



EUROPEAN PATENT APPLICATION

(43) Date of publication:
09.06.2021 Bulletin 2021/23

(51) Int Cl.:
F24H 1/10 (2006.01) **F24H 1/12 (2006.01)**
F24H 9/20 (2006.01) **F23N 5/24 (2006.01)**

(21) Application number: **19213429.4**

(22) Date of filing: **04.12.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME KH MA MD TN

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(54) **GAS-FIRED HEATING APPLIANCE WITH HARMFUL GAS DETECTION**

(57) The present invention discloses a gas-fired heating appliance adapted for being connected to a common chimney via flue pipes to discharge fumes and introduce outside air. The gas-fired heating appliance includes a housing, a burner, a gas valve, a fan, a harmful gas sensor, and a controller. The harmful gas sensor is disposed in the housing for detecting a concentration of the harmful gases within air inside of the housing. The harmful gas sensor can be used to detect one or several or all of CO, CO₂, NO_x and other harmful gases normally contained in fumes. The controller is electrically connected with the burner, the gas valve, the fan, and the harmful gas sensor for controlling the fan and/or the burner and/or the gas valve based on the detection of the harmful gas sensor. In this way, when there is fumes recirculation inside of the housing, it will be quickly detected and appreciates actions can be taken against the fumes recirculation.

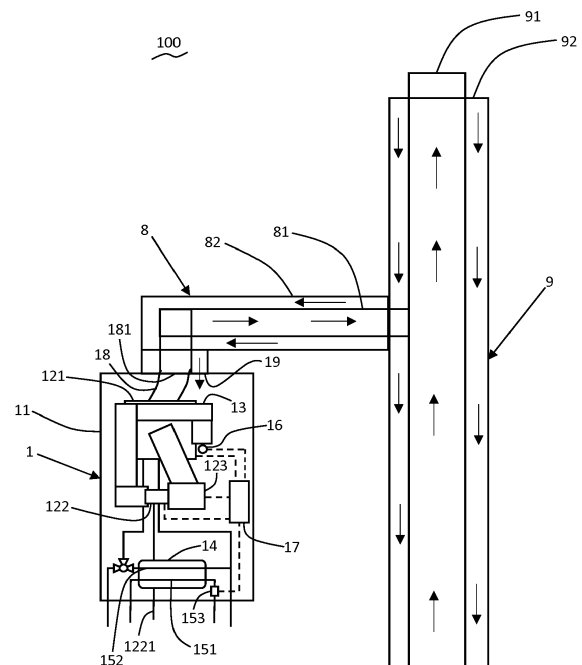


Fig. 1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a gas-fired heating appliance, and more particularly to a gas-fired heating appliance that is able to detect interior air quality thereof.

BACKGROUND OF THE INVENTION

[0002] Gas-fired heating appliances generally include gas water heaters and gas boilers. A typical gas boiler is operable to heat a transfer fluid, such as water, which is pumped around a boiler circuit. The boiler circuit is typically connected, via suitable valves to space heating apparatuses such as radiators or under floor heating loop, so that the heat output from the boiler can be used for space heating purposes. The gas boiler usually generates fumes containing harmful gases, like CO (Carbon monoxide), CO₂ (Carbon dioxide), NO_x (Nitric oxide) etc., which shall be discharged outdoors. For boilers installed on multiple flue configurations, a number of boilers installed in multiple-family houses can be connected to a common chimney via flue pipes to release fumes. The chimney can be a concentric duct composed of coaxial inner and outer tubes, usually the inner tube is provided to discharge the fumes and the outer tube is provided to introduce fresh air.

[0003] However, there exist some risks. If a neighbor non-return flap installed in the flue pipes is missing or damaged, the fumes in the chimney can return to inside of the boiler. Moreover, if a neighbor or own flue seal is damaged, the fumes can also return inside of the boiler. Such return of the fumes may result in a combustion failure. Since the returning fumes may replace the fresh air or decrease the concentration of the oxygen in the fresh air inside of the boiler, the boiler will not ignite on ignition or lose the flame on combustion, and corresponding fault codes will be displayed accordingly. In addition, the fumes can enter the family house and result in a hazardous pollution if the outer casing of the boiler is not well air sealed.

SUMMARY OF THE INVENTION

[0004] It is an object of present invention to provide a gas-fired heating appliance that is able to monitor quality of air inside of the appliance and perform certain operations to improve the air quality and alert installers or users when the air quality is getting worse mainly because of fumes recirculation, thereby increasing the safety of the appliance.

[0005] According to present invention there is provided a gas-fired heating appliance adapted for being connected to a common chimney via flue pipes to discharge fumes and introduce outside air. The gas-fired heating appliance includes a housing, a burner, a gas valve, a

fan, a harmful gas sensor, and a controller. The housing defines a first port and a second port surrounding the first port, wherein one of the first and the second ports is provided to discharge fumes and the other of the first and the second ports is provided to introduce outside air. The burner is disposed in the housing for combustion of a mixture of introduced outside air and fuel gas to generate fumes. The gas valve is associated with the burner for regulating supply of fuel gas to the burner. The fan is disposed in the housing for driving the introduced outside air supplied to the burner and urging the fumes to be discharge outside through the flue pipes and the common chimney. The harmful gas sensor is disposed in the housing for detecting a concentration of the harmful gases within air inside of the housing. The harmful gas sensor can be used to detect one or several or all of CO, CO₂, NO_x and other harmful gases normally contained in fumes. The controller is electrically connected with the burner, the gas valve, the fan, and the harmful gas sensor for controlling the fan and/or the burner and/or the gas valve based on the detection of the harmful gas sensor. In this way, when there is fumes recirculation inside of the housing, it will be quickly detected and appreciates actions can be taken against the fumes recirculation.

[0006] Preferably, the controller is configured to start a standby operation when an excess of harmful gases is detected while the appliance is in a standby mode.

[0007] Wherein, the excess of harmful gases is detected when the harmful gas sensor detects that the concentration of the harmful gases is larger than or equals to a first threshold.

[0008] Wherein, the standby operation includes activating the fan to run to evacuate fumes in the air inside of the housing.

[0009] Preferably, the standby operation further includes increasing the fan speed step by step, like every two minutes.

[0010] Moreover, the standby operation includes stopping the fan running if the harmful gas sensor detects that the concentration of the harmful gases reduces to a second threshold within a first time duration after the excess of harmful gases being detected.

[0011] Furthermore, the standby operation includes displaying a fault code if the harmful gas sensor detects that the concentration of the harmful gases does not reduce to a second threshold within a first time duration after the excess of harmful gases being detected, so that the user or the installer can be notified there is bad air quality inside of the housing.

[0012] Preferably, the standby operation further includes keeping the fan running to continue evacuating fumes until the user or the installer stops it, and disabling the combustion of the burner to avoid danger or damages.

[0013] Wherein, the second threshold equals to or is lower than the first threshold.

[0014] In one embodiment, the controller is configured to stop the combustion of the burner and then enter the

standby operation when the appliance operates in a domestic hot water mode for a second time duration after the excess of harmful gases being detected. By this means, a comfort of domestic hot water demand can ensured. For example, a user taking a shower will not be interrupted suddenly.

[0015] In one embodiment, the controller is configured to stop the combustion of the burner and then enter the standby operation when the excess of harmful gases is detected while the appliance operates in a space heating mode.

[0016] In one embodiment, the appliance further includes a counter that is able to count once when the excess of harmful gases is detected and the burner is in operation, and wherein the controller is configured to display a fault code when the accumulated number of times reaches a predetermined value within a certain time period.

[0017] Preferably, the controller is further configured to keep the fan running and disable the combustion of the burner.

[0018] In one embodiment, the harmful gas sensor is disposed adjacent to the port for introducing outside air. Since the sensor is positioned at entrance of the fresh air, the fumes recirculation from other boilers can be quickly detected when the appliance is in a standby mode.

[0019] In an alternative embodiment, the appliance further includes an air duct disposed in the housing for guiding the outside air to the burner, and wherein the harmful gas sensor is disposed at an inlet of the air duct, which is better to detect fumes recirculation when the appliance is running because the fan is sucking the fresh air and the fumes recirculation from other boilers or this boiler's own thermal module can be detected quickly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] For a more complete understanding of the present invention, and the advantages thereof, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a schematic diagram showing a gas boiler connected with a common chimney via flue pipes in accordance with a first embodiment of present invention;

Fig. 2 is a schematic diagram showing a gas water heater connected with a common chimney via flue pipes in accordance with a second embodiment of present invention;

Fig. 3 is a flowchart showing operations of the gas boiler shown in Fig. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] Reference will now be made to the drawing figures to describe the preferred embodiments of the present invention in detail. However, the embodiments can not be used to restrict the present invention. Changes such as structure, method and function obviously made to those of ordinary skill in the art are also protected by the present invention.

[0022] The gas-fired heating appliance of the present invention is suitable for home applications and could be fired with combustible gas, such as natural gas, city gas, liquefied petroleum gas, methane, etc.. Gas-fired heating appliances can be used to heat domestic water for hot water demands of users, such as gas water heaters, or gas boilers that can provide both domestic hot water and needs of space heating. A gas boiler and a gas water heater will be respectively exemplified to explain the present invention in details in the following embodiments.

[0023] Referring to Fig. 1, in a first embodiment of present invention, a gas-fired heating appliance and chimney system 100 includes a gas boiler 1, a common chimney 9, and flue pipes 8 connected between the gas boiler 1 and the common chimney 9. The common chimney 9 can be connected by a number of gas-fired heating appliances in multi-family house on multiple flue configurations, for example, the chimney may be out of the building or in the building. Each of the flue pipes 8 and the common chimney 9 may take forms of a concentric duct composed of coaxial inner tube 81, 91 and outer tube 82, 92, wherein, one of the inner and the outer tubes is provided to discharge fumes and the other of the inner and the outer tubes is provided to introduce outside fresh air. In this embodiment, the inner tube 81, 91 is to discharge the fumes and the outer tube 82, 92 is to introduce fresh air.

[0024] The gas boiler is preferably a condensing boiler. The boiler 1 includes a housing 11, and a thermal module 121, a gas valve 122, a fan 123 all contained in the housing 11. The housing is usually sealed in appropriate means to prevent gas leakage. The housing 11 defines a first port 181 communicating with the inner tubes 81, 91, and a second port 182 surrounding the first port and communicating with the outer tubes 82, 92. The thermal module 121 typically includes a cylindrical burner combined with ignition and monitoring electrodes for combustion of a mixture of fresh air and fuel gas to generate fumes, and an integral condensation heat exchanger that consists of a number of stacked coils surrounding the cylindrical burner. The gas valve 122 is connected with a fuel gas supplying line 1221 and operable to regulate supply of the fuel gas to the burner. The fan 123 is provided to route the fresh air mainly containing oxygen for combustion preferably through an air duct 13 to the burner, and to urge the fumes to be released into the flue pipes via a flue duct 281.

[0025] A plate heat exchanger 14 is disposed in the

housing 11. A domestic water path 151 is provided to introduce cold water that can pass through the plate heat exchanger 14 to obtain heat, and output the heated water for sanitary usage, such as showering or bathing. A transfer fluid path 152 is connected with the integral condensation heat exchanger for obtaining heat, and external space heating apparatuses for radiating heat into interior of buildings. The transfer fluid path 152 can also be switched to pass through the plate heat exchanger 14, however, the two paths 151, 152 are physically isolated to avoid mixing the domestic water and the transfer fluid, but allowing heat interchanging therebetween. A flow sensor 153 is disposed in and preferably at the inlet of the domestic water path 151 and able to generate a signal when there is water flow passing through the path 151 for domestic hot water demand.

[0026] A harmful gas sensor is provided inside of the housing 11 at a proper position to detect concentration of the harmful gases with the air inside of the housing. The harmful gases can be one or all kinds of harmful gases contained in the fumes, such as CO, CO₂, NO_x, etc. In other words, if there is a recirculation of fumes from the common chimney 9, or other gas-fired heating appliances in the system, or even the gas boiler 1 itself, such fumes recirculation can be detected by this gas sensor. In this embodiment, the harmful gas sensor can be a CO₂ sensor such as TELAIRE® T6713 series working by NDIR (Non-Dispersive Infrared) technology. The NDIR technology uses a broadband infrared (IR) emitter, which covers all of the wavelengths of interest for a given set of gases to be measured. Optical band pass filter attached to the gas sensor allow that portion of IR wavelengths at which a specific gas, like CO₂ absorbs IR energy, then the gas sensor produces a signal that is proportional to the amount of IR energy absorbed by the gas of interest. In this embodiment, the harmful gas sensor 16 is preferably provided at an inlet of the air duct 13, which is better to detect fumes recirculation when the boiler is running because the fan 123 is sucking the fresh air and the fumes recirculation from other boilers or this boiler's own thermal module can be detected quickly.

[0027] A controller 17 is also provided in the housing 11 and electrically connected with the burner, the gas valve 122, the fan 123, the flow sensor 153, and the harmful gas sensor 16. The controller 17 is configured to control various operations of the gas boilers, which will be described in details with reference to the flowchart shown in Fig. 3. The controller 17 can be a logic control circuit formed by a number of electronic components connected in accordance with certain wiring patterns; or it may also be a microcontroller (MCU) storing program instructions; or it may be integrated chips with specific use, such as Field-Programmable Gate Arrays (FPGAs).

[0028] Fig. 2 shows a gas-fired heating appliance and chimney system 200 in a second embodiment of present invention, wherein, a gas water heater 2 is connected to a common chimney 9 via flue pipes 8. The gas water heater 2 includes an air tight housing 21 having a first

port 281 and a second port 29, a burner 221 combined with ignition and monitoring electrodes 2211, 2222, a finned tube heat exchanger 222 connected with a cold water incoming line 251 and a hot water output line 252, a gas valve 23 connected in a fuel gas supplying line 231, a fan 24 for driving introduced outside air and urging fumes discharged into the flue pipes 8 via a gas hood 28. A harmful gas sensor that can also be a CO₂ sensor provided adjacent to the second port 29 where outside fresh air is introduced. Since the sensor is positioned at entrance of the fresh air, the fumes recirculation from other boilers can be quickly detected when the gas water is in a standby mode. A controller 27 is also provided in the housing 21 and electrically connected with the burner 221, the gas valve 23, the fan 24, the flow sensor 253, and the harmful gas sensor 26. As the components in present embodiment are the same as or similar to those in the first embodiment, a detailed explanation of functional operation is omitted for sake of brevity and simplicity.

[0029] Referring to Fig. 3, in conjunction with Fig. 1, a flowchart of controlling operations of the gas boiler in accordance with the first embodiment of present invention is shown. The controller 17 monitors CO₂ concentration of the air inside of the housing 11 via the CO₂ sensor 16 in real time or periodically (step 411). If the concentration of CO₂ is larger than or equals to a first threshold, such as 9000ppm (step 411), which means there is an excess of CO₂, the controller 17 will further check if the burner is in operation through the monitoring electrode (step 413). If the burner is not in operation, which means the gas boiler is in a standby mode, the controller 17 then starts a standby operation. The controller 17 first activates the fan 123 to run to evacuate fumes in the fresh air so that the quality of the fresh air becomes good for ignition (Step 421). In a preferred embodiment, the fan 123 runs at a lowest speed at first, then increases the speed step by step. It is well known to the skilled person that the fan speed can be regulated by adjusting the PWM signal to the current of the fan. During the fan running, the controller 17 continues to check if the CO₂ concentration reduces to a second threshold within a first time duration after the excess of CO₂ being detected (Step 422). The second threshold equals to or is lower than the first threshold. If the CO₂ concentration can reduce to the second threshold within the first time duration, which means the quality of the air inside of the housing is good enough for a successful ignition, the controller 17 stops the fan running (Step 423) and then continues to monitor the CO₂ concentration. Preferably, the controller can stop the fan after a delay. If the CO₂ concentration does not reduce to the second threshold within the first time duration, which means the air quality is still not good enough for ignition, the controller 17 then displays a fault code on a display panel (not shown) of the gas boiler to remind the user so that the user can inspect the boiler and take appropriate actions against fumes, preferably, the controller 17 also disables the combustion

of the burner, such as cutting off the gas valve 122 to avoid danger and damages, meanwhile keeps the fan running to evacuate fumes (Step 424).

[0030] Return to the step 413, if the burner is in operation, a counter for fumes recirculation will count once (Step 414), then the controller 17 further checks if the accumulated number of times reaches a predetermined value within a certain time period (Step 415). In this embodiment, the predetermined value is five, and the certain time period is 24-hour. Therefore, if the accumulated number of times of the counter reaches five within past 24 hours, which means there is a high frequency of detection of excess of CO₂, then the controller 17 displays a fault code, and preferably, disables the combustion of the burner and keeps the fan running to evacuate fumes (Step 424); otherwise, the controller 17 further checks if there is a demand of domestic hot water (Step 416). The controller 17 can detect domestic hot water demand via the flow sensor 153, that is, if there is a water flow in the domestic water path 151, the flow sensor will send a corresponding signal to the controller 17, then the controller 17 will wait for a second time duration after the excess of CO₂ being detected, like three hours to ensure the comfort of users using the hot water (Step 417). If there is no domestic hot water demand, namely the boiler is in operation in a space heating mode, or the second time duration lapses after the excess of CO₂ being detected in the domestic hot water mode, the controller 17 stops the combustion of the burner, such as by cutting off the gas valve 122 (Step 418) and then enters the standby operation. It is obvious to the skilled person that, for a gas water heater, the step 416 can omitted because if the burner is in operation, the flow sensor shall detect a water flow at the same time, so there is no need to detect "domestic hot water demand".

[0031] The harmful gas detection can also be used by an installer. On installation, the controller is operable to conduct the detection of harmful gases on site, and if there is an excess of harmful gases being detected, he or she can inspect and take actions against fumes recirculation right now. Moreover, since the fumes usually contain CO, CO₂, NO_x and other harmful gases, an excess of CO₂ also reflects an excess of CO or NO_x, therefore, the excess of CO and NO_x can also be limited by only detection of CO₂ and thus the excess limitation. Furthermore, for a condensation boiler, the risk of condensation in air side caused by potential fumes recirculation can be reduced because the fumes recirculation can be detected quickly and the fan will be started to evacuate the fumes.

[0032] It is to be understood, however, that even though numerous, characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosed is illustrative only, and changes may be made in detail, especially in matters of number, shape, size, and arrangement of parts within the principles of the invention to the full extent indicated

by the broadest general meaning of the terms in which the appended claims are expressed.

5 Claims

1. A gas-fired heating appliance (1, 2) adapted for being connected to a common chimney (9) via flue pipes (8) to discharge fumes and introduce outside air, comprising:

a housing (11, 21) defining a first port (181, 281) and a second port (19, 29) surrounding the first port, wherein one of said first and said second ports is provided to discharge fumes and the other of said first and said second ports is provided to introduce outside air;

a burner disposed in the housing for combustion of a mixture of introduced outside air and fuel gas to generate fumes;

a gas valve associated with the burner for regulating supply of fuel gas to the burner;

a fan disposed in the housing for driving the introduced outside air supplied to the burner and urging the fumes to be discharge outside through the flue pipes and the common chimney;

a harmful gas sensor disposed in the housing for detecting a concentration of the harmful gases within air inside of the housing; and

a controller electrically connected with the burner, the gas valve, the fan, and the harmful gas sensor for controlling the fan and/or the burner and/or the gas valve based on the detection of the harmful gas sensor.

2. A gas-fired heating appliance according to claim 1, wherein said controller is configured to start a standby operation when an excess of harmful gases is detected while the appliance is in a standby mode.

3. A gas-fired heating appliance according to claims 2, wherein the excess of harmful gases is detected when the harmful gas sensor detects that the concentration of the harmful gases is larger than or equals to a first threshold.

4. A gas-fired heating appliance according to claims 2 or 3, wherein said standby operation includes activating the fan to run.

5. A gas-fired heating appliance according to claim 4, wherein said standby operation further includes increasing the fan speed step by step.

6. A gas-fired heating appliance according to claims 4 or 5, wherein said standby operation further includes stopping the fan running if the harmful gas sensor detects that the concentration of the harmful gases

reduces to a second threshold within a first time duration after the excess of harmful gases being detected.

7. A gas-fired heating appliance according to claims 4 or 5, wherein said standby operation further includes displaying a fault code if the harmful gas sensor detects that the concentration of the harmful gases does not reduce to a second threshold within a first time duration after the excess of harmful gases being detected. 5
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8. A gas-fired heating appliance according to claim 7, wherein said standby operation further includes keeping the fan running and disabling the combustion of the burner. 15
9. A gas-fired heating appliance according to claims 6 or 7, wherein the second threshold equals to or is lower than the first threshold. 20
10. A gas-fired heating appliance according to any of claims 2-9, wherein said controller is configured to stop the combustion of the burner and then enter said standby operation when the appliance operates in a domestic hot water mode for a second time duration after the excess of harmful gases being detected. 25
11. A gas-fired heating appliance according to any of claims 2-9, wherein said controller is configured to stop the combustion of the burner and then enter said standby operation when the excess of harmful gases is detected while the appliance operates in a space heating mode. 30
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12. A gas-fired heating appliance according to claim 2, further comprising a counter that is able to count once when the excess of harmful gases is detected and the burner is in operation, and wherein said controller is configured to display a fault code when the accumulated number of times reaches a predetermined value within a certain time period. 40
13. A gas-fired heating appliance according to claim 12, wherein said controller is further configured to keep the fan running and disable the combustion of the burner. 45
14. A gas-fired heating appliance (2) according to claim 1, wherein said harmful gas sensor (26) is disposed adjacent to the port for introducing outside air. 50
15. A gas-fired heating appliance (1) according to claim 1, further comprising an air duct (13) disposed in the housing for guiding the outside air to the burner, and wherein said harmful gas sensor (16) is disposed at an inlet of the air duct. 55

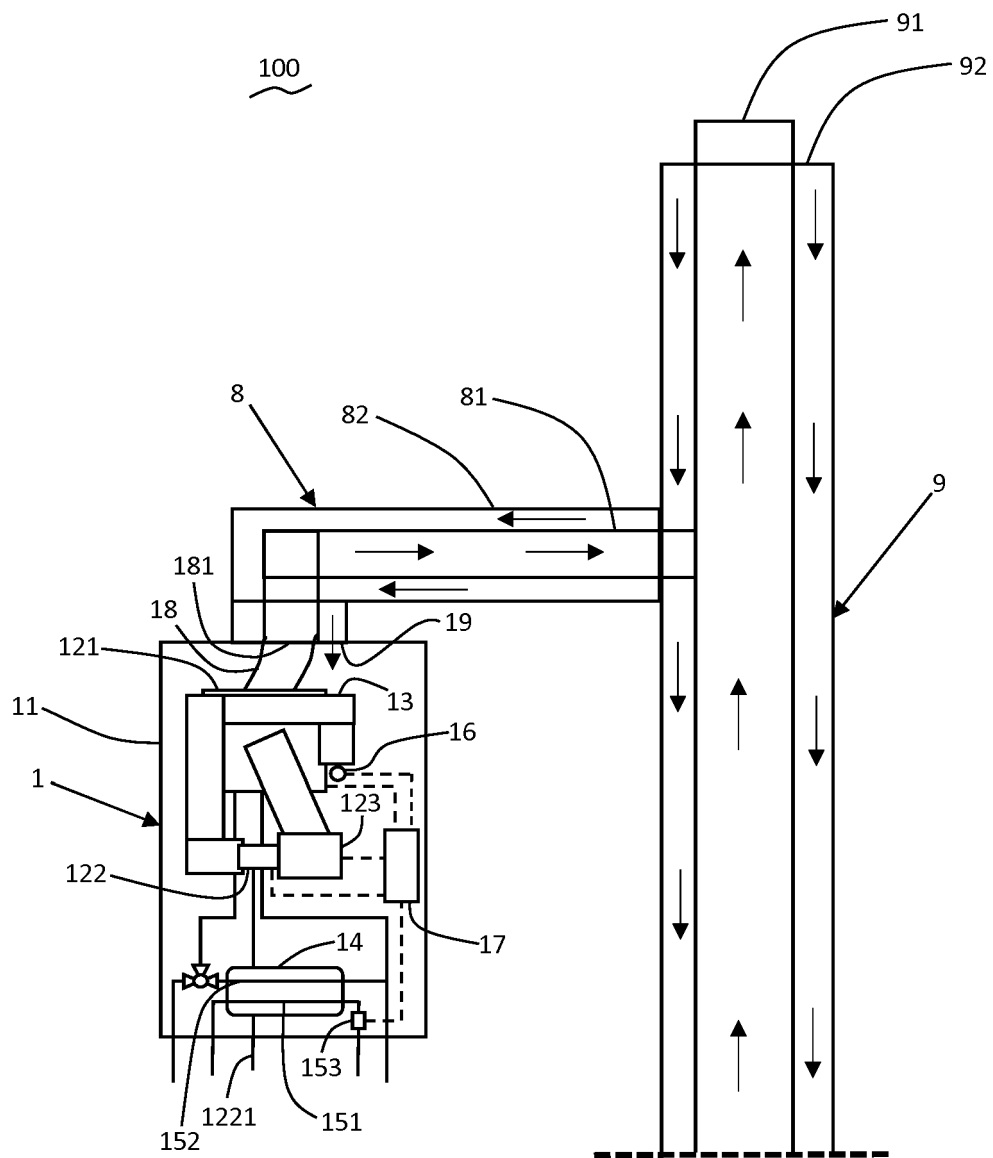


Fig. 1

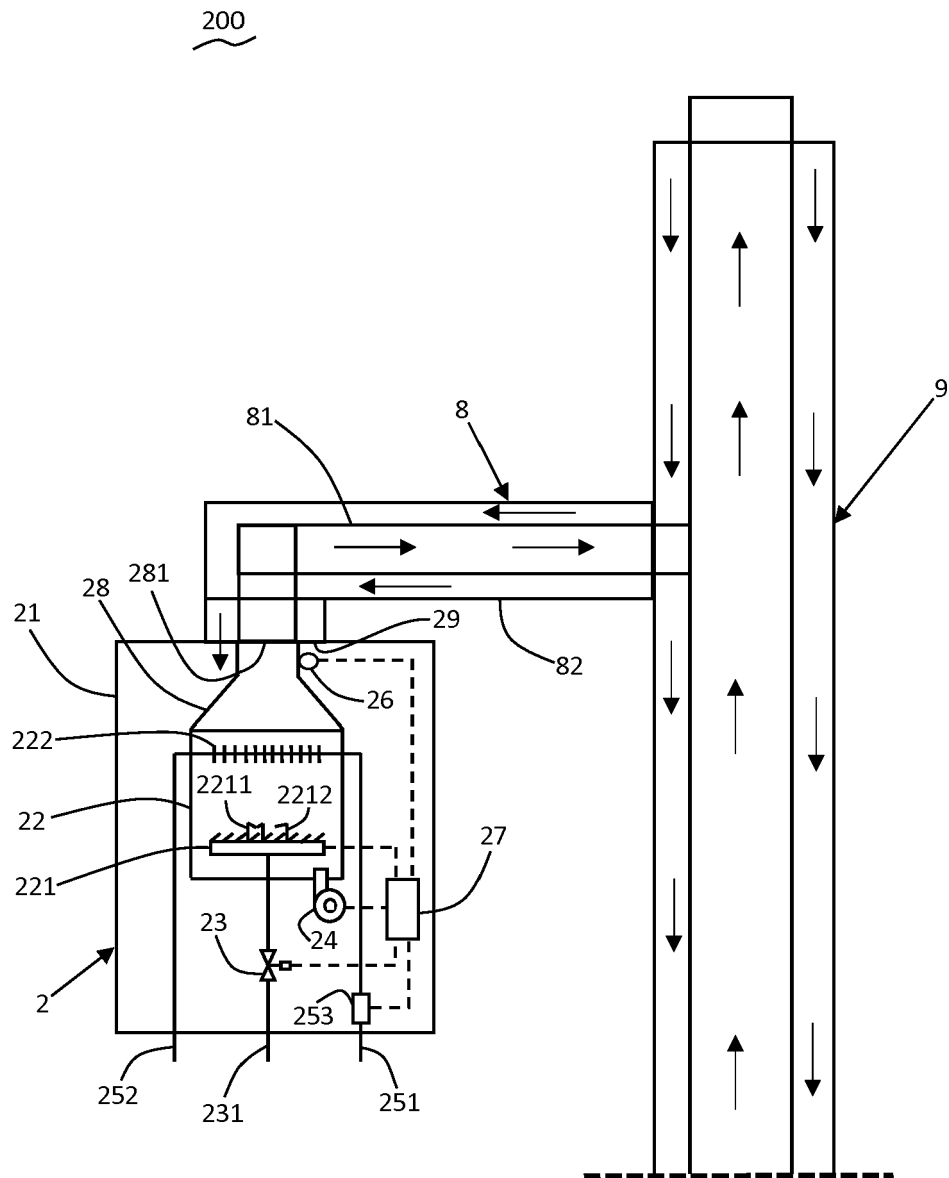


Fig. 2

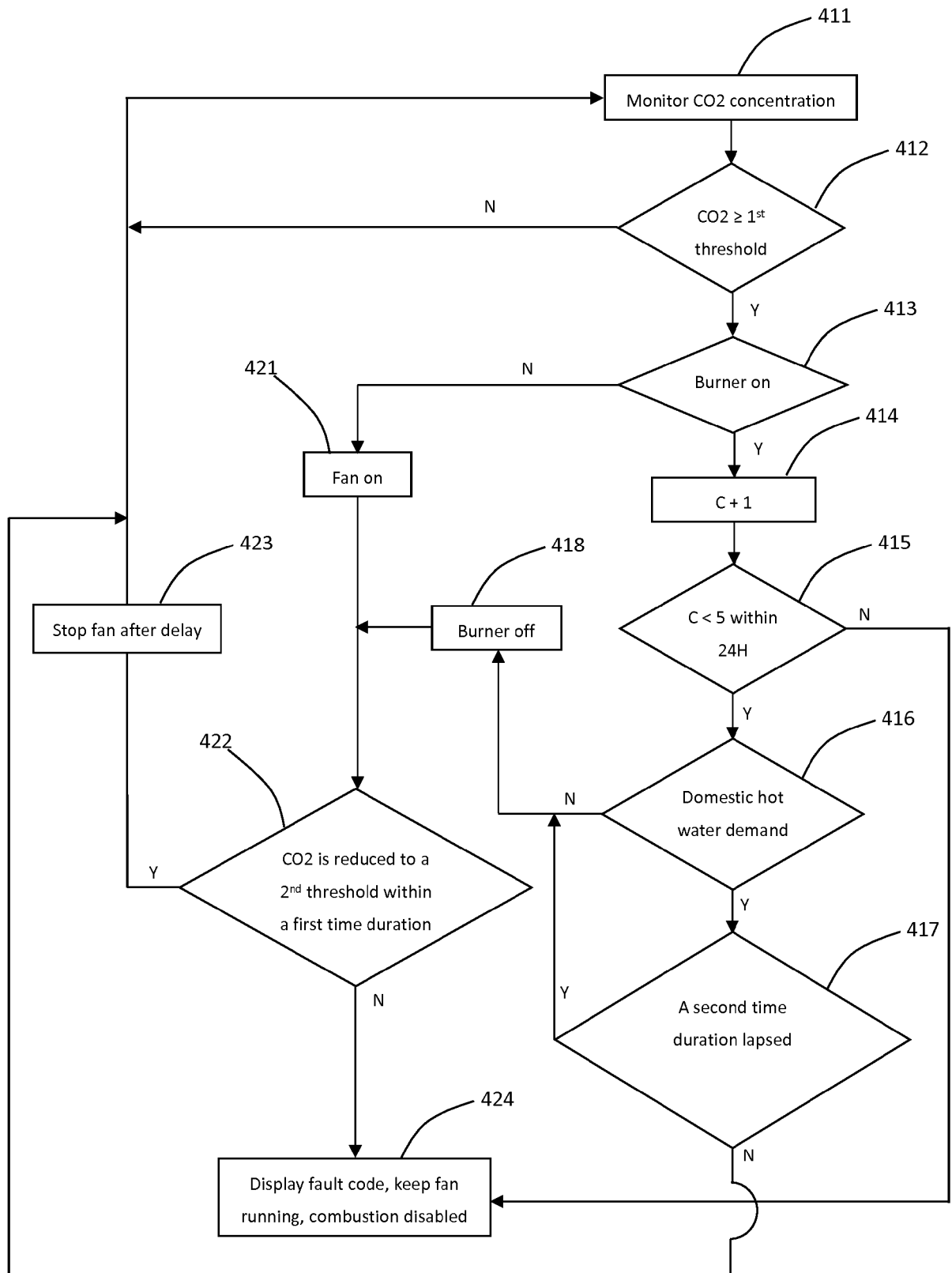


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 19 21 3429

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 2015/096504 A1 (ANDO MASAKAZU [JP]) 9 April 2015 (2015-04-09)	1,14,15	INV. F24H1/10 F24H1/12 F24H9/20 F23N5/24
A	* paragraph [0023] - paragraph [0050]; figure 1 *	2-13	
Y	DE 30 08 399 A1 (KUEPPERSBUSCH [DE]) 17 September 1981 (1981-09-17) * page 2 - page 6; figure 1 *	1,14,15	
A	US 5 797 358 A (BRANDT JOHN H [US] ET AL) 25 August 1998 (1998-08-25) * the whole document *	1	
A	CN 104 110 869 A (QINGDAO ECONOMIC DEV ZONE HAIER WATER HEATER CO LTD; HAIER GROUP CORP) 22 October 2014 (2014-10-22) * the whole document *	1	
A	DE 298 02 545 U1 (BOSCH GMBH ROBERT [DE]) 17 June 1999 (1999-06-17) * the whole document *	1	TECHNICAL FIELDS SEARCHED (IPC)
			F24H F23N
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 20 April 2020	Examiner Ast, Gabor
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 19 21 3429

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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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20-04-2020

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2015096504 A1	09-04-2015	NONE	
DE 3008399 A1	17-09-1981	NONE	
US 5797358 A	25-08-1998	AU 3722397 A US 5797358 A WO 9801709 A2	02-02-1998 25-08-1998 15-01-1998
CN 104110869 A	22-10-2014	NONE	
DE 29802545 U1	17-06-1999	AT 243830 T DE 29802545 U1 EP 0936409 A2	15-07-2003 17-06-1999 18-08-1999

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