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(72) Inventors:
• **Kim, Hyun Sang**
Seoul 152-888 (KR)
• **Lee, Myung Hoon**
Seoul 152-888 (KR)

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(74) Representative: **Maillet, Alain**
Cabinet Le Guen Maillet
5, place Newquay
B.P. 70250
35802 Dinard Cedex (FR)

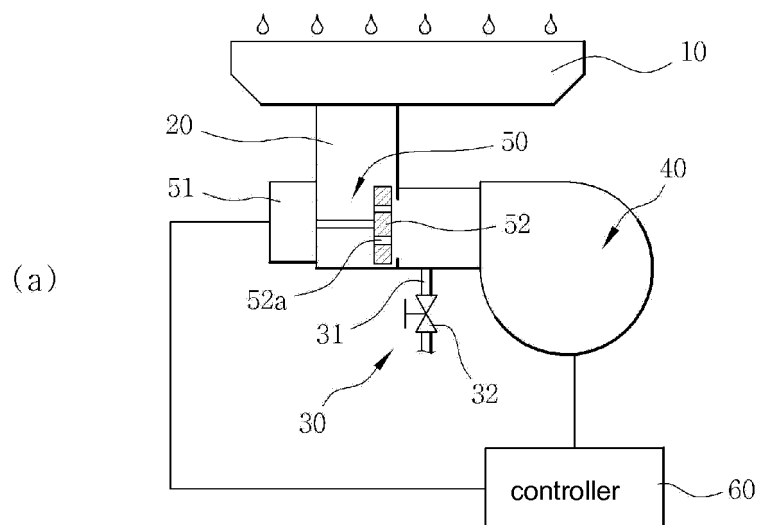
(71) Applicant: **Daesung Industrial Co., Ltd.**
Seoul 152-888 (KR)

(54) **Premix combustion device of gas burner**

(57) A premix combustion device of a gas burner applicable to a domestic gas boiler or water heater is disclosed. The premix combustion device includes a gas mixture supply pipe to supply gas mixture to the gas burner, and a gas supply means and air supply means connected with the gas mixture supply pipe. A damper is provided at a predetermined position in the gas mixture supply pipe to regulate the amount of the gas mixture to

be supplied to the gas burner, degree of opening of the damper is adjusted by an electrically operated valve controlled by a control signal from a controller, and an valve disc arranged to open and close the gas mixture supply pipe according to operation of the valve is provided with a plurality of holes. The premix combustion device extends the range of controllable combustion, ensuring supply of water at a set temperature.

Fig. 1



Description

[0001] The present invention relates to a premix combustion device of a gas burner, and more particularly to a premix combustion device of a gas burner having a gas mixture damper which can extend the range of controllable combustion by controlling the amount of premix gas formed by mixing air and combustible gas, by adjusting the degree of opening of the gas mixture damper.

[0002] Combustion systems applicable to a general domestic boiler or water heater include a premix combustion system and a Bunsen combustion system. Among the combustion systems, the premix combustion system can maintain a constant air-to-gas ratio and reduce excessive air, thereby increasing efficiency of the system and reducing the amount of exhaust gas.

[0003] For the premix combustion system, in which the amount of gas to be mixed with air is determined according to the amount of air, the range of controllable combustion depends on the performance of the air supply fan which regulates the amount of air. The combustion system has a turn down ratio (TDR), which refers to the ratio of the minimum work to maximum work which can be controlled by the combustion system. A combustion system having a high TDR is advantageous in that it can supply heating water and hot water at a set temperature under any heat load condition.

[0004] For the conventional premix combustion system as above in which the amount of gas is determined by the pressure generated by the air supply fan, however, the TDR determined according to the performance of the fan is merely 1:5. Thus, the conventional combustion system fails to ensure that the water is supplied at a set temperature under various conditions of heat load such as a low flow rate and a narrow range of temperature rise, since it cannot properly control combustion operation under these conditions.

[0005] A prior art technique proposed to solve such problem is known from Korean Patent No. 0181016 (Title: "SUPPLYING SYSTEM AND CONTROL METHOD FOR PREMIXED FUEL ON GAS BOILER"). The technique proposes adjusting the proportion of gas to be mixed with air based on a measured value of pressure difference produced by a damper installed in a supply path of a gas mixture. However, the damper provided in the supply path of the gas mixture is simply adapted to passively produce pressure difference in moving air, and thus cannot actively adjust the pressure difference or the amount of gas mixture supplied to the burner, and thereby a separate control means needs to be provided.

[0006] Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a premix combustion device of a gas burner which can maintain a constant water supply temperature under various conditions of heat load by adjusting the degree of opening of a gas mixture damper to regulate the amount of premix gas formed by mixing air and combustion gas, thereby ex-

tending the range of controllable combustion.

[0007] In accordance with the present invention, the above and other objects can be accomplished by the provision of a premix combustion device of a gas burner applicable to a domestic gas boiler or water heater, comprising a gas mixture supply pipe to supply gas mixture to the gas burner; and a gas supply means and air supply means connected with the gas mixture supply pipe, wherein a damper is provided at a predetermined position in the gas mixture supply pipe to regulate the amount of the gas mixture to be supplied to the gas burner.

[0008] Degree of opening of the damper provided at the predetermined position in the gas mixture supply pipe to regulate the amount of the gas mixture to be supplied to the gas burner may be adjusted by an electrically operated valve controlled by a control signal from a controller, and an valve disc may be arranged to open and close the gas mixture supply pipe according to operation of the valve, and is provided with a plurality of holes.

[0009] Degree of opening of the damper provided at the predetermined position in the gas mixture supply pipe to regulate the amount of the gas mixture to be supplied to the gas burner is adjusted by a pressure adjusting valve having a valve disc elastically installed by a spring according to fluid pressure, and the valve disc is arranged to open and close the gas mixture supply pipe according to operation of the valve, and is provided with a plurality of holes.

[0010] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a view schematically illustrating the configuration of a premix combustion device of a gas burner according to an exemplary embodiment of the present invention, in which FIG. 1(a) is a view illustrating a damper in a closed state and FIG. 1(b) is a view illustrating the damper in an open state; and FIG. 2 is a view schematically illustrating the configuration of a premix combustion device of a gas burner according to another embodiment of the present invention, in which FIG. 2(a) is a view illustrating a damper in a closed state and FIG. 2(b) is a view illustrating the damper in an open state.

[0011] Preferred embodiments of a premix combustion device of a gas burner as above are described in detail with reference to the accompanying drawings.

[0012] FIG. 1 is a view schematically illustrating the configuration of a premix combustion device of a gas burner according to one embodiment of the present invention, in which FIG. 1(a) illustrates a damper in a closed state and FIG. 1(b) illustrates the damper in an open state.

[0013] The premix combustion device of a gas burner applicable to a domestic gas boiler or water heater includes a gas mixture supply pipe 20 to supply premix gas

to the gas burner 10, and a gas supply means 30 and air supply means connected with the gas mixture supply pipe 20. A damper is provided at a predetermined position in the gas mixture supply pipe 20 to regulate the amount of premix gas to be supplied to the gas burner.

[0014] The premix combustion device performs combustion of a gaseous fuel in which the fuel (gaseous fuel) and air (primary air) are premixed before being supplied to the burner where the premix gas is burned. As the fuel and air are premixed, the premix flame generated through the premix combustion device obtains a good quality blue flame which produces less CO and has a uniform and low flame temperature with low production of NOx. Also, the short length of the flame contributes to realization of a compact combustion system with a small combustion chamber.

[0015] The gas mixture supply pipe 20 is connected to the gas burner of the gas boiler or water heater to supply premix gas formed by mixing air and gas, and a gas supply means 30 and air supply means 40 are provided at predetermined positions in the gas mixture supply pipe 20. The gas supply means 30 can include a gas supply pipe 31 and a valve 32, and the air supply means 40 can include an air supply fan which is rotated by a motor. A damper is installed at a predetermined position in the line of the gas mixture supply pipe 20 to open and close the gas mixture supply pipe 20.

[0016] The damper provided at a predetermined position in the line of the gas mixture supply pipe 20 to regulate the amount of gas mixture to be supplied to the gas burner is configured with an electrically operated valve 51 and valve disc 52, and the degree of opening thereof is controlled by a control signal from the controller 60. The valve disc 52, which is driven to open and close the gas mixture supply pipe 20 by operation of the valve 51, is provided with a plurality of holes 52a functioning to cause a uniform amount of gas mixture to be supplied to the burner and be completely burned in normal combustion operation of the burner. The size, number and position of the holes 52a are preferably determined in accordance with the capacity and properties of the gas burner.

[0017] In the present invention configured as above, if the heating power of the gas burner is weak, the air pressure generated by the air supply means 40 is lowered by the controller 60 to close the damper as shown in FIG. 1 (a). In this case, complete combustion is ensured by allowing a uniform amount of gas mixture to be supplied through the holes 52a that are formed in the valve disc 52.

[0018] In the situation as above, when the heating power of the gas burner is increased, the air pressure generated by the air supply means 40 is raised by the controller 60 to increase the degree of opening of the damper to thereby increase the amount of the gas mixture to be supplied as shown in FIG. 1(a). Thereby, complete combustion of the gas mixture is ensured with a uniform flame, regardless of the level of the heating power.

[0019] FIG. 2 is a view schematically illustrating the configuration of a premix combustion device of a gas

burner according to another embodiment of the present invention, in which FIG. 2(a) is a view illustrating a damper in a closed state and FIG. 2(b) is a view illustrating the damper in an open state.

[0020] In the illustrated embodiment, the degree of opening of the damper 70, which is arranged at the gas mixture supply pipe 20 so as to regulate the amount of gas mixture to be supplied to the gas burner, is adjusted by a pressure adjusting valve having an valve disc 72 elastically installed by a spring 71, according to fluid pressure, as shown in FIG. 2. The valve disc 72 which opens and closes the gas mixture supply pipe 20 through operation of the spring 71 is provided with a plurality of holes 72a.

[0021] In this case, the damper 70 includes the valve disc 72 shaped in a circular plate and provided with the spring 71 generating predetermined compression and tension force and the plurality of holes 72a, and a support rod 73, and is installed at a predetermined position in the line of the gas mixture supply pipe 20 to open and close the gas mixture supply pipe 20. The degree of opening of the damper 70 is adjusted according to air pressure generated by the air supply means 40, that is, the air supply fan controlled by the controller 60. If the amount of air blown by the air supply means 40 is large and thus the air pressure is high, the distance between the gas mixture supply pipe 20 and the valve disc 72 is widened to allow a large amount of gas mixture to be supplied to the burner. If the amount of air blown by the air supply means 40 is small and thus the air pressure is low, the distance between the gas mixture supply pipe 20 and the valve disc 72 is narrowed to reduce the amount of gas mixture to be supplied to ensure complete combustion of the gas mixture.

[0022] In the illustrated embodiment, if the heating power of the gas burner is weak and thus the air pressure generated by the air supply means 40 is lowered by the controller 60 as shown in FIG. 2(a), the valve disc 72 is moved forward by the tensional force of the spring 71 to close the damper 70, and a uniform amount of gas mixture is supplied through the holes 72a that are formed in the valve disc 72.

[0023] In the above situation, if the air pressure generated by the air supply means 40 is raised by a control signal from the controller 60 to increase the heating power of the gas burner as shown in FIG. 2(b), the spring 71 is compressed, resulting in backward movement of the valve disc 72 which in turn raises the degree of opening of the damper 70 to increase the amount of gas mixture to be supplied, thereby ensuring complete combustion of the gas mixture with a uniform flame, regardless of the level of the heating power.

[0024] As described above, the premix combustion device of the burner according to embodiments of the present invention is provided with a gas mixture damper in the path of the gas mixture through which the gas mixture is supplied to the burner, and allows regulation of the amount of the gas mixture through adjustment of the

degree of opening of the gas mixture damper at a minimum number of rotations of the air supply fan ensuring stable operation of the fan, thereby extending the range of controllable combustion of the burner applied to a gas boiler or water heater and leading to complete combustion by the flame of the burner under various conditions of heat load such as a low flow rate and a narrow range of temperature rise, ensuring supply of water at a set temperature.

[0025] As is apparent from the above description, the present invention provides a premix combustion device of a burner provided with a gas mixture damper installed in the path of gas mixture to supply the gas mixture to the burner, in which the degree of opening of the gas mixture damper is adjusted with a minimum number of rotations of the air supply fan ensuring stable operation of the fan, and thereby the range of controllable combustion of the burner applied to a gas boiler or water heater is extended, leading to complete combustion of the gas mixture by the flame of the burner under various conditions of heat load such as a low flow rate and a narrow range of temperature rise, ensuring supply of water at a set temperature.

[0026] Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

[0027] For example, the embodiments described above employ a configuration in which the distance between the gas mixture and the valve disc adjusted by forward or backward movement of the damper, but it is also possible to employ another configuration in which the valve disc of the damper is pivotally arranged to adjust the opening angle of the damper.

be supplied to the gas burner is adjusted by an electrically operated valve controlled by a control signal from a controller, and an valve disc is arranged to open and close the gas mixture supply pipe according to operation of the valve, and is provided with a plurality of holes.

3. The premix combustion device according to claim 1, wherein degree of opening of the damper provided at the predetermined position in the gas mixture supply pipe to regulate the amount of the gas mixture to be supplied to the gas burner is adjusted by a pressure adjusting valve having a valve disc elastically installed by a spring according to fluid pressure, and the valve disc is arranged to open and close the gas mixture supply pipe according to operation of the valve, and is provided with a plurality of holes.

Claims

1. A premix combustion device of a gas burner applicable to a domestic gas boiler or water heater, comprising:

- a gas mixture supply pipe to supply gas mixture to the gas burner; and a gas supply means and air supply means connected with the gas mixture supply pipe,

wherein a damper is provided at a predetermined position in the gas mixture supply pipe to regulate the amount of the gas mixture to be supplied to the gas burner.

2. The premix combustion device according to claim 1, wherein degree of opening of the damper provided at the predetermined position in the gas mixture supply pipe to regulate the amount of the gas mixture to

Fig. 1

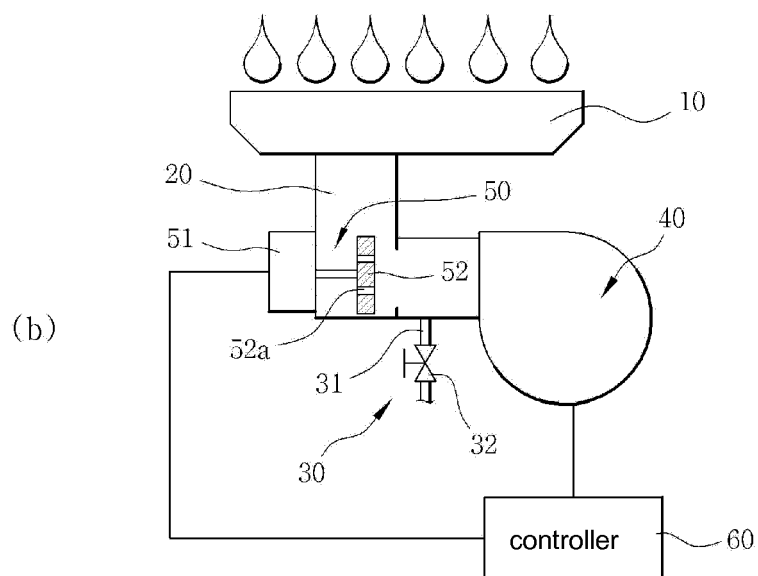
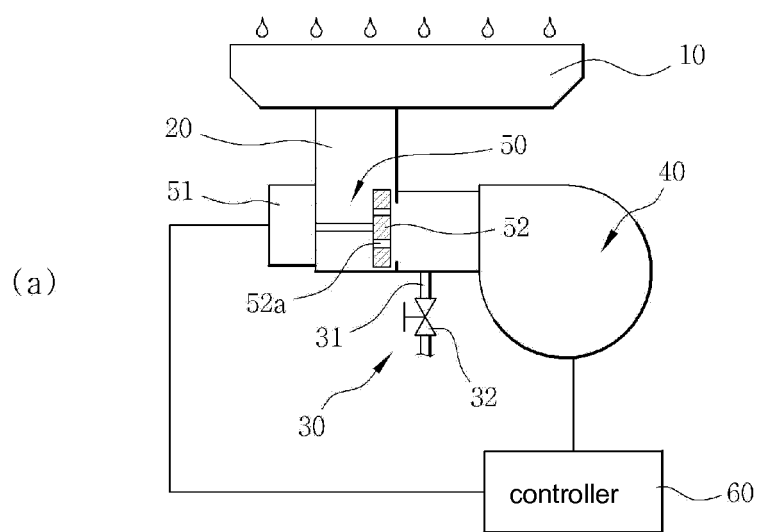
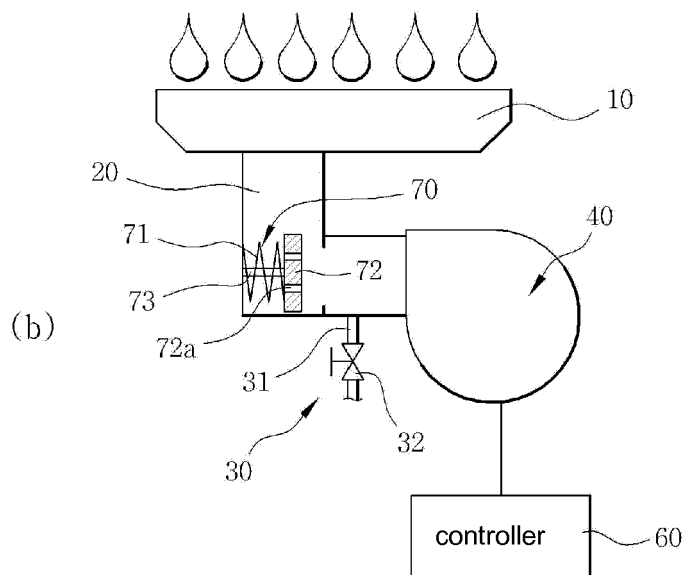
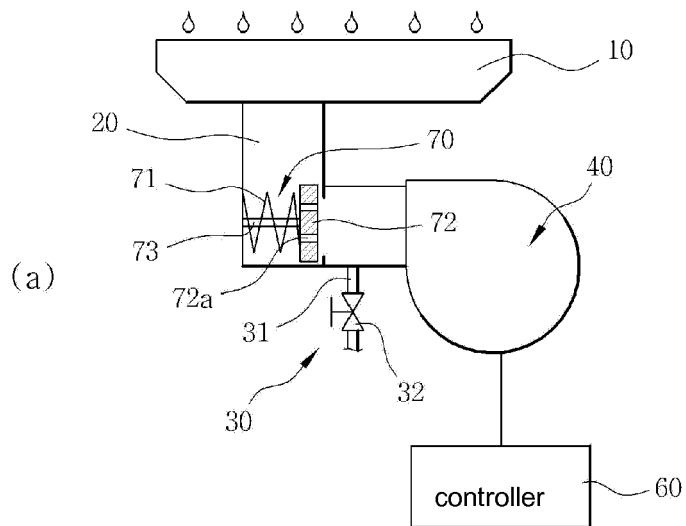


Fig. 2



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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