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(54) METHOD AND CONTROLLER FOR OPERATING A GAS BURNER APPLIANCE

(57) Method for operating a gas burner appliance (10), the gas burner appliance (10) comprising: a combustion chamber (11), a mixing device (23), a fan (14), a gas safety valve unit (19) assigned to the gas duct (16) having a first gas safety valve (19a) and a second gas safety valve (19b) positioned downstream of the first gas safety valve (19a), a gas flow modulator (18) assigned to the gas duct (16), and an electrical or electronic absolute pressure sensor (21) assigned to the gas duct (16) positioned downstream of the first gas safety valve (19a). The gas burner appliance (10) is operated to compensate for a fluctuating gas inlet pressure of the gas burner appliance by executing the following steps: Measure a first absolute pressure by the absolute pressure sensor (21) when at least the first gas safety valve (19a) of the gas safety valve unit (19) is closed. Measure a second absolute pressure by the absolute pressure sensor (21) when the gas safety valve unit (19) is opened. Determine a pressure difference between the first absolute pressure or a pressure depending on the first absolute pressure and the second absolute pressure or a pressure depending on the second absolute pressure. Operate the gas flow modulator (18) dependent from said pressure difference.

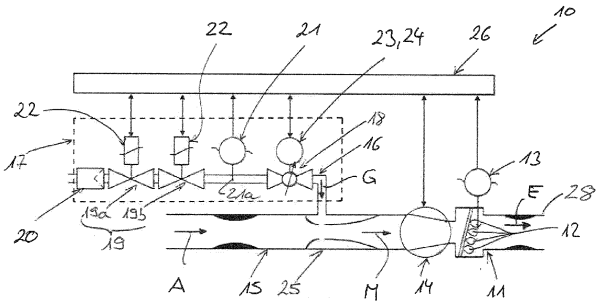

Fig. 1

EP 4 119 846 A1

Description

[0001] The invention relates to a method for operating a gas burner appliance. Further on, the invention relates to a controller for operating a gas burner appliance.

[0002] EP 2 667 097 A1 discloses a method for operating a gas burner appliance. During burner-on-phases in a regular combustion mode of the gas burner appliance, after combustion has been started in connection with a burner-start-up, a gas/air mixture having a defined mixing ratio of gas and air is provided to a combustion chamber for combusting the gas/air mixture. The mixing ratio of gas and air of the gas/air mixture corresponds to the so-called λ-value of the gas/air mixture. The gas/air mixture is provided by a mixing device mixing an air flow provided by an air duct with a gas flow provided by a gas duct. The mixing device may be provided by a Venturi nozzle. The air flow flowing through the air duct is provided by fan in such a way that the nominal fan speed of the fan depends on a nominal burner-load of the gas burner appliance, wherein a fan speed range of the fan defines a so-called modulation range of the gas burner appliance. According to EP 2 667 097 A1, the defined mixing ratio of gas and air and thereby the λ-value of the gas/air mixture is kept constant over the entire modulation range of the gas burner appliance by a pneumatic gas flow regulator. The pneumatic gas flow regulator is provided by a gas armature. In addition to the pneumatic gas flow regulator, the gas armature comprises a safety gas valve and a throttle used for calibration. The pneumatic gas flow regulator uses a pressure difference between the gas pressure of the gas flow in the gas duct and a reference pressure, wherein either the air pressure of the air flow in the air duct or the ambient pressure is used as reference pressure, and wherein the pressure difference between the gas pressure of the gas flow in the gas duct and the reference pressure is determined and controlled pneumatically. EP 2 667 097 A1 discloses a method for operating a gas burner appliance in which the defined mixing ratio of the gas/air mixture is kept constant over the entire modulation range of the gas burner. This is done by the pneumatic gas flow regulator establishing a pneumatic control to keep the mixing ratio of gas and air within the gas/air mixture constant.

[0003] Instead of using pneumatic gas flow regulator, it is also known from prior art to control the mixing ratio of gas and air within the gas/air mixture by an electric or electronic gas flow modulator. The invention relates to a gas burner control making use of such an electric or electronic gas flow modulator.

[0004] DE 198 24 521 A1 discloses a method to control the mixing ratio of gas and air of the gas/air mixture and thereby the λ-value of the gas/air mixture on basis of a signal provided by an electrical or electronic sensor like an anemometer. An actual value corresponding to a pressure ratio between a gas pressure in a gas duct and an air pressure in an air duct or corresponding to a pressure ratio between the gas pressure in the gas duct and the air pressure at the reference point is provided by the electrical or electronic sensor, wherein this actual value is compared with a nominal value. A control variable for the electric or electronic gas flow modulator is generated on basis of the control deviation between the actual value and nominal value, wherein the electric gas flow modulator is adjusted on basis of this control variable to control the defined mixing ratio of gas and air in the gas/air mixture thereby keeping the λ-value of the gas/air mixture constant.

[0005] EP 2 405 198 B1 discloses a method for calibrating the regulation of a gas burner appliance. US 2006 / 0 292 505 A1 and JP 4 850 163 B2 disclose other prior art.

[0006] As mentioned above, the amount of the air flow and thereby the amount of the flow of the gas/air mixture having the defined mixing ratio of gas and air provided to the burner chamber depends on the desired burner load. The nominal burner-load corresponds to a desired heat demand. The nominal burner-load defines the fan speed at which the fan is operated. The fan speed range of the fan of the gas burner appliance defines the modulation range of the gas burner appliance. A maximum fan speed of the fan defines the maximum burner-load of the gas burner appliance. If a desired heat demand requires maximum burner load, then the fan is operated at maximum fan speed. If a desired heat demand requires burner-load being 50% of the maximum burner load, then the fan is operated at 50% of the maximum fan speed. If a desired heat demand requires burner-load being 20% of the maximum burner load, then the fan is operated at 20% of the maximum fan speed.

[0007] As mentioned above, at any burner load of the gas burner appliance and at any fan speed of the fan the mixing ratio of gas and air of the gas/air mixture is kept at a defined value, preferably constant.

[0008] The combustion quality of the gas burner appliance may vary in view of a fluctuating gas inlet pressure. Further, the combustion quality of the gas burner appliance may vary in view of fluctuating weather conditions, namely in view of a fluctuating ambient air pressure.

[0009] Gas burner appliances known from practice make use of a mechanical pressure regulator to compensate for a fluctuating gas inlet pressure. A mechanical pressure regulator may be provided as a separate unit of the gas burner appliance. Such mechanical pressure switches require additional installation space and cause additional hardware costs.

[0010] Other gas burner appliances known from practice make use of a combustion quality sensor, e. g. from a flame ionization sensor, to compensate for a fluctuating gas inlet pressure. Such a compensation for a fluctuating gas inlet pressure making use of a combustion quality sensor first results into a poor combustion quality before it is possible to provide the compensation. Further, such a compensation for a fluctuating gas inlet pressure making use of a combustion quality sensor reacts slowly.

[0011] The present invention provides an accurate re-

act fast reacting method for operating a gas burner appliance to compensate at least for a fluctuating gas inlet pressure of the gas burner.

[0012] The gas burner appliance is operated to compensate for a fluctuating gas inlet pressure of the gas burner appliance by executing the following steps:
Measure a first absolute pressure by the absolute pressure sensor when at least the first gas safety valve of the gas safety valve unit is closed.

[0013] Measure a second absolute pressure by the absolute pressure sensor when the gas safety valve unit is opened.

[0014] Determine a pressure difference between the first absolute pressure or a pressure depending on the first absolute pressure and the second absolute pressure or a pressure depending on the second absolute pressure.

[0015] Operate the gas flow modulator dependent from said pressure difference.

[0016] The above method allows to compensate at least for a fluctuating gas inlet pressure of the gas burner appliance in an accurate and fast manner.

[0017] Preferably, the first absolute pressure is measured by the absolute pressure sensor when at least the first gas safety valve of the gas safety valve unit is closed and when the fan is stopped or when the fan is running, wherein - if the fan is running - the pressure depending on the first absolute pressure is determined from the measured first absolute pressure and from the fan speed, and then the pressure difference is determined between the pressure depending on the first absolute pressure and the second absolute pressure. This improves the accuracy of the method providing compensation for a fluctuating gas inlet pressure of the gas burner appliance.

[0018] Preferably, the second absolute pressure is measured by the absolute pressure sensor when the gas safety valve unit is opened and when the fan is running. The pressure difference is determined between the first absolute pressure or the pressure depending on the first absolute pressure and the second absolute pressure, wherein the pressure difference may be adapted into an adapted pressure difference as a function of the fan speed, and the gas flow modulator may then be operated on basis of said adapted pressure difference to compensate for a fluctuating gas inlet pressure of the gas burner appliance. This further improves the accuracy of the compensation for a fluctuating gas inlet pressure of the gas burner appliance.

[0019] For a start-up of the gas burner appliance, the following steps are executed: Measure the first absolute pressure when at least the first gas safety valve of the gas safety valve unit is closed. Then open the gas safety valve unit, run the fan at a defined fan speed, activate an ignition device and measure continuously or at a defined sampling rate the second absolute pressure while increasing the opening position of the gas flow modulator. Determine continuously or at the defined sampling rate the pressure difference. Adjust continuously or at the defined sampling rate the opening position of the gas flow modulator dependent from said pressure difference. This allows to provide a very favorable start-up of the gas burner appliance.

[0020] After a start-up of the gas burner appliance while a gas-air mixture is combusted, the following steps are executed: Adapt the first absolute pressure to compensate for fluctuating weather conditions. Measure continuously or at the defined sampling rate the second absolute pressure. Determine continuously or at the defined sampling rate the pressure difference. Adjust continuously or at the defined sampling rate the opening position of the gas flow modulator dependent from said pressure difference. This allows to compensate in addition for fluctuating weather conditions.

[0021] The controller for operating a gas burner appliance according to the present invention is defined in claim 15.

[0022] Preferred developments of the invention are provided by the dependent claims and the description which follows.

[0023] Exemplary embodiments are explained in more detail on the basis of the drawing, in which:

Figure 1 shows a first gas burner appliance to be controlled by the method and controller of the present invention;

Figure 2 shows a gas armature of a second gas burner appliance to be controlled by the method and controller of the present invention;

Figure 3 shows a third gas burner appliance to be controlled by the method and controller of the present invention.

[0024] The present invention relates to a method and a controller for operating a gas burner appliance.

[0025] Figure 1 shows a schematic view of a first exemplary gas burner appliance 10. The gas burner appliance 10 comprises a combustion chamber 11 in which combustion of a gas/air mixture M having a defined mixing ratio of gas G and air A takes place during a regular combustion mode of the gas burner appliance 10, namely after a start-up of the gas burner appliance 10 and after successfully igniting the gas/air mixture M. The combustion of the gas/air mixture M results into flames 12 and into exhaust gas E. The flames 12 are monitored by a combustion quality sensor, preferably by a flame ionization sensor 13 providing as output signal an electrical flame ionization current. The flame ionization sensor 13 provides its output signal to a controller 26. The exhaust gas E emanates from the combustion chamber 11 through an exhaust pipe 28.

[0026] The gas/air mixture M is provided to the combustion chamber 11 of the gas burner appliance 10 by mixing a flow of the air A with a flow of the gas G. A fan 14 sucks in air A flowing through an air duct 15 and gas G flowing through a gas duct 16. An electrical or electronic gas flow modulator 18 being configured to adjust

the gas flow through the gas duct 16 and a gas safety valve unit 19 having preferably two gas safety valves 19a, 19b are assigned to the gas duct 16. The gas flow modulator 18 and the gas safety valves 19a, 19b are part of a gas armature 17 further comprising a sieve 20 and an electrical or electronic absolute pressure sensor 21. The sieve 20 and the electrical or electronic absolute pressure sensor 21 are both assigned to the gas duct 16. The absolute pressure sensor 21 provides its output signal to the controller 26.

[0027] In Figure 1, the electrical or electronic absolute pressure sensor 21, namely the measuring point 21a of the same, is positioned downstream of the second gas safety valve 19b of gas safety valve unit.

[0028] In Figure 1, the electrical or electronic absolute pressure sensor 21, namely the measuring point 21a of the same, is positioned downstream of gas safety valve unit 19 und upstream of the electrical or electronic gas flow modulator 18.

[0029] The gas armature 17 of Figure 1 can be replaced by the gas armature 17 of Figure 2. In Figure 2, the electrical or electronic absolute pressure sensor 21, namely the measuring point 21a of the same, is positioned downstream of the first gas safety valve 19a of the gas safety valve unit 19 and upstream of the second gas safety valve 19b of the gas safety valve unit 19.

[0030] The gas safety valves 19a, 19b of the gas safety valve unit 19 are operated by electric coils 22 being part of the gas armature 17. In a regular combustion mode, the electric coils 22 are energized by the controller 26 to open the gas safety valves 19a, 19b. In burner-off phases the gas safety valves 19 are closed.

[0031] In Figure 1, each gas safety valve 19a, 19b is operated by one separate electric coil 22. With the use of separate electric coils 22 it is possible to open and close the gas safety valves 19a, 19b independently from each other. Alternatively, the gas safety valves 19a, 19b may be operated commonly by a common electric coil 22.

[0032] The electrical or electronic gas flow modulator 18 is operated by a motor 23 also having an electric coil 24. In Figure 1, the gas flow modulator 18 is an electric gas flow modulator 18 operated by the controller 26. The gas flow modulator 18 is in its closed position not gas tight.

[0033] The gas/air mixture M having the defined mixing ratio of gas G and air A is provided to the combustion chamber 11 of the gas burner appliance 10. The gas/air mixture M is provided by mixing the airflow A provided by an air duct 15 with a gas flow G provided by a gas duct 16. The airflow and the gas flow become preferably mixed by a mixing device 25. The mixing device 25 may be a venturi nozzle.

[0034] The quantity of the air flow A and thereby the quantity of the gas/air mixture flow M is adjusted by the fan 14, namely by the speed of the fan 14. The fan speed can be adjusted on basis of a nominal burner-load. In a regular combustion mode of the gas burner appliance 10, a nominal fan speed of the fan 14 depends on the nominal burner load. The fan 14 is operated by the controller 26. The fan speed range of the fan 14 defines a modulation range of the gas burner appliance 10. In a regular combustion mode of the gas burner appliance 10, a modulation of "1" means that the fan 14 is operated at maximum fan speed (100% of maximum fan speed) and thereby at a full-load of the gas burner appliance 10. A modulation of "2" means that the fan 14 is operated at 50% of the maximum fan speed and a modulation of "5" means that the fan 14 is operated at 20% of the maximum fan speed. By changing the fan speed of the fan 14, the burner-load of the gas burner appliance 10 can be adjusted.

[0035] In a regular combustion mode of the gas burner appliance 10, the defined mixing ratio of gas G and air A within the gas/air mixture M and thereby the A-value of the gas/air mixture M is kept at a nominal value, preferably constant, over the entire modulation range of the gas burner appliance 10. Said defined mixing ratio of gas G and air A or said λ-value of the gas/air mixture M is kept at a defined value over the modulation range of the gas burner appliance using the electrical or electronic gas flow modulator 18 of a gas armature 17 to keep the defined mixing ratio of gas and air and thereby the λ-value preferably constant over the modulation range of the gas burner appliance. In Figure 1, the control variable for the electric gas flow modulator 18 in order to keep the λ-value constant is generated by the controller 26 on basis of the flame ionization current provided by the flame ionization sensor 13.

[0036] The details described above in connection with Figure 1 fully apply to the modification of Figure 2. Figures 3 a shows schematic view of other exemplary gas burner appliance 10'. In Figures 1, 2 and 3 identical reference numbers are used for identical parts. In order to avoid unnecessary repetitions, below only the differences of the gas burner appliances 10, 10' will be described.

[0037] In Figure 3, during a regular combustion mode the constant mixing ratio of gas G and air A within the gas/air mixture M is controlled by the electrical or electronic gas flow modulator 18 on basis of a signal provided by an electric or electronic pressure sensor or flow meter 27 and not on basis of the flame ionization current provided by the flame ionization sensor 13. In this case the electric or electronic sensor 27 may provide to the controller 26 an actual value corresponding to a pressure ratio between a gas pressure in a gas duct 16 and an air pressure in an air duct 15 or corresponding to a pressure ratio between the gas pressure in the gas duct 16 and the air pressure at the reference point, wherein the controller 26 may compare said actual value with a nominal value. In this case, the controller 26 may generate the control variable for the electric gas flow modulator 18 on basis of the control deviation between the actual value and the nominal value, wherein the gas flow modulator 18 may be operated on basis of this control variable to keep over the entire modulation range of the gas burner appliance 10 the defined mixing ratio of gas and air and

thereby the λ-value constant. The gas flow modulator 18 is in its closed position not gas tight.

[0038] In Figure 3, the absolute pressure sensor 21 is positioned between the gas safety valve unit 19 and the gas flow modulator 18. Alternatively, the absolute pressure sensor 21, namely the measuring point 21a of the same, may be positioned downstream of the first gas safety valve 19a and upstream of the second gas safety valve 19b.

[0039] The present invention provides a method for operating such gas burner appliances 10, 10' to compensate at least for a fluctuating gas inlet pressure of the gas burner appliance 10, 10'. The gas burner appliance 10, 10' is operated to compensate for a fluctuating gas inlet pressure of the gas burner appliance 10, 10' by executing the following steps:

Measure a first absolute pressure by the absolute pressure sensor 21 when at least the first gas safety valve 19a of the gas safety valve unit 19 is closed. In Figure 2 the second gas safety valve 19b needs to be opened. In Figures 1 and 3 both gas safety valve 19a, 19b may be closed.

[0040] Measure a second absolute pressure by the absolute pressure sensor 21 when the gas safety valve unit 19 is opened. In Figures 1, 2 and 3 both gas safety valve 19a, 19b need to be opened.

[0041] Determine a pressure difference between the first absolute pressure or a pressure depending on the first absolute pressure and the second absolute pressure or a pressure depending on the second absolute pressure.

[0042] Operate the gas flow modulator 18 dependent from said pressure difference.

[0043] The first absolute pressure may be measured by the absolute pressure sensor 21 when at least the first gas safety valve 19a of the gas safety valve unit 19 is closed and when the fan 14 is stopped. Alternatively, the first absolute pressure may be measured by the absolute pressure sensor 21 when at least the first gas safety valve 19a of the gas safety valve unit 19 is closed and when the fan 14 is running, wherein then the pressure depending on the first absolute pressure is determined from the measured first absolute pressure and from of the fan speed. Said pressure depending on the first absolute pressure is preferably determined from the measured first absolute pressure and from of the fan speed of the fan 14 on basis of a first characteristic curve. The first characteristic curve may be empirically determined and may be stored within a memory unit of the controller 26.

[0044] The second absolute pressure is measured by the absolute pressure sensor 21 when the gas safety valve unit 19 is opened and when the fan 14 is running.

[0045] The pressure difference is preferably determined between the first absolute pressure or the pressure depending on the first absolute pressure and the second absolute pressure. Said pressure difference may be adapted into an adapted pressure difference as a function of the fan speed of the fan 14. The gas flow modulator 18 is then operated on basis of said adapted pressure difference to compensate for a fluctuating gas inlet pressure of the gas burner appliance 10, 10'.

[0046] The pressure difference is preferably adapted into a said adapted pressure difference on basis of a second characteristic curve. The second characteristic curve may be empirically determined and may be stored within the memory unit of the controller 26.

[0047] For a start-up of the gas burner appliance 10, 10', the following steps are executed: Measure the first absolute pressure by the absolute pressure sensor 21 when at least the first gas safety valve 19a of the gas safety valve unit 19 is closed. As mentioned above, the pressure depending on the first absolute pressure may be determined from the measured first absolute pressure and from the fan speed, if the first absolute pressure is measured while the fan 14 is running. The first absolute pressure or the pressure depending on the first absolute pressure is stored within the memory unit of the controller 26. For the start-up of the gas burner appliance 10, 10', then open the gas safety valve unit 19, run the fan 14 at a defined fan speed, activate an ignition device (not shown) positioned with the combustion chamber 11 and measure continuously or at a defined sampling rate the second absolute pressure by the absolute pressure sensor 21 while increasing the opening position of the gas flow modulator 18. The opening position of the gas flow modulator 18 is increased to increase the content of the gas G within the gas/air mixture M provided to the combustion chamber 11 in order to provide an ignitable gas/air mixture M. Determine continuously or at the defined sampling rate the pressure difference between the stored first absolute pressure (if the first absolute pressure is measured while the fan 14 is not running) or the stored pressure depending on the first absolute pressure and the second absolute pressure (if the first absolute pressure is measured while the fan 14 is running) and the second absolute pressure. Adjust continuously or at the defined sampling rate the opening position of the gas flow modulator 18 dependent from said pressure difference. The pressure difference may be adapted into said adapted pressure difference as a function of the fan speed of the fan 14, wherein the gas flow modulator 18 may then be operated on basis of said adapted pressure difference to compensate for a fluctuating gas inlet pressure of the gas burner appliance 10, 10'. This provides an efficient and fast start-up of the gas burner appliance 10, 10'.

[0048] After the start-up of the gas burner appliance 10, 10' - while the gas-air mixture M is combusted within the combustion chamber 11 - at least the following steps are executed: Measure continuously or at a defined sampling rate the second absolute pressure by the absolute pressure sensor 21. Determine continuously or at the defined sampling rate the pressure difference between the stored first absolute pressure (if the first absolute pressure is measured while the fan 14 is not running) or the stored pressure depending on the first absolute pres-

sure and the second absolute pressure (if the first absolute pressure is measured while the fan 14 is running) and the second absolute pressure. Adjust continuously or at the defined sampling rate the opening position of the gas flow modulator dependent from said pressure difference.

[0049] The pressure difference may be adapted into said adapted pressure difference as a function of the fan speed of the fan 14, wherein the gas flow modulator 18 may then be operated on basis of said adapted pressure difference to compensate for a fluctuating gas inlet pressure of the gas burner appliance 10, 10'.

[0050] After the start-up of the gas burner appliance 10, 10' - while the gas-air mixture M is combusted within the combustion chamber 11 - the following additional step may be executed: Adapt the first absolute pressure to compensate in addition for fluctuating weather conditions.

[0051] The first absolute pressure may be adapted to compensate for fluctuating weather conditions on basis of an absolute pressure measured by an additional absolute pressure sensor (not shown) not being assigned the gas duct 16. Such an additional absolute pressure sensor (not shown) may be assigned to a circuit board of the controller 26.

[0052] Alternatively, the first absolute pressure may be adapted to compensate for fluctuating weather conditions on basis of an absolute pressure received over the internet. The controller 26 may have an interface in order to receive data about the actual weather conditions and about the actual absolute air pressure over the internet.

[0053] Alternatively, the first absolute pressure may be adapted to compensate for fluctuating weather conditions on basis of the first absolute pressure is adapted to compensate for fluctuating weather conditions by executing the following steps: During the start-up of the gas burner appliance 10, 10' measure the first and second absolute pressure and determine a first difference from the same and use said difference as offset value. After the start-up of the gas burner appliance 10, 10' determine continuously or at the defined sampling rate a second difference between the second absolute pressure and the offset value, filter said second difference by limiting the temporal gradient of said second difference to a maximum value and use the filtered second difference as adapted first absolute pressure.

[0054] After the start-up of the gas burner appliance 10, 10' - while the gas-air mixture M is combusted within the combustion chamber 11 - the following alternative steps may be executed: Measure continuously or at a defined sampling rate the second absolute pressure. Determine continuously or at the defined sampling rate the pressure difference. Adjust continuously or at the defined sampling rate the opening position of the gas flow modulator dependent from said pressure difference, namely dependent from the temporal gradient of said pressure difference. When using these steps, it is longer of advantage to compensate separately for fluctuating weather condition.

[0055] The invention further provides the controller 26 being configured to operate the gas burner appliance 10, 10' according to the above method. The controller 26 is configured to compensate for a fluctuating gas inlet pressure of the gas burner appliance by executing at least the following steps: Measure a first absolute pressure by the absolute pressure sensor 21 when at least a first gas safety valve 19a of a gas safe-ty valve unit 19 is closed. Measure a second absolute pressure by the absolute pressure sensor 21 when the gas safety valve unit 19 is opened. Determine a pressure difference between the first absolute pressure or a pressure depending on the first absolute pressure and the second absolute pressure or a pressure depending on the second absolute pressure. Operate the gas flow modulator 18 dependent from said pressure difference.

[0056] The invention allows to compensate at least for a fluctuating gas inlet pressure of the gas burner appliance 10, 10'. In addition, fluctuating weather conditions causing a fluctuating ambient air pressure may be compensated.

List of reference signs

[0057]

10	gas burner appliance
10'	gas burner appliance
11	combustion chamber
12	flame
13	flame ionization sensor
14	fan
15	air duct
16	gas duct
17	gas armature
18	gas flow modulator
19	safety gas valve unit
19a	safety gas valve
19b	safety gas valve
20	sieve
21	absolute pressure sensor
21a	measuring point
22	coil
23	motor
24	coil
25	mixer
26	controller
27	electric or electronic sensor
28	exhaust pipe

Claims

1. Method for operating a gas burner appliance (10, 10'), the gas burner appliance comprising:

a combustion chamber (11) being configured to

combust a defined gas/air mixture,
a mixing device (23) being configured to provide said gas/air mixture by mixing an air flow provided by an air duct (15) with a gas flow provided by a gas duct (16),
a fan (14) being configured provide the air flow or the flow of the gas/air mixture,
a gas safety valve unit (19) assigned to the gas duct (16) being configured to open or close the gas duct (16),
the gas safety valve unit (19) having a first gas safety valve (19a) and a second gas safety valve (19b) positioned downstream of the first gas safety valve (19a),
a gas flow modulator (18) assigned to the gas duct (16) being configured to keep a mixing ratio of gas and air within the gas/air mixture at a defined value,
an electrical or electronic absolute pressure sensor (21) assigned to the gas duct (16) positioned downstream of the first gas safety valve (19a),
wherein the gas burner appliance (10, 10') is operated to compensate for a fluctuating gas inlet pressure of the gas burner appliance (10, 10') by executing the following steps:

measure a first absolute pressure by the absolute pressure sensor (21) when at least the first gas safety valve (19a) of the gas safety valve unit (19) is closed,
measure a second absolute pressure by the absolute pressure sensor (21) when the gas safety valve unit (19) is opened,
determine a pressure difference between the first absolute pressure or a pressure depending on the first absolute pressure and the second absolute pressure or a pressure depending on the second absolute pressure,
operate the gas flow modulator (18) dependent from said pressure difference.

2. Method of claim 1, **characterized in that** the first absolute pressure is measured by the absolute pressure sensor (21) when at least the first gas safety valve (19a) of the gas safety valve unit (19) is closed and when the fan (14) is stopped.

3. Method of claim 1, **characterized in that** the first absolute pressure is measured by the absolute pressure sensor (21) when at least the first gas safety valve (19a) of the gas safety valve unit (19) is closed and when the fan (14) is running, wherein the pressure depending on the first absolute pressure is determined from the measured first absolute pressure and from of the fan speed.

4. Method of claim 3, **characterized in that** the pressure depending on the first absolute pressure is determined from the measured first absolute pressure and from the fan speed on basis of a first characteristic curve.

5. Method one of claims 1 to 4, **characterized in that** the second absolute pressure is measured by the absolute pressure sensor (21) when the gas safety valve unit (19) is opened and when the fan is running.

6. Method one of claims 1 to 5, **characterized in that** the pressure difference is determined between the first absolute pressure or the pressure depending on the first absolute pressure and the second absolute pressure.

7. Method one of claims 6, **characterized in that**

the pressure difference is adapted into an adapted pressure difference as a function of the fan speed,
the gas flow modulator (18) is operated on basis of said adapted pressure difference to compensate for a fluctuating gas inlet pressure of the gas burner appliance.

8. Method of claims 7, **characterized in that** the pressure difference is adapted into said adapted pressure difference on basis of a second characteristic curve.

9. Method of one of claims 1 to 8, **characterized in that** for a start-up of the gas burner appliance (10, 10') the following steps are executed;

measure the first absolute pressure when at least the first gas safety valve (19a) of the gas safety valve unit (19) is closed,
then open the gas safety valve unit (19), run the fan (14) at a defined fan speed, activate an ignition device and measure continuously or at a defined sampling rate the second absolute pressure while increasing the opening position of the gas flow modulator (18),
determine continuously or at the defined sampling rate the pressure difference,
adjust continuously or at the defined sampling rate the opening position of the gas flow modulator (18) dependent from said pressure difference.

10. Method of one of claims 1 to 9, **characterized in that** after a start-up of the gas burner appliance (10, 10') while a gas-air mixture is combusted the following steps are executed:

adapt the first absolute pressure to compensate

for fluctuating weather conditions,
measure continuously or at a defined sampling rate the second absolute pressure,
determine continuously or at the defined sampling rate the pressure difference,
adjust continuously or at the defined sampling rate the opening position of the gas flow modulator (18) dependent from said pressure difference.

11. Method of claim 10, **characterized in that** the first absolute pressure is adapted to compensate for fluctuating weather conditions on basis of an absolute pressure measured by an additional absolute pressure sensor not being assigned the gas duct (16).

12. Method of claim 10, **characterized in that** the first absolute pressure is adapted to compensate for fluctuating weather conditions on basis of an absolute pressure received over the internet.

13. Method of claim 10, **characterized in that** the first absolute pressure is adapted to compensate for fluctuating weather conditions by executing the following steps:

during the start-up of the gas burner appliance (10, 10') measure the first and second absolute pressure and determine a first difference from the same and use said difference as offset value,
after a start-up of the gas burner appliance (10, 10') determine continuously or at the defined sampling rate a second difference between the second absolute pressure and the offset value,
filter said second difference by limiting the temporal gradient of said second difference to a maximum value and use the filtered second difference as adapted first absolute pressure.

14. Method of one of claims 1 to 9, **characterized in that** after a start-up of the gas burner appliance (10, 10') while a gas-air mixture is combusted the following steps are executed:

measure continuously or at a defined sampling rate the second absolute pressure,
determine continuously or at the defined sampling rate the pressure difference,
adjust continuously or at the defined sampling rate the opening position of the gas flow modulator (18) dependent from said pressure difference, namely dependent from the temporal gradient of said pressure difference.

15. Controller (26) of a gas burner appliance (10, 10') for operating the gas burner appliance (10, 10'), the controller (26) is configured to compensate for a fluctuating gas inlet pressure of the gas burner appliance (10, 10') by executing the following steps:

measure a first absolute pressure by the absolute pressure sensor (21) when at least a first gas safety valve (19a) of a gas safety valve unit (19) is closed,
measure a second absolute pressure by the absolute pressure sensor (21) when the gas safety valve unit (19) is opened,
determine a pressure difference between the first absolute pressure or a pressure depending on the first absolute pressure and the second absolute pressure or a pressure depending on the second absolute pressure,

operate a gas flow modulator (18) dependent from said pressure difference.

16. Controller of claim 15, **characterized in that** the controller (26) is configured to operate the gas burner appliance according to the method of one of claims 1 to 14.

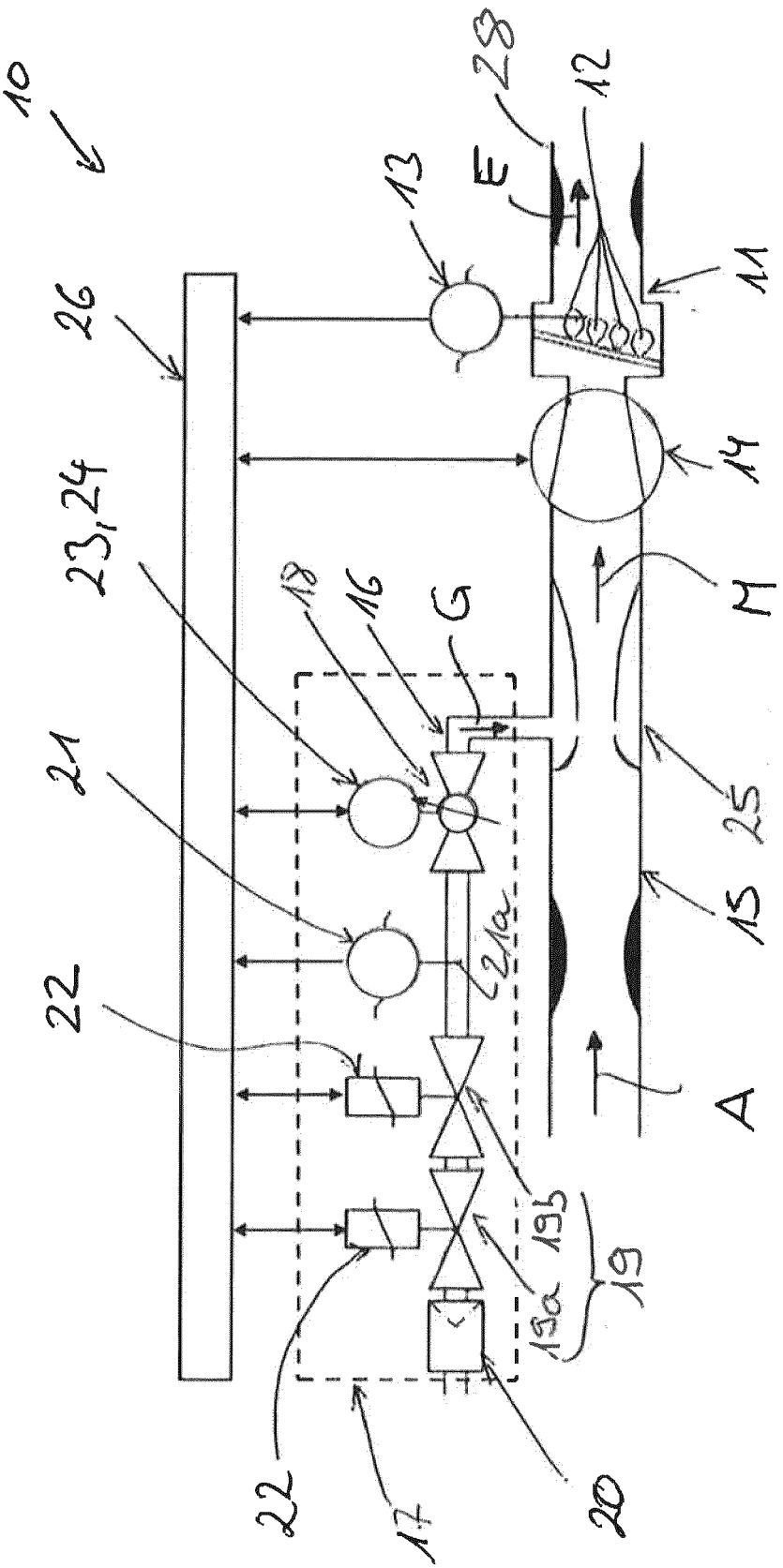
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Fig. 1

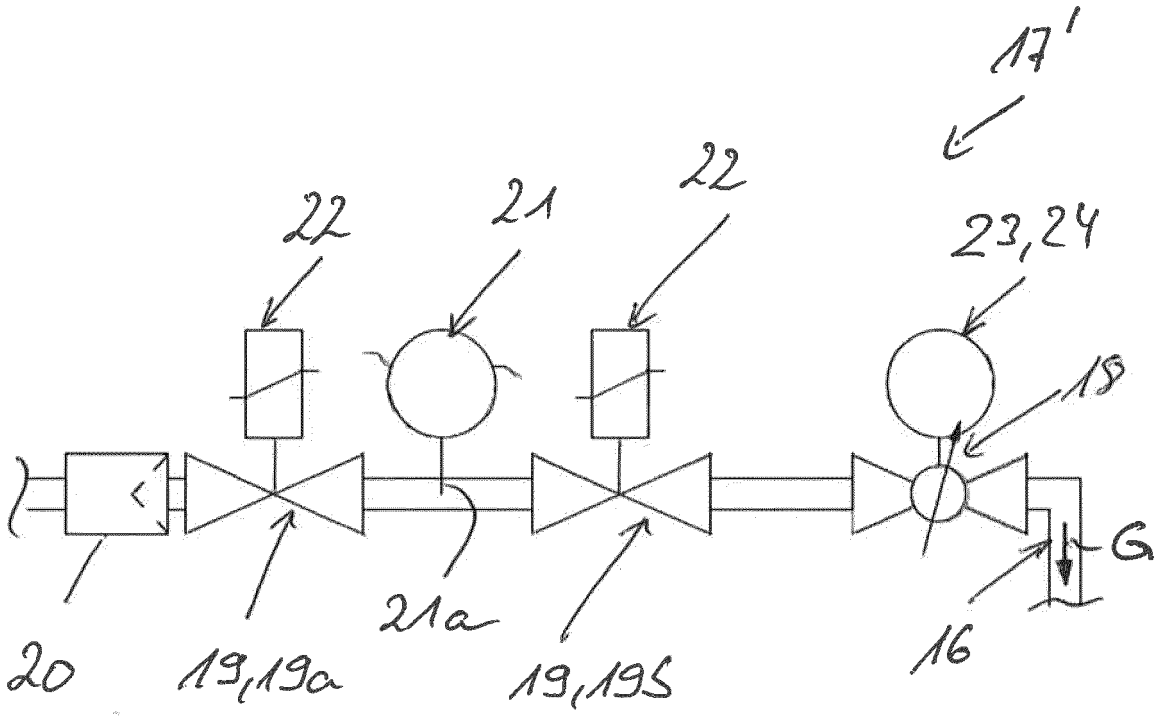

Fig. 2

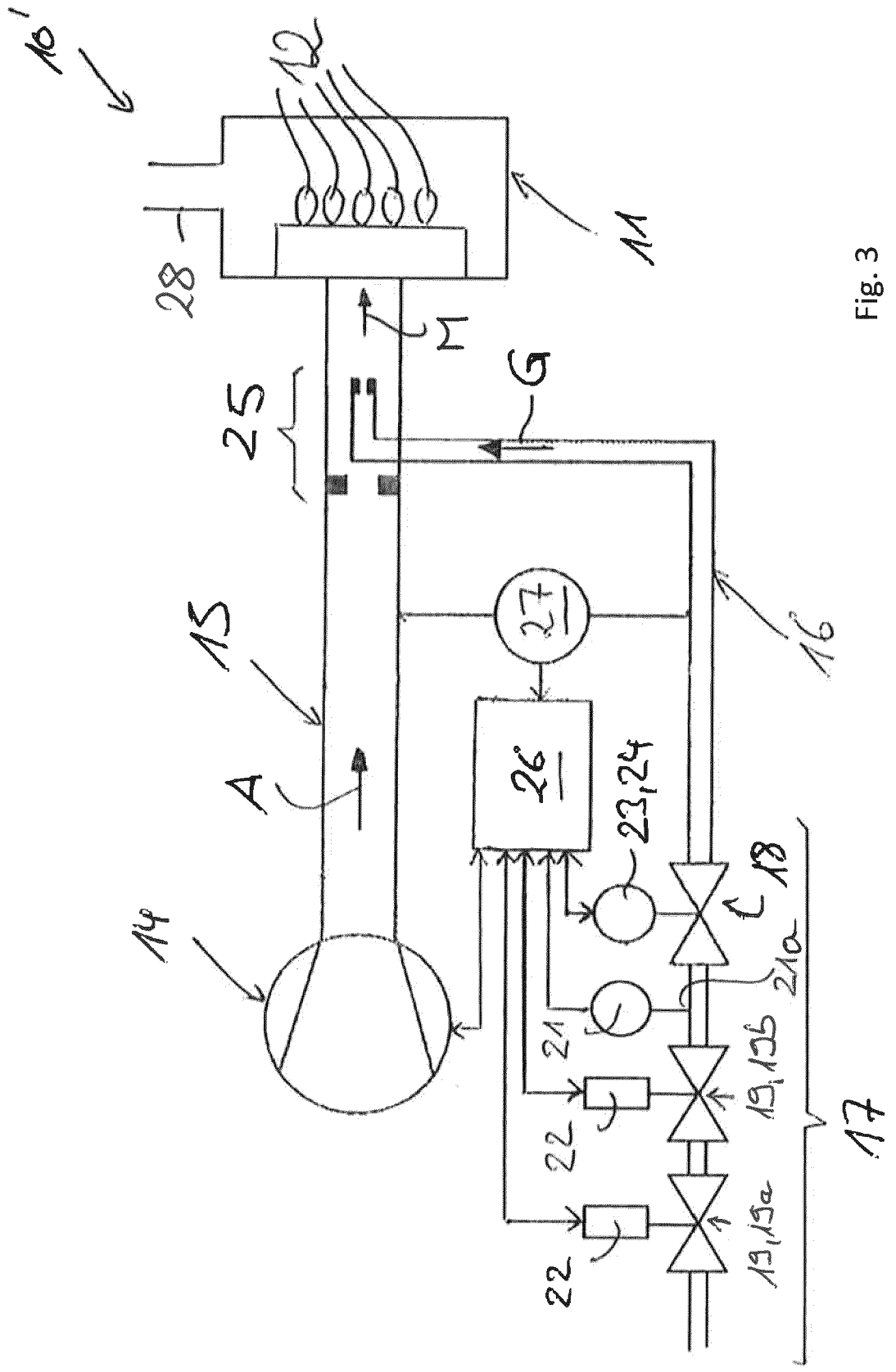

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 21 18 5474

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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F23N
F23D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 November 2021	Vogl, Paul

CATEGORY OF CITED DOCUMENTS

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