gas and hydrogen at a ratio of hydrogen to carbon based fuel gas of 98vol% or less. 5
11. The method according to claim 8, **characterized in that** the fluid is detected by measuring a first temperature at a least at the location of the probe (41) in the lower part (21) of the combustion chamber (20). 10
12. The method according to claim 11, **characterized in that** the fluid is detected by measuring a second temperature at a least a location in a different, in particular geodetically upper, part (22) of the combustion chamber (20) and evaluating the difference of the first and the second temperature. 15 20
13. The method according to claim 11 or 12, **characterized in that** the first and the second temperatures are measured with respect a surface temperature of the burner (30) as reference temperature. 25
14. The method according to one of the claims 11 to 13, **characterized in that** the fuel gas consists of pure hydrogen, a carbon-based fuel gas or a mixture of a carbon based fuel gas and hydrogen. 30
15. A boiler (100), in particular for domestic hot water generation or central heating, comprising the system (10) of one of the claims 1 to 7 and/or configured to implement the method of one of the claims 8 to 14. 35

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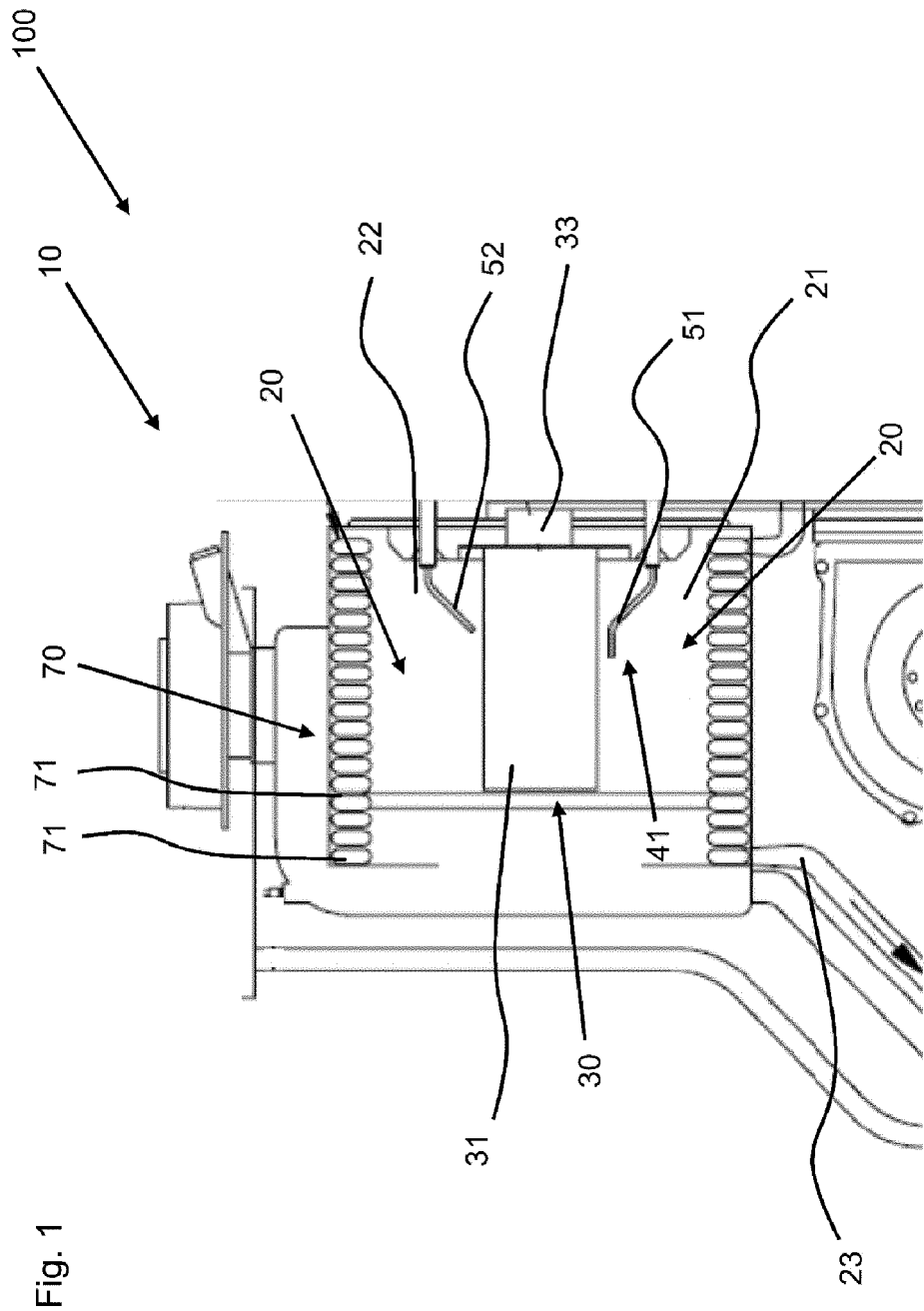


Fig. 1

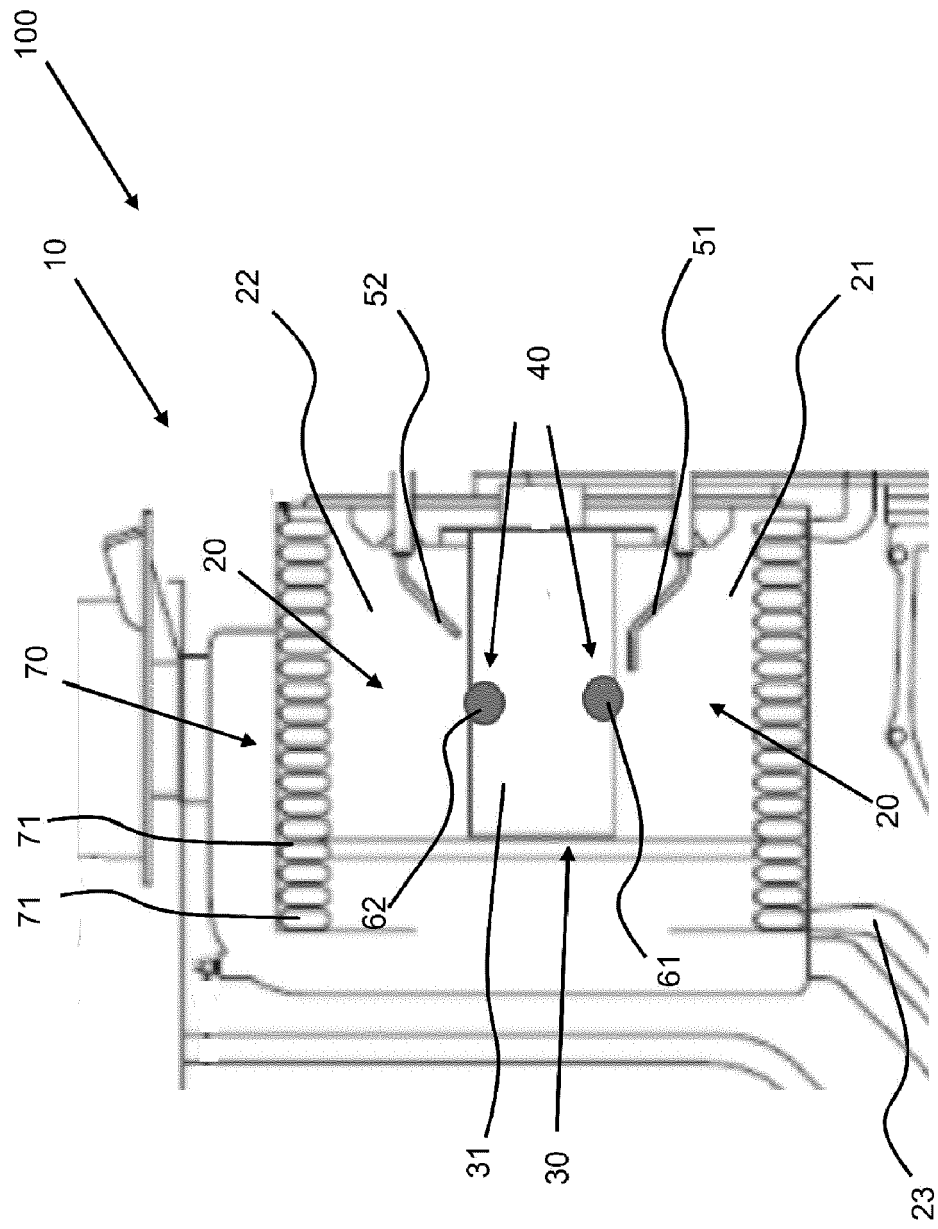


Fig. 2

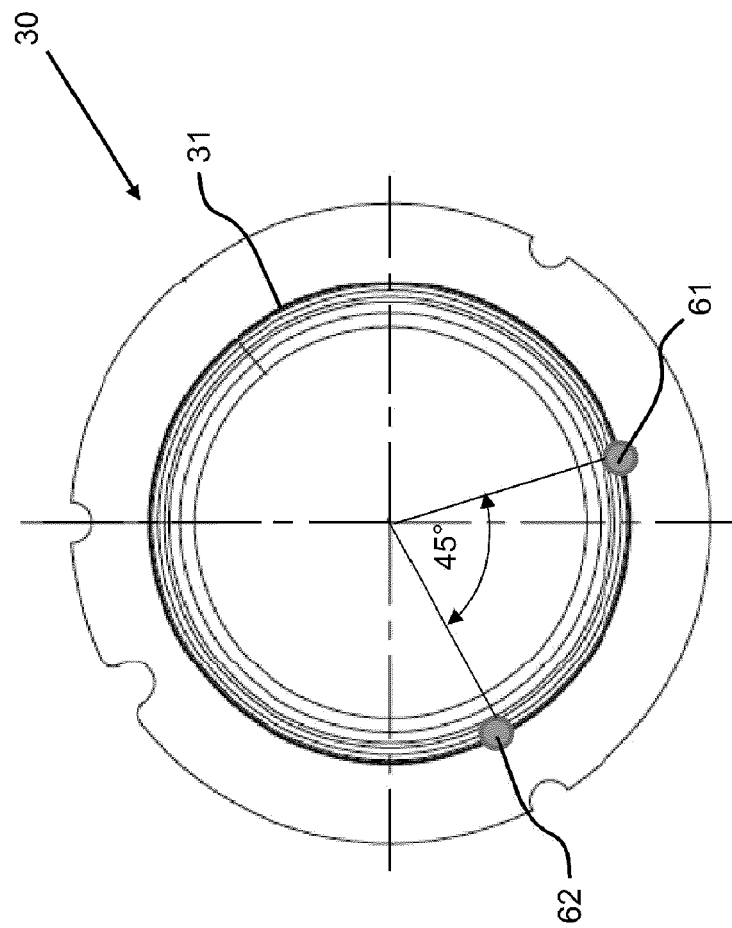


Fig. 3

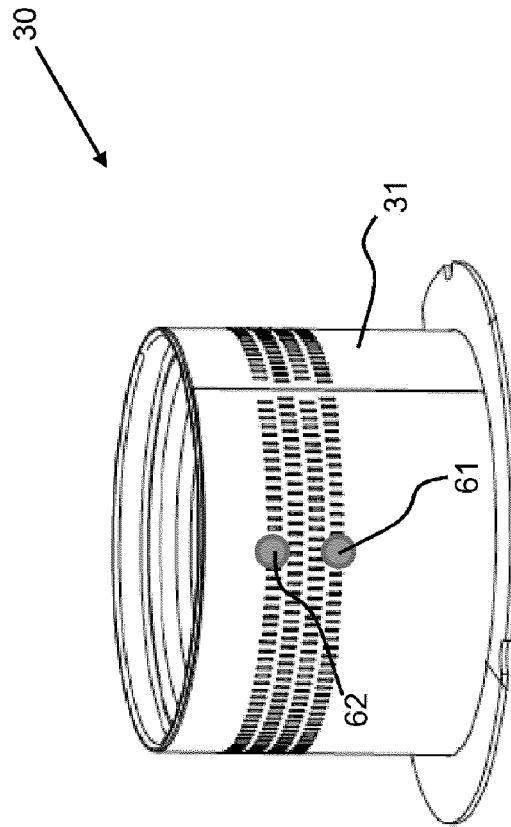


Fig. 4



EUROPEAN SEARCH REPORT

Application Number

EP 21 18 7114

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EPO FORM 1503 03.82 (P04C01)

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 22 December 2021	Examiner von Mittelstaedt, A
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			

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

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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