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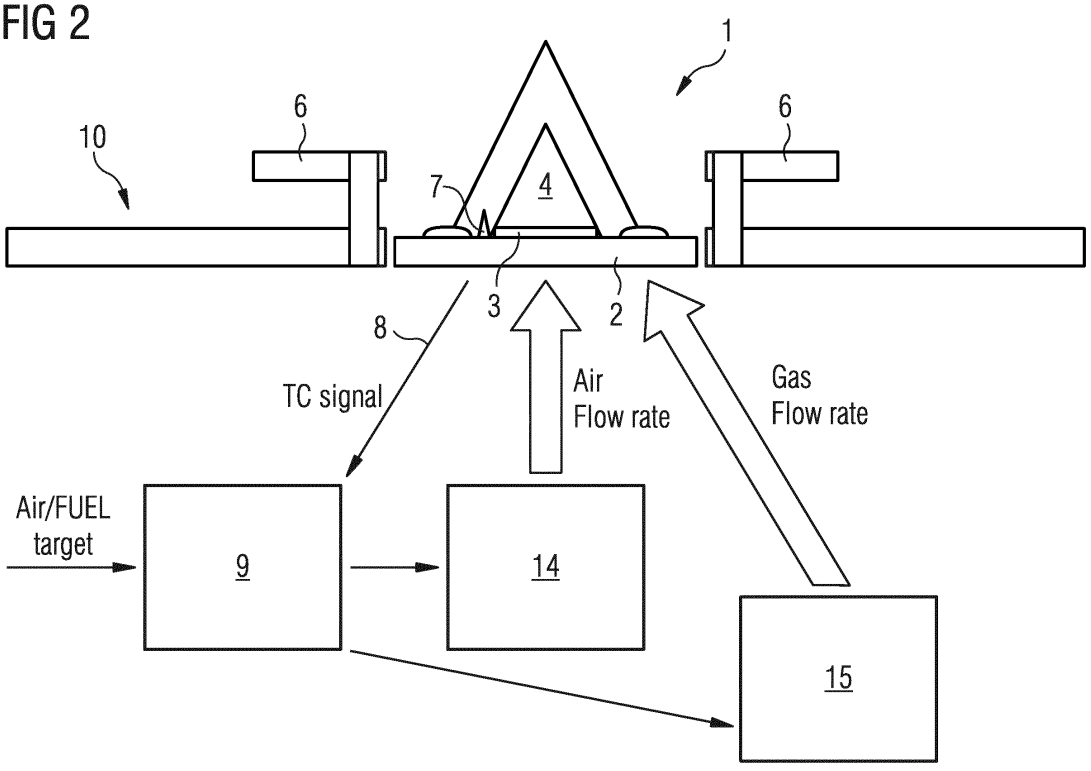
(54) GAS BURNER ARRANGEMENT FOR A GAS-COOKING APPLIANCE WITH A THERMOCOUPLE

(57) A gas burner arrangement (1) for a gas-cooking appliance (10), particularly a gas hob (10), comprising at least one gas burner (2) adapted to receive a fuel flow from a fuel supply (3) and for providing a fuel-supplied flame (4) to a cooking vessel (5), at least one support (6) arranged to support the cooking vessel (5) above the gas burner (2), particularly above the fuel-supplied flame (4), a thermocouple (7) adapted to generate a thermocouple signal (8) depending on the thermal state of said thermo-couple (7), and a control unit (9) connected to the thermocouple (7), the control unit (9) being adapted to receive the thermocouple signal (8) and to process said thermocouple signal (8) to an output signal, wherein the control unit (9) is capable of determining if the cooking vessel (5) is placed on the support (6), particularly above the fuel-supplied flame (4), dependent on the thermocouple signal (8).

FIG 2



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Description

[0001] The present invention relates to a gas burner arrangement for a gas-cooking appliance, a gas-cooking appliance comprising such gas burner arrangement and a method for determining if a cooking vessel is placed above a gas burner.

[0002] A gas-cooking appliance, particularly a gas hob, as known in the art usually comprises a gas burner arrangement with at least one gas burner adapted to receive a fuel flow, particularly a flow of gas or a gas-air mixture, from a fuel supply. The fuel is used to provide a fuel-supplied flame to a cooking vessel placed above said flame above the gas burner. Usually such gas-cooking appliance further comprises at least one support arranged to support the cooking vessel above the flame or burner.

[0003] It is known to provide standard gas-cooking appliance, for example gas hobs, with a thermocouple (TC). Such thermocouple usually is adapted to generate a thermocouple signal depending on the thermal state of said thermocouple. The thermocouple usually is connected to a control unit being adapted to receive the thermocouple signal. In standard gas-cooking appliances such thermocouple is used for safety reasons to detect whether a flame is on. When the flame is on the TC is generating a tension at its end, and then this tension is usually fed to a mechanical tap in order to allow the gas to feed the burner.

[0004] The document GB 2 146 804 A describes a temperature control arrangement for controlling the temperature of a gas burner in accordance with a desired operating temperature set by a user-operable control knob. A temperature sensing circuit includes a TC, which monitors the temperature of a cooking vessel being heated. A comparator compares two input signals, indicative respectively of the temperature sensed by the TC and of the temperature set on the potentiometer, and generates an error signal. Accordingly, a solenoid gas valve is activated in dependence on the error signal. However, safety and combustion in such configuration are insufficiently controlled.

[0005] The document WO 02 097 333 A2 describes a gas cooker having a TC in order to avoid an additional temperature sensor. The TC is connected to a heat display unit, which displays a heat status for the gas cooker point, depending on a parameter from the TC signal. However, also according to this document safety and combustion in such configuration are insufficiently controlled.

[0006] US2010239987A describes a method for operating a cooking point with a gas burner of a gas hob disclosed in which pan detection is provided for switching off the gas burner when the pan is removed. However, said document mainly focusses on a method to switch off or not gas and does not disclose a possibility to sense, if the pot is placed on the pan support or not.

[0007] It is an object of the present invention to provide a gas burner arrangement and/or a gas-cooking appliance with improved functions.

[0008] It is a further object of the present invention to provide a gas burner arrangement and/or a gas-cooking appliance with improved safety and/or combustion control.

[0009] This and other problems are solved by the subject matter of the attached independent claims.

[0010] The above objects of the invention are achieved by a gas burner arrangement according to claim 1, a gas-cooking appliance comprising such gas burner arrangement according to claim 13, and a method for determining if a cooking vessel is placed above a gas burner of a gas burner arrangement according to claim 14.

[0011] Preferred embodiments may be taken from the dependent claims.

[0012] A gas burner arrangement for a gas-cooking appliance, particularly a gas hob, according to claim 1 comprises at least one gas burner adapted to receive a fuel flow from a fuel supply and for providing a fuel-supplied flame to a cooking vessel. Thereby, the cooking vessel can be placed above the gas burner, particularly above the fuel-supplied flame. Such gas burner arrangement according to the present invention further comprises at least one support arranged to support the cooking vessel above the gas burner, particularly above the fuel-supplied flame, and a thermocouple adapted to generate a thermocouple signal depending on the thermal state of said thermocouple. Furthermore, a gas burner arrangement according to the present invention comprises a control unit connected to the thermocouple, the control unit being adapted to receive the thermocouple signal and to process said thermocouple signal to an output signal. Advantageously, according to the gas burner arrangement of the invention the control unit is capable of determining if the cooking vessel is placed on the support, particularly above the fuel-supplied flame, dependent on the thermocouple signal.

[0013] The present inventors have found that a signal from a thermocouple signal, particularly in the form of thermo-tension of such thermocouple, can be used to detect if a generic cooking vessel, for example a pot, pan, grid, or the like, has been placed over the flame, burner and/or the support of a gas burner. Thereby, the level of the thermocouple signal changes significantly, if such vessel is placed over the flame, particularly over the support or burner, or not.

[0014] A gas burner arrangement for a gas-cooking appliance according to the present invention comprises at least one gas burner adapted to receive a fuel flow from a fuel supply and for providing a fuel-supplied flame to a cooking vessel. In connection therewith it is to be understood that such fuel may be a gas or a gas-air mixture. A person skilled in the art will immediately acknowledge that usually such fuel-supplied flame is supplied with a gas or a gas-air mixture, particularly a gas-air mixture, and usually uses a primary air supply in form of the air, which is fed to the burner from below the cooktop

and/or the burner. Thereby, usually the amount of the primary air in the air-gas mixture ranges from about 60% to about 80%, whereby stoichiometric would be 100%. Particularly in a state where the flame or burner supplied by said fuel is burning, the thermocouple generates a thermocouple signal depending on the thermal state of said thermocouple. Advantageously, for the purpose of the present invention a thermocouple of various types can be applied. Particularly, a standard thermocouple as used for safety reasons in known gas hobs can be applied.

[0015] A "thermocouple" as used herein, preferably refers to a temperature-measuring device comprising two dissimilar conductors or semiconductors that contact each other at one or more spots, where a temperature differential is experienced by the different conductors or semiconductors. Upon such temperature differential, the thermocouple produces a voltage or tension when the temperature of one of the spots differs from the reference temperature at other parts of the circuit. Particularly, a thermocouple as used herein may be adapted to convert a temperature gradient into an electrical current signal. A thermocouple is advantageous in that it is relatively inexpensive, interchangeable, may be supplied with standard connectors, and/or can measure a wide range of temperatures. In contrast to most other methods of temperature measurement, thermocouples are advantageous in that such thermocouple can be self-powered and require no external form of excitation.

[0016] According to the present invention, the thermocouple is connected to a control unit, which is adapted to receive the thermocouple signal, e.g. a thermo-tension or thermoelectric current as an input signal. Said input signal is processed into an output signal by the control unit. In an embodiment, the control unit comprises a comparator and is adapted to generate an output signal dependent on the comparison of the thermocouple signal to at least one predetermined set value. Such predetermined set value may be stored in the control unit. Particularly, such predetermined set value can be a threshold value to which the thermocouple signal is compared.

[0017] The above described problems are also advantageously solved by a method for determining if a cooking vessel is placed above a gas burner of a gas burner arrangement of a gas-cooking appliance, according to claim 12.

[0018] Such method according to the present invention comprises at least the following steps:

a) providing a thermocouple signal (8) from a thermocouple (7) to a control unit (9),

b) comparing thermocouple signal (8) to at least one predetermined set value,

c) generating an output signal (11) dependent on the comparison in step b), wherein the output signal (11) is indicative for whether a cooking vessel (5) is placed on the support (6), particularly above the fuel-supplied flame (4), and

d) providing said output signal (11) to at least one signal output device.

[0019] In connection therewith, it is to be understood that any feature or advantage described in connection with the gas burner arrangement according to the present invention may also be understood as a feature or advantage of the method according to the present invention, and vice versa.

[0020] Accordingly, features referring to a gas burner arrangement according to the method of the present invention may also be features of a gas burner arrangement according to the present invention.

[0021] In the method and/or gas burner arrangement according to the present invention, the control unit is capable of determining if the cooking vessel is placed above the fuel-supplied flame dependent on the thermocouple signal, either by a significant change of the thermocouple signal characteristic for a state where a vessel is placed or not placed above the flame, burner or the support, or alternatively or additionally by comparison of the thermocouple signal to a predetermined set value.

[0022] In a preferred embodiment of the method and/or the gas burner arrangement according to the present invention said method in step b) further comprises comparing the thermocouple signal to at least one first predetermined set value for at least one first predetermined amount of time. Accordingly, in an embodiment the control unit of the gas burner arrangement of the present invention is capable of comparing the thermocouple signal to at least one first predetermined set value for at least one first predetermined amount of time. If the thermocouple signal for the first predetermined amount of time is lower than the at least one first predetermined set value, said output signal generated by the control unit, particularly in step c) of the method according to the present invention, is indicative for a state in which a cooking vessel is placed on the support, particularly above the fuel-supplied flame.

[0023] Additionally or alternatively, said method in step b) further comprises comparing the thermocouple signal to at least one second predetermined set value for at least one second predetermined amount of time. Accordingly, in an embodiment the control unit of the gas burner arrangement of the present invention is capable of comparing the thermocouple signal to at least one second predetermined set value for at least one second predetermined amount of time. If the thermocouple signal for the second predetermined amount of time is higher than the at least one second predetermined set value, said output signal generated by the control unit, particularly in step c) of the method according to the present invention, is indicative for a state in which no cooking vessel is placed on the support, particularly above the fuel-supplied flame. In an embodiment of the present gas burner arrangement and/or the method according to the present invention the at least one first predetermined set value and the at least one second predetermined set value are

identical. In an alternative embodiment of the present gas burner arrangement and/or the method according to the present invention the at least one first predetermined set value is different from the at least one second predetermined set value. In a further embodiment of the present gas burner arrangement and/or the method according to the present invention the at least one first predetermined amount of time and the at least one second predetermined amount of time are identical. Alternatively, the at least one first predetermined amount of time is different from the at least one second predetermined amount of time, or at least partially overlap.

[0024] In a particularly preferred embodiment of the method and/or the gas burner arrangement according to the present invention a first predetermined set value is indicative for a state in which a cooking vessel is placed on the support, particularly above the fuel-supplied flame. At the same time, the thermocouple signal may be compared to a second predetermined set value, i.e. the period for comparison to the first and the second predetermined set value is identical. Said second predetermined set value thereby is indicative for a state in which no cooking vessel is placed on the support, particularly above the fuel-supplied flame.

[0025] If the thermocouple signal is compared to said first predetermined set value and to said second predetermined set value, and if the thermocouple signal is lower than the first predetermined set value, said output signal generated by the control unit is indicative that a cooking vessel is placed on the support, particularly above the fuel-supplied flame. However, if the thermocouple signal is higher than the second predetermined set value, said output signal generated by the control unit is indicative for a state in which no cooking vessel is placed on the support, particularly above the fuel-supplied flame.

[0026] In an embodiment the distance between the cooking vessel, particularly the bottom of such cooking vessel, and the gas burner, particularly the fuel-supplied flame, is about 3.0 cm, preferably of about 2.0 cm, more preferably of about 1.0 cm. It will be immediately understood by a person skilled in the art that the distance between cooking vessel and the gas burner, particularly the flame, can be adjusted dependent on the height of a support arranged to support the cooking vessel above the gas burner, particularly above the fuel-supplied flame. In an advantageous embodiment of the gas burner arrangement and/or the method according to the present invention, the support is arranged such that the cooking vessel is placed above the gas burner, particularly above the flame, with a distance to about 3 cm, preferably of about 2 cm, more preferably of about 1 cm. Thereby, it is advantageous if the distance between the cooking vessel, and the gas burner, particularly the flame, is relatively low. This is, as the present inventors have found that, if the distance between the cooking vessel and the gas burner, particularly the flame, is shorter, the more indicative for the presence or non-presence of a vessel is the thermocouple signal, and particularly a change thereof. Particularly, in an embodiment according to which the thermocouple signal is compared to a first and to a second predetermined set value, the distance between said predetermined set values can be higher, if the distance between the cooking vessel and the gas burner, particularly the flame is lower. In other words, having a relatively low distance between the cooking vessel and the gas burner, particularly the flame, allows for a relatively high difference between a first and a second predetermined set value. Accordingly, the accuracy of determination whether a cooking vessel is present or not can be higher, if the distance between cooking vessel and the gas burner, particularly the flame, is relatively low.

[0027] In a further advantageous embodiment of the gas burner arrangement and/or the method according to the present invention, the thermocouple signal is a thermos-tension and/or a thermoelectric current.

[0028] It will be immediately understood by a person skilled in the art that various forms of thermocouples can be applied within the scope of the present invention. However, thermocouples generating a signal in the form of a thermo-tension and/or a thermoelectric current are of particular advantage, as such thermocouples can be arranged and exchanged relatively easy, and are of generally low costs.

[0029] In a further advantageous embodiment of the gas burner arrangement and/or the method according to the present invention, the thermocouple is arranged such that the thermocouple signal is indicative for whether the cooking vessel is placed above the support, particularly above the fuel-supplied flame.

[0030] Such placement of the thermocouple advantageously allows to determine dependent on the thermocouple signal, particularly the thermocouple signal being compared to at least one predetermined set value, whether a cooking vessel is placed above the support, particularly above the fuel-supplied flame, or not.

[0031] In a further advantageous embodiment of the gas burner arrangement and/or the method according to the present invention, the thermocouple is arranged at a position, which is below a cooking vessel to be placed on the support.

[0032] Such placement of the thermocouple below a cooking vessel to be placed on the support, advantageously allows to determine dependent on the thermocouple signal, particularly the thermocouple signal being compared to at least one predetermined set value, whether a cooking vessel is placed above the support, particularly above the fuel-supplied flame, or not.

[0033] In a further advantageous embodiment of the gas burner arrangement and/or the method according to the present invention, the thermocouple is arranged adjacent to the gas burner, particularly adjacent to the fuel-supplied flame.

[0034] Such arrangement of the thermocouple is advantageous, as the placement allows for a compact design of the gas burner arrangement according to the present invention. Moreover, the thermocouple being

placed adjacent to the gas burner, particularly adjacent to the fuel-supplied flame, allows for a relatively precise determination of whether a cooking vessel is placed above the support, particularly above the fuel-supplied flame, or not.

[0035] The gas burner of the gas burner arrangement and/or the method according to the present invention, may in general be of usually applied gas burner types. For example, the gas burner is a flush burner. A "flush burner" as used herein, preferably refers to a burner in which the flame spreader is flush to the cooktop. In such configuration according to which the gas burner is a flush burner, the flame shape is changing a lot with and without the cooking vessel. This will facilitate to determine whether a cooking vessel is or is not placed on the support, particularly above a flame. This is, as particularly a difference between a first and a second predetermined set value is bigger. Alternatively, the gas burner may be a cylindical gas burner, particularly with a 'tower' style.

[0036] In a further advantageous embodiment of the gas burner arrangement and/or the method according to the present invention, the control unit is connected to at least one regulation means. Such regulation means is capable of regulating the fuel received by the at least one gas burner from the fuel supply, dependent on the output signal.

[0037] Particularly, the flow rate of the fuel may be regulated dependent on the output signal. For example, the fuel flow rate may be turned on or off, dependent on whether a vessel is placed above the burner or flame, or not. Particularly, the operation unit may be adapted to control the regulation means such that the fuel flow rate is lowered or turned off, dependent on the output signal, if no vessel is placed above the burner or flame. Additionally or alternatively, the operation unit may be adapted to control the regulation means such that the fuel flow rate is increased or turned on, dependent on the output signal, if a vessel is placed above the burner or flame.

[0038] In a further advantageous embodiment of the gas burner arrangement and/or the method according to the present invention, the at least one regulation means is a valve, preferably an electronic gas valve. In an embodiment more than one valve is provided. Preferably, a valve for control of gas flow and one valve for control of an air supply is provided. More preferably, in addition one valve for regulating the flow rate of a fuel mixture is provided. Such valve(s) advantageously allow to control the fuel flow rate, and/or the fuel composition, e.g. the amount of gas and/or air in a gas-air mixture. Particularly, with such valve(s) and the control thereof by the method and/or the gas burner arrangement according to the present invention combustion may be advantageously controlled. Moreover, the control unit may be configured such that the valve, particularly the fuel flow is switched on after the flame extinguished.

[0039] In a further advantageous embodiment of the gas burner arrangement and/or the method according to the present invention, the mixture comprises air. In a still further embodiment the system comprise an air actuator means. Particularly, the fuel supply may comprise an air actuator means. Such air actuator means is capable of providing air. For example, a fan element can be provided as an air actuator means. The control unit may be connected to said fuel supply and/or said air actuator means such that the air actuator means is capable of regulating the amount of air in the fuel or the amount of air or air flow rate supplied to the flame or burner, dependent on the output signal. Particularly, such air actuator means can be controlled by the control unit dependent on the output signal, and thus the air flow rate of the air generated by the air actuator means can be adjusted dependent on the output signal. For example, the control unit may be configured such that the actuator means is controlled to provide minimum air amount to fulfill combustion control.

[0040] In a further advantageous embodiment of the gas burner arrangement and/or the method according to the present invention, the fuel system may comprise a gas actuator means for providing said gas to the burner or flame. The control unit may be connected to said fuel supply and/or said gas actuator means such that the gas actuator means is capable of regulating the amount of gas in the fuel or the amount of gas or gas flow rate supplied to the flame or burner, dependent on the output signal. Particularly, such gas actuator means can be controlled by the control unit dependent on the output signal, and thus the gas flow rate of the gas generated or released by the gas actuator means can be adjusted dependent on the output signal.

[0041] In a further advantageous embodiment of the gas burner arrangement and/or the method according to the present invention, the at least one regulation means, is capable of regulating the amount of fuel received by the at least one gas burner from the fuel supply, dependent on the output signal. Particularly, such regulation means, more particularly in the form of a valve, may regulate the flow rate of the fuel received by the at least one gas burner. Particularly, such regulation means may be adapted to turn the flow rate of the fuel on or off, or regulate the flow rate to an adjustable value. Particularly, the fuel may be provided as gas or a gas-air mixture. Such regulation means, more particularly in the form of a valve, may regulate the flow rate of the gas or a gas-air mixture received by the at least one gas burner. Additionally or alternatively such regulation means may also be adjusted to regulate the amount or flow rate of air and the amount or flow rate of gas. Accordingly, the mixture of air and gas can be adapted to the output signal dependent on the thermocouple signal. Such arrangement particularly allows to provide an advantageous combustion control. The thermocouple signal from the thermocouple may, for example, be used to close the loop of a combustion control. For example, to tune the amount of air or gas to achieve a target air/fuel ratio, dependent on the desired needs, and particularly dependent on the thermocouple signal from the thermocouple. It is also

possible with such arrangement to supply more air and/or gas in order to achieve a desired optimal target air/fuel ratio dependent on the desired needs, and particularly dependent on the thermocouple signal from the thermocouple. This advantageously allows to reduce the impact of the drift of components, e.g. tap, fan, injector, during the life of the hob.

[0042] The present inventors have also surprisingly found that the measured thermocouple signal of the thermocouple is linked to the amount of gas and/or air in the fuel. According to an embodiment of the present invention the thermocouple and, particularly the thermocouple signal of said thermocouple can be used as a feedback signal for the fuel supply, particularly the air/gas ratio. This advantageously allows the control unit to control the air/gas ratio. More advantageously, the control unit can be configured such that dependent on the thermocouple signal from the thermocouple a predetermined air/gas ratio is controlled by the control unit, particularly in connection with the regulation of regulation means as described herein. This advantageously allows achieving an improved tracking of the target or set air/gas ratio in a fuel in a closed loop control system.Particularly, norms and standards may require CO pollutants to be lower than a threshold. According to the present invention the control unit may be configured such that an air/gas ratio is controlled in order to be achieve pollutants smaller than such CO pollutants threshold.

[0043] In a further advantageous embodiment of the gas burner arrangement and/or the method according to the present invention, the control unit is adapted to process said thermocouple signal to an output signal, and is connected to at least one signal output device.

[0044] Such signal output is capable of generating a signal dependent on the output signal, wherein the signal is perceptible to a user. Such signal output device can be provided in various forms, for example, in order to inform a user about various parameters related to the burner arrangement or condition. Particularly, such signal output device may be provided in the form of a display and/or a speaker. On a display, for example, a visual signal can be provided to the user. For example, the user can be informed about whether the flame is burning or not, whether the fuel flow is on or off, about the amount or flow rate of the fuel, about the flame and/or heat intensity, or the like. Additionally or alternatively, such signal output device may be provided in the form of a speaker. With such speaker, for example, an acoustic signal, e.g. an alarm signal, can be provided to the user. For example, the user can be informed about a malfunction of the gas burner, an overheating, a flame, which has extinguished, or the like. Additionally or alternatively a signal output device can be provided in the form of a regulation means for regulating at least one function of a gas gas-cooking appliance, particularly a gas burner assembly.

[0045] The control unit and/or the signal output device may comprise a time device, e.g. a clock. Particularly, the control unit may be configured to measure the cooking duration time and/or a predetermined amount of time for the determination of a predetermined set value.

[0046] The above described problems are also advantageously solved by a gas-Cooking appliance, particularly a gas hob according to claim 13. Such gas-cooking appliance comprises a gas burner arrangement according to the present invention.

[0047] In connection therewith, it is to be understood that any feature or advantage described in connection with the gas burner arrangement according to the present invention or the method according to the present invention, may also be understood as a feature or advantage of the gas-cooking appliance according to the present invention.

[0048] All described embodiments of the invention have the advantage, that safety, particularly due the possibility of detection of a vessel, of a gas burner arrangement or gas-cooking appliance is advantageously improved. Moreover, the usability, particularly due to the possibility for assisted cooking, of a gas burner arrangement or gas-cooking appliance is advantageously improved. Still further performances, for example a better combustion, of a gas burner arrangement or gas-cooking appliance is advantageously improved. Still further a gas burner arrangement or gas-cooking appliance or method according to the present invention advantageously provides the possibility of diagnosis for malfunction, for example of the electromechanical gas systems.

[0049] Particularly, the gas burner arrangement and/or the method according to the present invention allows for the diagnosis of the correct functioning of the gas burner, the gas burner arrangement, and the gas-cooking appliance according to the present invention. Such diagnosis may advantageously be achieved by, for example, by comparing the actual thermocouple signal in a given set condition, e.g. a certain power, a certain time elapsed from ignition etc., to a standard reference value, e.g. values pre-set and stored in the control unit, e.g. by the supplier, which reflect a new gas cooking appliance, and/or new gas burner arrangement. Thereby the respective algorithm for such comparison may also be based on some assumptions, e.g. that the gas tap is properly functioning, or the like. Dependent on the degree of which the actual measured values differ from the pre-set values, the control unit may provide an output signal, which is indicative for the user of the result of the diagnosis. For example, if the actual measured values are not differing from the pre-set values in a significant manner the user may be informed that the gas burner arrangement does not need a service maintenance or vice versa. Particularly, the pre-set values and the set condition or a respective set program may both be stored in the control unit, and be operatable therefrom. Accordingly, the present invention provides an advantageous system to detect and/or diagnose a failure of the gas system components, e.g. the injector, fan, tap, or the like. Particularly, if the thermocouple signal of the thermocouple

is differing from an expected value, particularly such preset value, it may be determined whether a fault is present in any of the components, and furthermore the cause or location of such failure may be determined.

[0050] According to the gas burner arrangement or gas-cooking appliance or method according to present invention, the thermocouple signal is advantageously not only used for controlling a security valve, as known in the art, rather than further advantageous functions are provided, particularly comprising the indication of whether a cooking vessel is placed on the burner or flame, of whether such flame is on or off, the regulation of the flow rate of the fuel or the regulation of the composition of the fuel. More particularly, the present invention allows to enhance the safety of a gas-cooking appliance in that it is capable of detecting and informing, if a cooking vessel is placed on the burner or flame for too long time. More particularly, the present invention allows to enhance the safety of a gas-cooking appliance in that it is capable of detecting if a flame is burning and no cooking vessel is placed for too long time. Still further, the present invention allows to measure the cooking time, with a clock device, and assist cooking. Particularly, an auto cooking program may be stored in and operated from the control unit. Such auto cooking program requires to use different parameters values in different cooking phases, i.e. steps of the recipe. Accordingly, the thermocouple value may be continuously compared to values, which reflect such cooking phases, and the output signal, may be adjusted according to the desired cooking conditions during the different cooking phases. This, advantageously allows to use the thermocouple in the gas burner arrangement according to the present invention for a automated cooking according to a certain cooking recipe. Particularly, such cooking recipe can be entered, stored and/or modified in the control unit.

[0051] The present invention will be described in further detail with reference to the drawings from which further features, embodiments and advantages may be taken, and in which:

FIGs 1A and 1B	illustrate schematical side views of a gas burner arrangement showing a first inventive embodiment;
FIG 2	illustrates a schematical side view of a gas burner arrangement showing a second inventive embodiment;

[0052] FIGs 1A, 1B and 2 show a gas burner arrangement 1 for a gas-cooking appliance 10, particularly a gas hob, which comprises at least one gas burner 2, which is adapted to receive a fuel flow from a fuel supply 3 and for providing a fuel-supplied flame 4 to a cooking vessel 5. In Fig. 1B the cooking vessel 5 in form of a usual cooking pot is placed on the gas burner 2. The cooking vessel 5 is placed on a support 6 arranged adjacent to the gas burner 3 to support the cooking vessel 5 above the flame 4. Fig. 1A shows the gas burner arrangement 1 of Fig. 1B without the vessel. The gas burner arrangement 1 comprises a thermocouple 7, which is arranged adjacent to the burner 3, particularly adjacent to the fuel-supplied flame (4), such that dependent on whether the cooking vessel 5 is placed above the support 6, or not, the thermocouple signal 8 generated by the thermocouple 7 is changed. Therefore, the thermocouple 7 is arranged such that the thermocouple signal 8 is indicative for whether the cooking vessel 5 is placed above the support 6, particularly above the fuel-supplied flame 4. The thermocouple 7 is arranged at a position, which is below a cooking vessel 5 to be placed on the support 6, particularly above the fuel-supplied flame 4. The thermocouple 7 is thereby adapted to generate a thermocouple signal 8 depending on the thermal state of said thermocouple 7, which particularly depends on whether a vessel 5 is placed above the flame 4 and above the burner 3, or not. It may be particularly seen when Fig. 1A and 1B are viewed vis-à-vis, that the flame structure of the flame 4 is significantly different, if a vessel 5 is placed on the support 6 compared to a situation where no vessel 5 is placed on the support 6. Particularly, the point of contact between the flame 4 and the thermocouple 7 is changed if a vessel 5 is placed on the support 6 compared to a situation where no vessel 5 is placed on the support 6. This change is also changing the thermocouple value. Accordingly, in order to determine, if a cooking vessel 5 is placed above the gas burner 2 of the gas burner arrangement 1 of the gas-cooking appliance 10, particularly on the support 6 above a fuel-supplied flame 4 provided by the gas burner 2, the method according to the present invention can be carried out. For this purpose a thermocouple signal 8 is provided from the thermocouple 7 to the control unit 9, the thermocouple signal 8 is compared to at least one predetermined set value in the control unit, and the control unit generates an output signal 11 dependent on the comparison. The output signal 11 thereby is indicative for whether a cooking vessel 5 is placed on the support 6, particularly above the fuel-supplied flame 4, or not. The output signal is further provided to at least one signal output device. Said output device can be of various forms, e.g. a display to inform the user, or a regulation means for regulating at least one function of a gas gas-cooking appliance, particularly a gas burner assembly. Particularly, when comparing the thermocouple signal 8 to the at least one first predetermined set value for at least one first predetermined amount of time, and if the thermocouple signal 8 for the first predetermined amount of time is higher than the at least one first predetermined set value, said output signal 11 is indicative for a state in which a cooking vessel 5 is placed on the support 6, particularly above the fuel-supplied flame 4. Additionally or alternatively, the comparison of thermocouple signal 8 to at least one second predetermined set value for at least one second predetermined amount of time, and if the thermocouple signal 8 for the second predetermined amount of time is lower than the at least

one second predetermined set value, said generated output signal 11 is indicative for a state in which no cooking vessel 5 is placed on the support 6, particularly above the fuel-supplied flame 4.

[0053] As may be best seen from Fig. 2, which shows the gas burner arrangement 1 of Figs. 1A and 1B with further elements, such as an air actuator 14, and a gas actuator 15, the gas burner arrangement 1 further comprises a control unit 9, which is connected to the thermocouple 7. The control unit 9 is adapted to receive the thermocouple signal 8 as an input signal and to process said thermocouple signal 8 to an output signal 11. According to the present invention, the control unit 9 is capable of determining if the cooking vessel 5 is placed above the support 6 dependent on the thermocouple signal 8. As may be particularly seen from Fig.1 the support 6 is arranged such that the cooking vessel 5 is placed above the gas burner 2 with a distance to about 3.0 cm, preferably of about 2.0 cm, more preferably of about 1.0 cm. In the shown embodiment the thermocouple signal 8 is a thermos-tension and/or a thermoelectric current.

[0054] More particularly, the control unit 9 is connected to regulation means 12. The regulation means 12, which are provided as electronic valves, are capable of regulating the fuel received by the at least one gas burner 2 from the fuel supply 3, dependent on the output signal 11.

[0055] Particularly, the an air-gas mixture, may be provided, whereby the air is provided by an air actuator means 14, particularly a fan element, and the gas is provided from a gas actuator means 15. The control unit 9 is connected to said air actuator means 14 and to said gas actuator means 15. The air actuator means 14 is capable of regulating the amount of air in the fuel and the gas actuator means 15 is capable of regulating the amount of gas in the fuel, dependent on the output signal 11, and particularly be control of the respective valves 12. Particularly, one valve 12 is provided, which is capable of regulating the amount of fuel received by the at least one gas burner 2 from the fuel supply 3, dependent on the output signal 11. The control unit 9 is adapted to process the thermocouple signal 8 to an output signal 11, is connected to at least one signal output device 13, which is not shown in the Figs. The signal output device 13 is capable of generating a signal dependent on the output signal 11, wherein the signal is perceptible to a user, for example a display informing the user.

[0056] The features of the present invention disclosed in the specification, the claims, and/or the figures may both separately and in any combination thereof be material for realizing the invention in various forms thereof.

List of reference numerals

[0057]

1 gas burner arrangement
2 gas burner
3 fuel supply
4 flame
5 cooking vessel
6 support
7 thermocouple
8 thermocouple signal
9 control unit
10 Gas-Cooking appliance
11 output signal
12 regulation means
13 signal output device
14 air actuator means
15 gas actuator means

Claims

1. A gas burner arrangement (1) for a gas-cooking appliance (10), particularly a gas hob (10), comprising
at least one gas burner (2) adapted to receive a fuel flow from a fuel supply (3) and for providing a fuel-supplied flame (4) to a cooking vessel (5),
at least one support (6) arranged to support the cooking vessel (5) above the gas burner (2), particularly above the fuel-supplied flame (4),
a thermocouple (7) adapted to generate a thermocouple signal (8) depending on the thermal state of said thermocouple (7),
and
a control unit (9) connected to the thermocouple (7), the control unit (9) being adapted to receive the thermocouple signal (8) and to process said thermocouple signal (8) to an output signal (11),
characterized in that
the control unit (9) is capable of determining if the cooking vessel (5) is placed on the support (6), particularly above the fuel-supplied flame (4), dependent on the thermocouple signal (8).

2. The gas burner arrangement (1) according to claim 1, wherein the support (6) is arranged such that the cooking vessel (5) is placed above the gas burner (2) with a distance to about 3.0 cm, preferably of about 2.0 cm, more preferably of about 1.0 cm.

3. The gas burner arrangement (1) according to any one of claims 1 to 2, wherein the thermocouple signal (8) is a thermo-tension and/or a thermoelectric current.

4. The gas burner arrangement (1) according to any one of claims 1 to 3, wherein the thermocouple (7) is arranged such that the thermocouple signal (8) is indicative for whether the cooking vessel (5) is placed above the support (6), particularly above the fuel-supplied flame (4).

5. The gas burner arrangement (1) according to any one of claims 1 to 4, wherein the thermocouple (7)

is arranged at a position, which is below a cooking vessel (5) to be placed on the support (6).

6. The gas burner arrangement (1) according to any one of claims 1 to 5, wherein the thermocouple (7) is arranged adjacent to the gas burner (2), particularly adjacent to the fuel-supplied flame (4).

7. The gas burner arrangement (1) according to any one of claims 1 to 6, wherein the control unit (9) is connected to at least one regulation means (12), the regulation means (12) being capable of regulating the fuel received by the at least one gas burner (2) from the fuel supply (3), dependent on the output signal (11).

8. The gas burner arrangement (1) according to claim 7, wherein the at least one regulation means (12) is a valve, preferably an electronic gas valve.

9. The gas burner arrangement (1) according to any one of claims 1 to 8, wherein the fuel comprises air, and wherein the fuel supply (3) comprises an air actuator means (14), particularly a fan element, for providing said air, and wherein the control unit (9) is connected to said fuel supply (3) and/or said air actuator means (14), wherein the air actuator means (14) is capable of regulating the amount of air in the fuel, dependent on the output signal (11).

10. The gas burner arrangement (1) according to any one of claims 1 to 9, and wherein the fuel supply (3) comprises a gas actuator means (15) for providing said gas, wherein the control unit (9) is connected to said fuel supply (3) and/or gas actuator means (15) and wherein the gas actuator means (15) is capable of regulating the amount of gas in the fuel, dependent on the output signal (11).

11. The gas burner arrangement (1) according to any one of claims 1 to 10, wherein the at least one regulation means (12), is capable of regulating the amount of fuel received by the at least one gas burner (2) from the fuel supply (3), dependent on the output signal (11).

12. The gas burner arrangement (1) according to any one of claims 1 to 11, wherein the control unit (9) adapted to process said thermocouple signal (8) to an output signal (11), and wherein the control unit (9) is connected to at least one signal output device (13), the signal output device (13) capable of generating a signal dependent on the output signal (11), wherein the signal is perceptible to a user.

13. A gas-cooking appliance (10), particularly a gas hob (10), comprising a gas burner arrangement (1) according to any one of the preceding claims.

14. A method for determining if a cooking vessel (5) is placed above a gas burner (2) of a gas burner arrangement (1) of a gas-cooking appliance (10), particularly on a support (6) arranged to support said cooking vessel (5) above a fuel-supplied flame (4) provided by the gas burner (2), comprising

a) providing a thermocouple signal (8) from a thermocouple (7) to a control unit (9),
b) comparing thermocouple signal (8) to at least one predetermined set value,
c) generating an output signal (11) dependent on the comparison in step b), wherein the output signal (11) is indicative for whether a cooking vessel (5) is placed on the support (6), particularly above the fuel-supplied flame (4),
d) providing said output signal (11) to at least one signal output device,

wherein the gas burner arrangement is a gas burner arrangement according to any one of claims 1 to 12.

15. The method according to claim 14 wherein
said method in step b) further comprises comparing the thermocouple signal (8) to at least one first predetermined set value for at least one first predetermined amount of time, and
if the thermocouple signal (8) for the first predetermined amount of time is lower than the at least one first predetermined set value, said output signal (11) generated in step c) is indicative for a state in which a cooking vessel (5) is placed on the support (6), particularly above the fuel-supplied flame (4),
and/or
said method in step b) further comprises comparing the thermocouple signal (8) to at least one second predetermined set value for at least one second predetermined amount of time, and
if the thermocouple signal (8) for the second predetermined amount of time is higher than the at least one second predetermined set value, said output signal (11) generated in step c) is indicative for a state in which no cooking vessel (5) is placed on the support (6), particularly above the fuel-supplied flame (4).

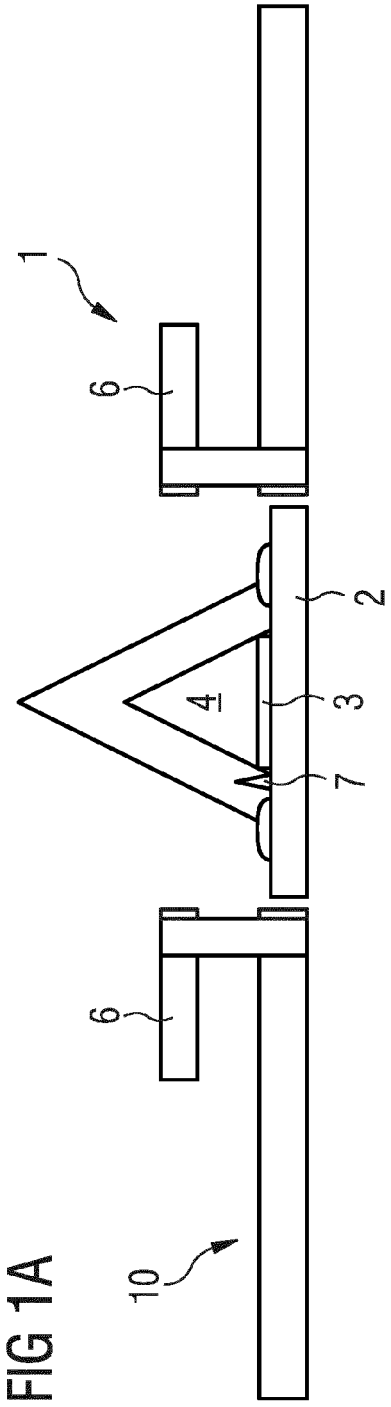


FIG 1A

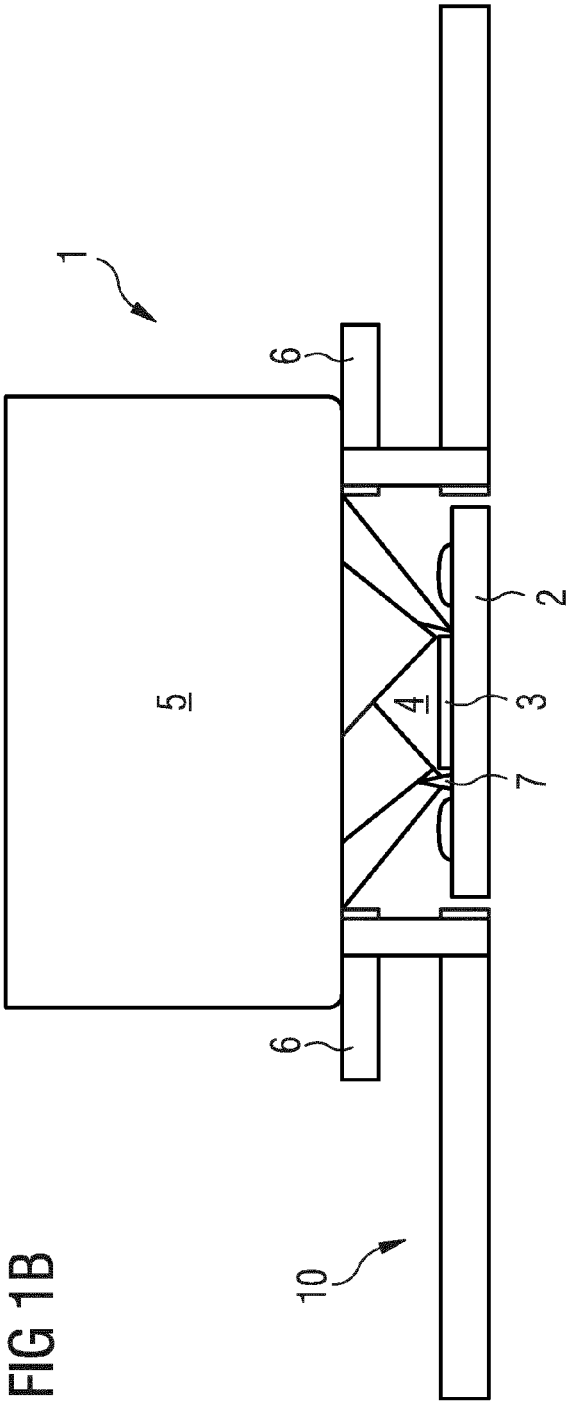
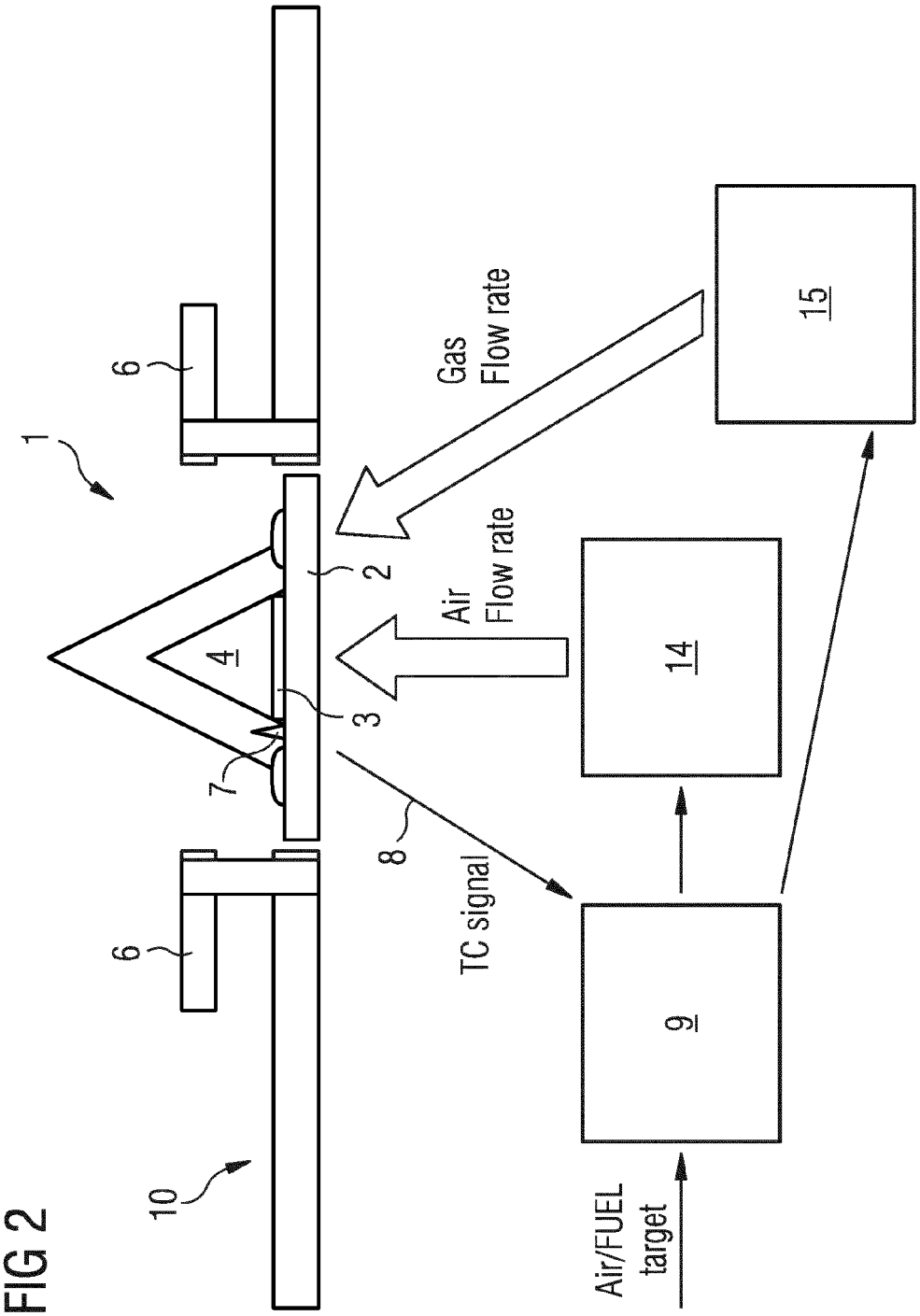


FIG 1B


1
2
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4
6
6
7
8
9
10
14
15
Gas
Flow rate
Air
Flow rate
TC signal
Air/FUEL
target

FIG 2

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EUROPEAN SEARCH REPORT

Application Number
EP 15 18 6148

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24 February 2016	Harder, Sebastian

CATEGORY OF CITED DOCUMENTS

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