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(54) GAS STOVE

(57) The object of the invention is to provide a gas stove capable of suppressing heat radiated from the side surface of a combustion chamber from being transmitted to the interior of the stove.

A gas stove 1 comprises a burner 2, a porous body 3, an air supply/discharge fan 6 , an external wall 9, an exhaust passage 26 communicating the porous body 3 and an exhaust slot 5, and an air supply passage 20, wherein a heat insulation space 12 is defined by the external wall 9 and the side surface 11 of the combustion chamber 10 which is airtight except for a supply opening 13 and a discharge opening 14 for air, and the air supply passage 20 and the supply opening 13 are communicated by an air supply branch pipe 15. During combustion of the burner 2, cooling air is supplied through an air supply branch pipe 15 to the heat insulation space 12, which suppresses the heat radiated from the side surface 11 of the combustion chamber 10 from being transmitted to the interior of the gas stove 1, and the air discharged from the discharge opening 14 cools the portion of a glass top panel 4 corresponding to the outer side of the combustion chamber 10.

FIG. 1 (a)

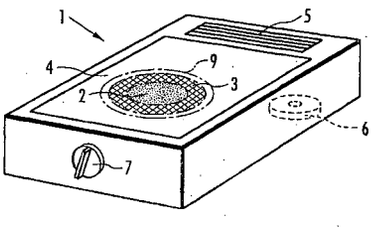
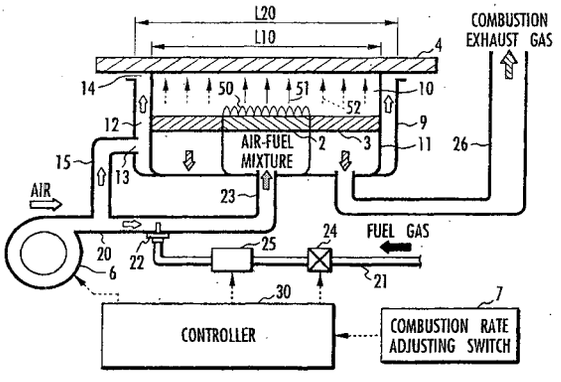


FIG. 1 (b)



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Description

TECHICAL FIELD

[0001] The present invention relates to a gas stove for heating an object placed on an upper panel of a combustion chamber without exposing flames during the heating.

BACKGROUND ART

[0002] Heretofore, a gas stove as shown in FIG. 5(a) is known, that comprises a heat-resistance glass top panel 101 disposed on an upper surface of a combustion chamber housing a burner 100 for heating an object to be cooked placed on the glass top panel 101. According to such conventional gas stove, an air supply/discharge fan 102 supplies combustion air to the burner 100 and discharges combustion exhaust gas from the burner 100 through an exhaust slot 103.

[0003] FIG. 5(b) is a cross-sectional view showing the gas stove of FIG. 5(a) from one side, wherein a controller 130 controls through a gas proportional valve 124 the flow rate of a fuel gas supplied from a gas supply passage 121 through a nozzle 122 to a mixture pipe 123, and controls through the air supply/discharge fan 102 the flow rate of combustion air supplied from an air supply passage 120 to the mixture pipe 123, according to a target combustion rate for the burner 100 set through a combustion rate adjusting switch 104 that adjusts the combustion rate of the burner 100.

[0004] Moreover, the gas supply passage 121 has a main gas valve 125 disposed thereto. A porous body 105 having air permeability is disposed on the outer side of the burner 100, and the porous body 105 is communicated with an exhaust passage 126 that guides the combustion exhaust gas from the burner 10 to the exhaust slot 103. By disposing the porous body 105 along the path for discharging the combustion exhaust gas from the burner 100, radiant heat 112 is generated from the porous body 105 being heated by the passing of hot combustion exhaust gas, in addition to hot air 111 produced from the combustion surface of the burner 100 generated by combustion flames 110. Thus, the thermal efficiency of the gas stove is enhanced.

[0005] When the gas stove having the above-explained structure is used, the heat radiated from the burner 100 and the porous body 105 brings the interior of the combustion chamber 140 to a very high temperature (approximately 1000 ºC), and the heat radiated from the side surfaces of the combustion chamber 140 heats the interior of the gas stove. As a result, the interior of the gas stove becomes very hot, and electrical components (such as electrical substrates, fan motors and solenoid valves) disposed within the gas stove may break down due to overheating.

SUMMARY OF THE INVENTION

[0006] In consideration of the above-described background, the present invention aims at providing a gas stove that prevents the electrical components disposed in the interior of the stove from being heated excessively by the heat radiated from the side surface of the combustion chamber, and relates to the improvement of a gas stove comprising a combustion chamber having a top panel disposed thereabove for placing an object to be heated, a surface-combustion burner and an air-permeable porous body disposed in the combustion chamber in confronting relation to the top panel, a fuel gas supply means for supplying a fuel gas to the burner, an exhaust passage having an end communicating with the combustion chamber via the porous body and another end communicating with an exhaust opening, and an air supply/discharge fan for supplying combustion air to the burner through an air supply passage and delivering a combustion discharge gas from the burner through the porous body and the discharge passage to the exhaust opening, the gas stove heating the object to be heated through the top panel by the heat radiated from the burner and the heat radiated from the porous body having been heated by the combustion exhaust gas from the burner.

[0007] In a first aspect of the present invention, the gas stove characterizes in comprising an external wall surrounding a side surface of the combustion chamber with a clearance therebetween so as to form a space defined by the side surface and the external wall, and an air supply branch pipe for communicating the space with the air supply passage.

[0008] According to the present invention, when the burner is burning, fuel gas is supplied from the fuel gas supply means and combustion air is supplied from the air supply/discharge fan. The interior of the combustion chamber becomes very hot by the heat radiated from the burner and the heat radiated from the porous body being heated by the hot combustion exhaust gas from the burner, and heat is radiated from the side surface of the combustion chamber.

[0009] However, during operation of the air supply/discharge fan, air is also supplied through the air supply passage and via the air supply branch pipe into the space defined by the side surface of the combustion chamber and the external wall. Therefore, the air supplied into the space suppresses the heat radiated from the side surface of the combustion chamber from being transmitted to the interior of the gas stove, and thus prevents the breakdown of the electrical components such as the motor activating the air supply/discharge fan caused by excessive heating of the interior of the gas stove. Further, according to the first aspect of the present invention, there is no need to provide a fan for supplying air into the space separately from the air supply/discharge fan, so the increase of cost of the gas stove can be suppressed.

[0010] In the above-mentioned first aspect, the gas stove further characterizes in that the space is formed airtightly except for a supply opening and a discharge opening for air, the air supply branch pipe being connected to the supply opening, and the gas stove further comprises an exhaust recycle pipe for communicating the air discharge opening with the air supply/discharge fan and recycling the air discharged through the discharge opening to the air supply/discharge fan.

[0011] According to the present invention, the air being supplied from the air supply branch pipe through the supply opening into the space is heated by the heat radiated from the side surface of the combustion chamber. Then, this heated air is discharged from the discharge opening formed to the space, travels through the discharge recycle pipe and sucked into the air supply/discharge fan, and then supplied through the air supply passage to the burner. Thereby, the temperature of combustion air being supplied to the burner is increased so that the temperature of the combustion flames of the burner becomes higher and the combustion speed of the burner becomes faster, thus the surface temperature of the burner is increased. Further, the temperature of the combustion exhaust discharged from the burner is also increased, by which the radiation conversion efficiency of the porous body through which the combustion exhaust passes is enhanced.

[0012] In a second aspect of the present invention, the gas stove characterizes in that it further comprises an external wall surrounding a side surface of the combustion chamber with a clearance therebetween so as to form a space defined by the side surface and the external wall that is airtight except for a supply opening and a discharge opening for air, and an exhaust recycle pipe for communicating the air discharge opening with the air supply/discharge fan and recycling the air discharged through the discharge opening to the air supply/discharge fan.

[0013] According to the present invention, the air within the room being supplied into the space through the supply opening is heated by the heat radiated from the side surface of the combustion chamber while it passes through the space, and then introduced through the exhaust recycle pipe into the air supply/discharge fan. Therefore, similar to the first aspect described above, the air heated within the space causes the temperature of the air being supplied through the air supply/discharge fan to the burner to increase, by which the surface temperature of the burner is increased during combustion and the radiation conversion efficiency of the porous body is improved.

[0014] In a third aspect of the present invention, the gas stove characterizes in comprising an external wall surrounding a side surface of the combustion chamber with a clearance therebetween so as to form a space defined by the side surface and the external wall that is airtight except for a supply opening and a discharge opening for air, and the air supply passage is composed of a first air supply communicating pipe that communicates an air delivery port of the air supply/discharge fan with the supply opening, said space, and a second air supply communicating pipe that communicates the discharge opening with the burner.

[0015] According to the present invention, the air being supplied through the first air supply communicating pipe into the space suppresses the heat radiated from the side surface of the combustion chamber from being transmitted to the interior of the gas stove, and the combustion air being heated while it is passed through the space and supplied through the second air supply communicating pipe to the burner causes increase of the combustion temperature of the burner and the radiation conversion efficiency of the porous body.

[0016] In a fourth aspect of the present invention, the gas stove further comprises an external wall surrounding a side surface of the combustion chamber with a clearance therebetween so as to form a space defined by the side surface and the external wall that is airtight except for a supply opening and a discharge opening for air, the discharge opening disposed to open toward a portion of the top panel corresponding to the outer side of the combustion chamber, and a cooling air supply means for supplying cooling air through the supply opening into the space.

[0017] According to the present invention, the cooling air supplied by the cooling air supply means through the air supply opening into the space passes through the space and out through the discharge opening toward the portion of the top panel positioned outside the combustion chamber. Thus, similar to the first aspect described above, the air passing through the space suppresses the heat radiated from the side surface of the combustion chamber from being transmitted to the interior of the gas stove, and the air discharged through the discharge opening cools the portion of the top panel positioned outside the combustion chamber. The present invention can therefore prevent the user from feeling the heat caused by the heating of the portion of the top panel positioned outside the combustion chamber.

[0018] In a fifth aspect of the present invention, the gas stove characterizes in comprising a cooling air supply means for supplying cooling air into the combustion chamber.

[0019] According to the present invention, the air being supplied by the cooling air supply means into the combustion chamber cuts down the ambient temperature inside the combustion chamber. Thus, the quantity of heat transmitted from the side surface of the combustion chamber to the interior of the gas stove can be cut down, and the top panel is prevented from being heated excessively especially when no object to be heated is placed on the top panel.

[0020] In addition, since the object to be heated placed on the top panel is mainly heated by infrared radiation emitted from the burner and the porous body and transmitted to the object to be heated through the top

panel, the effect that the reduction of ambient temperature within the combustion chamber has on the heating power for heating the object to be heated is only minor.

[0021] Moreover, in the fifth aspect of the present invention, the gas stove characterizes in that an external wall is disposed to surround a side surface of the combustion chamber with a clearance between the side surface, thereby forming a space defined by the side surface and the external wall that is airtight except for a supply opening and a discharge opening for air, the discharge opening disposed in communication with the combustion chamber and opening toward a bottom surface of the top panel, and the cooling air supply means supplies cooling air from the supply opening through the space and the discharge opening into the combustion chamber.

[0022] According to the present invention, the air passing through the space suppresses the heat radiated from the side surface of the combustion chamber from being transmitted to the interior of the gas stove, and the air supplied through the discharge opening into the combustion chamber is blown directly onto the bottom surface of the top panel, so the effect of cooling the top panel can be further enhanced.

[0023] Furthermore, in the fourth or fifth aspect described above, the cooling air supply means is composed of an air supply branch pipe that is branched out from the air supply passage.

[0024] According to the present invention, cooling air is supplied through the air supply branch pipe either into the space or into the combustion chamber, so there is no need to dispose a fan for supplying cooling air separately from the air supply/discharge fan. Therefore, the increase of cost of the gas stove can be suppressed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] FIG. 1 is an external view and a block diagram of a gas stove according to a fist embodiment of the present invention; FIG. 2 is a block diagram of a gas stove according to second and third embodiments of the present invention; FIG. 3 is a block diagram showing a gas stove according to a fourth embodiment of the present invention; and FIG. 4 is a block diagram of a gas stove according to fifth and sixth embodiments of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0026] Now, first through fifth embodiments of the present invention will be explained with reference to FIGS. 1 through 4. FIG. 1 is an external view and a block diagram of a gas stove according to a fist embodiment of the present invention, FIG. 2 is a block diagram of a gas stove according to second and third embodiments of the present invention, FIG. 3 is a block diagram showing a gas stove according to a fourth embodiment of the present invention, and FIG. 4 is a block diagram of a gas stove according to fifth and sixth embodiments of the present invention.

[0027] The first embodiment of the present invention will be explained with reference to FIG. 1. As shown in FIG. 1(a), a gas stove 1 is for heating an object to be cooked (object to be heated) that is placed on a heat-resistant glass top panel 4 placed above a combustion chamber housing a surface-combustion burner 2 and an annular porous body 3 (refer to FIG. 1(b)).

[0028] The gas stove 1 also has an air supply/discharge fan 6 for supplying combustion air to the burner 2 and for sending the combustion discharge gas of the burner 2 through the porous body 3 and a discharge passage (refer to FIG. 1(b)) into an exhaust slot 5, and a combustion rate adjusting switch 7 for adjusting the combustion rate of the burner 2. Further, an external wall 9 is disposed outside the combustion chamber.

[0029] Next, FIG. 1(b) is a cross-sectional view showing the gas stove 1 illustrated in FIG. 1(a) from one side, in which the burner 2 and the porous body 3 are disposed in the combustion chamber 10. The combustion air supplied by the air supply/discharge fan 6 through an air supply passage 20 and the fuel gas supplied via a nozzle 22 disposed on the end of a gas supply pipe 21 are mixed in a mixture pipe 23 and supplied to the burner 2. The gas supply pipe 21 has a main gas valve 24 and a gas proportional valve 25, disposed in this order from the upstream side thereof. The gas supply pipe 21 and the nozzle 22 constitute the fuel gas supply means of the present invention.

[0030] The combustion exhaust gas from the burner 2 is discharged by the air supply/discharge fan 6 via the porous body 3 and exhaust passage 26 and out through the exhaust slot 5 (refer to FIG. I(a)). Further, a heat insulation space 12 (which corresponds to the space according to the present invention) is defined by side surfaces 11 of the combustion chamber 10 and an external wall 9 disposed with a distance from the side surfaces 11.

[0031] The heat insulation space 12 is formed in airtight manner with the exception of a supply opening 13 and a discharge opening 14 for air. The supply opening 13 is disposed in the lower area of the heat insulation space 12, and is communicated with the air supply passage 20 through an air supply branch pipe 15 (which corresponds to a cooling air supplymeans according to the present invention). The discharge opening 14 is disposed along the side surface of the combustion chamber 10 at the upper area of the heat insulation space 12, so that air is discharged toward a portion of the glass top panel 4 corresponding to the outer area of the combustion chamber 10 (in the drawing, the portion corresponding to the inner area of diameter L20 excluding the inner area of diameter L10).

[0032] The operation of the gas stove 1 is controlled by a controller 30 comprising a microcomputer and the like. A combustion rate adjusting switch 7 is connected to the controller 30, and the combustion operation of the

burner 2 is controlled by the controller 30 in accordance with a user manipulating the combustion rate adjusting switch 7.

[0033] Actually, the controller 30 controls the flow rate of fuel gas supplied to the burner 2 by adjusting the opening of the gas proportional valve 25 while the main gas valve 24 is opened, and also controls the flow rate of combustion air supplied to the burner 2 by adjusting the rotation speed of the air supply/discharge fan 6.

[0034] During combustion of the burner 2, the object to be cooked is heated through the glass top panel 4 by the heat 51 from the combustion surface of the burner 2 produced by combustion flames 50 of the burner 2 and the radiant heat 52 generated from the porous body 3 being heated by the passing of hot combustion discharge gas from the burner 2.

[0035] At this time, the interior of the combustion chamber 10 becomes very hot (approximately 1000 ºC) due to the heat 51 from the burner 2 and the radiant heat 52 from the porous body 3, and therefore the side surface 11 of the combustion chamber 10 also generates radiant heat. The side surface 11 of the combustion chamber 10 is formed of plate metal made for example of stainless steel, and the inner side of the side surface 11 (close to the porous body 3) is exposed to hot heat from the combustion exhaust gas of the burner 2 and oxidized thereby, by which the radiation ratio is increased.

[0036] However, during combustion of the burner 2, a portion of the combustion air (corresponding to the cooling air according to the present invention) supplied from the air supply/discharge fan 6 is fed to the heat insulation space 12 via the air supply branch pipe 15 from the air supply passage 20, and the air entering the heat insulation space 12 through the supply opening 13 passes through the heat insulation space and exists from the discharge opening 14.

[0037] Thus, the air flowing through the heat insulation space 12 prevents the heat radiated from the side surface 11 of the combustion chamber 10 from being transmitted to the interior of the gas stove 1. This arrangement prevents the interior of the gas stove 1 from being heated excessively by the heat radiated from the side surface 11 of the combustion chamber 10 that may otherwise cause the electrical components such as the substrate of the controller 30 (not shown), the main gas valve 24, the gas proportional valve 25 and the fan motor of the air supply/discharge fan 6 (not shown) to malfunction by the heat.

[0038] Further, the heat insulation space 12 and the heat insulating effect of the air passing through the heat insulation space 12 prevents the external wall 9 from being heated excessively, so the radiation ratio of the external wall 9 is prevented from being increased by oxidization.

[0039] Since the air passing through the heat insulation space 12 is discharged from the exhaust opening 14 toward the glass top panel 4, the portion of the glass top panel 4 to which air is blown (in the drawing, the inner area of diameter L20 excluding the inner area of diameter L10) is cooled by the air. Thus, heat is suppressed from being transmitted to the portion of the glass top panel 4 corresponding to the outer side of the upper portion of combustion chamber 10 (in the drawing, the inner area of diameter L10), which may otherwise cause the user to feel the heat, or cause the handle of a pan or other cooking utensil to be heated excessively and thus hard to hold.

[0040] According to the present first embodiment, the discharge opening 14 of the heat insulation space 12 is placed to face the portion of the glass top panel 4 corresponding to the outer side of the combustion chamber 10, but the effects of the present invention can be achieved by disposing the discharge opening of the heat insulation space 12 at other locations.

[0041] Moreover, the heat insulation space 12 is formed airtightly with the exception of the supply opening 13 and the discharge opening 14 for air, but even if the heat insulation space 12 is not formed airtightly, the same effects of the present invention can be achieved by supplying air into the heat insulation space 12 through the air supply branch pipe 15.

[0042] Now, a second embodiment of the present invention will be described below with reference to FIG. 2 (a). The parts of the gas stove shown here which are identical to those shown in FIG. 1 are denoted with the same reference numbers, and will not be described in detail below.

[0043] According to the second embodiment of the present invention, similar to the first embodiment explained above, the heat insulation space 12 is formed in airtight manner with the exception of the supply opening 13 and the discharge opening 40 for air, and the supply opening 13 of the heat insulation space 12 is communicated with the air supply passage 20 through the air supply branch pipe 15. Further, an exhaust recycle pipe 42 is disposed to communicate the discharge opening 40 of the heat insulation space 12 and an air intake port 41 of the air supply/discharge fan 6.

[0044] Therefore, during combustion of the burner 2, the air being supplied from the air supply branch pipe 15 enters through the supply opening 13 into the heat insulation space 12, exits through the discharge opening 40, and travels through the discharge recycle pipe 42 into the air intake port 41 of the air supply/discharge fan 6.

[0045] In this example, the air being heated by the heat radiated from the side surface of the combustion chamber 10 while traveling through the heat insulation space is introduced through the exhaust recycle pipe 42 into the air intake port 41 of the air supply/discharge fan 6. Thereafter, the heated air is mixed with the room air taken in through the air intake port 41, and supplied to the air supply passage 20.

[0046] Thus, similar to the first embodiment, the air flowing through the heat insulation space 12 suppresses

the transmission of heat radiated from the side surface of the combustion chamber 10 to the interior of the gas stove.

[0047] Furthermore, along with the increase of temperature of the combustion air supplied to the burner 2, the temperature of the combustion flames 50 of the burner 2 is raised as a result, and the combustion speed of the burner 2 is also increased, so the surface temperature of the burner 2 during combustion is increased and the temperature of the combustion exhaust discharged through the porous body 3 is also increased, thus the radiation conversion efficiency at the porous body 3 is improved.

[0048] Next, a third embodiment of the present invention will be described below with reference to FIG. 2(b). The parts which are identical to those of the gas stoves shown in FIG. 1 and FIG. 2 are denoted by the same reference numbers, and will not be described in detail below.

[0049] According to the third embodiment of the present invention, similar to the second embodiment described above, the heat insulation space 12 is formed in airtight manner with the exception of the supply openings 43 (43a, 43b) and the discharge opening 40 for air, having an exhaust recycle pipe 42 communicating the discharge opening 40 of the heat insulation space 12 and the air intake port 41 of the air supply/discharge fan 6.

[0050] However, the present embodiment does not have the air supply branch pipe 15 (refer to FIG. 2(a)) which was disposed in the second embodiment, and the supply openings 43 are opened at the bottom of the heat insulation space 12. In this embodiment, air is fed through the supply opening 43 into the heat insulation space 12 by the operation of the air supply/discharge fan 6, and the air is heated by the heat radiated from the side surface of the combustion chamber 10 while it passes through the heat insulation space, then lead through the air supply communicating pipe 42 to the air intake port 41 of the air supply/discharge fan 6.

[0051] According to the second embodiment described previously, air is supplied to the heat insulation space 12 through the air supply branch pipe 15, so that the air heated while passing through the heat insulation space 12 is supplied again to the heat insulation space 12, and the heat insulating effect of the heat insulation space 12 is somewhat deteriorated.

[0052] In comparison, according to the present third embodiment, the air in the room is supplied through the open air supply opening 13 into the heat insulation space 12. Therefore, the heat insulating effect of the heat insulation space 12 will not be deteriorated, but still, the combustion air supplied to the burner 2 is heated so as to increase the combustion temperature of the burner 2 and to improve the radiation conversion efficiency at the porous body 3.

[0053] Next, a fourth embodiment of the present invention will be described with reference to FIG. 3. The parts in the present embodiment which are identical to those of the gas stove shown in FIG. 1 are denoted by the same reference numbers, and will not be described in detail below.

[0054] According to the fourth embodiment of the present invention, the heat insulation space 12 is formed in airtight manner except for the intake opening 45 and discharge opening 46 for air, and the space is extended so as to surround the bottom surface of the combustion chamber.

[0055] The air supply passage 20 (corresponding to a first air supply communicating pipe according to the present invention) is connected to the supply opening 45 of the heat insulation space 12, and the mixture pipe 23 (corresponding to a second air supply communicating pipe according to the present invention) is connected to the discharge opening 46 of the heat insulation space 12. Thus, the air sucked into the air supply/discharge fan 6 is fed through the air supply passage 20, the heat insulation space 12 and the mixture pipe 23 to the gas burner 2.

[0056] In this example, the heat insulating effect of the heat insulation space 12 is enhanced by the air passing through the heat insulation space 12 from the supply opening 45 toward the discharge opening 46, and the heat radiated from the side and bottom surfaces of the heat insulation space 12 affectively heats the air passing through the heat insulation space 12.

[0057] Since heated air is supplied as combustion air through the mixture pipe 23 to the burner 2, the combustion temperature of the burner 2 is increased and the radiation conversion efficiency of the porous body 3 can be improved, similar to the case of the aforementioned second and third embodiments.

[0058] Next, a fifth embodiment of the present invention will be described with reference to FIG. 4(a). The parts of the present embodiment which are identical to those of the gas stove shown in FIG. 1 are denoted by the same reference numbers, and will not be described in detail below.

[0059] According to the fifth embodiment, a discharge opening 60 of the heat insulation space 12 is disposed in communication with the combustion chamber 10. Therefore, the air being supplied through the air supply branch pipe 15 during combustion of the burner 2 enters the air supply opening 13, travels through the heat insulation space 12, and flows into the combustion chamber 10 through the discharge opening 60.

[0060] The air flowing into the combustion chamber 10 from the discharge opening 60 reduces the ambient temperature within the combustion chamber 10, so the heat quantity radiated from the side surface of the combustion chamber 10 is reduced. This arrangement prevents abnormal heating of the interior of the gas stove 1 caused by the heat radiated from the side surface 11 of the combustion chamber 10. Furthermore, since the ambient temperature within the combustion chamber 10 is decreased, the upper surface of the glass top panel

4 can be prevented from being overheated.

[0061] Though air is supplied into the combustion chamber 10 through the heat insulation space 12 according to the fifth embodiment, the effects of the present invention can also be achieved by supplying air directly into the combustion chamber 10 from the air supply branch pipe 15, without providing the heat insulation space 12.

[0062] Next, a sixth embodiment of the present invention will be described with reference to FIG. 4 (b). The parts which are identical to those of the gas stove shown in FIG. 1 are denoted by the same reference numbers, and will not be described in detail below.

[0063] According to the sixth embodiment of the present invention, a discharge opening 61 of the heat insulation space 12 is communicated with the combustion chamber 10 in a manner similar to the second embodiment described earlier, and the discharge opening 61 opens toward the lower surface of the glass top panel 4.

[0064] Therefore, the heat insulating effect is achieved by the heat insulation space 12 according to the present embodiment, similar to the first embodiment. Further, the air blown toward the glass top panel 4 from the discharge opening 61 enhances the effect of cooling the glass top panel 4 while lowering the ambient temperature within the combustion chamber 10, similar to the fifth embodiment.

[0065] Though cooing air is supplied to the heat insulation chamber 12 through the air supply/discharge fan 6 according to fifth and sixth embodiments, the cooling air can also be supplied to the heat insulation space 12 through another fan disposed separately from the air supply/discharge fan 6.

[0066] Moreover, the first through sixth embodiments described above illustrates a gas stove 1 having a porous body 3 disposed outside a burner 2, but the present invention is also applicable to a gas stove having a porous body 3 disposed to the inner side and a burner disposed to the outer side.

INDUSTRIAL APPLICABILITY

[0067] The gas stove according to the present invention comprises a combustion chamber having a top panel disposed thereabove for placing an object to be heated, a surface-combustion burner disposed within the combustion chamber in confronting relation to the top panel and a porous body for radiating exhaust heat, and can be applied to a gas stove with enhanced thermal efficiency.

Claims

1. A gas stove comprising:

a combustion chamber having a top panel disposed thereabove for placing an object to be heated;
a surface-combustion burner and an air-permeable porous body disposed in the combustion chamber in confronting relation to the top panel;
a fuel gas supply means for supplying a fuel gas to the burner; an exhaust passage having an end communicating with the combustion chamber via the porous body and another end communicating with an exhaust opening; and
an air supply/discharge fan for supplying combustion air to the burner through an air supply passage and delivering a combustion discharge gas from the burner through the porous body and the discharge passage to the exhaust opening;
the gas stove heating the object to be heated through the top panel by the heat radiated from the burner and the heat radiated from the porous body having been heated by the combustion exhaust gas from the burner; wherein
the gas stove further comprises an external wall surrounding a side surface of the combustion chamber with a clearance therebetween so as to form a space defined by the side surface and the external wall, and an air supply branch pipe for communicating the space with the air supply passage.

2. The gas stove according to claim 1, wherein said space is formed airtightly except for a supply opening and a discharge opening for air, the air supply branch pipe being connected to the supply opening; and

the gas stove further comprises an exhaust recycle pipe for communicating the air discharge opening with the air supply/discharge fan and recycling the air discharged through the discharge opening to the air supply/discharge fan.

3. A gas stove comprising:

a combustion chamber having a top panel disposed thereabove for placing an object to be heated;
a surface-combustion burner and an air-permeable porous body disposed in the combustion chamber in confronting relation to the top panel;
a fuel gas supply means for supplying a fuel gas to the burner; an exhaust passage having an end communicating with the combustion chamber via the porous body and another end communicating with an exhaust opening; and
an air supply/discharge fan for supplying combustion air to the burner through an air supply passage and delivering a combustion dis-

charge gas from the burner through the porous body and the discharge passage to the exhaust opening;
the gas stove heating the object to be heated through the top panel by the heat radiated from the burner and the heat radiated from the porous body having been heated by the combustion exhaust gas from the burner; wherein
the gas stove further comprises an external wall surrounding a side surface of the combustion chamber with a clearance therebetween so as to form a space defined by the side surface and the external wall that is airtight except for a supply opening and a discharge opening for air; and
an exhaust recycle pipe for communicating the air discharge opening with the air supply/discharge fan and recycling the air discharged through the discharge opening to the air supply/discharge fan.

4. A gas stove comprising:

a combustion chamber having a top panel disposed thereabove for placing an object to be heated;
a surface-combustion burner and an air-permeable porous body disposed in the combustion chamber in confronting relation to the top panel;
a fuel gas supply means for supplying a fuel gas to the burner; an exhaust passage having an end communicating with the combustion chamber via the porous body and another end communicating with an exhaust opening; and
an air supply/discharge fan for supplying combustion air to the burner through an air supply passage and delivering a combustion discharge gas from the burner through the porous body and the discharge passage to the exhaust opening;
the gas stove heating the object to be heated through the top panel by the heat radiated from the burner and the heat radiated from the porous body having been heated by the combustion exhaust gas from the burner; wherein
the gas stove further comprises an external wall surrounding a side surface of the combustion chamber with a clearance therebetween so as to form a space defined by the side surface and the external wall that is airtight except for a supply opening and a discharge opening for air; and
the air supply passage is composed of a first air supply communicating pipe that communicates an air delivery port of the air supply/discharge fan with the supply opening, said space, and a second air supply communicating pipe that communicates the discharge opening with the burner.

5. A gas stove comprising:

a combustion chamber having a top panel disposed thereabove for placing an object to be heated;
a surface-combustion burner and an air-permeable porous body disposed in the combustion chamber in confronting relation to the top panel;
a fuel gas supply means for supplying a fuel gas to the burner; an exhaust passage having an end communicating with the combustion chamber via the porous body and another end communicating with an exhaust opening; and
an air supply/discharge fan for supplying combustion air to the burner through an air supply passage and delivering a combustion discharge gas from the burner through the porous body and the discharge passage to the exhaust opening;
the gas stove heating the object to be heated through the top panel by the heat radiated from the burner and the heat radiated from the porous body having been heated by the combustion exhaust gas from the burner; wherein .

the gas stove further comprises an external wall surrounding a side surface of the combustion chamber with a clearance therebetween so as to form a space defined by the side surface and the external wall that is airtight except for a supply opening and a discharge opening for air, the discharge opening disposed to open toward a portion of the top panel corresponding to the outer side of the combustion chamber; and

a cooling air supply means for supplying cooling air through the supply opening into the space.

6. A gas stove comprising:

a combustion chamber having a top panel disposed thereabove for placing an object to be heated;
a surface-combustion burner and an air-permeable porous body disposed in the combustion chamber in confronting relation to the top panel;
a fuel gas supply means for supplying a fuel gas to the burner; an exhaust passage having an end communicating with the combustion chamber via the porous body and another end communicating with an exhaust opening; and
an air supply/discharge fan for supplying combustion air to the burner through an air supply passage and delivering a combustion dis-

charge gas from the burner through the porous body and the discharge passage to the exhaust opening;
the gas stove heating the object to be heated through the top panel by the heat radiated from the burner and the heat radiated from the porous body having been heated by the combustion exhaust gas from the burner; wherein
the gas stove further comprises a cooling air supply means for supplying cooling air into the combustion chamber.

7. The gas stove according to claim 6, wherein an external wall is disposed to surround a side surface of the combustion chamber with a clearance between the side surface, thereby forming a space defined by the side surface and the external wall that is airtight except for a supply opening and a discharge opening for air, the discharge opening disposed in communication with the combustion chamber and opening toward a bottom surface of the top panel; and

the cooling air supply means supplies cooling air from the supply opening through the space and the discharge opening into the combustion chamber.

8. The gas stove according to any one of claims 5 through 7, wherein the cooling air supply means is composed of an air supply branch pipe that is branched out from the air supply passage.

FIG. 1 (a)

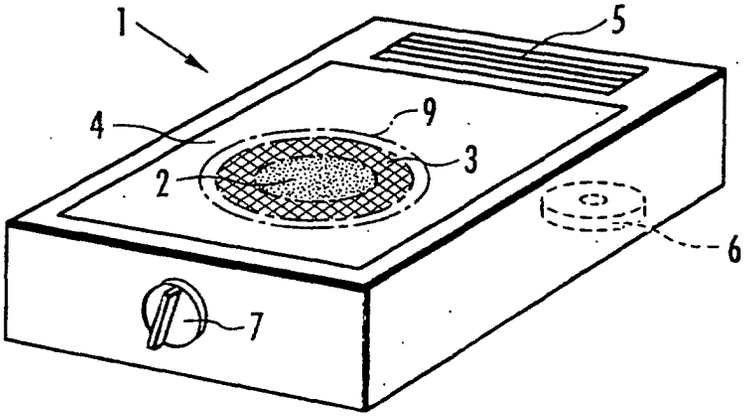
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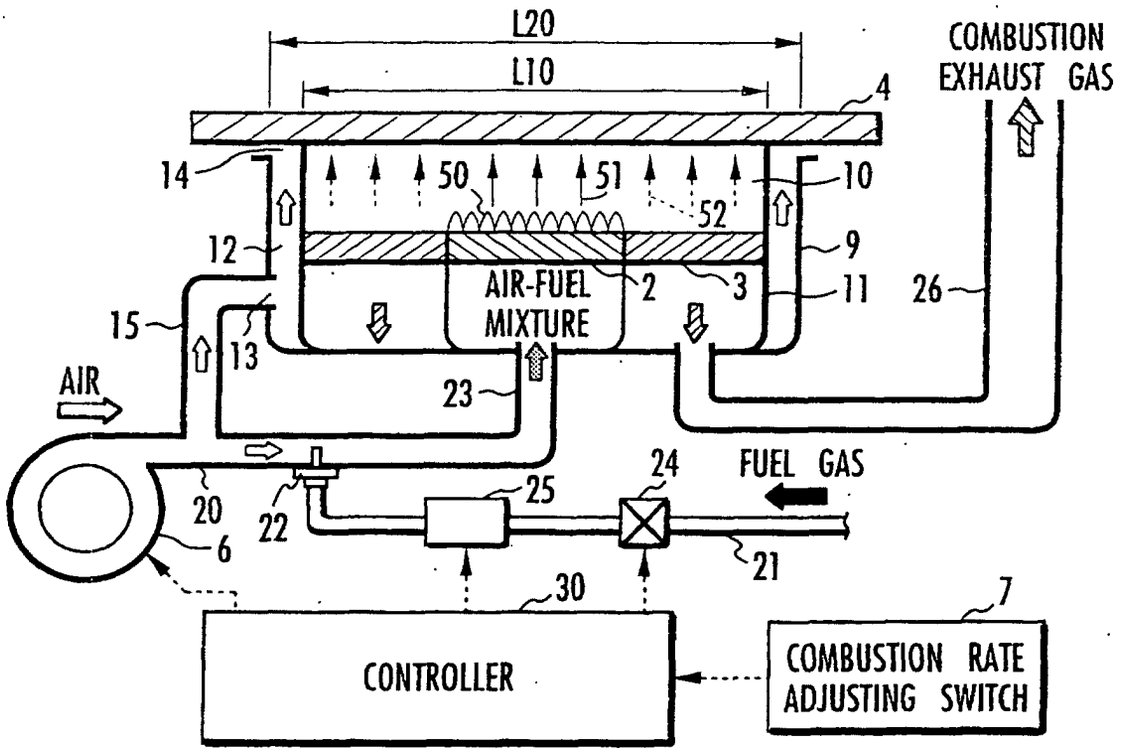
FIG. 1 (b)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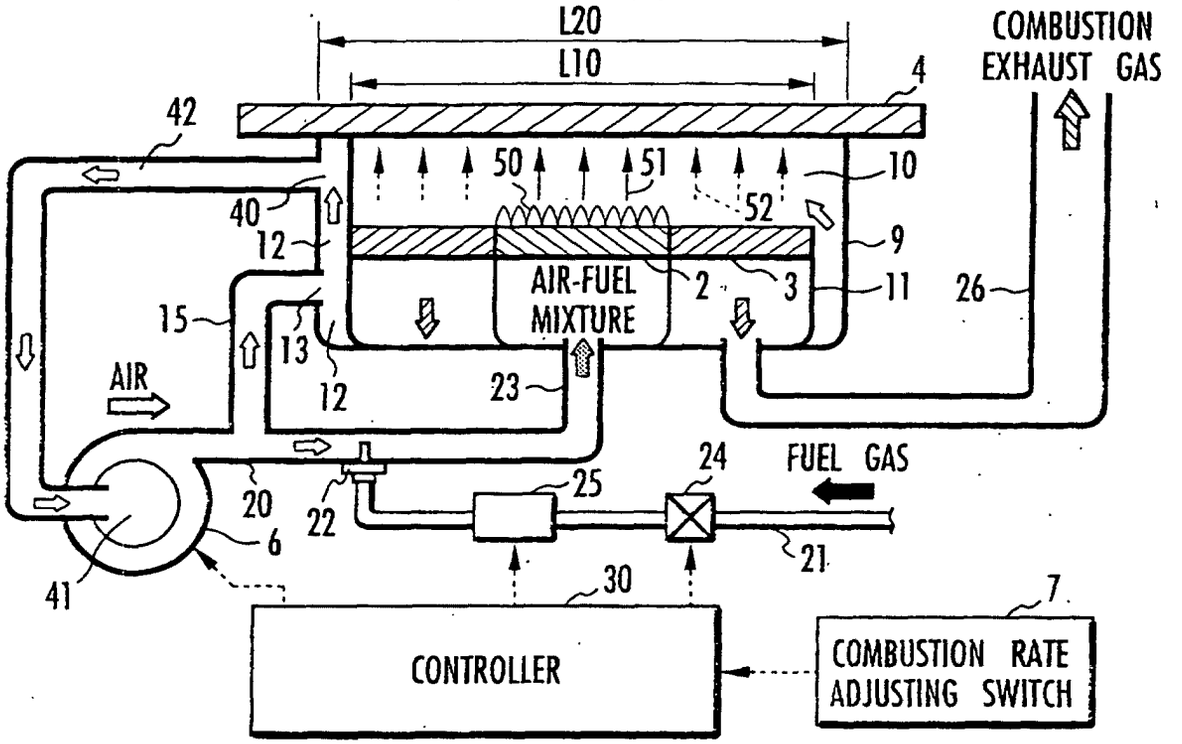
52
10
12
9
AIR-FUEL MIXTURE
2
3
11
26
15
13
AIR
23
24
FUEL GAS
25
20
22
6
21
30
7
CONTROLLER
COMBUSTION RATE ADJUSTING SWITCH

FIG. 2 (a)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12
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AIR-FUEL MIXTURE
2
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11
26
15
13
12
23
AIR
FUEL GAS
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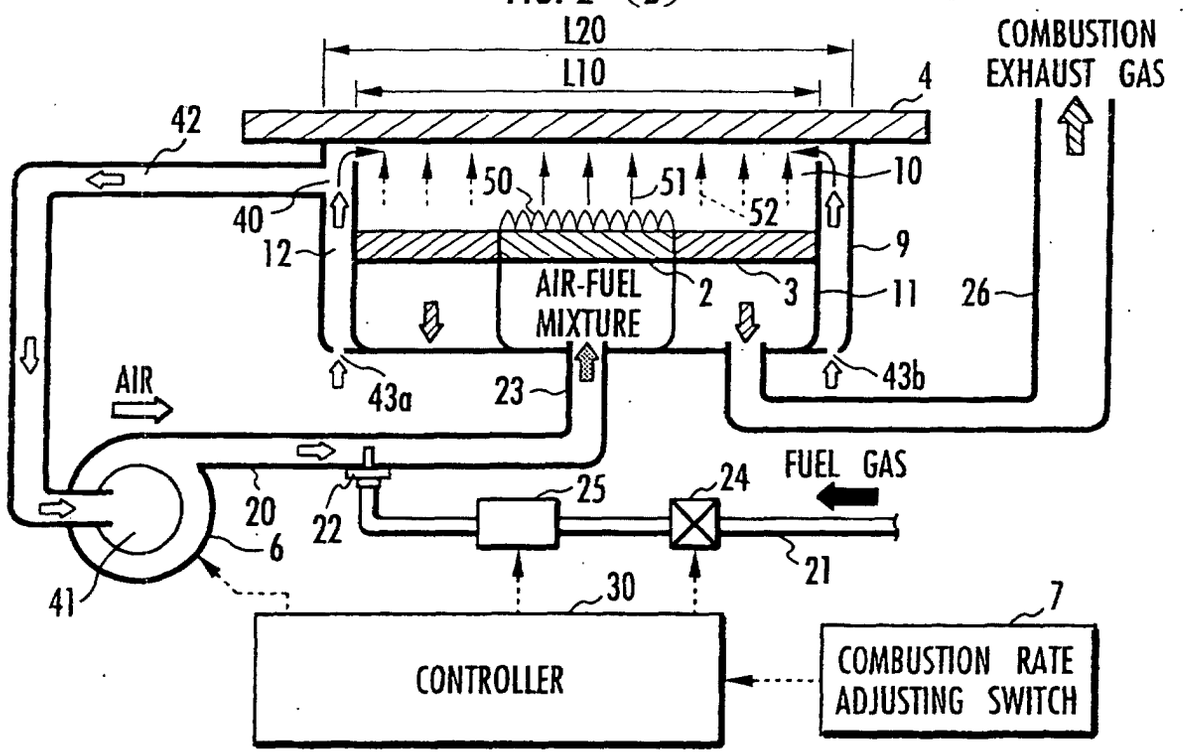
22
6
21
41
30
7
CONTROLLER
COMBUSTION RATE ADJUSTING SWITCH

FIG. 2 (b)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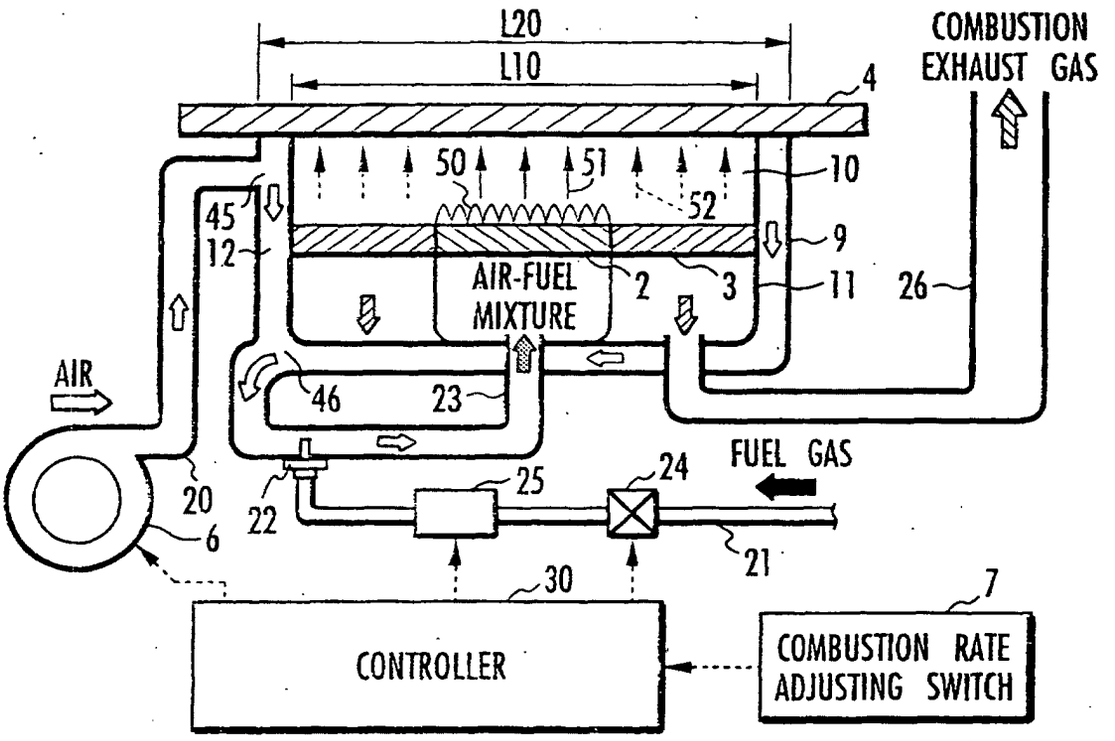
52
10
40
12
9
AIR-FUEL MIXTURE
2
3
11
26
43a
43b
23
AIR
FUEL GAS
24
25
20
22
6
21
41
30
7
CONTROLLER
COMBUSTION RATE ADJUSTING SWITCH

FIG. 3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L10
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COMBUSTION EXHAUST GAS
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51
52
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45
12
9
AIR-FUEL MIXTURE
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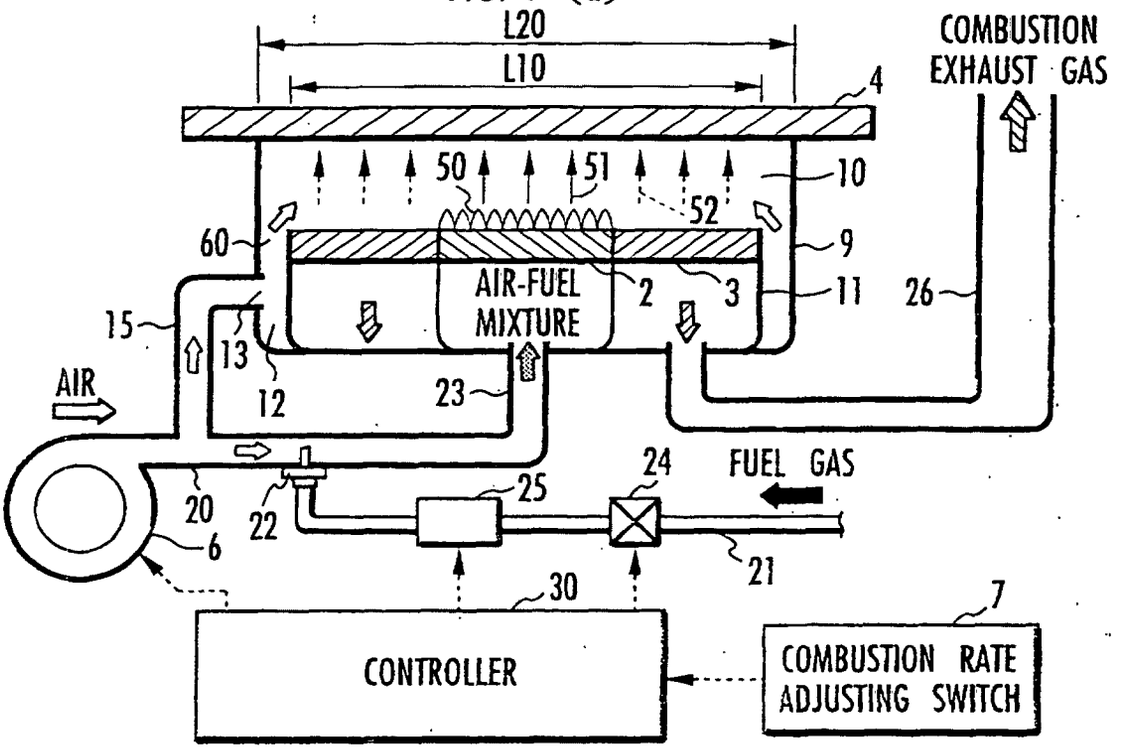
3
11
26
AIR
46
23
FUEL GAS
24
25
20
22
6
21
30
7
CONTROLLER
COMBUSTION RATE ADJUSTING SWITCH

FIG. 4 (a)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52
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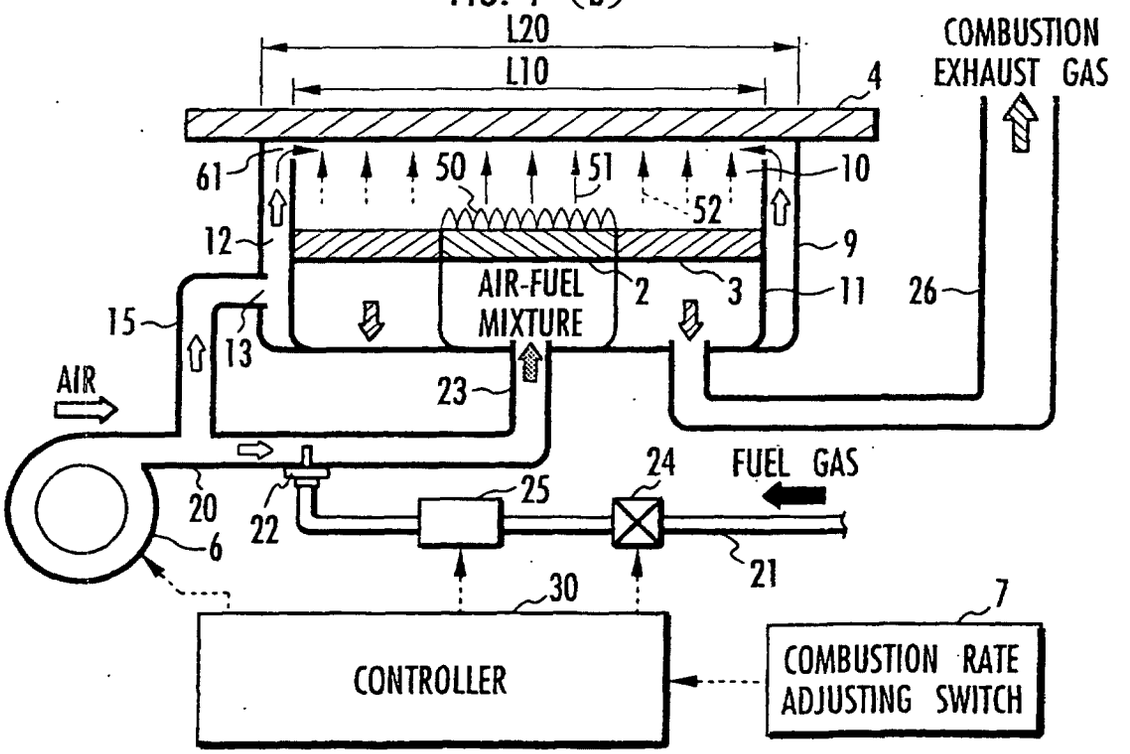
60
9
AIR-FUEL MIXTURE
2
3
11
26
15
13
12
23
AIR
24
FUEL GAS
25
20
22
6
21
30
7
CONTROLLER
COMBUSTION RATE ADJUSTING SWITCH

FIG. 4 (b)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COMBUSTION EXHAUST GAS
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10
12
9
AIR-FUEL MIXTURE
2
3
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26
15
13
AIR
23
24
FUEL GAS
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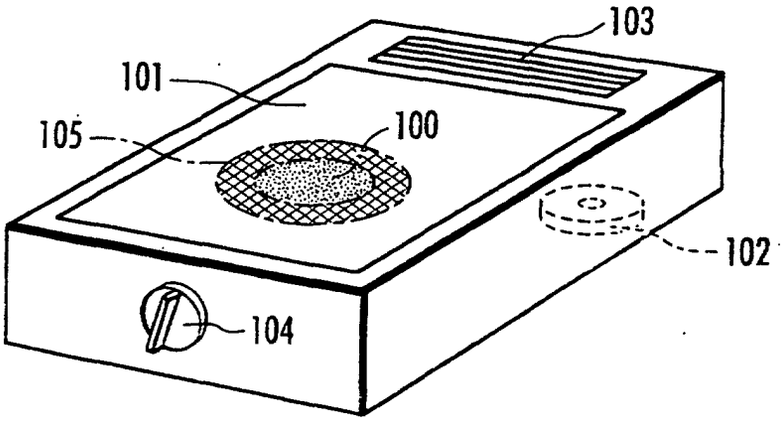
20
22
6
21
30
7
CONTROLLER
COMBUSTION RATE ADJUSTING SWITCH

FIG. 5 (a)


103
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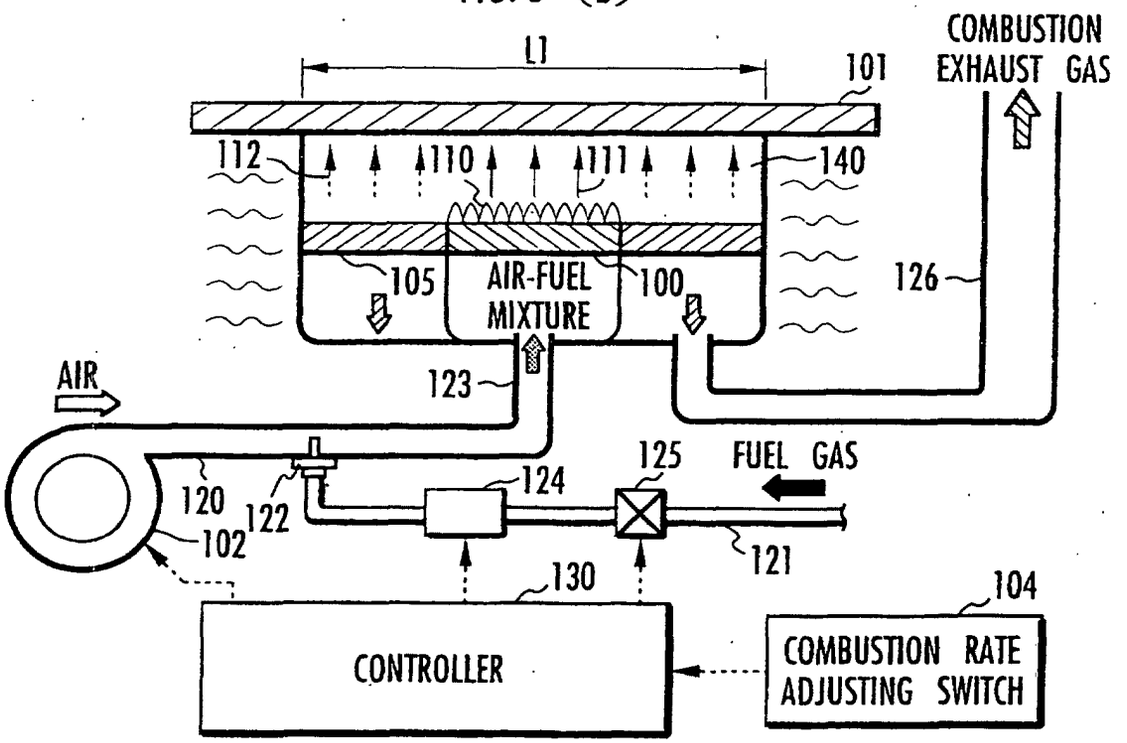
102
104

FIG. 5 (b)


L1
101
COMBUSTION EXHAUST GAS
112
110
111
140
105
AIR-FUEL MIXTURE
100
126
AIR
123
125
FUEL GAS
124
120
122
102
121
130
104
CONTROLLER
COMBUSTION RATE ADJUSTING SWITCH

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/00271

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] F24C3/04, F24C15/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] F24C3/04, F24C15/20, F24C3/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2003
Kokai Jitsuyo Shinan Koho	1971-2003	Toroku Jitsuyo Shinan Koho	1994-2003

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 5-33844 Y2 (Tokyo Gas Co., Ltd.), 27 August, 1993 (27.08.93), Full text; Figs. 1 to 4 (Family: none)	1-8

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
07 April, 2003 (07.04.03)	22 April, 2003 (22.04.03)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

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