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(54) GAS DISTRIBUTION DEVICE AND COMBUSTOR HAVING SAME, AND WATER HEATER

(57) A gas distribution device (100) and a combustor having same, and a water heater. The gas distribution device (100) comprises multiple gas distribution pipes (1), the gas distribution pipes (1) being parallel to each other and arranged at intervals, and each of the gas distribution pipes (1) being provided with multiple gas nozzles (2); and at least one gas delivery pipe (3) communicated with the gas distribution pipes (1) to connect the gas distribution pipes (1) as an integrated structure, the gas delivery pipe (3) being used for supplying gas to the gas distribution pipes (1), and the gas distribution pipe (3) being provided with a gas delivery interface (4), and the gas delivery interface (4)being used for connecting a gas inlet valve. Since the gas distribution device (100) is communicated with the gas distribution pipes (1) by means of the gas delivery pipe (3), and the gas delivery pipe (3) is integrally connected to the gas distribution pipes (1), the gas delivery pipe (3) can synchronously deliver the same amount of gas to the gas distribution pipes (1), so that the gas content in each gas distribution pipe (1) is well-distributed, thereby enabling a flame spurting out from the gas distribution device (100) to be more stable.

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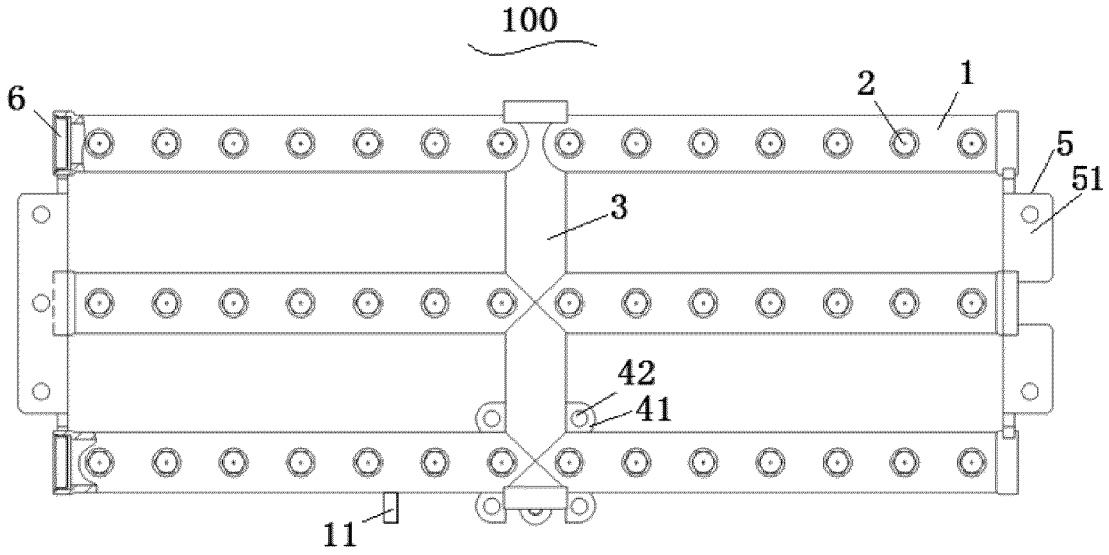

FIG. 1

Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority to Chinese Patent Application No. 201820719372.3, entitled "GAS DISTRIBUTION DEVICE AND COMBUSTOR HAVING SAME, AND WATER HEATER", filed with the Chinese Patent Office on May 15, 2018, and to Chinese Patent Application No. 201820719386.5, entitled "GAS DISTRIBUTION DEVICE AND COMBUSTOR HAVING SAME, AND WATER HEATER", filed with the Chinese Patent Office on May 15, 2018, and to Chinese Patent Application No. 201820720557.6, entitled "GAS DISTRIBUTION DEVICE AND COMBUSTOR HAVING SAME, AND WATER HEATER", filed with the Chinese Patent Office on May 15, 2018, which are incorporated herein by reference in their entireties.

TECHNICAL FIELD

[0002] The present invention relates to a field of water heater technology, in particular, to a gas distribution device, and a combustor having the same, and a water heater.

BACKGROUND

[0003] A combustors, as an important device in a water heater or a wall-mounted furnace, is mainly powered by fuel gas, to provide domestic hot water or heating for users through flame combustion. The heating rate and continuous heating steadiness of a combustor mainly depend on the flame combustion condition of a flame distributor, the flame combustion temperature and flame height of a flame distributor are related directly to the gas supply condition of a gas distribution device. The gas distribution pipes of existing gas distribution devices are independent from each other, and are also supplied with gas through their respective gas supply pipelines, thus, uneven gas supply in gas distribution pipes is prone to occur. Moreover, the above gas distribution device is relatively large in size, and may occupy spaces in the water heater or the wall-mounted furnace reserved for other components. In addition, after a long-term operation, gas leakage or breakage and the like may easily occur at a position where the gas supply pipeline and the gas distribution pipe connect.

[0004] The above information disclosed in the background is only used to render a better understanding of the background of the present invention, and thus may contain information not regarded as the existing technology known to those ordinary skilled in the art.

SUMMARY

[0005] To solve or alleviate technical problems in the existing technology and provide at least one beneficial option, embodiments of the present invention provide a gas distribution device, and a combustor having the same, and a water heater.

[0006] According to an embodiment of the present invention, it is provided a gas distribution device, including: a plurality of gas distribution pipes arranged in parallel and at intervals, each of the gas distribution pipes being provided with a plurality of gas nozzles; and at least one gas delivery pipes communicated with each of the gas distribution pipes, to connect the gas distribution pipes into an integral structure, the gas delivery pipes being used for supplying gas into each of the gas distribution pipes; the gas delivery pipes are provided with a gas delivery interface for connecting a gas inlet valve.

[0007] In some embodiments, the gas distribution device further includes connectors provided on two sides of each of the gas delivery pipes, respectively, to connect end portions of each of the gas distribution pipes at corresponding positions into an integral structure.

[0008] In some embodiments, a mounting platform is provided on the connectors for connecting and fixing a required device.

[0009] In some embodiments, the gas delivery pipes are arranged perpendicular to each of the gas distribution pipes.

[0010] In some embodiments, the gas delivery pipes run through a middle portion of each of the gas distribution pipes.

[0011] In some embodiments, a blocking member is provided at an end portion of each of the gas distribution pipes.

[0012] In some embodiments, the gas distribution pipes are integrally formed with the gas delivery pipes through a die casting process.

[0013] In some embodiments, the gas distribution pipes are provided with a pressure detection port for connecting a pressure detection device, to detect a pressure of gas flowing into the gas distribution pipes.

[0014] In some embodiments, the pressure detection device is detachably connected to the pressure detection port, and the pressure detection port is detachably provided with a sealing cover; the sealing cover is used for sealing the pressure detection port, when the pressure detection device is detached from the pressure detection port.

[0015] In some embodiments, the pressure detection port is integrally arranged on the gas distribution pipes.

[0016] In some embodiments, the gas delivery interface is provided with a fixed mounting seat, a plurality of mounting holes are circumferentially arranged at intervals on the fixed mounting seat, and the mounting holes are adapted to the gas inlet valve.

[0017] In some embodiments, on the fixed mounting seat, at least one set of first mounting holes are symmetrically arranged along a direction of a first diameter of the gas delivery interface, at least one set of second mounting holes are symmetrically arranged along a direction of a second diameter of the gas delivery interface, and

the first diameter is perpendicular to the second diameter.

[0018] In some embodiments, on the fixed mounting seat, at least one set of third mounting holes are symmetrically arranged along a direction of a third diameter of the gas delivery interface, the third diameter being between the first diameter and the second diameter.

[0019] In some embodiments, a hole spacing between a set of the symmetrically-arranged first mounting holes, a hole spacing between a set of the symmetrically-arranged second mounting holes, and a hole spacing between a set of the symmetrically-arranged third mounting holes are greater than an outer diameter of the gas distribution pipes.

[0020] In some embodiments, the fixed mounting seat is integrally arranged with the gas delivery interface.

[0021] According to an embodiment of the present invention, it is provided a combustor including the gas distribution device as described in above embodiments.

[0022] According to an embodiment of the present invention, it is provided a water heater including the combustor as described in above embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] In the drawings, like reference numerals refer to same or similar components or elements throughout the several drawings unless otherwise specified. The drawings are not necessarily drawn to scale. It should be understood that these drawings only depict some embodiments in accordance with the present disclosure and are not to be construed as limiting the scope of the present invention.

FIG. 1 is a front view of a structure of a gas distribution device according to an embodiment of the present invention;

FIG. 2 is a rear perspective view of a structure of a gas distribution device according to an embodiment of the present invention;

FIG. 3 is a sectional view of a structure of gas distribution pipes of a gas distribution device according to an embodiment of the present invention;

FIG. 4 is a sectional view of a structure of a position of a gas delivery pipe of a gas distribution device according to an embodiment of the present invention;

FIG. 5 is a front view of a structure of a gas distribution device according to another embodiment of the present invention

FIG. 6 is a schematic diagram of a partial structure of an electronic thermostatic valve interface according to an embodiment of the present invention;

FIG. 7 is a schematic diagram of a partial structure of a mechanical thermostatic valve interface according to an embodiment of the present invention;

FIG. 8 is a schematic diagram of a partial structure of a water-gas linkage valve interface according to an embodiment of the present invention;

FIG. 9 is a schematic diagram of a distribution of mounting holes of a fixed mounting seat according to an embodiment of the present invention; and

FIG. 10 is a schematic diagram of a distribution of mounting holes of a fixed mounting seat according to another embodiment of the present invention.

DETAILED DESCRIPTION

[0024] In the following, only certain exemplary embodiments are briefly described. As will be appreciated by those skilled in the art, the described embodiments may be modified in various ways without departing from the spirit or scope of the present invention. Accordingly, the drawings and description are to be regarded as illustrative in nature rather than restrictive.

[0025] As shown in FIG. 1 and FIG. 2, embodiments of the present invention provide a gas distribution device 100 including a plurality of gas distribution pipes 1 and at least one gas delivery pipe 3. The respective gas distribution pipes 1 are in parallel and arranged at intervals. Each of the gas distribution pipes 1 is provided with a plurality of gas nozzles 2. The gas nozzles 2 are used for supplying gas upwards to corresponding ejection pipes of a flame distributor (not shown). The gas delivery pipes 3 are in communication with each of the gas distribution pipes 1. The gas delivery pipes 3 connect respective gas distribution pipes 1 into an integral structure. The gas delivery pipes 3 are used for supplying gas into each of the gas distribution pipes 1. The gas delivery pipes 3 are provided with a gas delivery interface 4 for connecting a valve.

[0026] The number of gas distribution pipes 1 depends mainly on the number of ejection pipes arranged on the flame distributor, the number of gas distribution pipes 1 required to be deployed is adjusted according to the number of the ejection pipes deployed on the flame distributor.

[0027] In an embodiment, to better realize a fixation of the three gas distribution pipes 1, and to enable an integral structure formed by the gas delivery pipes 3 and the gas distribution pipes 1 to be more stable, ends, on the same side of the gas delivery pipes 3, of the gas distribution pipes 1 may be connected into an integral structure through connectors 5, so that the connectors 5, the gas distribution pipes 1 and the gas delivery pipes 3 form a grid structure together. A mounting platform 51 may be provided on the connectors 5, to facilitate a fixation of the gas distribution device 100 with other devices required.

[0028] In a specific example, as shown in FIG. 1, three gas distribution pipes 1 are provided, the three gas distribution pipes 1 are arranged in parallel and at intervals. The gas delivery pipes 3 are arranged perpendicular to middle portions of the three gas distribution pipes 1, and the gas delivery pipes 3 run through a middle portion of each of the gas distribution pipes, and are communicated with each of the gas distribution pipes 1. The ends, on

one side of the gas delivery pipes 3, of the gas distribution pipes 1 are connected into an integral structure through one connector 5, and the ends, on the other side of the gas delivery pipes 3, of the gas distribution pipes 1 are connected into an integral structure through another connector 5. Three gas distribution pipes 1 together with one gas delivery pipe 3 and two connectors 5 form a criss-cross frame-shaped grid structure. Since the gas delivery pipe 3, the gas distribution pipes 1 and the connectors 5 are in the same plane, the space occupied by the gas distribution device 100 is effectively saved. Meanwhile, since the gas delivery pipe 3 is integrally connected to middle portions of the three gas distribution pipes 1, the same amount of gas may be synchronously delivered to each of the gas distribution pipes 1.

[0029] In order to smoothly deliver gas in the gas delivery pipes 3 to each of the gas distribution pipes 1, the gas delivery pipes 3 are preferably arranged perpendicular to each of the gas distribution pipes 1.

[0030] In an embodiment, the communication of the gas delivery pipes 3 with the gas distribution pipes 1 may be understood as a direct spatial communication between the two, or as a gas flow communication between the two.

[0031] In a specific implementation, when the communication of the gas delivery pipes 3 with the gas distribution pipes 1 is a direct spatial communication, as shown in FIG. 2 to FIG. 4, the gas delivery pipe 3 may run through sequentially, and communicate the middle portions of the gas distribution pipes 1, so that an interior of each of the gas distribution pipes 1 is communicated with the interior of the gas delivery pipe 3, thereby forming a gas delivery passage. Alternatively, each of the gas distribution pipes 1 run through the gas delivery pipe 3, so that the interior of each of the gas distribution pipes 1 is communicated with the interior of the gas delivery pipe 3, thereby forming a gas delivery passage.

[0032] In an alternative implementation, when the communication of the gas delivery pipe 3 with the gas distribution pipes 1 is a gas flow communication, the gas delivery pipe 3 may be arranged on one side (e.g., above, or below) of the plane where the gas distribution pipes 1 are located, and be communicated with the middle portion of the each of the gas distribution pipes 1. That is, a pipe wall of the gas delivery pipe 3 is directly communicated with a joint of the pipe wall at the middle portion of each of the gas distribution pipes 1, so that gas in the gas delivery pipe 3 may flow into each of the gas distribution pipes 1 through the communication position.

[0033] It should be noted that in above embodiments, the position where the gas delivery pipe 3 and the gas distribution pipes 1 are connected may be adaptively adjusted according to operation requirements, the gas delivery pipe 3 is not necessarily to communicate with the gas distribution pipes 1 only at the middle portion, instead, the gas delivery pipe 3 may also communicate with the gas distribution pipes 1 at any positions thereon. When the gas delivery pipe 3 communicates with the gas distribution pipes 1 at a position other than the middle portion, the specific arrangement manner (including, but not limited to, connections and deployments) may be the same as the arrangement manner of the gas delivery pipe 3 described in above embodiments, and thus it is not repeated herein in detail, it may be implemented with reference to above embodiments.

[0034] In an embodiment, as shown in FIG. 1 and FIG. 2, to obtain a better gas tightness of the gas distribution pipes 1, a blocking member 6 may be provided at an end of each gas distribution pipe 1. Preferably, the blocking member 6 employs a structure of a sealing cap or a sealing plug structure inserted at a port of the gas distribution pipes 1.

[0035] In an embodiment, the gas distribution pipes 1 are integrally formed with the gas delivery pipes 3 through a die casting process, to form an integral structure. In this way, the strength of the overall structure of the gas distribution device 100 may be improved, while the manufacturing process is simple. The integrally formed gas distribution device 100 has better gas tightness, free of gas leakage, thereby improving safety.

[0036] In an embodiment, as shown in FIG. 5, the gas distribution device 1 is provided with a pressure detection port 11. The pressure detection port 11 is used for connecting with a pressure detection device. The pressure detection device may be used not only for detecting the pressure of gas flowing into the gas distribution pipes 1, but also for detecting the pressure of gas in the gas distribution pipe 1 before it is ejected through the gas nozzles 2. Since gas will experience pressure loss when entering the gas distribution device 100 (for example, the pressure loss occurring when the gas delivery pipe 3 supplies gas into the gas distribution pipes 1), the pressure and the flow rate of gas ejected from the gas nozzle 2 may be regulated by detecting the pressure of gas in the gas distribution pipe 1 before it enters into the gas nozzle 2. For example, the size of the diameter of the gas nozzles 2 or the magnitude of the gas pressure in the gas distribution pipes 1 is regulated.

[0037] The pressure detection port 11 may be provided at any position of the gas distribution pipes 1, it may be selected according to requirements and manufacturing processes. For example, it may be provided at both ends, at the middle portion, or in the vicinity of any of the gas nozzles 2 of the gas distribution pipes 1. The number of the pressure detection ports 11 may also be adaptively adjusted according to operation requirements or structures of the gas distribution device 100. For example, in the case that the interiors of the gas distribution pipes 1 communicate with each other, it may be possible to provide a pressure detection port 11 on only one of the gas distribution pipes 1. In the case that the interiors of the gas distribution pipes 1 are not communicated with each other, instead, they are independent from each other, it is also possible to provide a pressure detection port lion each of the gas distribution pipes 1, so that the gas pressure loss in each of the gas distribution pipes 1 is mon-

itored.

[0038] In an embodiment, a pressure detection device is provided detachably on the pressure detection port 11. A sealing cover 12 for sealing the pressure detection port 11 is detachably provided on the pressure detection port 11. When the pressure detection is not required to be performed, the sealing cover 12 is arranged on the pressure detection port 11, and when the pressure in the gas distribution pipes 1 is required to be detected, the sealing cover 12 is detached and the pressure detection device is installed, so that the pressure loss of the gas flowing into the gas distribution pipes 1 is detected.

[0039] Any sealing means in the existing technology may be employed as the sealing cover 12. For example, a sealing plug or a sealing cap may be employed as the sealing cover 12. Bolts and gaskets may also be used to seal the pressure detection port 11. The specific manner for sealing the pressure detection port 11 may be selected as desired, which is not limited to embodiments described herein, as long as a complete seal may be achieved when the pressure detection device is detached from the pressure detection port 11.

[0040] In order to improve the strength and gas tightness of the pressure detection port 11 provided on the gas distribution pipes 1, the pressure detection port 11 may be integrally formed and die-casted on the gas distribution pipes 1.

[0041] In an embodiment, as shown in FIG. 1 and FIG. 2, the gas delivery interface 4 is provided with a fixed mounting seat 41. A plurality of mounting holes 42 are circumferentially arranged at intervals on the fixed mounting seat 41, and each mounting hole 42 is adapted to a gas inlet valve (to be described later).

[0042] Because the number and arrangement manner of holes required for connecting and fixing various valves are different, a corresponding number of mounting holes 42 at corresponding positions may be selected from the fixed mounting holes 42 for connection according to requirements, to meet the connection and installation requirements of various models and types of valves.

[0043] In an embodiment, the valve may be any valve known in the existing technology. For example, the valve may be an electronic thermostatic valve (as shown in FIG. 6), a mechanical thermostatic valve (as shown in FIG. 7), or a water-gas linkage valve (as shown in FIG. 8).

[0044] As shown in FIG. 6, in the case of an electronic thermostatic valve interface 7, to realize a connection, four mounting holes 42 on the fixed mounting seat 41 are required. Assembly holes 71 are provided on the diagonal line of the electronic thermostatic valve interface 7, respectively, to connect with four mounting holes 42 at corresponding positions, so that the gas delivery interface 4 is connected with the electronic thermostatic valve.

[0045] As shown in FIG. 7, in the case of a mechanical thermostatic valve interface 8, to realize a connection, two mounting holes 42 on the fixed mounting seat 41 are required. Two assembly holes 81 are symmetrically provided on the mechanical thermostatic valve interface 8, to connect with two mounting holes 42 at corresponding positions, so that the gas delivery interface 4 is connected with the mechanical thermostatic valve.

[0046] As shown in FIG. 8, in the case of a water-gas linkage valve interface 9, to realize a connection, two mounting holes 42 on the fixed mounting seat 41 are required. Two assembly holes 91 are symmetrically provided on the mechanical thermostatic valve interface 9, to connect with two mounting holes 42 at corresponding positions, so that the gas delivery interface 4 is connected with the water-gas linkage valve.

[0047] In an embodiment, as shown in FIG. 9, the mounting holes 42 may include at least one set of first mounting holes 4201, which are symmetrically arranged on the fixed mounting seat 41 along a direction of a first diameter 43 of the gas delivery interface 4, and at least one set of second mounting holes 4202, which are symmetrically arranged along a direction of a second diameter 44 of the gas delivery interface 4. The first diameter 43 is perpendicular to the second diameter 44. The arrangement manner of the first mounting holes 4201 and the second mounting holes 4202 on the fixed mounting seat 41 in the present embodiment may at least meet the mounting requirements of a valve requiring two or four mounting holes. For example, it is an electronic thermostatic valve, a mechanical thermostatic valve, or a water-gas linkage valve.

[0048] In an alternative embodiment, as shown in FIG. 10, the mounting holes 42 include at least one set of first mounting holes 4201 symmetrically arranged along a direction of the first diameter 43 of the gas delivery interface 4, at least one second set of mounting holes 4202 symmetrically arranged along a direction of the second diameter 44 of the gas delivery interface 4, and at least one set of third mounting holes 4203 symmetrically arranged along a direction of the third diameter 45 of the gas delivery interface 4. The first diameter 43 is perpendicular to the second diameter 44. Preferably, the third diameter 45 is located between the first diameter 43 and the second diameter 44. The arrangement manner of the first mounting holes 4201, the second mounting holes 4202, and the third mounting hole 4203 on the fixed mounting seat 41 in the present embodiment may at least meet the mounting requirements of a valve requiring six or less mounting holes. For example, it is an electronic thermostatic valve, a mechanical thermostatic valve, or a water-gas linkage valve.

[0049] It should be noted that the arrangement manner and number of the mounting holes 42 may be adaptively adjusted depending on various shapes and sizes of the fixed mounting seat 41, and is not limited to the number and arrangement manner of the mounting holes 42 described in above embodiments. With respect to the arrangement manner and number of mounting holes 42, the types of valve to be connected should also be considered.

[0050] In an embodiment, as shown in FIG. 1, to facilitate connection of the gas delivery interface 4 with a

valve without interfering with the gas distribution pipe 1, a hole spacing between two mounting holes symmetrically disposed, such as the hole spacing between the first mounting holes 4201, between the second mounting holes 4202, or between the two third mounting holes 4203 is at least greater than an outer diameter of the gas distribution pipes 1.

[0051] In an embodiment, the fixed mounting seat 41 may be die-cast integrally with the gas delivery interface 4, to simplify the process and ensure strength and gas tightness of the gas delivery interface 4.

[0052] To adapt to different valves, part of or all of the mounting holes 42 may be set as threaded holes, to facilitate a firm connection with the valve.

[0053] Another embodiment of the present invention provides a combustor including the gas distribution device 100 according to any of the embodiments described above.

[0054] Another embodiment of the present invention provides a water heater including the above-described combustor.

[0055] Another embodiment of the present invention provides a wall-mounted furnace including the above-described combustor.

[0056] In the description of the present invention, it is to be understood that the orientations or position relationships indicated by terms "center", "longitudinal", "transverse", "length", "width", "thickness", "upper", "lower", "front", "rear", "left", "right", "vertical", "horizontal", "top", "bottom", "inner", "outer", "clockwise", "counterclockwise", "axial", "radial", "circumferential" and the like are based on the orientations or position relationships shown in the drawings for ease of description and simplicity of description only, and are not intended to indicate or imply that the device or assembly referred to must have a particular orientation, or be constructed and operated in a particular orientation. It is therefore not to be construed as limiting the present invention.

[0057] Furthermore, the terms "first" and "second" are used for descriptive purposes only and are not to be construed as indicating or implying relative importance or implicitly indicating the number of technical features indicated. Therefore, features defined with "first" and "second" may explicitly or implicitly include one or more such features. In the description of the present invention, "a plurality of" means two or more, unless specifically defined otherwise.

[0058] In the present invention, the terms "mounted", "coupled", "connected", "fixed", and the like are to be construed broadly, for example, as fixed or detachable connections, or as a single unit, unless expressly stated and defined otherwise. It can be a mechanical connection, an electrical connection, or a communication; it may be a direct connection or an indirect connection through an intermediary, or two components may be interconnected inside or in an interactive relationship with each other. The specific meaning of the terms in the present invention will be understood by those of ordinary skill in the art, as the case may be.

[0059] In this application, unless expressly stated and defined otherwise, reference to a first feature as being "above" or "below" a second feature may include reference to the first and second features being in direct contact, and reference to the first and second features not being in direct contact but being in contact by additional features therebetween. Furthermore, the first feature being "above", "over" and "on" the second feature includes the first feature being directly above and obliquely above the second feature, or merely indicates that the first feature has a higher horizontal height than the second feature. The first feature being "below", "underneath" and "under" the second feature includes the first feature being directly above and obliquely above the second feature, or merely indicates that the first feature has a lower horizontal height than the second feature.

[0060] The following disclosure provides many different embodiments or examples for implementing different structures of the present invention. To simplify the disclosure of the present invention, components and arrangements of specific examples are described below. They are, of course, merely exemplary and are not intended to limit the present invention. In addition, the present invention may have repeated reference numerals and/or reference letters in various examples for purposes of simplicity and clarity, which does not inherently indicate a relationship between the various implementations and/or arrangements discussed. In addition, examples of various specific processes and materials are provided herein, but one of ordinary skill in the art may recognize the application of other processes and/or the use of other materials.

[0061] The above are only the preferred implementations of the present invention. It should be noted that the above preferred implementations should not be regarded as limiting the present invention, and the protection scope of the present invention should be subject to the scope defined by the claims. For those of ordinary skill in the art, without departing from the spirit and scope of the present invention, several improvements and modifications can be made, and these improvements and modifications should also be regarded as the protection scope of the present invention.

Claims

1. A gas distribution device , **characterized by** comprising: a plurality of gas distribution pipes arranged in parallel and at an interval, each of the gas distribution pipes being provided with a plurality of gas nozzles; and at least one gas delivery pipes communicated with each of the gas distribution pipe, each of the gas distribution pipe being connected into an integral structure; the gas delivery pipe being used for supplying gas into each of the gas distribution pipe; the gas delivery pipe being provided with a gas

delivery interface , and the gas delivery interface being configured to connect a gas inlet valve.

2. The gas distribution device according to claim 1, **characterized in that** the gas distribution device further comprises a connector provided on two sides of each of the gas delivery pipe, the connector is configured to connect an end portion of each of the gas distribution pipe at a corresponding position into an integral structure.

3. The gas distribution device according to claim 2, **characterized in that** a mounting platform is provided on the connectors, the mounting platform (51) is configured to connect and to fix a required device.

4. The gas distribution device according to claim 1, **characterized in that** the gas delivery pipe is arranged perpendicular to each of the gas distribution pipe.

5. The gas distribution device according to claim 4, **characterized in that** the gas delivery pipe runs through a middle portion of each of the gas distribution pipes.

6. The gas distribution device according to claim 1, **characterized in that** a blocking member is provided at an end portion of each of the gas distribution pipe.

7. The gas distribution device according to claim 1, **characterized in that** the gas distribution pipe is integrally formed with the gas delivery pipes through a die casting process.

8. The gas distribution device according to any of claims 1 to 7, **characterized in that** the gas distribution pipe is provided with a pressure detection port, the pressure detection port is configured to connect a pressure detection device, in order to detect a pressure of gas flowing into the gas distribution pipe.

9. The gas distribution device according to claim 8, **characterized in that** the pressure detection device is detachably connected to the pressure detection port, and the pressure detection port is detachably provided with a sealing cover; the sealing cover is used for sealing the pressure detection port when the pressure detection device is detached from the pressure detection port.

10. The gas distribution according to claim 9, **characterized in that** the pressure detection port is integrally arranged on the gas distribution pipes.

11. The gas distribution device according to any of claims 1 to 7, **characterized in that** the gas delivery interface is provided with a fixed mounting seat, a plurality of mounting holes are circumferentially arranged at an interval on the fixed mounting seat, and the mounting hole is adapted to the gas inlet valve.

12. The gas distribution device according to claim 11, **characterized in that** on the fixed mounting seat, at least one set of first mounting holes are symmetrically arranged along a direction of a first diameter of the gas delivery interface, at least one set of second mounting holes are symmetrically arranged along a direction of a second diameter of the gas delivery interface, and the first diameter is perpendicular to the second diameter.

13. The gas distribution device according to claim 12, **characterized in that** on the fixed mounting seat, at least one set of third mounting holes are symmetrically arranged along a direction of a third diameter of the gas delivery interface, the third diameter being provided between the first diameter and the second diameter.

14. The gas distribution device according to claim 13, **characterized in that** a hole spacing between a set of the symmetrically-arranged first mounting holes, a hole spacing between a set of the symmetrically-arranged second mounting holes, and a hole spacing between a set of symmetrically-arranged third mounting holes are greater than an outer diameter of the gas distribution pipes.

15. The gas distribution device according to claim 11, **characterized in that** the fixed mounting seat is integrally arranged with the gas delivery interface.

16. A combustor, **characterized by** comprising a gas distribution device according to any one of claims 1 to 15.

17. A water heater, **characterized by** comprising a combustor according to claim 16.

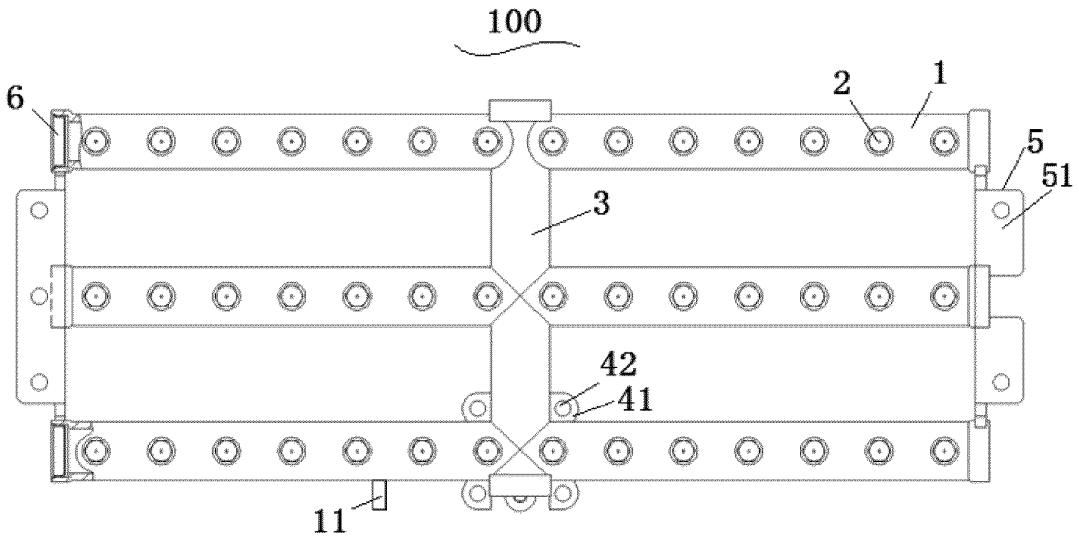

FIG. 1

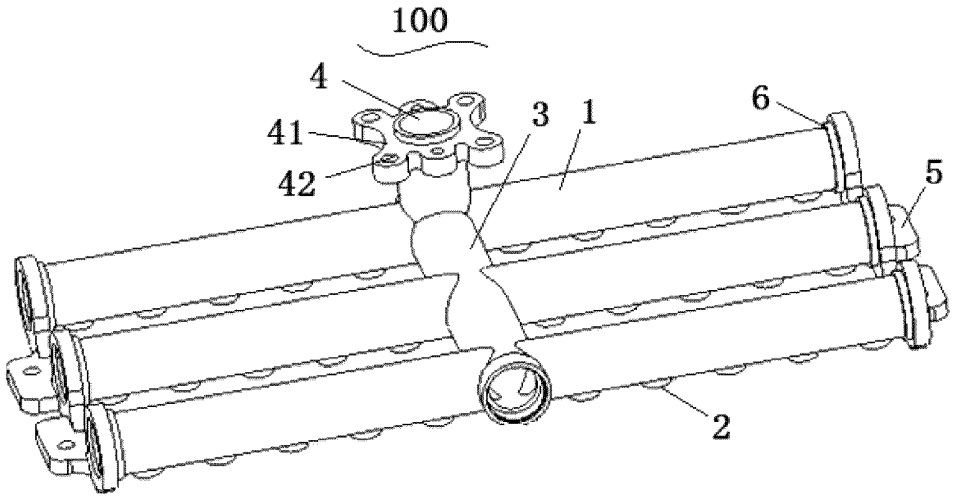

FIG. 2

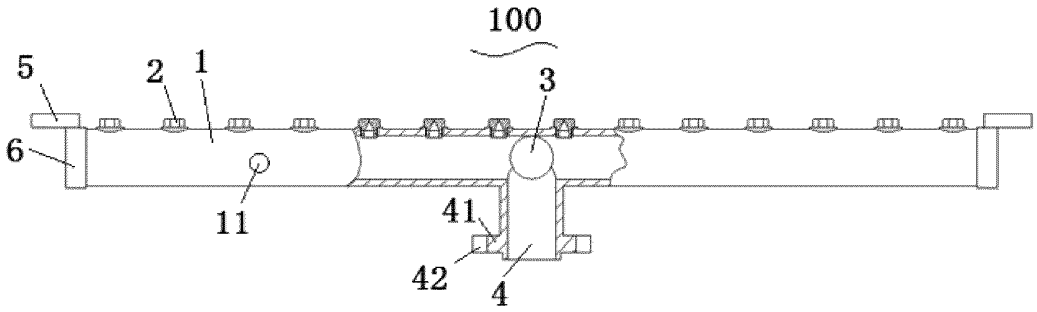

FIG. 3

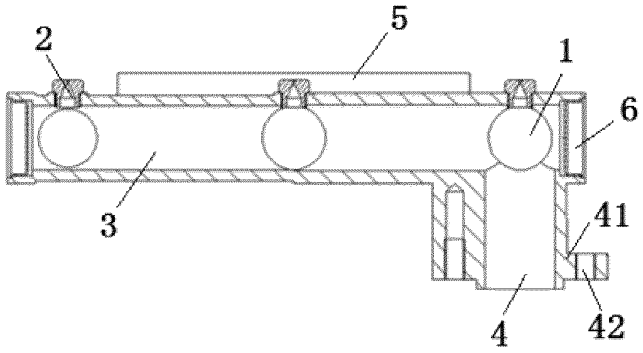

FIG. 4

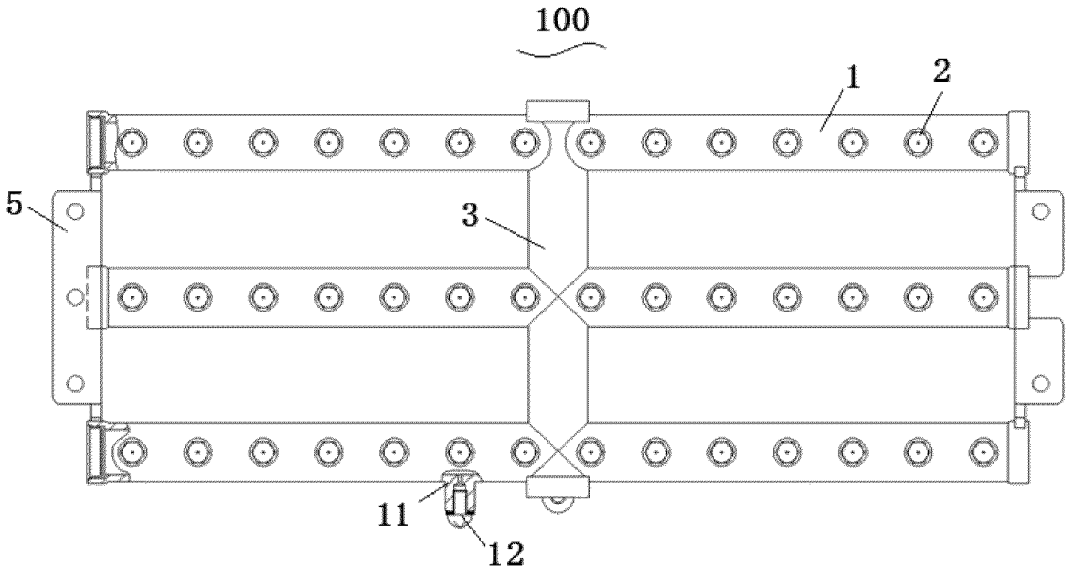

FIG. 5

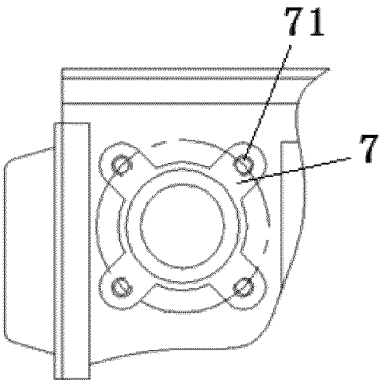

FIG. 6

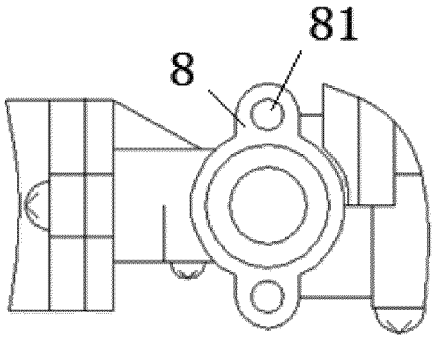

FIG. 7

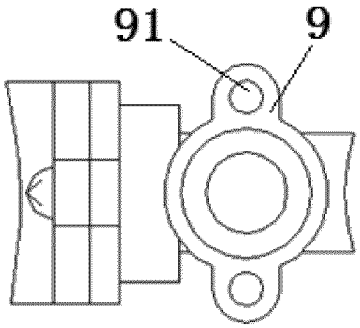

FIG. 8

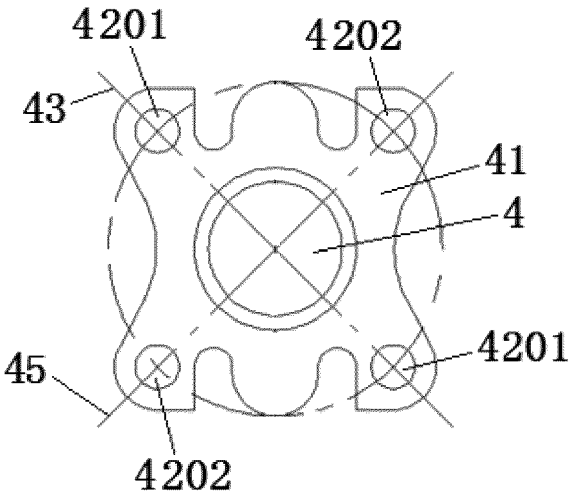

FIG. 9

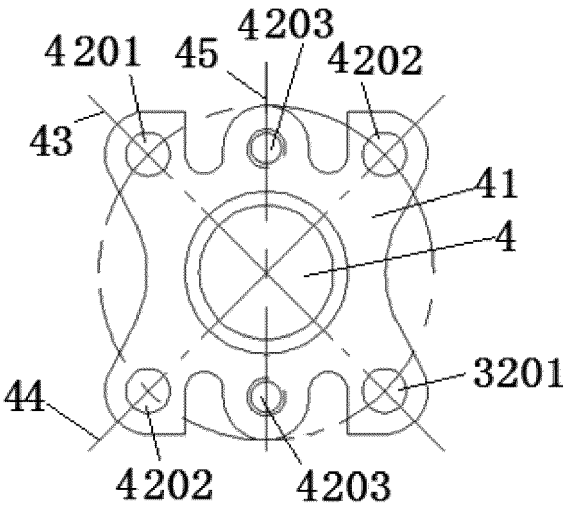

FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/087079

A. CLASSIFICATION OF SUBJECT MATTER

F23D 14/84(2006.01)i; F23D 14/58(2006.01)i; F23N 1/00(2006.01)i; F24H 9/18(2006.01)i

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)

F23D; F24H; F23N

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

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

VEN; CNABS; CNTXT; DWPI; CNKI: 分气, 燃烧器, 管, 输气, 喷嘴, 平行, 安装, 固定, 热水器, combustor, water, heater, burner, pipe, tube, distribut+, nozzle, gas, supply, fix+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 208186352 U (WUHU MEDIA KITCHEN & BATH APPLIANCES MFG CO., LTD. ET AL.) 04 December 2018 (2018-12-04) claims 1-10, description, paragraphs [0004]-[0050], and figures 1-3	1-17
PX	CN 208312386 U (WUHU MEDIA KITCHEN & BATH APPLIANCES MFG CO., LTD. ET AL.) 01 January 2019 (2019-01-01) claims 1-9, description, paragarphs [0004]-[0059], and figures 1-7	1-17
PX	CN 208186412 U (WUHU MEDIA KITCHEN & BATH APPLIANCES MFG CO., LTD. ET AL.) 04 December 2018 (2018-12-04) claims 1-10, description, paragarphs [0004]-[0063], and figures 1-7	1-17
X	CN 206803164 U (GUANGDONG LINGYI ELECTRIC TECHNOLOGY CO., LTD.) 26 December 2017 (2017-12-26) description, paragraphs [0006]-[0028], and figures 1 and 2	1-17
A	CN 206846783 U (WUHU MEDIA KITCHEN & BATH APPLIANCES MFG CO., LTD.) 05 January 2018 (2018-01-05) entire document	1-17
A	CN 206582894 U (HUANG, WANPING) 24 October 2017 (2017-10-24) entire document	1-17

☑ 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
17 July 2019	**01 August 2019**

Name and mailing address of the ISA/CN	Authorized officer
National Intellectual Property Administration, PRC (ISA/CN) **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China**	
Facsimile No. **(86-10)62019451**	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/087079

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP H1190623 A (SHOWA ALUMINUM CORP) 06 April 1999 (1999-04-06) entire document	1-17

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2019/087079

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 208186352 U	04 December 2018	None	
CN 208312386 U	01 January 2019	None	
CN 208186412 U	04 December 2018	None	
CN 206803164 U	26 December 2017	None	
CN 206846783 U	05 January 2018	CN 108870435 A	23 November 2018
CN 206582894 U	24 October 2017	None	
JP H1190623 A	06 April 1999	None	

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 201820719372 **[0001]**
- CN 201820719386 **[0001]**
- CN 201820720557 **[0001]**